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John GRIVAS

PSYCHOLOGY

VCE UNITS 1 AND 2

NINTH EDITION

jacaranda
A Wiley Brand

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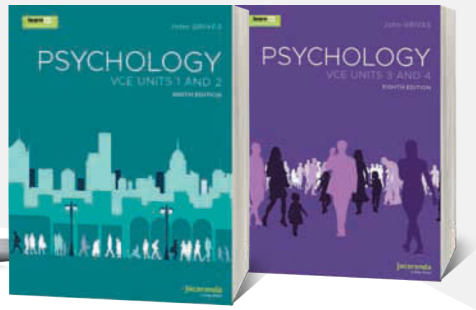
Contents

About this resource

Everything you need for your students to succeed



PSYCHOLOGY

VCE UNITS 1 AND 2 | NINTH EDITION

Developed by expert Victorian teachers for VCE students

Tried, tested and trusted. The NEW Jacaranda VCE Psychology series continues to deliver curriculum-aligned material that caters to students of all abilities.

Completely aligned to the VCE Psychology Study Design

Our expert author team ensures 100 per cent coverage of the new VCE Psychology Study Design (2023–2027).

Everything you need for your students to succeed, including:

- **NEW!** Access targeted question sets including all relevant past VCAA exam questions since 2013. Ensure assessment preparedness with practice SACs for Areas of Study.
- **NEW!** Additional information and case studies available in learnON for extension and further study.
- **NEW!** Teacher-led videos unpack concepts and explain VCAA exam questions.

Learn online with Australia's most

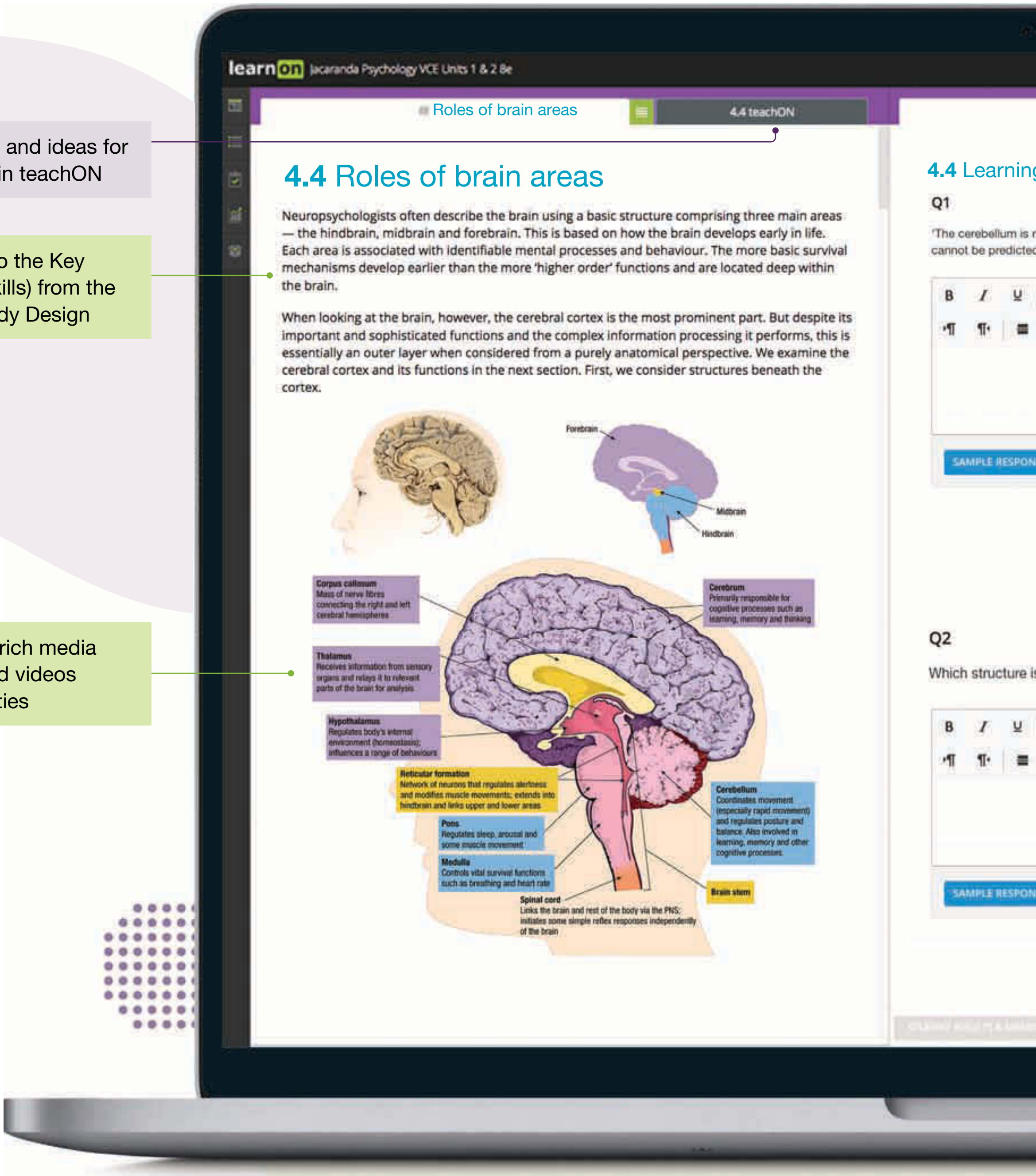
Everything you need for each of your lessons in one simple view

- **Trusted, curriculum-aligned theory**
- **Engaging, rich multimedia**
- **All the teacher support resources you need**
- **Deep insights into progress**
- **Immediate feedback for students**
- **Create custom assignments in just a few clicks.**

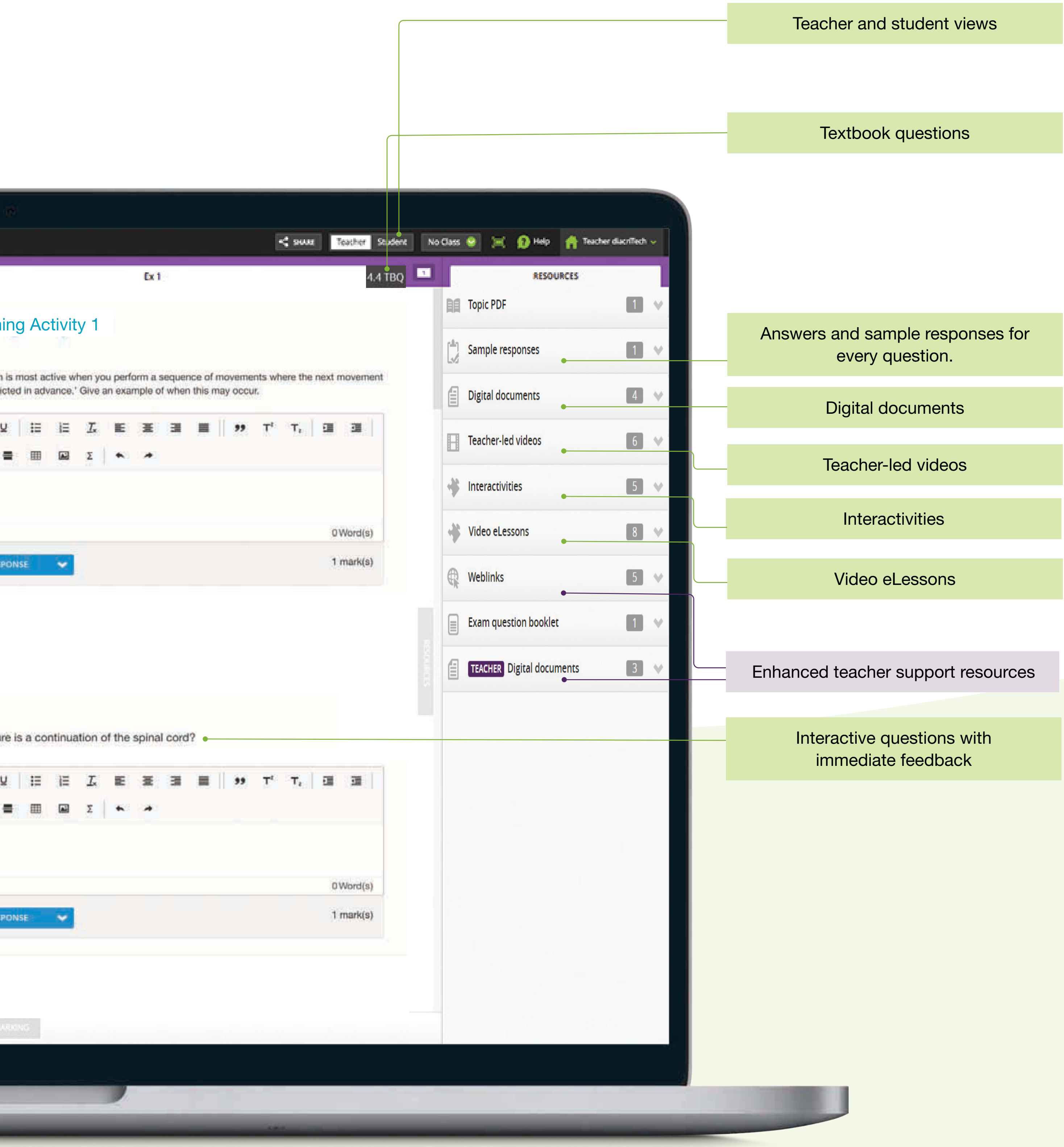
Practical teaching advice and ideas for each lesson provided in teachON

Each lesson linked to the Key Knowledge (and Key Skills) from the VCE Psychology Study Design

Reading content and rich media including embedded videos and interactivities



powerful learning tool, learnON

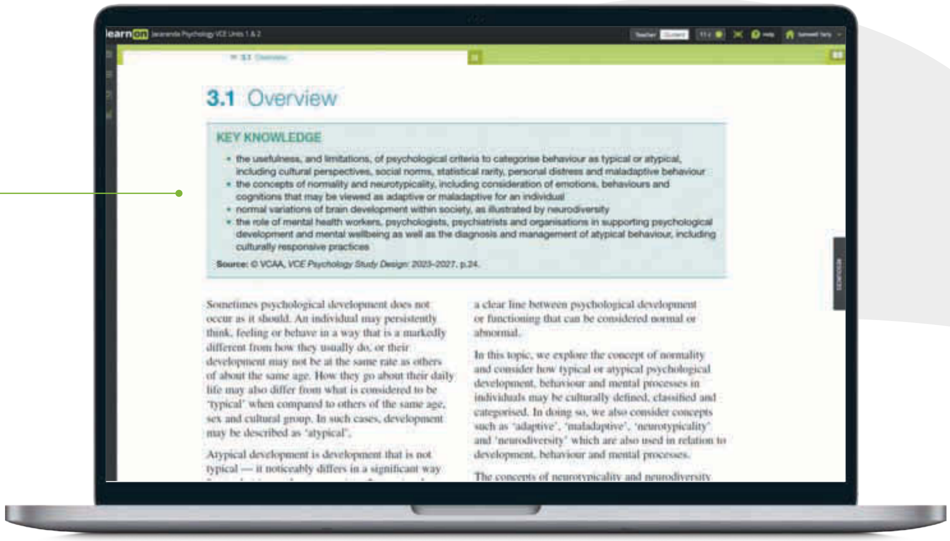


Get the most from your online resources

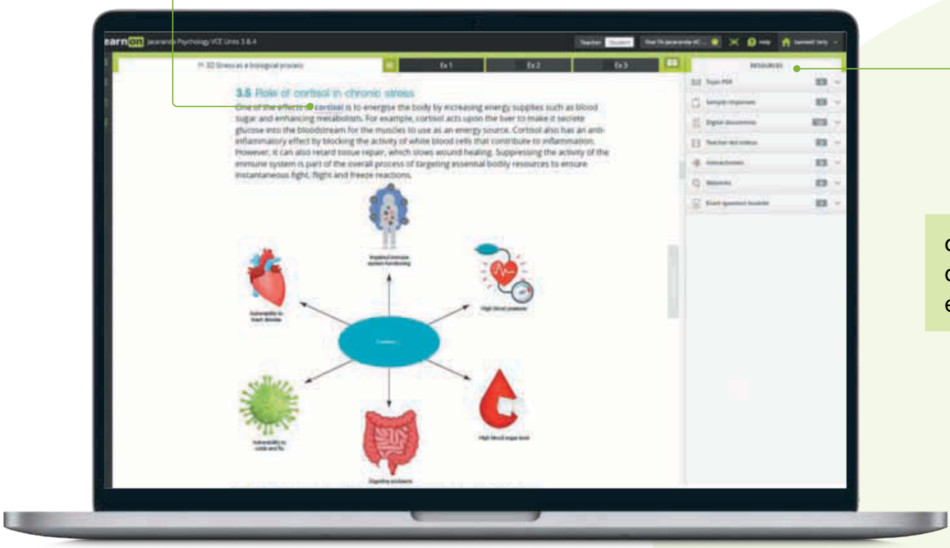
Online, these new editions are the complete package

Trusted Jacaranda theory, plus tools to support teaching and make learning more engaging, personalised and visible.

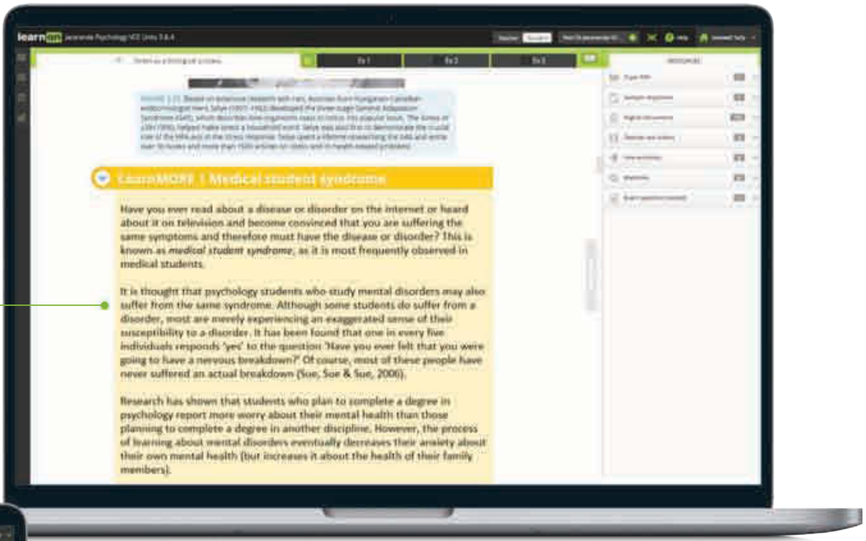
Each topic is linked to Key Knowledge and Key Skills from the VCE Psychology Study Design.



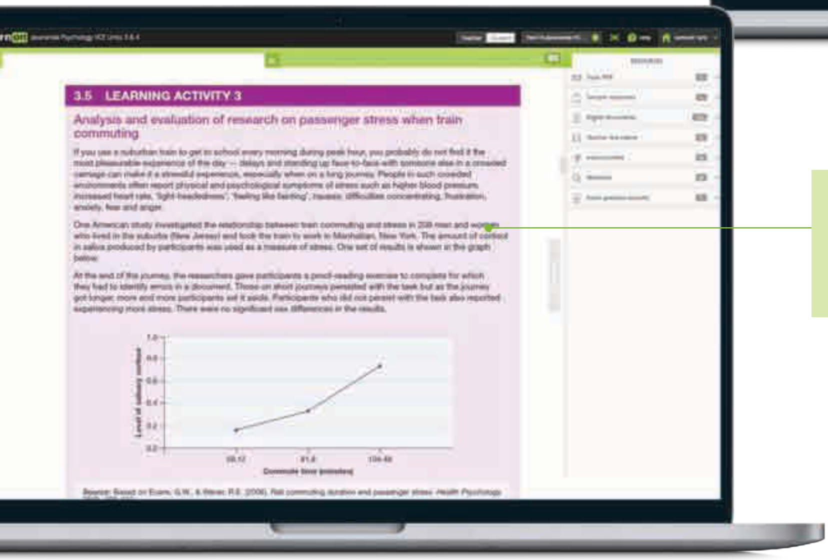
Interactive glossary terms help develop and support literacy.



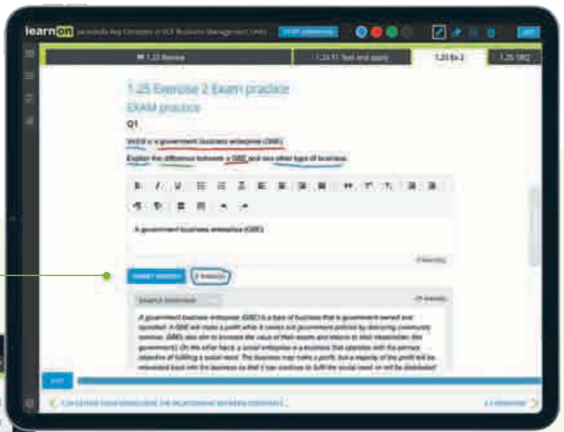
onResources link to targeted digital resources including video eLessons and weblinks.



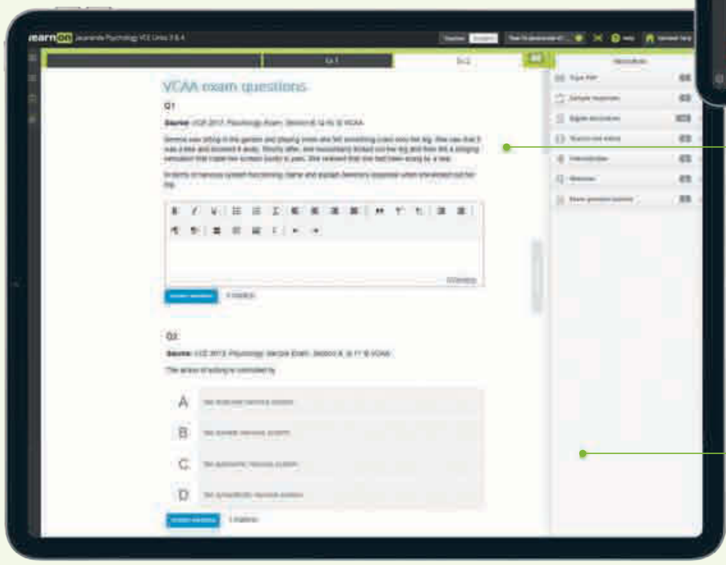
learnMORE — additional information and case studies available for extension and further study.



A variety of question sets; Review, Multiple-choice, Analysis and evaluation, and VCAA exam questions encourage students to practise and apply the skills and concepts they are studying.



Teacher-led videos that explain how to approach exam questions, including VCAA exam questions

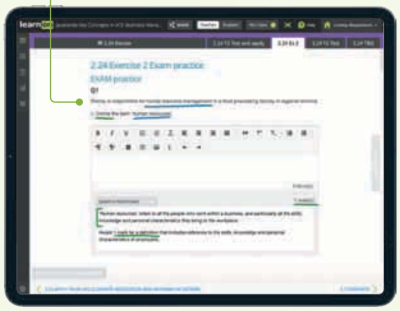


- Online and offline question sets contain practice questions, exam-style questions and past VCAA exam questions with exemplary responses and marking guides.
- Every question has immediate feedback to help students to overcome misconceptions as they occur and to study independently — in class and at home.

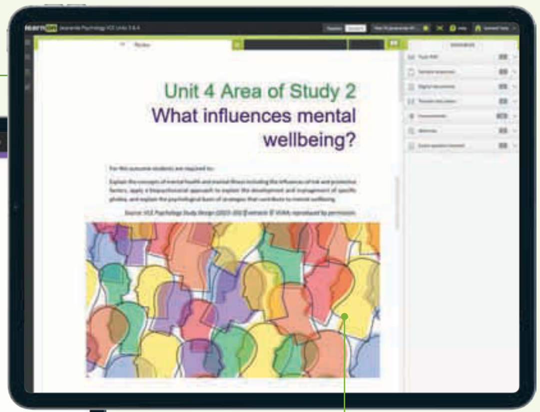
Topic reviews

Topic reviews include online summaries and topic level review exercises, including exam questions that cover multiple concepts.

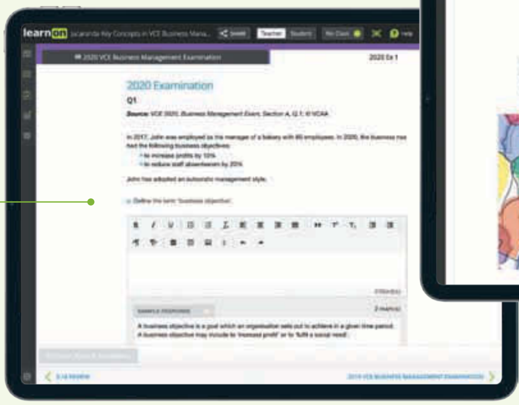
End-of-topic exam questions include relevant past VCE exam questions and are supported by teacher-led videos.



Get exam-ready!



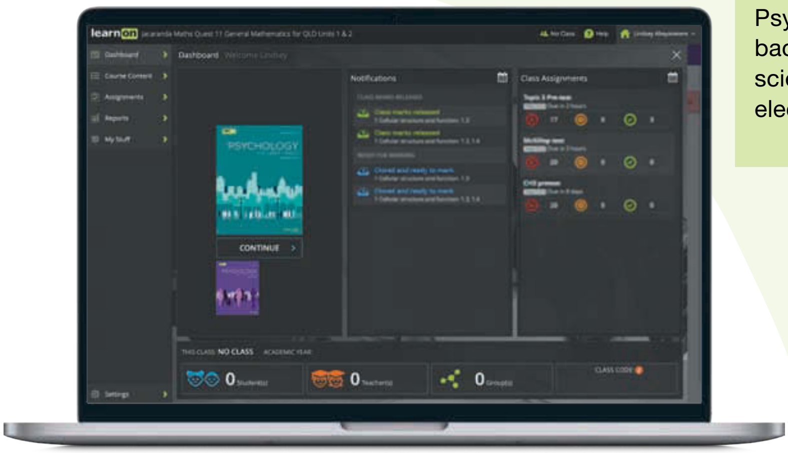
Students can start preparing from lesson one, with exam questions embedded in every lesson — with relevant past VCAA exam questions since 2013.

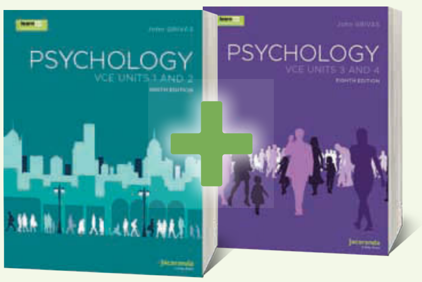


Practice, customisable SACs available to build student competence and confidence.

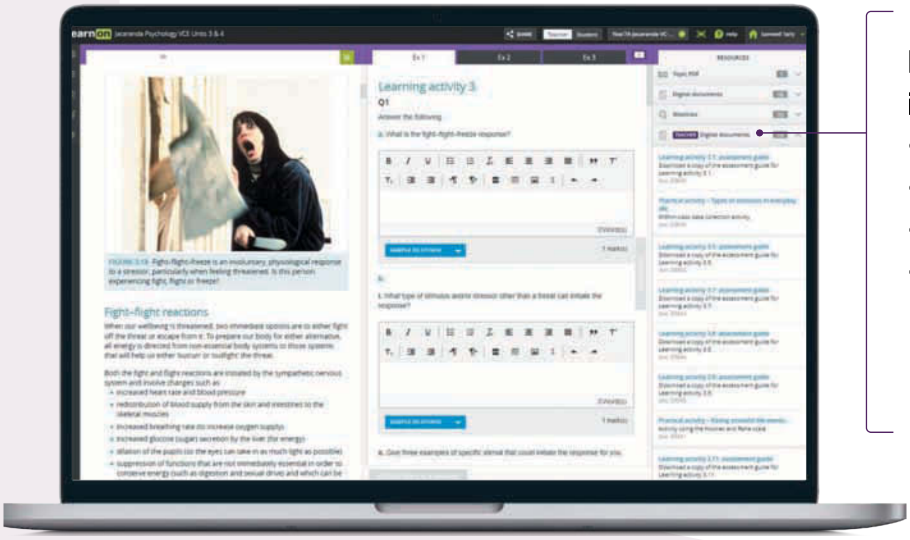
Combine units flexibly with the Jacaranda Supercourse

Build the course you've always wanted with the Jacaranda Supercourse. You can combine all Psychology Units 1 to 4, so students can move backwards and forwards freely. Or combine junior science with Psychology Units 1 & 2 for custom elective courses. The possibilities are endless!





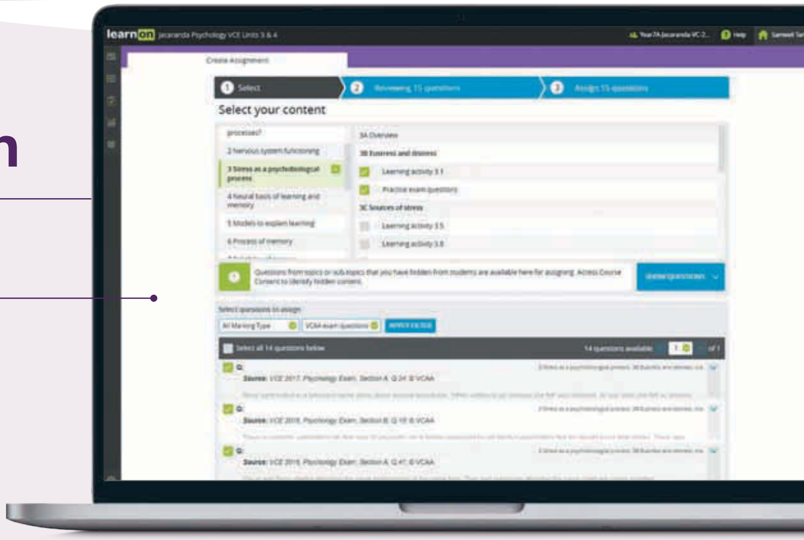
A wealth of teacher resources



Enhanced teacher support resources, including:

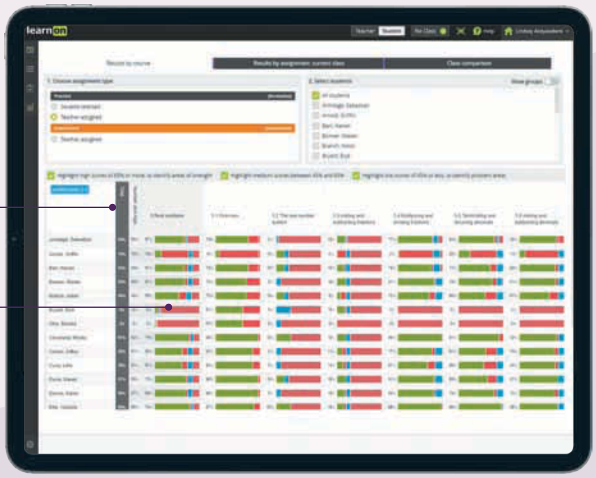
- work programs and curriculum grids
- teaching advice and additional activities
- quarantined topic tests (with solutions)
- quarantined SACs (with worked solutions and marking rubrics).

Customise and assign



A testmaker enables you to create custom tests from the complete bank of thousands of questions (including past VCAA exam questions).

Reports and results



Data analytics and instant reports provide data-driven insights into performance across the entire course.

Show students (and their parents or carers) their own assessment data in fine detail. You can filter their results to identify areas of strength and weakness.

Acknowledgements

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Exam terminology

The following terms are often used in the VCE Psychology exam. Refer back to this list when answering the topic questions to ensure you understand what each question is asking you to do.

Key term	What does it mean?
Analyse	Examine the components of; Look for links, patterns, relationships and anomalies
Compare	Show similarities and/or differences
Contrast	Show differences
Define	Give the precise meaning of
Describe	Provide a general description
Discuss	Give an overall account of
Draw conclusions	Make reasoned decisions or judgement
Evaluate	Make a judgement, weigh up the pros and cons
Explain	Make clear and understandable (may require reasons)
How	The way in which something happens
Identify	List, state
Illustrate	Use examples to show understanding
Justify	Give reasons and/or evidence to support a point of view
List	Make brief points
Outline	Give an overview, a brief summary
Suggest	State ideas
To what extent	Describe the degree or level to which a statement, opinion or contention is correct or valid
What	Provide information about something
Why	Give the reason for something
With reference to	Indicate what something relates to

1 Key science skills and research methods in psychology

TOPIC CONTENT

1.1 Overview

KEY SCIENCE SKILLS

- Develop aims and questions, formulate hypotheses and make predictions
- Plan and conduct investigations
- Comply with safety and ethical guidelines
- Generate, collate and record data
- Analyse and evaluate data and investigation methods
- Construct evidence-based arguments and draw conclusions
- Analyse, evaluate and communicate scientific ideas

Source: © *VCAA, VCE Psychology Study Design: 2023–2027*. pp.12–13.

Psychology is a scientific discipline that seeks to describe, explain, understand and predict human behaviour and mental processes. It explores individuals and groups to better understand how people, communities and societies think, act and feel. It applies biological, psychological and social perspectives to the systematic study of behaviour.

The development of key science skills is a core component of the study of VCE Psychology and applies across Units 1 to 4 in all areas of study.

In this topic, we examine the key science skills and research methodology prescribed for VCE Psychology.

1.1.1 Defining psychology and its subject matter

How do psychologists conduct research on topics of interest? What ethical principles do they have to follow?

Why are we alike yet so different from one another? What role do genetics and our everyday experiences play? What is the connection between our brain and behaviour? What is brain plasticity? Which parts of our brains do what? Does concussion lead to fatal brain disease? Is autism a brain development disorder? Why do young children view the world in a self-centred way? How do we make sense of what we see or taste? Are some people 'supertasters'? Why do individuals experience the world differently? What is normal behaviour? What is abnormal behaviour? Is ADHD a mental health disorder? What factors influence how other people perceive us? When are we more likely to obey someone? How can the presence of others influence our behaviour?

Questions such as these will form the basis of your study of psychology this year. You will also have the opportunity to ask your own questions and plan investigations to seek answers.

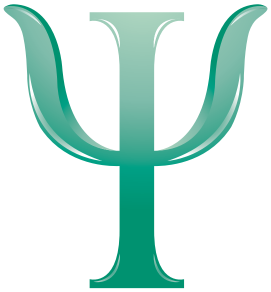

Figure 1.1 This symbol is used globally to represent the discipline of psychology. It is based on the Greek letter psi.

The term psychology originates from two Greek words — *psyche*, meaning mind, and *logos*, which loosely translated means study or knowledge. Psychology was therefore originally defined as the study of the mind. Over time, this definition has broadened to include behaviour.

Psychology is now commonly defined as the scientific study of human behaviour and mental processes. This is consistent with the definition used in the VCE Psychology Study Design. But what do the terms behaviour and mental processes mean?

Generally, the term **behaviour** refers to any type of action made by a living person (or animal) that can be observed or measured. Behaviour is what organisms *do* — their actions and reactions in response to internal or external stimuli. It includes activities such as walking, talking, texting, socialising, reading this definition, and so on. It also includes the firing of neurons in certain areas of the brain in response to light or to initiate movement, and to the secretion of stress hormones when anxious. All these involve activity that can be seen, recorded or measured in some way as they occur, unlike mental processes that cannot be seen as they take place.

The term **mental processes** refers to any process that takes place in the mind. What you think about, feeling sad, happy or in love, your attitudes, your choice of words in a conversation, how you interpret incoming sensory information, your self-awareness, what motivates you to study or party, imagining, learning, remembering, are all examples of mental processes. They are private, internal experiences that occur in our minds and cannot be seen by anyone in the way that we can see actions such as smiling, hugging and bike riding. Mental processes, however, underlie most of our observable behaviours.

Because mental processes cannot be directly observed, psychologists draw conclusions about them on the basis of observable or measurable behaviour, or by asking people about their thoughts or how they are feeling. They are therefore said to be *indirectly* observed. For example, rapid eye movements observed in a sleeping person indicate that they are likely to be dreaming. Similarly, a person who is observed chanting anti-racist statements at a demonstration may be reasonably assumed to have a negative attitude towards racism. And a person being observed in a problem-solving experiment may be asked to describe their thinking at different stages of the problem-solving process.

Some psychologists describe behaviour more broadly to include mental processes and everything else done by an organism, both consciously and non-consciously. Some also prefer to distinguish between observable activities (called **overt behaviour**) and activities hidden from view and therefore not directly observable (called **covert behaviour**).

Although most psychologists distinguish between behaviour and mental processes, and often investigate them separately, in reality, behaviour and mental processes are closely interrelated and influence each other continuously. For example, *feeling* angry about the way someone has treated you may affect what you *think* about the person and the way you *behave* towards them when you next meet them. Similarly, *thinking* you have not adequately prepared for an exam may cause you to *feel* anxious which may result in *behaviour* such as a faster heart rate, pacing the corridor and talking quickly.

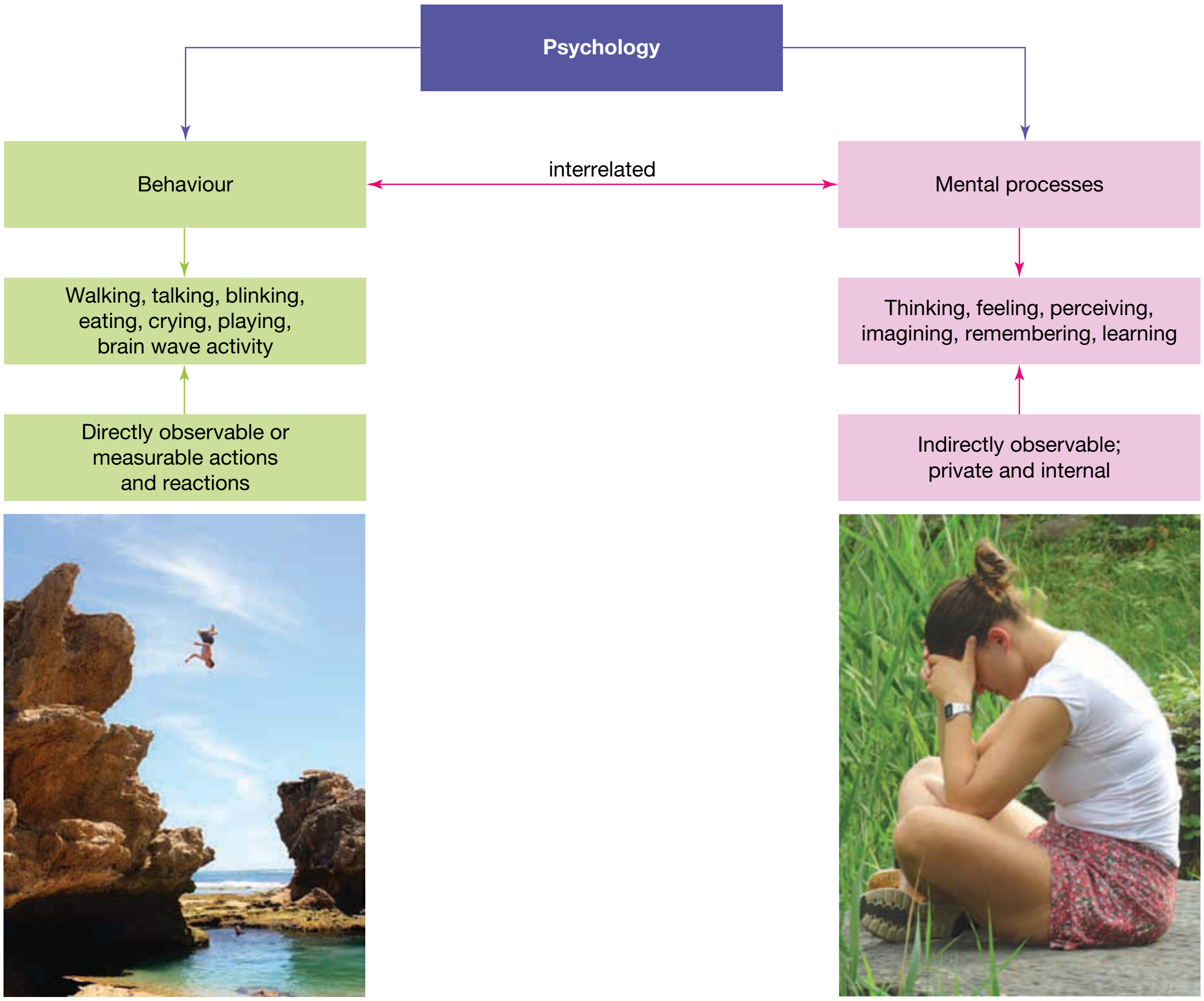

Figure 1.2 Behaviour and mental processes are different but interrelated.

People are the main subject matter of psychology. However, animals may also be used in psychological research. This is mainly done when suitable people are not available for an investigation of research interest or when human research participants cannot be used because of the risk of psychological or physical harm.

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1.1 LEARNING ACTIVITY 1

Review

1. a. Consider each activity listed in the left-hand column in the table. For each activity, tick (✓) the appropriate column to indicate whether you think it is a behaviour or a mental process.

Activity	Behaviour	Mental process
a. whistling aloud		
b. deciding whether to shoot for a goal or pass to a team mate		
c. starting to feel excited about going to a party		
d. looking at yourself in a mirror		
e. breathing		
f. singing a song 'in your head'		
g. experiencing a nosebleed		
h. worrying about giving a speech		
i. planning an excuse to get out of a date		
j. watching a movie alone at home		
k. posting a photo on Instagram		
l. adding numbers		
m. experiencing 'butterflies in the stomach'		
n. scratching an itch		
o. looking at the time on your watch		

   b. Which of the activities in the table were the most difficult to classify as either a behaviour or a mental process? Explain why.

2. Explain the relationship between behaviour and mental processes with reference to one of the activities in the table.

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1.1.2 Scientific nature of psychology

Psychologists undertake investigations about behaviour and mental processes in a scientific way. Scientific research involves using an appropriate research method to collect data relating to a question or problem of interest, then summarising the data and drawing justifiable conclusions about it. Importantly, the research is based on scientific assumptions, attitudes and procedures, and is planned, conducted and reported in accordance with scientific standards. This overall approach is commonly referred to as the *scientific method*.

The scientific method typically occurs in the series of steps shown in Figure 1.3. Note the steps are consistent with the sequence of key science skills prescribed in the VCE Psychology Study Design.

Thoughtfully planned investigations using scientific method are the main way by which psychological knowledge is advanced. Even though some psychologists do not conduct investigations, all psychologists have been extensively trained in the scientific method.

Figure 1.3 Steps in the scientific method that are commonly followed when conducting psychological research. There are variations of the steps, but all are based on scientific attitudes and practices. Note the steps are consistent with the sequence of key science skills prescribed in the VCE Psychology Study Design.

In Units 1 and 2 you will undertake a range of scientific investigations to develop key science skills. There will be opportunities to develop, use and demonstrate these skills in a variety of situations, including when conducting your own investigations and when evaluating the research of others.

All key science skills are evident in the research methods commonly used for psychological investigations. A **research method** is a particular way of conducting an investigation to collect accurate and reliable data on a specific question or problem of interest. For example, experiments, correlational studies and observational studies are different research methods. Collectively, research methods provide the means or 'tools' for observing, measuring, manipulating or controlling what takes place in a psychological investigation.

Each type of research method has its advantages and limitations. Some are more suited to particular research hypotheses and data collection than others.

The choice of research method depends on which is most appropriate for the hypothesis being tested and the type of data to be collected. This is not unlike the choice made by a motor mechanic when selecting tools to repair a car engine. Their selection will depend on the specific engine problem in need of repair and the work that needs to be done to fix it. Each tool will have a specific use and way of being used. Similarly, each research method has a particular logic underlying its use and how it is used.

If, for example, a psychologist wanted to find out whether it is true that 'you can't judge a book by its cover', or, more specifically, whether or not you can judge someone's personality from their physical appearance, they would conduct scientific research and collect relevant data in order to test the accuracy of this adage (or 'saying').

They might call for volunteer males and females to be participants in their research and ask one half to be photographed, then the other half to look at the photos and describe the personality of each person in a photo. The psychologist may then give a personality test to each person who was photographed to generate personality profiles which could then be compared with the descriptions provided by the research participants.

If the descriptions closely matched the profiles and stood up to statistical tests for checking the results, then the psychologist may conclude that the adage is incorrect based on the results obtained from their research. Alternatively, if the descriptions differed considerably from the profiles, the psychologist may conclude that the adage is correct based on the results obtained. Thus, the use of scientific method helps ensure that the data collected are accurate and reliable and that the conclusions drawn from the data are justifiable and can be trusted.

Most of what psychologists know about behaviour and mental processes is based on empirical evidence. **Empirical evidence** is data collected through systematic observations and/or carefully controlled experiments. This type of evidence allows psychologists to draw accurate conclusions which are more likely to be valid and free from personal biases, as compared to our 'common sense' conclusions based on everyday observations of behaviour.

Because psychological research involves the collection of empirical evidence using scientific attitudes and practices, as shown in Figure 1.4, it is often called *empirical research*.

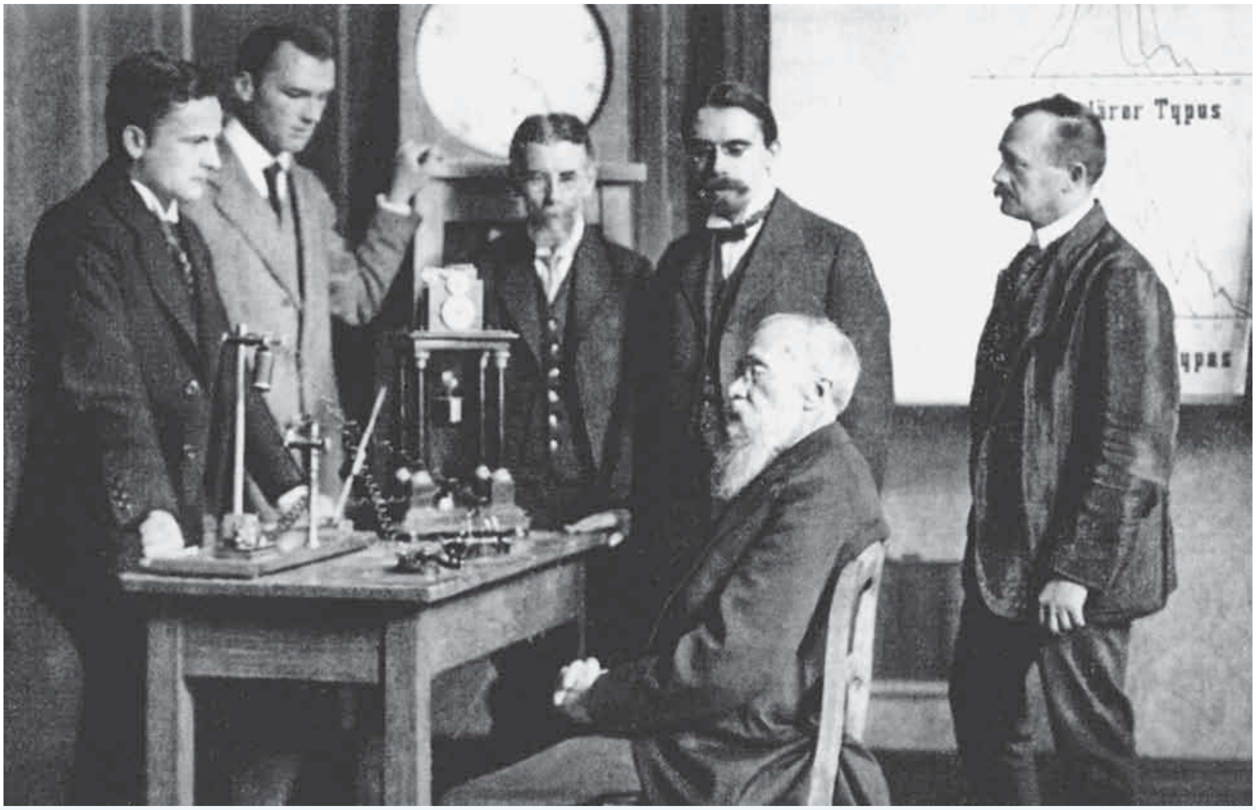

Figure 1.4 The year 1879 marks the beginning of psychology as a science. This is when Wilhelm Wundt established the first psychology research laboratory at the University of Leipzig in Germany. Wundt (seated) is widely regarded as the 'father of psychology'. He is shown with some of his students and an apparatus used for one of his experiments on perceptual processes. For example, participants were exposed to a stimulus (such as a sound) generated by the apparatus and asked to report their sensations. Their reaction time was also recorded to measure the speed of their perception.

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1.1.3 Scientific vs non-scientific explanations

There are many ways of explaining human behaviour and mental processes that are not based on science. Some of these approaches claim to be scientific but are not. Some have scientific-sounding names and use very elaborate systems to explain how we think, feel or behave. Consequently, they seem to be based on science. Among these non-scientific explanations are astrology, numerology, graphology and palmistry.

Astrology describes the belief that the movement and positions of the stars and planets influences a person's personality, moods, behaviour, events in their life and so on.

Numerology involves examining significant numbers in a person's life, such as birth date, house address or phone number, to predict future events or describe influences on their life.

Graphology involves interpreting handwriting to judge a person's personality and identify significant issues in their life.

Palmistry involves examining the lines on the palm of a person's hand and using these to describe aspects of their thoughts, feelings and behaviour, as well as to predict future events in their life.

These kinds of alternative approaches are often called pseudosciences. 'Pseudo' is a prefix used to indicate that something is fake or falsely imitates something else. Consequently, *pseudoscience* means fake or false science.

Psychologists and other scientists generally believe that the methods and results, and, therefore, the claims, of pseudoscientists are often inaccurate as they are not based on true science. The non-scientist is likely to draw inaccurate conclusions about human behaviour and mental processes (and other events) because the conclusions are based on faulty or insufficient evidence resulting from unsystematic study (if any). Typically, 'supportive evidence' that may be supplied lacks independent review, especially by competent researchers with expertise on the topics.

Psychologists and other scientists also hold a view that common sense, faith or personal beliefs cannot be used as the sole basis of explaining human behaviour and mental processes, or determining whether or not something is true. However, common sense does have a place in scientific investigations; for example, when planning, conducting, evaluating and reporting psychological research.

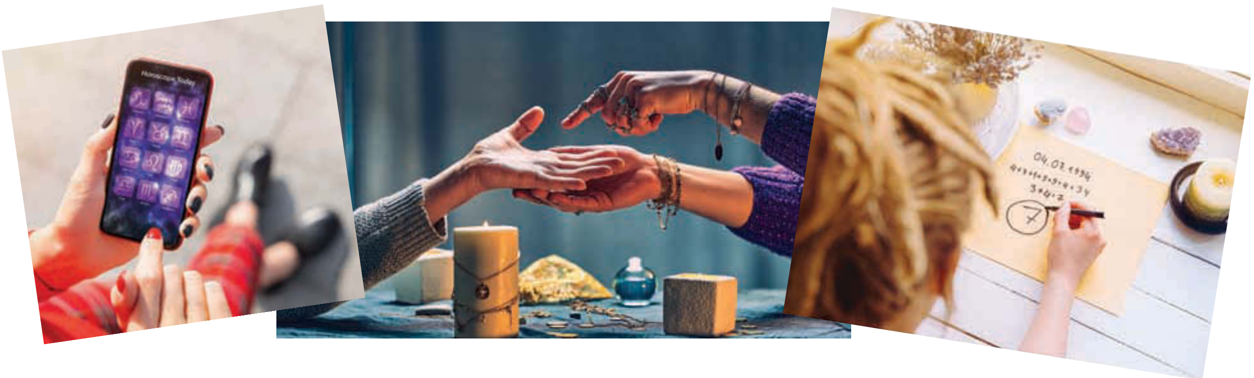

Figure 1.5 Some of the more popular non-scientific approaches to explain human behaviour and mental processes

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Figure 1.6 Sometimes our actions are influenced by our 'gut feeling'. What does common sense suggest about the reliability of 'gut feel'? Consider the common belief that answer-changing in multiple-choice exams results in an increased number of wrong answers rather than an improved score. Although our 'gut feel' can sometimes result in a correct decision, many research studies since the 1950s have found that students should be advised to review and revise answers to multiple-choice questions if required before submitting them.

1.1 LEARNING ACTIVITY 2

True–False test on common sense psychology

In everyday life we often use common sense in trying to understand our own behaviour and that of others. We draw on our life experiences, particularly our observations of how we and others do things, to develop opinions on matters such as the best way to teach children to read, what causes phobias, why people bully others, how stress affects exam performance, what makes people attractive to others, whether we are born with our personality or intelligence, and why we dream.

Psychologists using the scientific method have conducted research to investigate the accuracy of each of the statements below. On the basis of 'common sense', indicate whether each statement is true or false by entering T or F in the space provided.

1. _______ People are either right-brained or left-brained.
2. _______ Dementia only affects older people.
3. _______ A fully qualified hypnotist can hypnotise anybody.
4. _______ Out of the 8 billion or so people on Earth, there is probably someone else who is exactly like you.
5. _______ People with schizophrenia have two or more distinct personalities.
6. _______ Having someone read study material to you while you are asleep results in better recall of the material when you awaken.
7. _______ In an emergency, your chances of getting help from someone increases as the number of bystanders increases.
8. _______ You can tell quite accurately what emotion a person is experiencing by observing the expression on their face.
9. _______ Everyone with autism has a rare intellectual gift.
10. _______ Having an imaginary friend in childhood indicates the presence of a social-emotional problem.
11. _______ Most people have one psychic ability.
12. _______ Only humans are capable of self-recognition when looking at their reflection in a mirror.
13. _______ Very intelligent children are usually frail and lacking sports abilities.
14. _______ Brain training will make you smarter.
15. _______ Most psychiatrists specialise in the use of psychoanalysis to treat mental health disorders.
16. _______ All human memories are stored in a specific area of the brain dedicated to that task.
17. _______ Identical twins have a telepathic connection that originates in the uterus.
18. _______ Day care damages the attachment between children and parents.
19. _______ You can't fool a lie detector.
20. _______ Brain activity stops during sleep.

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1.2 Aims, hypotheses and variables

There is a virtually endless list of topics of research interest in psychology and many approaches to investigating those topics. An initial step is for the researcher to develop an idea about what to investigate then determine what aspect of the topic they wish to focus on. The specific topic of research interest is often called the research 'question' or 'problem'.

When the topic has been identified and refined, the next step is to construct a research hypothesis that can be tested, taking account of the variables of specific relevance to the investigation.

1.2.1 Aims

It is important that the researcher is clear in their own mind as to what their research question will be. This helps focus their research activities. If they begin with a broad area of interest, they will need to narrow this down to a specific area.

Having chosen their topic area, they will need to determine exactly what their aim is in the research. This involves deciding what the investigation is actually trying to achieve.

The **aim** is a statement outlining the purpose of the investigation. It can range in length from a single sentence to a short paragraph and should be expressed as clearly and precisely as possible. Some examples of appropriate research aims are:

- The aim of this investigation is to identify sex differences in methods used to solve the same problem.
- The aim of this experiment is to assess the effects of food colour on perception of taste.
- To compare the taste sensitivities of an adolescent with those of a very old person.
- To measure reaction times to a visual stimulus when one eye is closed.
- To determine differences between males and females as to which qualities are most important for popularity.

It is often possible to re-state the research question as the aim. For example, a researcher might be interested in ways of reducing the number of accidents caused by red P-plate drivers. After reading relevant information on the topic, such as reports on other investigations that may have been conducted on P-plater accidents, the researcher may construct the following research question: *'Does defensive driving training help to reduce the number of accidents caused by red P-plate drivers?'* This may be converted into an aim statement such as: *The aim of this investigation is to examine whether defensive driving training helps reduce the number of accidents red P-plate drivers cause.*

When writing the aim for one of your investigations, consider the following points:

- Ensure the aim describes the purpose of your investigation — what you are actually trying to find out from conducting the investigation.
- Make the aim as clear and uncomplicated as possible.
- Try and limit the aim to a single sentence to help focus your thinking.
- It may help to try expressing the aim as a research question to start with.
- If you have both a research question and an aim, ensure your aim clearly and closely relates to the research question.
- If you have more than one aim, ensure the aims are related.

1.2.2 Hypotheses

In psychology as in other sciences, different research methods are used to test one or more hypotheses relevant to the question or problem a researcher aims to investigate. The hypothesis formulated for an investigation is commonly called the research hypothesis.

A **research hypothesis** is a testable prediction of the relationship between two or more variables (events or characteristics). For example, it may be a prediction about the relationship between:

- attending a revision lecture (one event) and the score achieved for a psychology test (another event)
- biological sex (one characteristic) and finger dexterity (another characteristic)
- reading (one event) and brain wave activity (one characteristic).

The hypothesis formulated for an investigation essentially describes the researcher's expectation about what the results will be. It is usually based on knowledge of other research findings or theories or models on the question of interest. This is why it is sometimes referred to as an 'educated' prediction or even a guess.

The hypothesis is formulated before the research is conducted and guides the investigation. A useful research hypothesis typically has the following characteristics:

- refers to events or characteristics that can be observed and measured and is therefore testable (e.g. attendance at a revision lecture and what is learned are measurable and therefore data can be collected for hypothesis testing)
- can be supported or 'refuted' (denied or shown to be incorrect) by the data collected for the investigation
- states the existence of a relationship between two or more variables (e.g. a relationship between revision lecture attendance and scores on a psychology test)
- states the expected relationship between the variables, sometimes referred to as the 'direction of the relationship' (e.g. how revision lecture attendance will influence test scores)
- states a possible explanation of the results (e.g. higher psychology test scores will be attributable to revision lecture attendance)
- based on observations, a theory, model or research findings
- prepared as a carefully worded written statement (rather than a question)
- expressed clearly and precisely (rather than vaguely and generally)
- written as a single sentence.

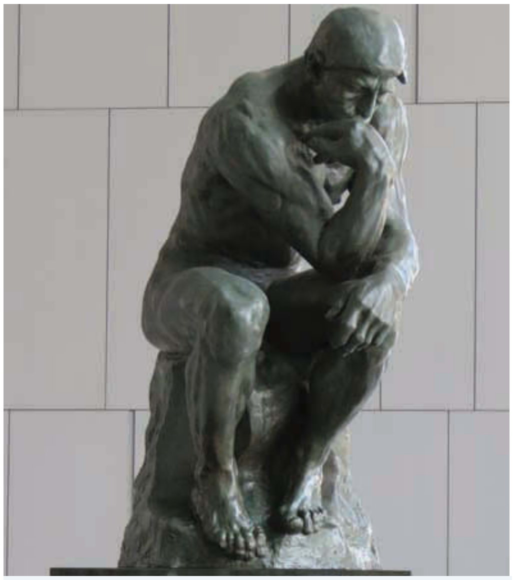
In some cases, the research hypothesis may also refer to the larger group (or 'population') from which the sample was drawn and therefore about which the researcher intends to draw conclusions and apply the results. The population, however, is most commonly described in the introduction to the report on the investigation.

Research hypotheses for the examples given earlier could be:

- Psychology students who attend a revision lecture before a test will achieve a better score on the test than students who do not.
- Females have better finger dexterity than males.
- Beta brain waves are predominant when reading.

There is no preferred writing style for a research hypothesis (nor is there a mandated style for VCE Psychology).

Different writing styles can be equally valid. For example, some hypotheses use an 'if-then' style, such as 'if a certain event occurs, then it will cause a certain response'. In relation to the revision lecture attendance and test score 'events' (or variables), an if-then hypothesis may be stated as: 'If students attend a revision lecture, then they will achieve better test scores'. A more generally stated prediction such as 'Revision lecture attendance improves test results' would also be an appropriate alternative.



The research hypothesis should be a thoughtful prediction about the relationship between the variables to be tested.

Whatever your preferred style, to help ensure the hypothesis is expressed as a statement rather than a question, you can start your hypothesis with a phrase such as 'It was hypothesised that …' when preparing your report (noting that research reports are written in the past tense).

It is not always possible to be entirely certain about the accuracy of a prediction within a hypothesis, especially when the question or problem of research interest has not been widely studied, if at all. This is mainly because the researcher does not necessarily know or can control the influence of the many different variables that can affect the behaviour or mental process being studied. Nonetheless, many researchers would consider it pointless to conduct an investigation when the outcome is certain.

Hypothesis versus theory and model

In VCE Psychology you need to be able to develop aims and hypotheses and link these to theories and models.

A research hypothesis is different from a theory and model. A research hypothesis is a specific prediction that guides the collection, analysis, interpretation and evaluation of data that has been collected to test it. In contrast, theories and models are generally broader and far more detailed, with a focus on describing and/or explaining.

A **theory** is a body of interrelated concepts ('ideas') that attempt to explain interrelated observations and make predictions about future events. Some well-known theories in psychology are Freud's theory of personality development, Piaget's theory of cognitive development and Gardner's theory of multiple intelligences. Freud's theory explains personality development in terms of abstract concepts such as the id, ego and superego and describes five psychosexual stages through which we progress from birth to early adulthood.

There are also theories on more specific aspects of behaviour and mental processes such as why we sleep and dream, why we may develop a specific mental health disorder, why we may gamble, why the moon looks bigger when low on the horizon, how we learn, how we process information when remembering, when we are more likely to change an unhealthy behaviour, and so on.

The term model is often used interchangeably with theory, however, a **model** in psychology focuses more on representing how some behaviour and/or a mental process(es) could, should or does occur. It may be a simple graphic or other type of representation of a single concept or a basic observation, such as a cause–effect relationship between two events, how a brain structure may respond to fear or how a new procedure for diagnosing a specific mental health disorder is performed. In particular, a model can be useful in understanding abstract or 'hard to visualise' concepts about behaviour and mental processes.

More complex models are often supported with or presented in the form of a diagram with boxes and arrows to organise and show relationships between different concepts. On the next pages, Figure 1.7 shows an example of a model used to represent the process of how a theory or model may be developed or change. Figure 1.8 shows an example of a model used to represent and explain human memory in terms of interrelated sub-systems involving different types of memory called sensory memory, short-term memory and long-term memory. This model is also commonly referred to as a theory of memory. Figure 1.9 shows a widely adopted contemporary model used to describe and explain human personality as a set of five broad 'factors'.

Theories and models vary in scope, complexity and detail. All have one or more limitations. Some are essentially a hypothesis that has been restated. Others explain many interrelated research findings and ideas. Along with explaining existing results, a useful theory or model generates new hypotheses and guides further research.

Many theories or models of child development, mental health, personality, learning, remembering, forgetting and so on, are the products of psychological research and have generated valuable new research. In addition, some theories have generated new models and some models have generated new theories.

Whatever their scope — from tiny to vast — theories and models serve a gap-filling function. They explain how findings and ideas fit together in an organised way and what they mean, thereby making psychology a discipline that does more than report isolated facts. Some can be used to predict behaviour or a mental process in real life settings, thereby helping achieve an important goal of psychology.

Psychologists prefer testable theories and models because they can be confirmed, revised or refuted by further scientific research. Therefore, theories and models tend to not be judged in terms of their accuracy but rather in terms of their usefulness. This means that a theory or model tends to not be considered as right or wrong. Instead, it is simply regarded as more or less useful.

Both theories and models can be refined or changed as further research is conducted. Those that are less useful are often overlooked or discarded.

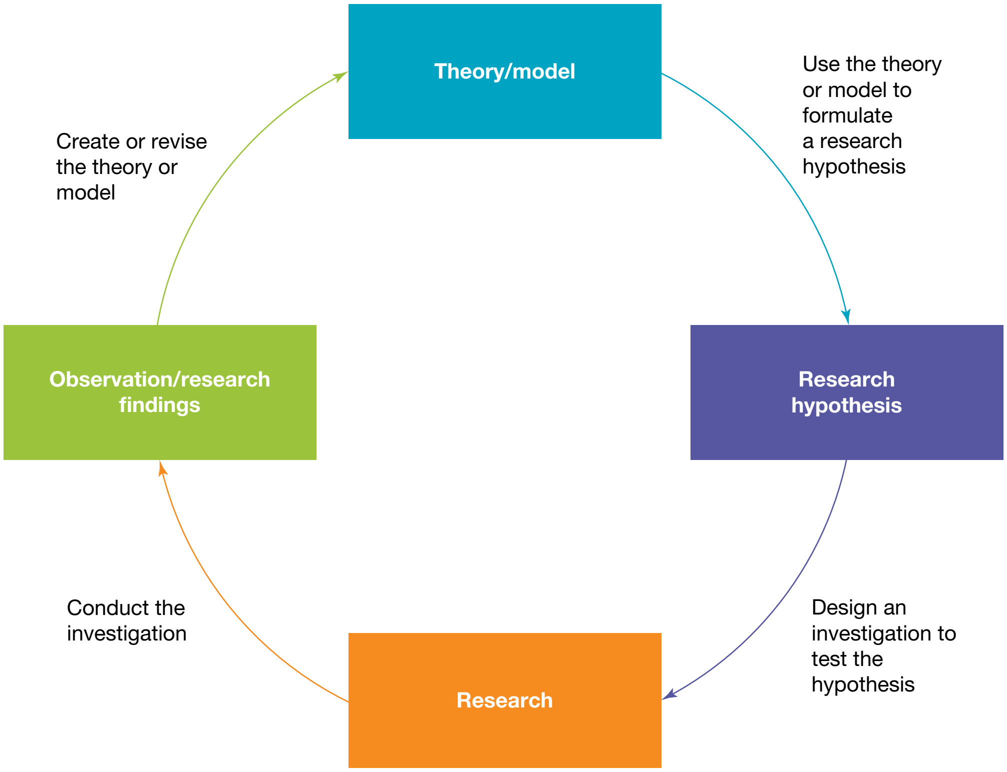


Figure 1.7 Theories and models are revised and expanded to reflect relevant research findings. New or revised theories and models lead to new observations or questions that stimulate new research and hypothesis testing.

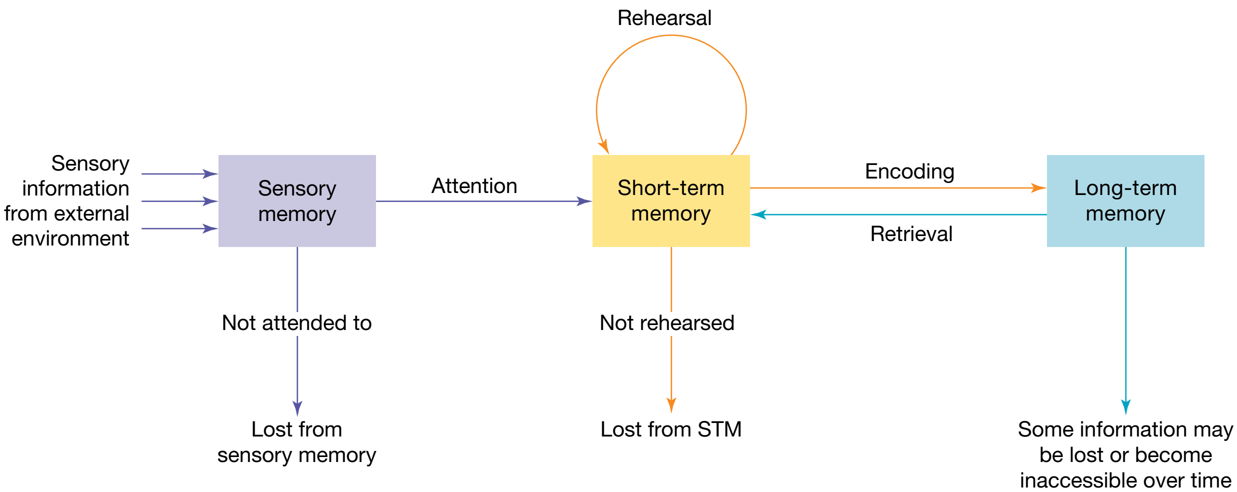


Figure 1.8 A contemporary model of human memory, representing it as a multi-storage system through which information flows

High score		Five personality factors and examples of associated traits	Low score
Adventurous, original, imaginative, broad interests	O	**Openness to experience** (originality, imagination, creativity, adventurousness, interests)	Unadventurous, conventional, uncreative, narrow interests
Hardworking, well organised, dependable, careful	C	**Conscientiousness** (competence, self-discipline, efficiency, thoroughness, reliability)	Careless, impulsive, unreliable, disorganised
Talkative, outgoing, fun loving, affectionate	E	**Extraversion** (Sociability, assertiveness, talkativeness, emotional expression)	Quiet, reserved, withdrawn, loner
Helpful, soft-hearted, good-natured, selfless	A	**Agreeableness** (cooperativeness, ruthlessness, temperament, selflessness)	Uncooperative, ruthless, irritable, selfish
Worrying, highly strung, insecure, self-conscious	N	**Neuroticism** (emotional stability)	Calm, relaxed, secure, comfortable

Figure 1.9 The Five Factor Model of Personality shown above is supported by considerable research evidence that there are five personality 'factors' that capture the variations in personality observed between individuals. Each 'factor' is very broad and comprises a large number of more specific personality traits that we are said to each have in varying amounts. The factors can be measured and scores assigned on the basis of test results. Individuals may achieve different combinations of high and low scores for each of the 'Big Five' as the factors are sometimes called.

1.2 LEARNING ACTIVITY 1

Review

1. Explain the difference between each of the following:
   a. the aim and hypothesis for a psychological investigation
   b. a psychological theory and model
   c. a research hypothesis and a theory or model.
2. Evaluate the following aim statement with reference to key characteristics of a well-constructed aim.
   'The aim of this investigation is to look at P-plate drivers.'
3. List six characteristics of a well-constructed research hypothesis.
4. a. Explain two possible limitations of the following research question if it were to be used as a hypothesis:
   Does excessive use of a mobile phone cause sleep loss?
   b. Rewrite the question above as a testable hypothesis.
5. Consider the following list of research questions. Choose four questions and formulate a hypothesis for each one. Ensure your hypotheses have key characteristics referred to in the text.
   a. Does use of good study techniques bring about an improvement in grades?
   b. Does amount of sleep the night before an exam affect exam performance?
   c. Does the number of 'peer passengers' in a car driven by a red P-plate driver affect driver performance?
   d. Does exercise reduce stress?

e. Do tattoos affect success in a job interview?
f. Are males more likely to help a female or a male in need of assistance?
g. Does the presence of other people affect how well someone performs a task for the first time?

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1.2 LEARNING ACTIVITY 2

Multiple-choice questions

1. Which term best describes the aim of a research investigation?
   A. purpose
   B. prediction
   C. problem
   D. question
2. Which statement about the aim of a research investigation is correct?
   A. The aim must be no longer than one sentence.
   B. The aim must be derived from the hypothesis.
   C. The aim and research question must be related.
   D. A research investigation must have only one aim.
3. *Source: VCAA 2021 Psychology, Section A, Q.17 (adapted); © VCAA*
   A hypothesis
   A. is a question the research study sets out to answer.
   B. predicts how the researcher will conduct the research study.
   C. is generated based on scientific knowledge or experience in order to understand and test ideas.
   D. is a method of research based on the researcher's prior knowledge and experience.
4. Which of the following could serve as a research hypothesis?
   A. Regular exercise will improve mental wellbeing.
   B. Does regular exercise improve mental wellbeing?
   C. Regular exercise has improved mental wellbeing.
   D. Regular exercise has not improved mental wellbeing.
5. If a research hypothesis is refuted, then it may be concluded that the hypothesis is
   A. supported by the results obtained.
   B. not supported by the results obtained.
   C. not related to the research question that was studied.
   D. not expressed clearly and precisely.

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1.2.3 Variables

A key science skill in VCE Psychology requires you 'to identify independent, dependent and controlled variables in controlled experiments'.

A **controlled experiment** is an experimental investigation to test the relationship between an independent variable and a dependent variable, whilst controlling all other variables. For example, to test whether talking on a hand-held mobile phone while driving (one variable) causes or influences a change in driver reaction time (another variable), or whether access to a reward (one variable) has an effect on exam performance (another variable).

In this section, we focus on the different types of variables in a controlled experiment and explain how variables being tested or measured are 'operationalised' and why this needs to be done.

A **variable** is something that can change ('vary') in amount or type and is measurable. For example, the time that it takes for a newborn infant to distinguish between different shapes is a variable that changes in amount (i.e. time) and type (i.e. square or circle). How long it takes to distinguish between the different shapes can also be measured.

Although personal characteristics, such as biological sex, blood type and racial or ethnic background are all inborn and therefore 'fixed' and ordinarily unchanging within an individual, in psychological research they are still considered to be variables because they can be of different types and are measurable. For example, 'male' and 'female' are two types of biological sex and 'O', 'A', 'B' and 'AB' are four different blood types.

Similarly, a group of people may vary in ethnic background and have different cultures, family backgrounds, religions, native languages and so on.

Consequently, there is a virtually endless list of variables that may be studied in psychology, such as intelligence (e.g. variations in IQ score), personality (e.g. variations in type), age (e.g. chronological years), exercise (e.g. variations in type), memory (e.g. variations in recall ability), reaction time, social media use, sleep habits, colour preferences, dietary preferences, and so on.

If an experiment involves testing whether a particular anger management technique reduced the incidence of road rage in people who had previously been convicted of road rage, the two variables being tested would be (1) the anger management technique and (2) the incidence of road rage.

Independent variable

Every controlled experiment has at least one independent variable and one dependent variable. In a simple experiment, one of these variables is manipulated (controlled, selected or changed) by the researcher to observe its effect on another variable.

The variable that is manipulated in order to measure its effect on the dependent variable is called the **independent variable (IV)**. It is sometimes referred to as the 'treatment' variable to which participants may be exposed (or not exposed).

The IV is assumed to have a direct effect on the dependent variable. Therefore, in terms of cause and effect, the IV is viewed as the cause of any change that may result in the dependent variable.

For example, in the road rage experiment, the IV would be the anger management technique. The experimenter would have *control* over and can therefore 'manipulate' which participants would learn the anger management technique and which participants would not, in order to test the effect(s) of the technique on the incidence or extent of road rage-related behaviour; that is, the dependent variable.

Selecting which participants are exposed or not exposed to an IV is one way of manipulating the IV. In this case, the IV is said to have two values (or levels) — exposure or non-exposure to the IV (or presence or absence of the IV), as shown in Figure 1.10. If the IV is biological sex, then the IV may be manipulated 'qualitatively' by varying its 'type' and male and female would be the two IV values. If test difficulty is the IV, then it may have the three qualitative values of 'easy', 'medium' and 'hard'.

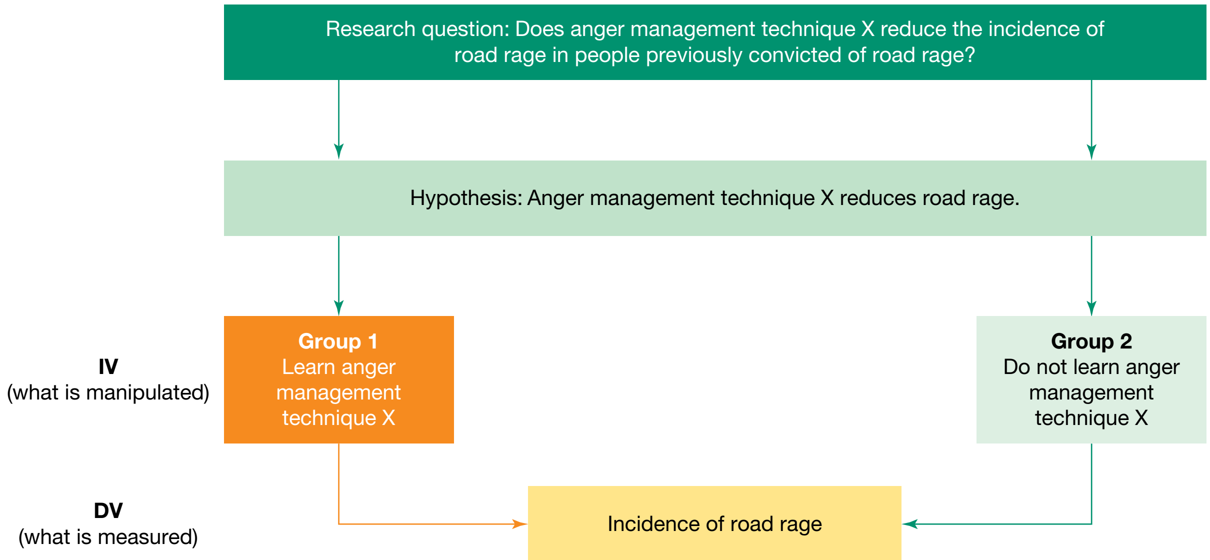

Figure 1.10 The independent and dependent variables in an experiment designed to investigate a technique that may reduce the incidence of road rage. The IV is assumed to have a direct effect on the DV. Selecting which participants are exposed or not exposed to an IV is one way of manipulating the IV.

In addition, a researcher may manipulate an IV 'quantitatively' by varying the 'amount' of the IV to which participants are exposed. For example, an experiment testing the effects of a new medication for treating anxiety disorders may vary the dosage for different groups of participants and use an IV with the two or more quantitative values such as 5 mg, 10 mg and so on. Similarly, a researcher may use sleep deprivation or exercise as an IV with different values involving amount of sleep loss or exercise for different groups of participants.

Dependent variable

The variable that the researcher uses to observe and measure the effects of the IV is called the **dependent variable (DV)**. It is the aspect of a participant's behaviour or experience that is assumed and expected to change as a result of the manipulation of the IV selected by the researcher.

The dependent variable is often the responses made by the participants and it usually has a numerical (quantitative) value. It is called the dependent variable because whether or not it changes and the way in which it changes 'depends' on the effects of the independent variable.

In terms of a cause–effect relationship, the DV is viewed as the *effect(s)* caused by manipulation of the IV, such as, exposure or non-exposure to the IV. In the road rage example, the DV is the measured change in the amount of road rage behaviour displayed by participants as a result of using or not using the anger management technique — the IV.

Controlled variable

In addition to the independent and dependent variables, there are other variables that the experimenter should anticipate and take account of.

A **controlled variable** is one that is considered to have an effect on the dependent variable in an experiment so it needs to be held constant ('controlled') to remove its potential effects. For example, in an experiment on the effect of caffeine on psychology test performance, one group of VCE Psychology students could drink coffee (the IV) before a psychology test and their scores for the test (the DV) would be compared with those of a class who did not drink coffee.

Variables that would have to be kept constant include caffeine (e.g. type and amount of coffee that participants drink), the test (e.g. everyone sits the same test), the test conditions (e.g. day and time, the room, instructions to participants, noise), the ability of the students (e.g. comparable ability in both groups) and prior experience with the test content.

When planning and conducting an experiment, it is essential that the experimenter is confident that manipulation of the IV is likely to cause the predicted change in the DV, rather than some other variable that is not adequately controlled. Therefore, the experimenter must ensure that it maintains that status so that it has no influence on the DV and thereby makes it difficult to isolate the effect of the IV.

Unlike the IV and DV, a controlled variable is not actually part of the experiment in itself. Nor is it a variable of interest in the investigation. For example, it is not relevant to the aim or hypothesis. But it's controlled because it could influence the outcome.

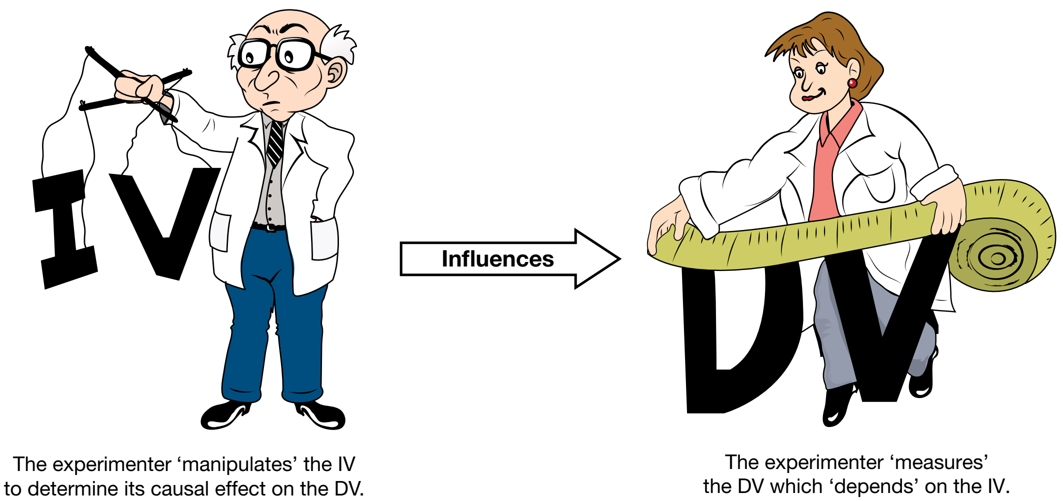

Figure 1.11 Distinguishing between the independent and dependent variables

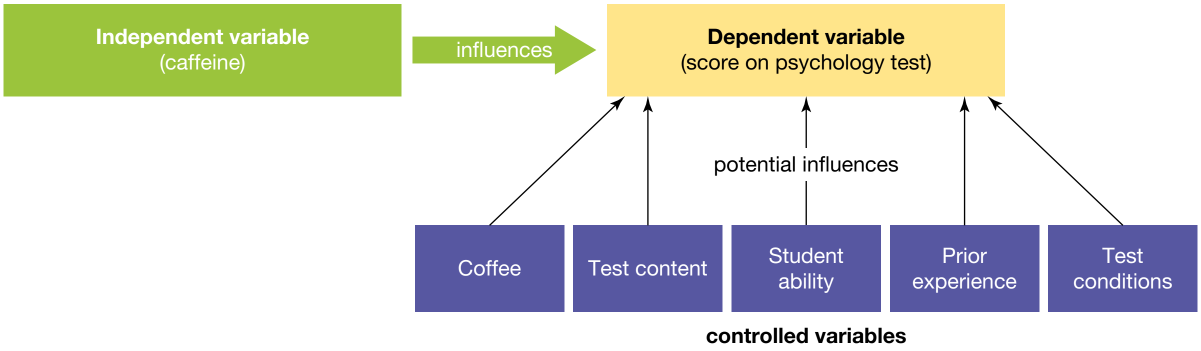

Figure 1.12 Independent, dependent and controlled variables in an experiment testing a cause–effect relationship between caffeine and psychology test performance

1.2 LEARNING ACTIVITY 3

Review

1. Explain the difference between the independent variable (IV) and the dependent variable (DV) in an experiment.
2. Identify the IV and DV in each of the following hypotheses.
   a. Listening to a radio broadcast of a sports event while studying for a test decreases performance on the test.
   b. Thinking positively when goal shooting improves accuracy in a match.
   c. Smoking cigarettes while driving a car increases driver alertness.
   d. People will behave differently in a crowd from the way they behave when alone.
   e. Reaction time to a visual stimulus is quicker than reaction time to a sound stimulus.
   f. Daydreaming occurs more often when a person is engaged in a simple task than when they are performing a complex task.
   g. Marijuana use impairs performance on a memory task.
   h. Drinking red cordial increases hyperactivity in children.
   i. Too much stress causes stomach ulcers.
   j. Brain wave activity changes during voluntary movement.
3. Give an example of how each of the following variables could be varied to have different levels or values.
   a. psychotherapy
   b. height
   c. religion
   d. birth order
4. a. Explain the meaning of controlled variable.
   b. Why do all variables in an experiment require ‘control’?
5. Suppose an experiment will be conducted to test one of the hypotheses in (a)-(j) above. Suggest three potential controlled variables. Ensure you identify the relevant hypotheses.

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1.2 LEARNING ACTIVITY 4

Multiple-choice questions

1. The independent variable in an experiment is
   - **A.** any variable that cannot be influenced by a controlled variable.
   - **B.** a measure of the participant's behaviour.
   - **C.** the variable that the experimenter specifically manipulates.
   - **D.** any variable that adversely affects the participant's performance.
2. An experiment is conducted to investigate whether learning is better when in a relaxed state. Three groups were required to learn the same novel material — one while in a state of 'high' relaxation; one while in a state of 'medium' relaxation; one while in a state of 'low' relaxation. All participants were subsequently given a test to measure how well they had learnt.

   The independent variable is
   - **A.** improvement in learning.
   - **B.** how well learning occurred.
   - **C.** the material learnt.
   - **D.** state of relaxation.
3. A researcher wanted to find out whether students' confidence in their teacher influences their study score in VCE Psychology. A randomly selected sample of psychology students were required to answer 10 questions about their teacher, and this information was used to divide the participants into 'low confidence' and 'high confidence' groups.

   The two groups were later compared on their study score. It was found that the 'high confidence' group achieved significantly higher study scores than the 'low confidence' group.

   In this experiment, the dependent variable is the
   - **A.** teacher.
   - **B.** students' confidence in the teacher.
   - **C.** VCE Psychology study score.
   - **D.** 10 questions about the teacher.
4. *Source: VCAA 2013 Psychology, Section A, Q.55* (*adapted*)*; © VCAA*
   Dr Tran conducted a controlled experiment on a technique for remembering nonsense syllables. The experimental group used Dr Tran's learning technique and had a greater recall of nonsense syllables than the control group.

   In Dr Tran's experiment, the independent variable (IV) and dependent variable (DV) were
   - **A.** IV: participant characteristics; DV: learning technique.
   - **B.** IV: number of nonsense syllables correctly recalled; DV: learning technique.
   - **C.** IV: learning technique; DV: number of nonsense syllables correctly recalled.
   - **D.** IV: participant characteristics; DV: number of nonsense syllables correctly recalled.
5. A researcher conducted an experiment to investigate the effect of hunger on reaction time. Forty volunteer participants were assigned to one of four groups: Group 1 — no food for 3 hours; Group 2 — no food for 6 hours; Group 3 — no food for 12 hours; Group 4 — no food for 24 hours. All completed the same computer-based reaction time test so comparisons could be made.
   In this experiment, the IV and DV were
   - **A.** IV: period of hunger deprivation; DV: reaction time test score
   - **B.** 12 hours: reaction time test score
   - **C.** reaction time test score; period of hunger deprivation
   - **D.** 40 volunteer participants; reaction time test score

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Operationalising independent and dependent variables

Operationalising the IV and DV involves defining *how* they will be manipulated or measured in the experiment (or other investigation) that will be conducted. This is an important step because many of the behaviours and mental processes psychologists investigate can have different meanings and can therefore be manipulated and measured in more than one way.

For example, suppose that an experimenter wants to find out whether noise has an effect on problem-solving ability. What is meant by 'noise' (the IV) and 'problem-solving ability' (the DV), and how will these variables be defined, manipulated and measured? Will the 'noise' be music? If so, will it be classical music, rock music or some other type of music? Will the noise be people talking, whales communicating, an engine revving, the sound of a plane flying overhead or a combination of different types of noises? Will the noise be loud, medium or soft? Will the noise be heard continuously or irregularly?

Similarly, consider 'problem-solving ability'. What type of problem? Will it be a personal problem, a problem involving someone else or an intellectual problem? Will the problem be simple or complex? Will the problem be presented orally, in writing or audiovisually? Will the problem be 'hands-on' or 'hands-off'? Will the problem have one solution or several solutions? Furthermore, precisely how will 'ability' to solve the problem be measured? Getting the problem right or wrong? Solving it quickly or slowly? Both accuracy and speed?

When the IV and DV have been operationalised, they may be stated this way in the hypothesis (but this is not essential). In the experiment on noise and problem-solving ability, the operationalised variables could be stated in the research hypothesis as follows:

'Units 1 and 2 VCE students who listen to loud rock music when solving previously unseen written problems will solve fewer problems than students who do not listen to loud rock music'.

Note how the IV and DV have been operationalised:

- IV: continuously listening to loud rock music (throughout a one-hour session)
- DV: the number of problems that are correctly solved.

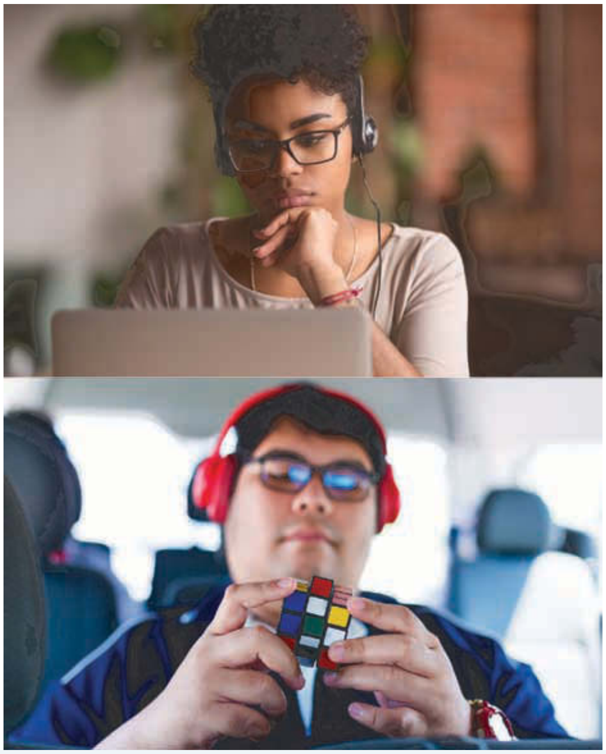

Figure 1.13 If an experimenter will test whether noise affects problem-solving, then 'noise' and 'problem-solving' are two variables that would need to be operationalised.

Operationalising the IV(s) and DV(s) ensures that these variables are also precisely defined and the experimenter (and everyone else) is absolutely clear about how they will be used in the experiment. The resulting definitions are sometimes referred to as *operational definitions*.

There are several important benefits of variables being defined precisely through operationalisation. These include:

- It helps ensure the independent and dependent variables are testable and therefore that the research hypothesis is testable.
- All researchers involved in conducting the experiment know exactly what is being manipulated and measured and how this will occur, which helps avoid experimenter biases and differences that can affect the results.

When the variables are defined in a very precise way, another researcher interested in the results, or perhaps even doubting them, will be able to repeat the experiment in order to test ('check') the results obtained for accuracy or to find out if the results are relevant to other groups or situations.

Table 1.1 Ways in which IVs and DVs can be operationalised

Research question	IV example	DV example
Do students learn more effectively in early morning or late afternoon classroom lessons?	• time of lesson	• score on a test of recall (amount of information remembered)
If a teacher ignores a student's attention-seeking behaviour in class, will this strategy reduce the student's attention-seeking behaviour?	• teacher not paying attention to attention-seeking behaviours	• frequency of attention-seeking behaviours
Does playing violent video games cause aggressive behaviour?	• a video game classified by the Commonwealth Government censors as violent	• number of presses of a button that administers a shock to another student
Does allowing a child to sleep in the same bed as their parents result in the child being overly attached to the parents?	• child sharing bed with both parents over a specified period of time	• frequency of separation anxiety behaviours when either or both parents leave the child alone with a stranger
What types of jokes are funny to people of different cultural backgrounds?	• different types of jokes	• number of audible laughs detected by an audiometer and number of smiles detected by an electromyograph (measures facial muscle contractions)

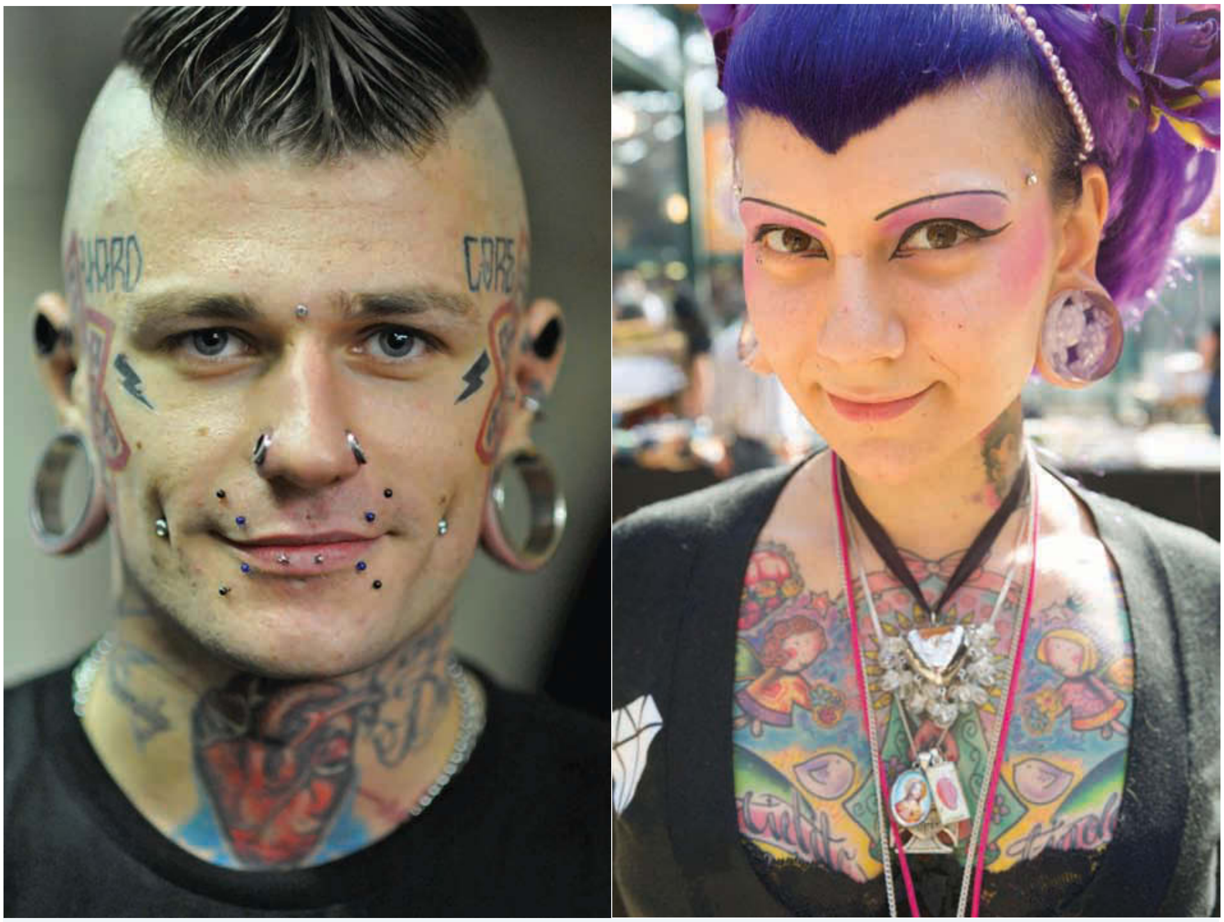

Figure 1.14 Do facial piercing and tattoos make a person more or less attractive? The answer depends on how you operationalise 'facial piercing', 'tattoos' and 'attractive'.

1.2 LEARNING ACTIVITY 5

Review

1. Explain the meaning of the phrase ‘operationalising the IV and DV’ with reference to an example for each variable.
2. What are three benefits of operationalising the variables relevant to research hypothesis?
3. Suggest how three of the following variables of research interest could be operationalised.
   a. memory
   b. happiness
   c. attraction
   d. intelligence
4. Suggest operationalised IVs and DVs for three of the following research questions:
   a. Does regular exercise improve psychological wellbeing?
   b. Do people drive less safely when feeling stressed?
   c. Do people talk more after they have eaten than they do when they are hungry?
   d. Does perception of time change when in a relaxed state?

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1.2 LEARNING ACTIVITY 6

VCAA exam questions

Question 1 (1 mark)

Source: VCAA 2016 Psychology, Section A, Q.63; © VCAA

Dr Terrence is running an experiment to investigate the effect that room temperature has on the time taken for people to fall asleep.

In this experiment, the independent variable is

A. room temperature.
B. time taken for people to fall asleep.
C. body temperature when people fall asleep.
D. time taken by people to adapt to room temperature.

Question 2 (1 mark)

Source: VCAA 2015 Psychology, Section A, Q.48; © VCAA

Dr Gregory wanted to test the effects of different methods of learning on memory retention. Equal numbers of participants were randomly allocated to three different learning groups. Each group learnt the same list of words that were presented on a computer screen, one at a time, in random order. For all groups, half of the words were printed in upper-case letters and half were printed in lower-case letters.

Each group was given a different method of learning the words, as follows:

- Group A – For each word presented, participants were asked to report whether the word was printed in upper-case letters or in lower-case letters.
- Group B – For each word presented, participants were asked to report whether the word rhymed with the word ‘stop’.
- Group C – For each word presented, participants were asked to report whether the word was a kind of animal.

After learning the list of words, participants were asked to recall as many words from the studied list as possible.

Dr Gregory then compared the mean number of words correctly recalled between the groups.

For Dr Gregory's study, the independent variable and the dependent variable were, respectively, the

A. method of learning the word list, time taken to learn the words.
B. method of learning the word list, number of words recalled.
C. number of words recalled, method of learning the word list.
D. number of words in each list, number of words recalled.

Question 3 (1 mark)

Source: VCAA 2015 Psychology, Section A, Q.63; © VCAA

Dr Nguyen is a psychologist interested in investigating the effect of age on the cycling ability of Victorians. He recruits 93 Victorian bike riders who responded to an advertisement that he placed in a newspaper.

The bike riders are divided into two groups:

- Group 1 consists of riders aged 20-39 years old.
- Group 2 consists of riders aged 40-59 years old.

The independent and the dependent variables in this study were, respectively,

A. cycling ability, age.
B. age, cycling ability.
C. cycling ability, 93 Victorian bike riders.
D. 93 Victorian bike riders, cycling ability.

Question 4 (1 mark)

Source: VCAA 2012 Psychology 1, Section A, Q.37; © VCAA

Louisa wanted to investigate some of the work done by Ebbinghaus on the forgetting curve. In her first experiment, participants learnt a list of 13 nonsense syllables. Their memory of these items was then tested at different points in time. Louisa's research produced results that were similar to the forgetting curves in the work by Ebbinghaus.

In a second experiment the same participants were required to memorise a list of 13 names. One hour later the participants were tested and were asked to list the names that they remembered.

In Louisa's second experiment, the dependent variable would have been the

A. response time.
B. rate of forgetting.
C. type of information learnt.
D. time taken the learn the words.

Question 5 (2 marks)

Source: VCAA 2016 Psychology, Section B, Q.4d (adapted); © VCAA

Mr Butler, a Psychology teacher, conducted a memory experiment on his Psychology class. He wanted to investigate whether the use of the 'Memoro' memory improvement technique is a more effective method of remembering lists of unrelated words in the order in which they are presented, than not using 'Memoro'. In the experiment, half of the class was given two minutes to study four lists of words. The students were told to try to remember the words from each list in the order in which they were presented. They were not given any other instructions.

The other half of the class was given two minutes to study the same four lists of words. The students were instructed to use 'Memoro' to help them remember the words from each list in the order in which they were presented.

Operationalise the dependent variable in this experiment.

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1.3 Scientific investigation methodologies

Scientific investigation methodology refers to the specific techniques used to collect and analyse data in an investigation; that is, *what* research method is used to conduct a scientific investigation.

In contrast, the scientific method refers to the steps that are followed to conduct the investigation; that is, *how* the investigation is conducted. As you would expect, each research method is based on, is a part of, and reflects the scientific method.

The types of research methods which you should consider when planning to conduct your own investigations are specified in the VCE Psychology Study Design (p. 17) where they are referred to as 'scientific investigation methodologies'.

Note that some of these methodologies require you to collect data directly through your own experiments or from first-hand observation, whereas others are based on data that was not gathered directly by you but rather was obtained by someone else. Furthermore, some may be conducted within the classroom and others in the field outside the classroom.

This text focuses on research methods involving observing and interacting with participants, either within the classroom or in fieldwork in a selected environment beyond the classroom. Figure 1.15 shows how these methods may be classified into types.

Sample selection is common to all investigations. It is undertaken early in the research process and is as important as choosing a research method. We consider key aspects of sample selection before examining different types of research methods and the specific features that distinguish them from each other.

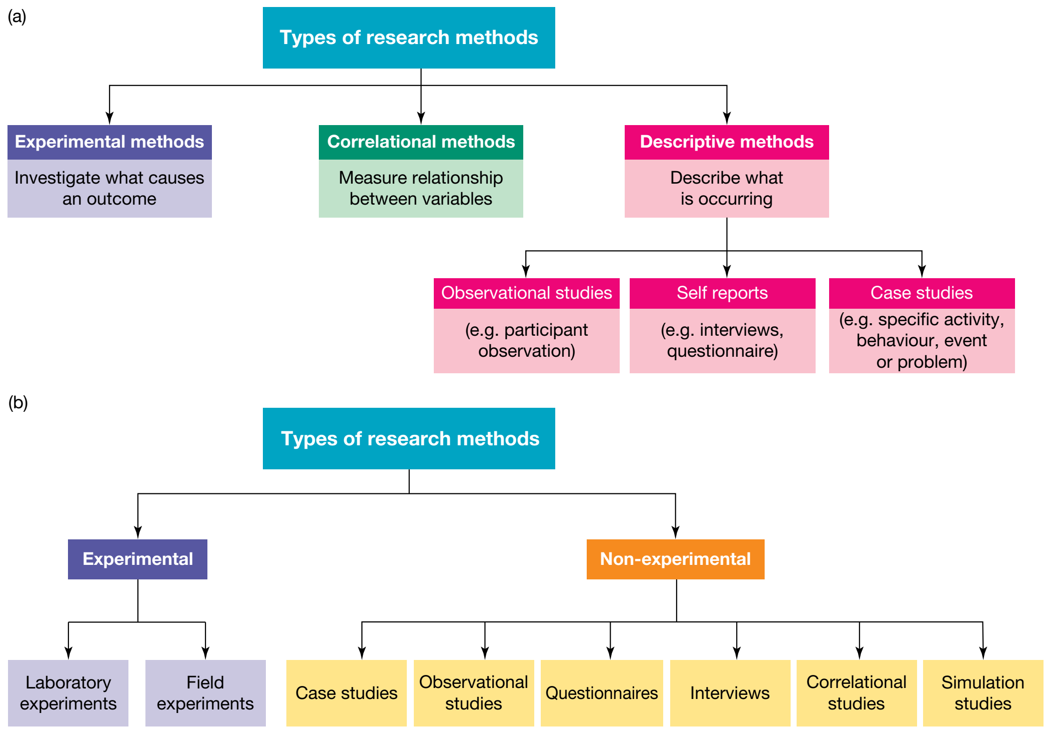

Figure 1.15 Types of research methods. (a) The classification system may vary according to criteria such as the purpose of the research, its specific procedures, the type of data that is collected and how the data are used. (b) Sometimes research methods are classified more simply as experimental and non-experimental

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Access learnON for a list of the types of scientific investigation methodologies you could use in your own investigations.

1.3.1 Population, sample and sampling

When planning an investigation, the researcher needs to decide who (or what) will be targeted for study in order to test their hypothesis. Decisions also need to be made about the sample composition, the sample size and how the sample will be selected.

Population

In scientific research, the population does not necessarily refer to all people (or animals) in the world, in a country, or even in a particular city or area. The term **population** refers to the entire group of research interest from which a sample is drawn and to which the researcher will seek to generalise (apply) the results of their investigation.

A population may be all preschool children, all blonde-haired females, all VCE Psychology students, all female VCE Psychology students, all Catholic school educated boys, or all male chimpanzees born in captivity. However, a population used for research does not always involve living things.

A population could also be measurable objects or events such as all community health centres in the Goulburn Valley region, all admissions at the Royal Melbourne Hospital, all VCE exam results in English in 2023, all days of school missed by Year 9 students, all drugs used to treat anxiety, all responses that could be made or have been made by one or more research participants, all calls to the Kids Helpline telephone number, or any other specific source of data.

Sample

A **sample** is a subset or part of the population that is selected for research purposes. For example, suppose that a researcher is interested in conducting an experiment to find out whether children who attended a child care centre during their preschool years have better language skills than children who did not attend a child care centre. It would be impractical to test every child who attended a child care centre and every preschool child who did not. The researcher would therefore select a sample with whom they conduct their investigation.

A sample is always smaller than a population. When studying people, psychologists can rarely be certain about any behaviour or mental process that occurs in a population because they can rarely study all its members — it's usually too large a group.

Consequently, researchers draw a sample that is appropriate for testing their hypothesis and attempt to generalise the results obtained for the sample to the population from which it is drawn, or even other groups or situations. This is why it is important that the sample accurately reflect the entire population of interest, although this is not always possible.

Sampling

Sampling is the process by which a subset or part of the population is selected for an investigation. The population of research interest is often referred to as the *target population*.

In psychology, sampling most often involves selection of participants for inclusion in experiments,

Figure 1.16 This sample is a subset of the population of all staff who work for a multinational corporation.

observational studies, case studies, interviews, or other research. Given that a population is not always people, sampling can also involve selecting a specific activity or process to study, time points at which to observe individuals, data from a set of data, and so on.

Sampling is usually undertaken with the goal of being able to use the sample to draw conclusions about the larger population. This is not unlike the goal of a medical researcher who analyses a sample of someone's blood to draw one or more conclusions about all of that person's blood.

Therefore, a sample should be selected in a scientific way so that the results obtained can be legitimately applied to its population. When sampling, it is important to ensure that the sample lacks bias and is like the larger population in as many ways as possible so the results can be generalised to that group. It must reflect its population in all the characteristics that are important in the investigation.

For example, when selecting a sample for an investigation involving people, the researcher will consider personal characteristics of participants (or subjects) that are important in the study.

'Participant variables' (or 'subject' variables) that are considered important are those that can influence the results of the study to be conducted. For example, in an investigation on how friendships form among adolescents, personal characteristics of participants such as their sex, age, type of school attended, family background, career aspirations, religion and cultural background could be assumed to be important. Participant variables such as blood type, left- or right-handedness and spatial abilities and may be assumed to not be important.

When a researcher selects a sample that mirrors or is approximately the same as its population, the sample is called a representative sample.
A **representative sample** is a sample that closely resembles the population from which it is drawn in key characteristics. It is assumed the sample has the minimum amount of possible errors in representing the population. When a sample does not adequately represent the key characteristics of its population it is called a **biased sample**.

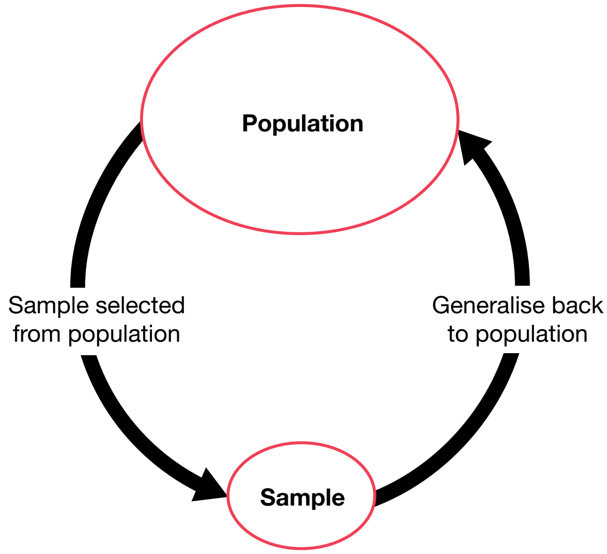


Figure 1.17 A sample is usually selected with the goal of generalising back to the larger population. A representative sample closely matches the population in the distribution of key characteristics

Sample size and representativeness

Sample size can impact on representativeness. Some researchers have described the law of large numbers in relation to sampling.

The *law of large numbers* suggests that as sample size increases, the attributes (characteristics) of the sample more closely reflect the attributes of the population from which the sample was drawn. For example, the more people who are selected for an experiment, the more likely it is that they will reflect and therefore be representative of the population.

Larger samples also minimise the likelihood of an unexpected sampling error resulting in a sample which does not represent its population well and would therefore make it difficult to apply the results to that population.

To apply the law of large numbers in an everyday situation, suppose you are deciding which of two universities to attend. To help you make this decision, you spend one open day at one of the universities and one open day at the other. At each open day, you attend a demonstration lecture for the course you are most interested in studying. You like one presentation much better than the other. Should this sample of small lecturers and lectures influence your decision about which university to attend? Can you see how results from such a very small sample could be very misleading? (Gazzaniga et al., 2011).

Although a relatively large sample may be preferred for an investigation, this is not always possible, especially for research with human participants. For example, the required number of participants may not be readily accessible or available, there may be budgetary or time constraints, there may be inadequate space available and other practical considerations may limit sample size.

It should also be noted that bigger does not necessarily mean better. The quality and usefulness of the sample will be influenced by the sampling technique used for its selection. In addition, for some investigations, such as a case study, the researcher may only be interested in a very small sample, possibly only one person to study a single case.

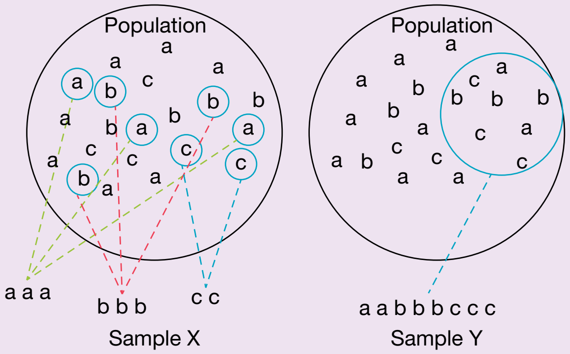
There is nothing wrong with conducting well-planned small investigations with small samples. The results just need to be interpreted carefully and it is also important to draw tentative ('cautious') rather than firm conclusions, whether the results support or refute the hypothesis.

Figure 1.18 The larger the number of beach goers in the sample, the more likely they will be representative of this population, depending on the sampling technique used to select them.

1.3 LEARNING ACTIVITY 1

Review

1. Define the terms sample and population as they are used in research.
2. Consider the diagram in Figure 1.17 and draw your own version that shows the relationship between a sample and a population.
3. Consider the following diagram and answer the questions.



   a. Which sample is representative and which is biased?
   b. Distinguish between a representative sample and a biased sample with reference to the diagram above.

4. For the following research samples, identify two different populations from which each sample could be drawn.
   a. 20 year 10 girls and 20 year 10 boys
   b. 40 teachers who have been teaching for more than 10 years
   c. 100 employees on leave from work because of stress-related reasons
   d. 30 adults diagnosed as having an anxiety disorder
5. For the following research questions, identify a sample that might be used to conduct the investigation and a population from which the sample could be drawn.
   a. Are people who wear uniforms at school or work more likely to be obedient to an authority figure?
   b. Is it easier for men or women to give up smoking?
6. What are two potential limitations of small sample size in an investigation where a larger sample was required?
7. Suppose you work at a hotel employing over 500 staff and want to measure the happiness of its staff members. With reference to the law of large numbers, explain why sampling one staff member for an interview about their happiness could provide a misleading estimate of the happiness of the population.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

1.3 LEARNING ACTIVITY 2

Multiple-choice questions

1. The research sample is best described as a ______ that is selected from a ______ targeted for study.
   A. participant; population
   B. participant; group
   C. subset; group
   D. subset; population

2. There are 200 employees at an organisation where a researcher conducted an experiment to test a new work stress management program. The researcher selected 50 participants from the 100 employees who volunteered to be in the experiment.
In this experiment, there were _____ employees in the sample, and _____ employees in the population.
   A. 50; 100
   B. 50; 150
   C. 50; 200
   D. 100; 200
3. *Source: VCAA 2015 Psychology, Section A, Q.65; © VCAA*
Dr Nguyen is a psychologist interested in investigating the effect of age on the cycling ability of Victorians. He recruits 93 Victorian bike riders who responded to an advertisement that he placed in a newspaper. The bike riders are divided into two groups:
   - Group 1 consists of riders aged 20–39 years old.
   - Group 2 consists of riders aged 40–59 years old.

   The population and the sample for this study were, respectively
   A. Victorians, 93 Victorian bike riders.
   B. 93 Victorian bike riders, Victorians.
   C. 93 Victorian bike riders, Victorian bike riders.
   D. Victorians who responded to the advertisement, 93 Victorian bike riders.
4. The law of large numbers suggests that
   A. sample size can impact on representativeness.
   B. the population must be the entire group of research interest from which a sample is drawn.
   C. participants must be selected from a from a larger group in an unbiased way, such that the sample obtained accurately reflects the total population.
   D. all possible participants must have an equal probability of being chosen for inclusion in the sample.
5. Representative sampling involves
   A. unexpected sampling errors.
   B. participant selection in an unbiased way.
   C. the law of large numbers.
   D. generalising back to the population.

To answer these and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

1.3.2 Sampling techniques

There are different ways of obtaining a sample. Two common sampling techniques are called random sampling and stratified sampling.

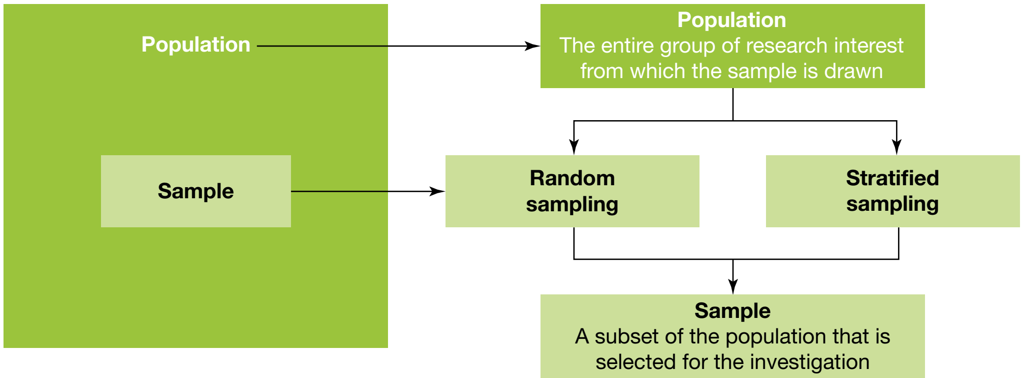


Figure 1.19 Two sampling techniques that may be used for sample selection. Stratified samples may also be randomly selected using a third technique called stratified random sampling.

Random sampling

The dictionary definition of the term 'random' is something which is haphazard, unpredictable or 'hit-or-miss'. However, when the term random is used by researchers in relation to a sample, it has the opposite meaning. Random actually means using a planned, systematic technique.

Random sampling is a sampling technique that ensures every member of the population of research interest has an equal chance of being selected to be part of the sample. A group selected in this way is known as a *random sample* and the selection process helps achieve a representative sample.

Although no sampling technique can produce a completely unbiased sample, random sampling achieves a good approximation, as it introduces the minimum possible amount of error in representing the population.

Random sampling can be conducted in a number of different ways.

One way is to obtain a complete list of all members in the target population. This list is commonly called a *sampling frame*. For example, an electoral roll may be used as a sampling frame, or the telephone numbers of all the people in a relevant and current database may be used. If you were conducting an investigation in your school, class rolls could be used, but only those with the names of students in the target population.

After the sampling frame is obtained, the researcher could obtain a random sample using a simple lottery procedure to select the required number of names. The lottery procedure could involve drawing names out of a box or tossing a coin. For example, if a sheet of paper had all the names of the people in the population on it, the sheet would be cut up into slips of paper equal in size, with one name on each slip of paper. The names would then be thoroughly mixed in the box to help ensure their distribution throughout the box. Then, names of sample members (or research participants) could be drawn out 'blindly', one at a time.

As a result of this simple but systematic procedure, the likelihood that the sample is representative of the population is increased, and so is the ability of the researcher to generalise the results to the sample's population.

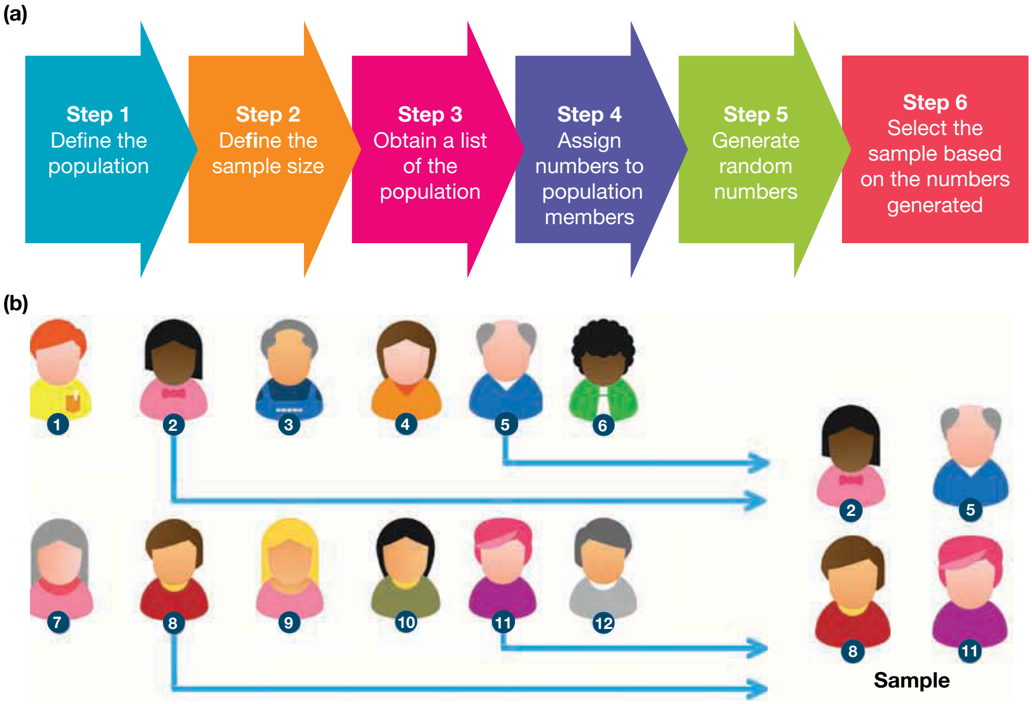


Figure 1.20 (a) Steps in random sampling when using a list of the target population. A group selected in this way is known as a random sample. (b) Random sampling does not guarantee the representative sample shown here, especially when sample size is small.

When a large number of participants are required, researchers often use a digitally generated list of random numbers. Free number generator apps suitable for research purposes are available online and at app stores. When the numbers are generated, each participant in the sampling frame is given a number from 1 through to however many are in the target population. If the first number in the list is 22, then the twenty-second person in the sampling frame is included in the sample; if the second number is 93, then the ninety-third person in the sampling frame is selected, and so on until the required number of participants have been selected.

Sometimes a researcher may not find it necessary or even desirable to use a random sample that is fairly representative of a population of interest. For example, a researcher interested in the language development of children may intentionally undertake a case study of a child raised in a harsh, deprived environment where there is little or no opportunity to learn language, rather than studying a sample of 'average' children from a 'normal' home environment.

The most important advantage of random sampling is that it helps ensure a highly representative sample, thereby enabling generalisations with greater confidence. The larger the sample, the more likely it is that this will occur, but there is no guarantee that the sample will be representative.

The main limitation of random sampling is that it can only truly be carried out if a complete list of the target population is available. If available, it may be difficult to gain access. If accessed, the process of random selection may be time-consuming.

Stratified sampling

In some research studies it is important to ensure that particular subgroups in a population of interest are represented in their known proportions in that population.

For example, suppose that a researcher wanted to study the attitudes of adult Australians to arsonists who deliberately light bushfires. They could reasonably expect that attitudes may differ depending on whether someone lives in an inner city suburb or in a rural community located in a bushfire prone area. Consequently, the researcher may want to ensure that each of these 'subgroups' was represented in the sample in about the same proportions that they were known to exist in the adult population. This can be achieved by using the sampling technique called stratified sampling.

Stratified sampling is the process of selecting a sample from a population comprised of various subgroups in such a way that each subgroup is represented. It involves dividing the population to be sampled into different subgroups (called *strata*), then selecting a separate sample from each subgroup (called *stratum*) in the same proportions as they occur in the population of interest.

Sociocultural factors such as residential area, type of accommodation, age, sex, income level, income type, educational qualifications, language spoken or preferred, and cultural background are examples of characteristics that may be used as the basis of dividing a population into strata.

The stratified sampling technique is commonly used to study behaviour and mental processes that tend to vary greatly among different subgroups within a population. For example, suppose you were going to undertake an investigation on the attitudes of students in your school towards the use of rewards and punishments by teachers. If you expect that attitudes may differ among students in different year levels, you would want to ensure each year level (stratum) is proportionally represented in your sample.

In this case, you could first obtain separate lists of the students in each year level and then randomly sample from each list. If, for example, about 10% of all students in your school are enrolled in year 12 and about 15% in year 11, then your sample would consist of about 10% year 12 students and about 15% year 11 students. This would ensure students from each year level are represented in about the same proportions in the sample as they are in the population (the school). Figure 1.21 shows an example of a stratified sample that could be obtained for the attitudes study.

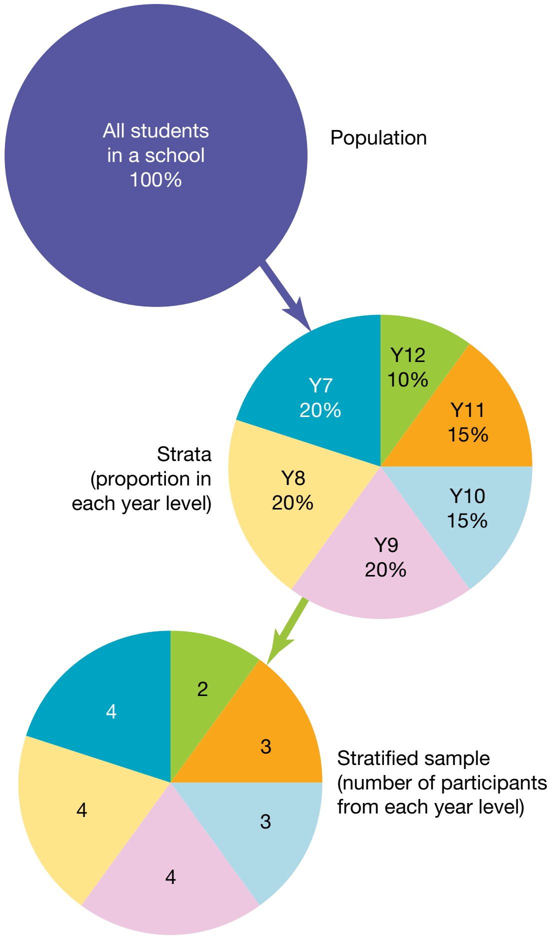


Figure 1.21 An example of a stratified sampling procedure to select participants for an investigation in a whole school population

Using this *stratified random sampling* technique would help ensure that the sample is highly representative of the population and therefore not biased in a way you consider to be important. For example, it would be biased if everyone in the target population does not have an equal chance of being a participant or if one or more groups are significantly under- or over-represented in the sample.

The most important advantage of stratified sampling is that it enables the researcher to sample specific groups (strata) within populations for comparison purposes; for example, males vs females, adolescents above or below a certain age, people who work in different departments of an organisations, or people of different ages and cultural backgrounds who have been diagnosed as having schizophrenia and will be exposed to a new type of treatment program for the disorder. This means that a stratified sample can provide greater precision for a research study and its findings when compared to the standard random sample taken from one larger group.

A major limitation of stratified sampling is that, like random sampling, it can be carried out only if complete lists of the target populations are available and accessible. However, if accessed, a representative sample cannot be obtained unless stratified random sampling is used. Either way, stratified sampling can be a very time-consuming and complex procedure, and therefore expensive procedure, more so than standard random sampling.

Figure 1.22 Convenience sampling is a third sampling technique that is widely used in psychology, but the one which is least likely to achieve a random sample. The technique involves selecting participants who are readily or most easily available. This may involve going to known locations of potential participants (such as homeless people) and seeking their voluntary participation.

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learnMORE | Convenience sampling

Access learnON to read about the commonly used technique of convenience sampling.

1.3 LEARNING ACTIVITY 3

Review

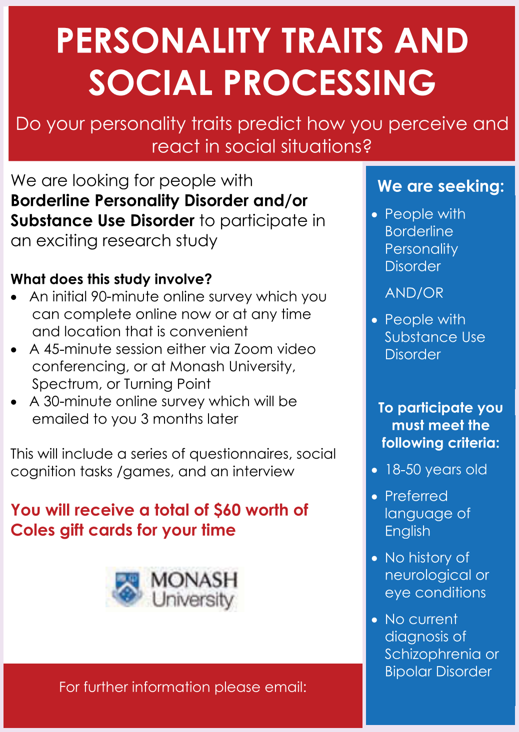
1. What does sampling involve?
2. Complete the following table to summarise the two sampling techniques.

Sampling technique	Description	Example for a within-school investigation	Advantages	Limitations
random sampling				
stratified sampling				

3. Complete the following passage about applying your knowledge of sampling techniques. Insert the correct term in each of the blank spaces.

   Whenever you read a report on an investigation, make sure to determine what ______ technique was used to select the ______. Doing so will help you judge whether the sample is likely to be ______ and how tentative any ______ made by the researcher should be.

4. a. Refer to Figure 1.22 and formulate a definition of 'convenience sampling'.
   b. Give an example of a convenience sample that may be used for an investigation conducted at school.
5. One way of accessing participants in a population of research interest is to advertise. Consider the following advertisement and answer the questions about the research.



   a. What is the specific question or topic of research interest?
   b. Identify the population from which the sample will be selected.
   c. Identify an important personal characteristic of the sample required by the researchers.
   d. Are the researchers undertaking random sampling, stratified sampling or convenience sampling?
   e. i. How representative is the sample obtained using the advertisement likely to be?
      ii. Will the researchers be able to apply (generalise) their results from the study described in the advertisement? Explain your answer.

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1.3 LEARNING ACTIVITY 4

VCAA exam questions

Question 1 (1 mark)

Source: VCAA 2010 Psychology 1, Section A, Q.31 (adapted); © VCAA

A researcher wishing to repeat a study believes that the age and gender of participants may influence the results. The researcher ensures that these characteristics are represented in the sample in the same proportion as in the population of research interest.

This is known as

A. random sampling.
B. stratified sampling.
C. representative sampling.
D. proportional sampling.

Question 2 (1 mark)

Source: VCAA 2008 Psychology 1, Section A, Q.30; © VCAA

Alex is conducting an experiment on visual perception and wishes to use random sampling to select her participants from the population of VCE students at her school.

An appropriate method would involve

A. calling for volunteers.
B. selecting every fourth student who enters the VCE common room.
C. organising participants alphabetically by surname and selecting every second participant.
D. assigning each VCE student a number and putting all numbers into a box and drawing out 20 numbers.

Question 3 (1 mark)

Source: VCAA 2006 Psychology 1, Section A, Q.31; © VCAA

Christopher would like to carry out an experiment that tests the effect of context on perceptual set. He wishes to test a sample of students and then generalise the results to all the VCE students at his school.

Which of the following methods for selecting participants is most likely to produce a sample that is representative of the population?

A. using the first 25 VCE students who respond to an advertisement in the school's newsletter
B. selecting the first 25 VCE students who walk into the library during lunchtime
C. testing everyone in his VCE psychology class (25 students)
D. generating a random list of 25 names from a list of all VCE students in the school

Question 4 (1 mark)

Source: VCAA 2006 Psychology 1, Section A, Q.31; © VCAA

Which of the following best describes a stratified sample?

A. a sample that is made up of people from different cultures
B. a sample of people who are selected for certain characteristics
C. a sample that equally represents all members of a population
D. a sample that includes both an experimental and a control group

Question 5 (3 marks)

Source: VCAA 2016 Psychology, Section B, Q.9; © VCAA

The Sunnydown Basketball League has 1500 players aged 12–18.

Explain how a researcher could design a random sampling procedure to investigate the effect of sports drinks on the performance of under-16 basketball players in the Sunnydown Basketball League.

To answer these and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

1.4 Controlled experiments

The VCE Psychology Study Design emphasises the **controlled experiment** — an experimental investigation of the relationship between one or more IVs and a DV, controlling all other variables. In particular, the researcher can investigate whether there is a cause–effect relationship between an IV and DV.

A properly conducted controlled experiment depends on rigorous control. This essentially involves taking steps to prevent or minimise the possibility that anything other than the IV(s) will affect the DV and therefore the results.

In this section, we consider key features of the controlled experiment and why it can be used to investigate causes of behaviour and links between behaviour and mental processes.

1.4.1 Experimental and control groups

In a relatively simple experiment, the participants are allocated to one of two groups. One group of participants, called the **experimental group**, is exposed to the IV. This group may also be described as being *experimental condition*. A second group of participants, called the **control group**, is not exposed to the IV. This group may be said to be in the *control condition*. The responses of those in the control group are compared with the responses of participants in the experimental group who are exposed to the IV under investigation.

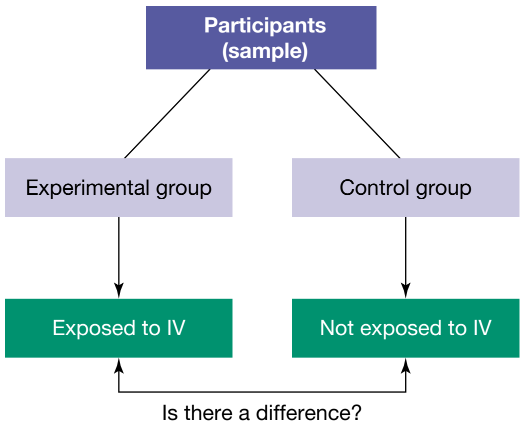

Figure 1.23 A simple experiment with one experimental group and one control group

For example, consider an experiment to investigate whether alcohol consumption affects driving ability. In this experiment, the IV which the experimenter will manipulate is the amount of alcohol consumed by research participants and the DV will be the number of driving errors made.

The experimental group would be tested on their driving skills in a driving simulator after having consumed an alcoholic drink (the experimental condition) and the control group would be tested on their driving ability in the driving simulator after having consumed a non-alcoholic drink (the control condition).

The control group provides a baseline ('reference point') or standard against which the researcher can compare the performance of the experimental group in order to determine the effect of the IV on the DV. If the driving performance of the experimental group is significantly worse than the driving performance of the control group, the experimenter will seek to conclude that the IV (consumption of alcohol) affected the DV (driving errors). A flow chart summary of this experiment is shown in Figure 1.24.

The experimental group and the control group need to be as similar as possible in the spread of personal characteristics of participants that can cause a change in the DV. For example, one group should not have significantly more participants who are more experienced ('better') drivers so that this does not become a possible reason for differences in the number of driving errors between the groups that may be recorded. It is also important that both groups are treated the same, except for the time when the experimental group is exposed to the IV.

Both of these conditions are necessary so that if the predicted change in performance occurs in the experimental group and does not occur in the control group, the experimenter can be more confident in concluding that it was the IV that probably caused the greater number of driving errors.

Sometimes the experimental condition and control condition are collectively called *experimental conditions*, which literally means 'all the conditions of the experiment'. When this expression is used, the condition in which the IV is present may be referred to as the 'treatment condition' because the IV is the 'treatment' to which the participants are exposed or not exposed.

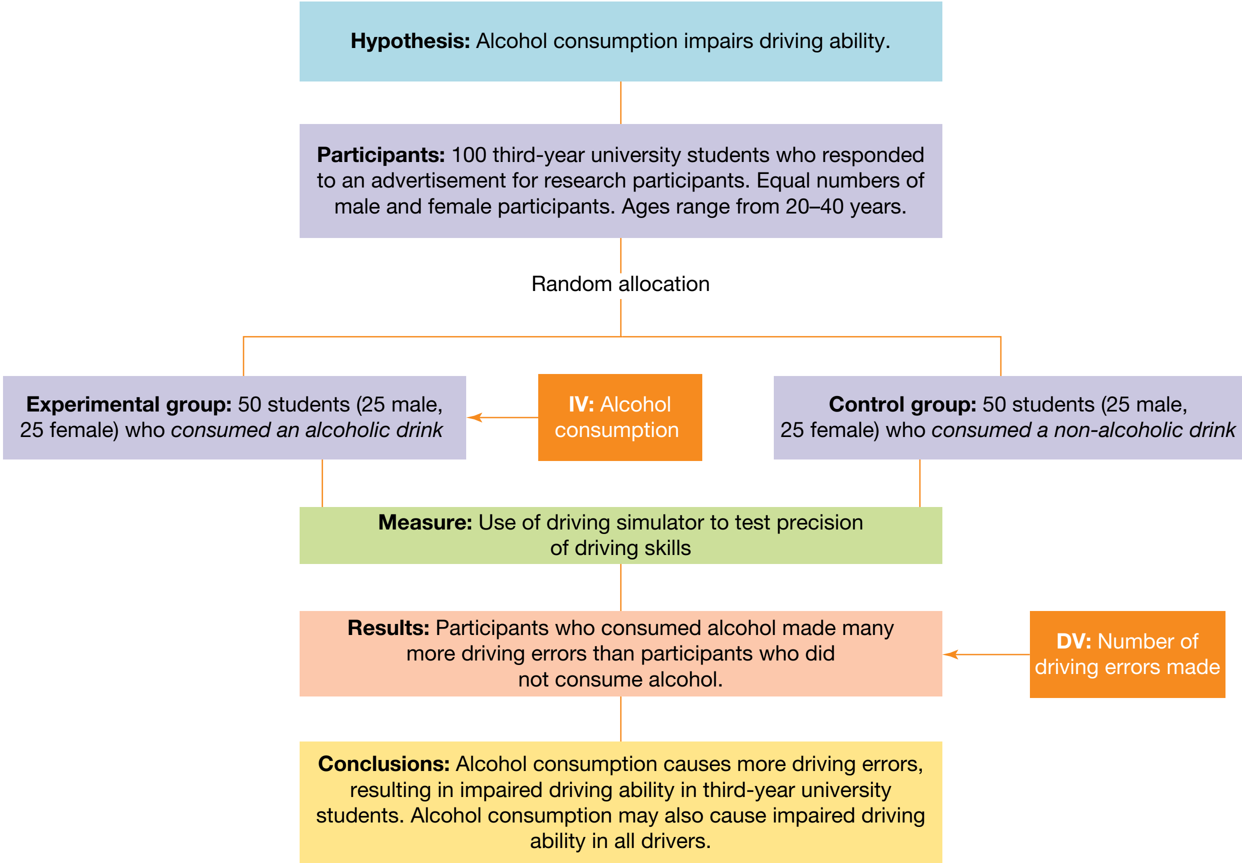

Figure 1.24 A flow chart of the experiment testing the effect of alcohol consumption on driving ability

A controlled experiment may also be conducted with multiple experimental groups; for example, to compare different levels of an IV. In such cases there may or may not be a control group.

There is also a type of controlled experiment that is intentionally conducted without a control group comprising different participants. For example, the same group of participants may be compared before and after exposure to the IV. We consider this type of experiment in the next section on experimental designs.

1.4.2 Random allocation

The method of selecting the sample is important in ensuring it is unbiased and representative of the population being studied. Equally important is the way in which participants are placed in the experimental and control groups (or conditions).

In an ideal research world, when a control group is used, everything about the experimental and control groups would be identical except for the IV. In reality, however, it is to be expected that there will be individual participant differences that may be uncontrolled variables and make it difficult to isolate the effects of the IV on the DV. Consequently, it is important to ensure that participant-related variables that might affect the results of the experiment are evenly spread in the experimental and control groups.

One way of minimising differences in the composition or make-up of the experimental and control groups is to randomly allocate participants to these groups.

Random allocation, also called *random assignment*, is a procedure used to place participants in groups (or conditions) so that they are as likely to be in one group as the other. This means that every participant has an equal chance of being selected for any of the groups used. Participants selected for the experiment are just as likely to be in the experimental group as the control group.

As with random selection, random allocation can be achieved using a lottery procedure in which chance alone will determine the group to which each participant will be assigned. For example, drawing 'names out of a box' or tossing a coin are also appropriate ways of randomly allocating participants to groups.

With a sufficiently large number of participants, it is reasonable to assume that each group will end up with the same kind of spread of participant characteristics, abilities and backgrounds that may affect the DV and therefore the results.

For example, consider the experiment on alcohol consumption and driving ability described previously. If the experimental group has a larger proportion of 'bad' drivers than the control group and the experimental group makes significantly more driving errors in the driving simulator, it will be difficult for the researcher to isolate the effect of alcohol (the IV) on driving ability (the DV).

The problem is that the participants in the experimental group may make more driving errors than the control group even when *not* under the influence of alcohol. Through random allocation of participants to the experimental and control groups, each group would be expected to end up with relatively even numbers of participants who are 'good' and 'bad' drivers.

The purpose of random allocation is to obtain groups that are as alike as possible in terms of participant variables *before* introducing the IV. With random allocation of participants to the experimental and control groups, researchers can more confidently conclude that if two groups responded differently in the experiment in terms of the number of driving errors, then it most likely had something to do with the effect of the IV. Consequently, random allocation is a crucial means of experimental control.

For a classroom experiment, placing all males in one group (or condition) and all females in the other group would *not* be a random allocation procedure. Similarly, assigning the people seated in the front half of the room to one group and the people seated in the back half to the other group is not random allocation. There could be a difference in one or more personal characteristics of participants who prefer to sit at the front or back of the classroom.

Random allocation is different from random sampling. Random allocation is used to place participants in groups (or conditions). Whereas random sampling is one of the methods that can be used to select participants for an experiment (or other types of investigations). Random sampling, however, is based on the same principle of 'equal opportunity for all participants'.

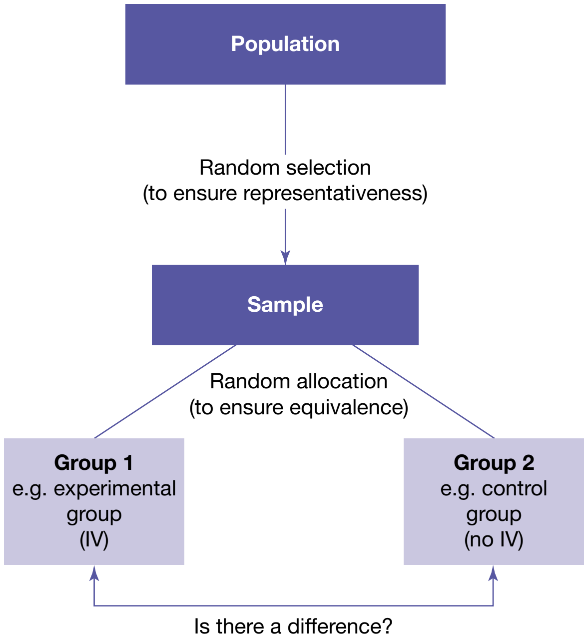

Figure 1.25 A simple experimental design with two groups that uses random sampling to select participants and random allocation to assign them to either condition

on Resources

Teacher digital document Practical activity — testing random allocation

1.4 LEARNING ACTIVITY 1

Review

1. List three key features that distinguish a controlled experiment from other research methods.
2. a. Distinguish between experimental and control groups (or conditions) in relation to the IV.
   b. Why is it important for the experimental and control groups to be as similar as possible in personal characteristics that may affect the DV?
   c. In what other way must the experimental and control groups be alike?
3. What is the purpose of using a control group in an experiment?
4. What is random allocation?
5. What does random allocation achieve in relation to groups selected for an experiment and why is it assumed that this is possible?
6. Why is random allocation considered to be a crucial feature of good experimental design?

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1.4 LEARNING ACTIVITY 2

Multiple-choice questions

1. All controlled experiments use
   A. random sampling.
   B. a control group.
   C. independent and dependent variables.
   D. All of the above are correct.
2. *Source: VCAA 2013 Psychology, Section A, Q.22; © VCAA*
   In an experiment studying the impact of meditation on stress, the control group should
   A. not meditate at all.
   B. meditate as often as the experimental group.
   C. be able to choose whether to meditate or not.
   D. meditate more often than the experimental group.
3. *Source: VCAA 2008 Psychology 1, Section A, Q.31 (adapted); © VCAA*
   In an experiment, the group that is not exposed to the independent variable is known as the
   A. experimental group.
   B. experimental condition.
   C. random group.
   D. control group.
4. One technique that an experimenter could use to control for individual participant differences in their experimental conditions is to
   A. use a small and carefully selected sample.
   B. use random allocation.
   C. select experienced participants from the population via a personal interview.
   D. use random sampling.
5. Random allocation refers to a research procedure in which
   A. each person in the population has an equal chance of selection into the sample.
   B. the researcher determines the group to which participants will be allocated.
   C. participants are matched on ability as experimental groups are formed.
   D. participants are assigned in a systematic way to different groups in the experiment.

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1.4.3 Experimental designs

There are different types of experimental designs that vary in terms of their specific procedures and complexity. Three of these designs are the between subjects, within subjects and mixed design. As with all research methods, each design has advantages and limitations.

Between subjects

In an experiment with a **between subjects** design, also called *independent groups* and *between groups*, each participant (or 'subject') is randomly allocated to one of two (or more) groups or conditions and provides one score for data analysis.

The simplest between subjects design uses two groups — most often one group as the experimental group and the other as the control group, but a control group is not always used.

For example, in a between subjects experiment to test the effectiveness of two medications for treating anxiety, one group of participants diagnosed with anxiety could receive one of the drugs and another would receive the other drug. The researcher can compare the effect of each medication on a different set of people.

As with all controlled experiments, random allocation is an essential feature of the between subjects design in order to control individual participant differences. Random allocation to the different conditions will help ensure groups are well matched on participant variables and therefore fairly equivalent. For example, in the anxiety drug experiment, each group would have participants with the same type(s) of anxiety disorder, symptoms, degree of severity, and so on.

The bigger the groups, the more likely it is that a uniform spread of characteristics and abilities will be achieved. Although random allocation does not guarantee that different conditions are entirely equivalent in the spread of participant variables, it does greatly reduce the likelihood of differences so that the effect(s) of the IV on the DV can be isolated.

The between subjects design is very common in experimental research. An advantage is that, unlike the within subjects design which uses the same participants in the experimental and control groups, there is not often a need to spread out the time period between the different experimental conditions. This means that the experiment can usually be completed on one occasion, which also helps ensure participant attrition ('dropout' rate) is negligible. There are also no order effects between conditions to control.

However, there is often a need for a larger number of participants to help ensure the spread of participant variables within the sample will match the distribution within the population. In addition, there is less control over participant variables than in other designs, especially when a small sample is used.

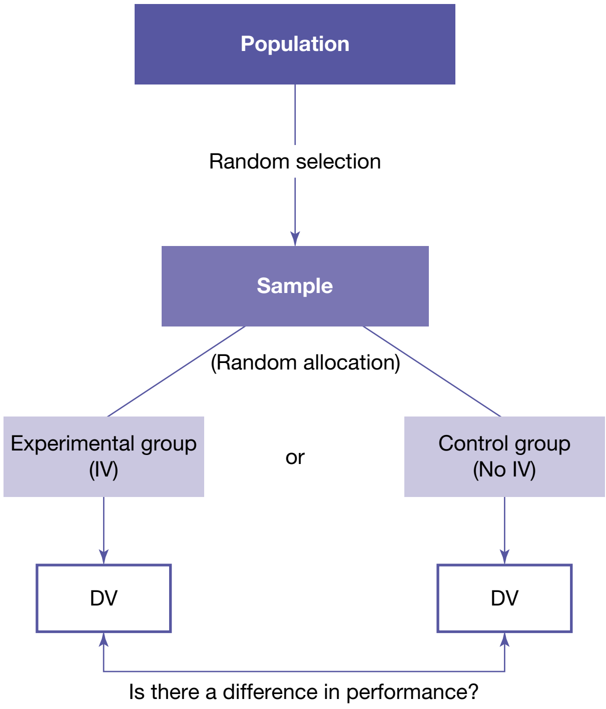

Figure 1.26 In a controlled experiment with a between subjects design, participants are randomly allocated to either the experimental or control group.

Within subjects

In a **within subjects** design, also called *repeated measures* and *within groups*, each participant ('subject') is in both the experimental and control groups or all the treatment conditions (if there is no control group). The groups (or conditions) are therefore identical in composition so individual participant differences may be controlled.

For example, suppose an experimenter is interested in investigating whether memory of a crime by eyewitnesses is better when hypnotised. Using the within subjects design, all participants may be shown a video of two robberies that are reasonably alike in detail, once when hypnotised and once when not. For each condition they could be given a test of recall with 20 questions about the robbery. The number of correct answers given under each condition could then be compared.

This design would give the experimenter strict control over all the possible participant variables that could influence memory, such as individual differences in attention, level of alertness, motivation, visual perception, prior experience, and so on.

Participant differences that could influence the DV in an unwanted way but which may not have been identified by the experimenter will also be controlled because the participants in both conditions are identical in every respect.

When planning a within subjects experiment, the experimenter has to consider *order effects* because they are more likely to arise for this type of design. For example, participants may perform better in the second condition because of practice or worse because of fatigue.

In either case, the order effect is an unwanted variable that needs to be controlled because the experimenter cannot be confident about whether the IV or order effect caused the change in the DV. Procedures for controlling order effects are explained in the topic on sources of error.

The main advantage of the within subjects design is that it can effectively control the unwanted influence of variables arising from individual participant differences. For instance, it can be assumed that any difference in performance on the DV in each condition of the experiment is unlikely to be due to individual participant differences because each participant is in every condition.

Another advantage is that this design also tends to require a relatively smaller number of participants when compared with other designs because the same participants are in all conditions.

However, the within subjects design also has limitations. Although this design keeps individual participant differences constant, it does not necessarily control all participant variables that can influence the results. For example, some participants may guess what the experiment is about as they compare the two conditions, creating expectations and beliefs that lead to unnatural responses. Other order effects in addition to practice and fatigue are also more likely to occur with this design.

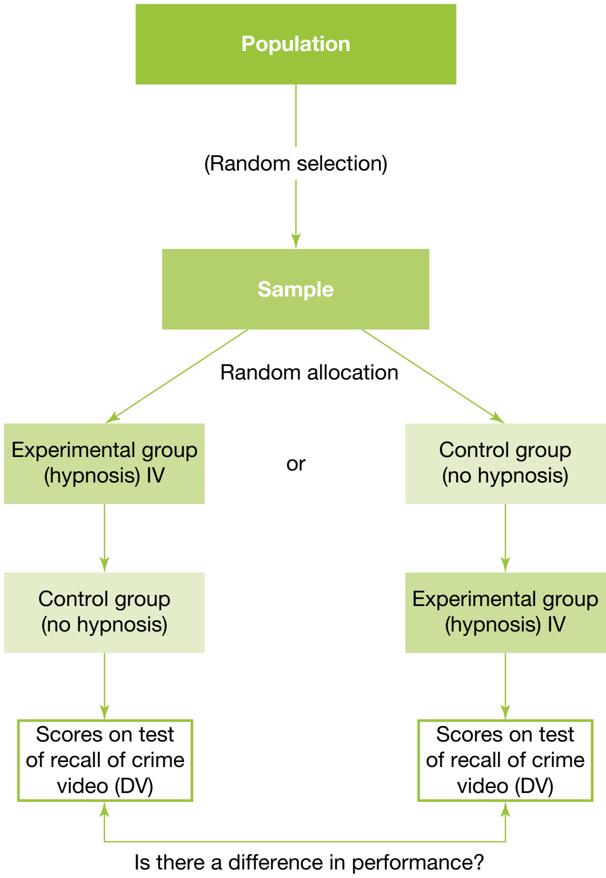

Figure 1.27 In a controlled experiment with a within subjects design, the same participants are in both the experimental and control groups (or all experimental groups if no control group).

Furthermore, within subjects experiments have greater participant attrition (loss) rates, especially when conducted over several days to reduce participant fatigue, boredom or overload. Participants may show up for the first session but not the second.

Mixed design

A **mixed design** experiment is an investigation that combines features of both a between subjects design and a within subjects design. This means that the researcher can assess the potential differences between two or more separate groups of participants (i.e. between subjects) as well as change in the individual members of each group over time (i.e. within subjects).

For example, suppose that a researcher is interested in studying how lack of sleep might affect the performance of air traffic controllers who work in towers with the responsibility of managing aircraft arriving and departing from airports.

Sleep deprivation time will be the IV and the amount of time will be varied for different groups of participants. For the DV, the researcher decides to use a task for which participants have to detect targets on a computer screen. The targets are presented like the blips of light representing planes they track on a radar screen. A participant's score will be the number of targets detected during a 90-minute session.

Fifteen volunteer participants will be randomly allocated to one of three groups: Group 1 who have been awake for 2 hours, Group 2 who have been awake for 12 hours, or Group 3 who have stayed awake and therefore had had no sleep for 24 hours. This will be the between subjects feature of the experiment.

Because an air traffic controller's job during an 8-hour shift involves a number of sessions separated by breaks, the researcher decides to test each participant during 4 sessions, with a 30-minute break between each. This will be the within subjects feature of the experiment.

In sum, different participants will be initially allocated to different groups to assess the effect of one level of the IV for each group (the between subjects variable), then all the participants will be assessed under all the levels of the IV to study change in performance over time (the within subjects variable). The researcher's data will comprise three sets of scores for each of four sessions, with four scores for each participant. Note that in the mixed design there are two or more IVs, one of which is a between subjects variable and one of which is a within subjects variable.

The main advantage of the mixed design is that the researcher can capitalise on the strengths of the between subjects and within subjects designs. In particular, fewer participants are needed for the experiment and there is greater sensitivity in the results; that is, they tend to be more precise and detailed.

1.4.4 Experimental settings

Psychological experiments can be conducted in a *laboratory setting* and therefore called a **laboratory experiment**, or outside the laboratory in a *field setting* and therefore called a **field experiment**.

A laboratory setting usually enables stricter control of variables but is sometimes criticised because of its artificiality, depending on what is studied. In a field setting, the conditions of the experiment are usually less strictly controlled, but it has the advantage of being able to make observations of participants' behaviour in a real-world environment where their behaviour is likely to occur more naturally.

For example, an experimenter may conduct a laboratory experiment to investigate how first year psychology students at their university make choices between risky and less risky bets with imaginary money and payoffs. But what if the money were real, and the setting a pokie venue or casino rather than a psychology laboratory in the basement of the psychology building?

Figure 1.28 Experiments in psychology can be conducted in both laboratory and field settings. (a) In a laboratory setting, social behaviour may be observed in a controlled situation established by the experimenter. (b) In a field setting, social behaviour may be observed in a real-world situation, but less control of conditions is possible.

Some experiments conducted in field settings are called natural experiments. A *natural experiment* takes advantage of a naturally occurring event — the IV is naturally occurring and is not manipulated by the experimenter, often because it is impossible or unethical to do so.

For example, a researcher may study the effect of a catastrophic event such as bushfire or flood on stress-related ill health. In this case, the IV is a bushfire or flood, a naturally occurring event. However, the IV is not controlled by the experimenter and there may be many uncontrolled variables. For example, in a bushfire study, it may be difficult to determine whether stress-related ill health (the DV) is caused by fire, smoke or stress due to loss of one's house.

In a true experiment, the researcher can manipulate the IV, so a natural experiment is often described as a *quasi-experiment* because it looks like an experimental design ('quasi' means 'resemble') but the researcher does not actually manipulate anything and it lacks random allocation.

1.4.5 Advantages and limitations of experimental research

A key feature of a typical psychological experiment is the experimenter's attempts to control the conditions in which a behaviour or event of interest occurs, whether the experiment is conducted in a laboratory setting or in a real-life setting. As well as controlling the IV and using a suitable measure for the DV, the experimenter also attempts to minimise or eliminate the influence of unwanted variables to concentrate entirely on the effect the IV has on the DV.

Elimination of all such variables is not always possible, but control is usually greater than in other research methods, especially if the experiment is conducted in a laboratory setting.

For example, if an unwanted variable is identified when designing the experiment and that variable cannot be removed, then the experimenter may attempt to minimise its effects to an acceptable level or monitor its effects and take account of those effects when interpreting the results and drawing conclusions. Consequently, the experiment has several advantages when compared to other research methods.

An important advantage is that the IV can be manipulated under controlled conditions in order to observe the effect on the DV, therefore making it possible to test if there is a cause-and-effect relationship between the IV and DV.

In addition, because controlled conditions are known conditions, the experimenter can set up the experiment a second time and repeat it to test (or 'check') the results. Alternatively, the experimenter can report the details of an experiment in such a precise way that others can replicate the experiment and test the results.

Replication is very important because when an experiment is repeated and similar results are obtained, there can be greater confidence in the consistency (reliability) and (accuracy) validity of the results obtained.

Although experimental research has the distinct advantage of being able to provide information about causal relationships between variables, experiments also have limitations. For instance, some research questions of importance in society cannot be studied experimentally for ethical or practical reasons.

These include questions relating to mental health, racism, poverty and homelessness. For example, it is not ethically permissible nor possible to manipulate or control a person's mental wellbeing or whether they are poor, homeless or abused. Similarly, the experimenter cannot break up families to measure the effects of family separation.

Nor would the laboratory always be the best setting for testing variables such as grief, hate or love. It may be difficult for participants to express these emotions very realistically in a laboratory setting.

The experimenter can randomly select participants from a target population to measure characteristics that already exist, but they cannot administer a 'treatment' such as mental health, race or grief. Personal characteristics of individuals cannot actually be manipulated. The experimenter cannot, for example, randomly assign a person to be a male and another to be 18 years old, or to make someone have dementia, a particular personality type or a higher level of self-esteem than someone else.

When the artificiality of a laboratory setting is a significant limitation, it may be possible to conduct the experiment in the field. But this may expose another limitation. Although a field experiment occurs in a real-life setting and therefore has a relationship to the real world, it is often difficult to strictly control all variables because of the unpredictability of that type of setting.

The ability to more strictly control variables is an advantage of the laboratory setting, however, it can be too dissimilar to real life. In some cases, bringing someone into the unfamiliar environment of a psychology laboratory can change their behaviour to the point where it is not appropriate to generalise the observed behaviour to situations outside the laboratory.

Figure 1.29 Participants may behave differently in the controlled conditions of the laboratory compared to how they behave in the real world.

1.4 LEARNING ACTIVITY 3

Review

1. Complete the following table to summarise the three experimental designs.

Experimental design	Description	Advantages	Limitations
between subjects			
within subjects			
mixed design			

2. What two crucial features do all three experimental designs have in common when variables are controlled?
3. Name the type of experimental design most likely to have been used in each of the following research studies.
   a. To compare the effectiveness of different psychotherapies for treating spider phobia, participants with a spider phobia were allocated to one of two treatment conditions or a control condition.
   b. To investigate the effects of an anxiety reduction medication, participants diagnosed with a phobia were tested before and after they were given the medication.
   c. To compare the effects of inspirational message types A and B, participants listened to message A for one week then completed an assessment on their personal wellbeing. The next day they started listening to message B for 2 weeks after which they completed the wellbeing assessment.
   d. To investigate whether meditation reduces stress, participants' blood pressure was measured immediately before and after a period of meditation, then again every 15 minutes throughout the next hour.
   e. A study on whether males and females are persuaded differently by a female car salesperson.

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1.4 LEARNING ACTIVITY 4

Analysis and evaluation of an experiment

Read the following summary of an experiment and answer the questions about the design.

An experiment was conducted to compare the effectiveness of learning online and learning from a book. The participants were 40 volunteer first-year psychology students at the university where the researcher worked. All responded to an ad on the noticeboard for first-year psychology students.

After arriving at the psychology lab, each participant was given written instructions describing the task and learning materials. These instructions were identical except for reference to either a computer or book for learning.

Participants were then randomly allocated to either of two groups. Group 1 were escorted to a nearby computer lab where they were each assigned to a computer in separate learning compartments and worked individually to learn new psychology content that was presented in 25 PowerPoint slides, read by a narrator during a 30-minute session.

Group 2 members were escorted to a nearby classroom, where they were each assigned a separate desk and learnt the same psychology content for the same amount of time. However, the PowerPoint slides were in a hard copy format presented as a printed booklet.

Both groups then returned to the experimental room for a test on the content. This was completed using a standard pen and paper format. The results showed that Group 1 performed significantly better than Group 2. The researcher concluded that online learning is more effective than text book learning.

a. Formulate a research hypothesis that would be supported by the results obtained for the experiment.
b. Identify the population and sample.
c. Give an advantage and a limitation of the sampling technique used for this particular experiment.
d. Identify the experimental design.
e. Identify the operationalised independent and dependent variables in the experiment.

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1.4 LEARNING ACTIVITY 5

VCAA exam questions

Question 1 (1 mark)

Source: VCAA 2021 Psychology, Section A, Q.38 (adapted); © VCAA

Professor Dominique wants to test an intervention for stress management. She plans to recruit participants from the university community and randomly allocate them to groups of four. Participants will be told that they will be locked in an escape room until they either solve the puzzles in there or an hour passes.

The groups in the experimental condition will be given a 30-minute presentation by one of her research assistants on effective coping strategies to help alleviate stress, then put into the escape room. The groups in the control condition will immediately go into the escape room after providing consent.

Immediately after leaving the escape room, the participants will rate their feelings of stress across the study period. The groups will be assessed on how long it took them to escape and their self-reported stress. The key outcome will be the difference between the two conditions.

Which experimental research design is Professor Dominique adopting?

A. within subjects
B. mixed subjects
C. between subjects
D. mixed design

Question 2 (1 mark)

Source: VCAA 2019 Psychology, Section A, Q.23 (adapted); © VCAA

Dimitri conducted a within subjects experiment. He used lists of 15 four-letter words as the stimuli. In the first condition, after a list of 15 words was presented, a beep signalled the end of the list and the time for participants to start writing the words down using free recall.

In the second condition later that day, using a different list of words, Dimitri added a distractor task for 30 seconds before the beep signalled that participants were to start writing down the words they remembered.

Which one of the following identifies an independent variable in this experiment?

A. the four-letter words used as stimuli
B. the number of words presented prior to recall
C. the number of words remembered in each serial position
D. the use or absence of the 30-second distractor task prior to recall

Question 3 (1 mark)

Source: VCAA 2017 Psychology, Section A, Q.30 (adapted); © VCAA

Dr Chan investigated the effects of caffeine on an individual's response to a physical stressor. She designed and administered an experiment involving 20 individuals (10 male and 10 female), aged between 20 and 40 years old, with no existing medical conditions.

In Condition 1 of the experiment, participants were required to drink a 100 mL cola drink that contained no caffeine. In Condition 2 of the experiment, the same participants were then required to drink a 100 mL cola drink that contained 20 mg of caffeine.

What type of research design has Dr Chan used in her experiment?

A. mixed subjects
B. within subjects
C. between subjects
D. mixed design

Question 4 (1 mark)

Source: VCAA 2013 Psychology, Section A, Q.10 (adapted); © VCAA

In a within subjects experiment

A. different participants are used in both the control and experimental conditions.
B. the same participants are used in both the control and experimental conditions.
C. the same participants are used in one trial of both the control and experimental conditions, and different participants are used in subsequent trials.
D. participants are put into pairs and one member of each pair is placed in the control condition and the other member is placed in the experimental condition.

Question 5 (1 mark)

Source: VCAA 2003 Psychology 2, Section A, Q.2 (adapted); © VCAA

In a within subjects experiment

A. different participants are used in both the control and experimental conditions.
B. the same participants are used in both the control and experimental conditions.
C. different participants with similar characteristics are used in both the control and experimental conditions.
D. the same participants are used in one trial of both the control and experimental conditions and different participants are then used in subsequent trials.

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1.5 Correlational studies

A **correlational study** is used to investigate the relationship that exists between variables without any control over the setting in which the relationship occurs or any manipulation by the researcher. There are no IVs or DVs, or control groups, nor can the researcher randomly allocate participants to different conditions. The researcher merely measures the relationship between the variables of interest with no intervention.

This is usually done by applying a statistical technique to data that have been collected on each variable. The statistics allow the researcher to determine the strength and type of relationship between the variables. The researcher may also be able to identify which variable may be of greater importance and to make predictions.

The researcher may investigate the relationship between or among any two or more variables, as long as the variables are measurable. The variables may involve anything — behaviour, mental processes, physical characteristics, physiological processes, objects or events. The study may involve data that already exist or the researcher may collect their own data on one or more of the variables.

For example, a researcher may be interested in understanding the relationship between air temperature and occurrence of violent crimes, self-esteem and body image, job satisfaction and pay rate, birth order and personality type, stress and ill-health, the physical attractiveness of a person and how much they help receive from strangers or whether the types of fear people have change with age.

To study the relationship between air temperature and occurrence of violent crimes, the researcher could obtain existing data on both the daily air temperature (such as maximum and minimum temperatures) during a period and violent crimes committed over this period of time in a particular area, then determine the number of violent crimes committed on very hot days and very cold days.

Alternatively, a researcher could conduct an investigation to generate and collect their own data on variables of interest. For example, a researcher could test a hypothesis on the relationship between cigarette smoking and anxiety by measuring participants' self-reported cigarette smoking and also their score on a test for measuring anxiety. Or to study the relationship between alertness and the speed and accuracy of visual perception, a researcher could ask participants to complete a self-rating scale of alertness and then a 5-minute, pencil and paper word search task. Scores on both tasks would then be compiled and assessed to help understand the relationship between the two variables.

Correlational studies are widely used in psychology. They are particularly useful when an experiment is inappropriate or impractical. For example, it would be unethical to raise a group of children who were only allowed to watch violent TV programs to investigate whether this made them more aggressive.

Similarly, suppose a researcher wanted to find out how a severe psychological trauma affects learning. It would be unethical to set up two similar groups of participants and expose one of these groups to some kind of traumatic event that would trigger a severe emotional reaction so that its effects on a measure of learning could be assessed.

Instead, the researcher might compare the performance of soldiers returning from combat duties. The participants could be soldiers who have returned home with varying degrees of traumatic combat experiences, ranging from little to severe, either self-assessed and/or assessed by a mental health professional. All would complete a learning task with which they have had no prior experience, such as learning how to create a list of step-by-step instructions for a computer to perform a simple task. The results could then be assessed to find out the relationship between level of trauma and how well the learning task is performed.

Figure 1.30 A correlational study may be used to study links between trauma acquired during armed combat and learning new skills.

Correlational studies are also a useful alternative when time, costs or other practical constraints prevent experimentation (or another research method). For example, the effects of psychological therapies, treatment programs and developmental changes can take a long time and therefore require long-term study. In such cases it would be impractical or unethical (or both) to restrict participants to the controlled environment of a psychology laboratory for the duration of the investigation.

Correlational studies are a non-experimental method. Therefore, the existence of a correlation does not establish whether one variable (such as air temperature) *causes* another (such as violent crimes).

The term **correlation** is used to describe the degree of a relationship between two variables; that is, how strongly two variables are 'co-related', associated or co-vary. When describing a correlation, reference may be made to the direction of the relationship between the variables and the strength of the relationship.

Direction of correlation

For any two variables which are measured in a correlational study, there are three possible relationships between them — positive, negative and zero (no relationship).

A **positive correlation** means that two variables change ('vary') in the same direction — as one variable increases, the other variable tends to increase (and vice versa). For example, as a child's age increases, vocabulary tends to increase (and as vocabulary increases, age tends to increase, or, the lower the age, the smaller the vocabulary). Similarly, there is a positive correlation between hours of exam study and exam marks. So, the more time you spend studying for an exam, the better the marks you are likely to achieve (and the less time you spend studying, the lower the marks). Note that both examples are positive correlations. The variables change in the same direction — upward or downward.

In contrast, a **negative correlation** means that two variables change in opposite directions — as one variable increases, the other variable tends to decrease (and vice versa). A negative correlation is like a seesaw. For example, as self-esteem increases, sadness tends to decrease (and as sadness increases, self-esteem tends to decrease). And, the more hours you spend on non-exam study activities, the lower the exam marks you are likely to achieve.

A **zero correlation** means that there is no relationship between two variables. For example, there is no relationship between intelligence and hair colour. These two variables can change entirely independently of each other. Similarly, there is no relationship between your birthday and exam grades.

A correlation is usually described 'quantitatively' by a number known as a **correlation coefficient**. When calculated, this is expressed as a decimal number which can range from +1.00 to –1.00. The plus or minus sign describes the *direction* of the relationship between the two variables; that is, positive or negative.

A correlation coefficient with a *plus* sign indicates a positive correlation. This means that high scores for one variable tend to go with high scores on the other, middle scores with middle scores, and low scores with low. For example, consider the results of a correlational study on age and problem-solving ability. If a high positive correlation (say +0.75) is found between age and problem-solving ability, then older people tend to be good problem-solvers (e.g. they solved many problems in a 20-minute period) and younger people tend to be poor problem-solvers (e.g. they solved fewer problems in a 20-minute period).

A correlation coefficient preceded by a *minus* sign indicates a negative correlation. This means that when a score on one variable is high, the score on the other tends to be low, and middle scores tend to go with middle scores. For example, if a high negative correlation (say –0.75) is found between age and problem-solving ability, then older people would tend to be poor problem-solvers and younger people would tend to be good problem-solvers.

When reporting correlation coefficients for positive correlations, researchers usually omit the plus sign from the front of the score. However, the minus sign is always included for a negative correlation.

Strength of correlation

The decimal number of the correlation coefficient describes the *strength* of the relationship between the sets of scores for two variables; that is, whether the relationship is strong, moderate or weak. A correlation coefficient which is close to +1.00 indicates a very strong positive correlation between two variables. A correlation coefficient which is close to –1.00 indicates a very strong negative correlation between two variables.

Correlation coefficients of 1.00 and –1.00 indicate perfect correlations but these rarely occur in psychology. A correlation coefficient which is close to 0.00 indicates little or no relationship between two variables. For example, 0.13 and –0.13 would be considered a very weak positive and very weak negative correlation respectively.

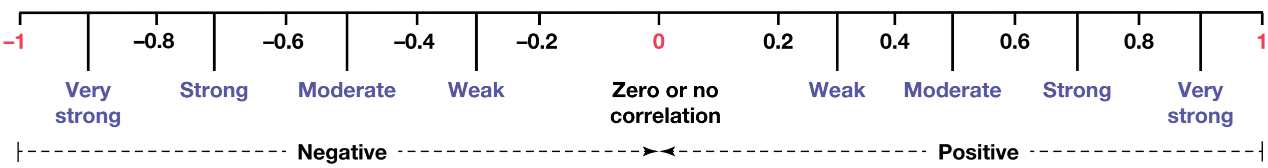

Figure 1.31 How correlation coefficients may be interpreted. There is no formally stated rule for determining the exact values at which a correlation is considered strong (high), moderate (medium) or weak (low).

1.5.1 Correlation and causation

Correlations show the existence and extent of relationships between variables but they do not necessarily indicate that one variable causes the other. For example, people get older as the world rotates on its axis. There is an extremely strong correlation between these two variables, but it would be incorrect to assume that the Earth's rotation *causes* people to age or that people's ageing *causes* the Earth to rotate.

There are also many instances when strong correlations suggest a logical cause–effect relationship. For example, the number of friends a person has may be closely related to how happy they are. Or, conversely, a person's happiness may be influenced by the number of friends they have, especially if they suddenly lost most of their friends.

But a very strong correlation doesn't necessarily mean that there is a cause–effect relationship because both variables may be correlated with a third variable.

For example, there is a strong positive correlation between the number of permanent teeth in children and their ability to answer increasingly difficult questions on intelligence tests.

It cannot be assumed, however, that having more teeth causes increased cognitive ability. The correlation is strong because a third variable — increasing age — accounts for both new teeth and cognitive development.

Similarly, talkativeness may be positively correlated with the personality trait of extraversion. However, the degree of talkativeness may be due to a correlation between talkativeness and having many close friends. This third variable may account for both talkativeness and extraversion.

When an alternative third variable may account for a correlation, in addition to the two variables that have the correlation, it may be referred to as the *third variable problem*, as shown in Figure 1.32.

When two variables are strongly correlated, this is not accepted by researchers as evidence of causation in the absence of other research evidence. In such cases, researchers may test the possible cause–effect relationship by conducting a controlled experiment.

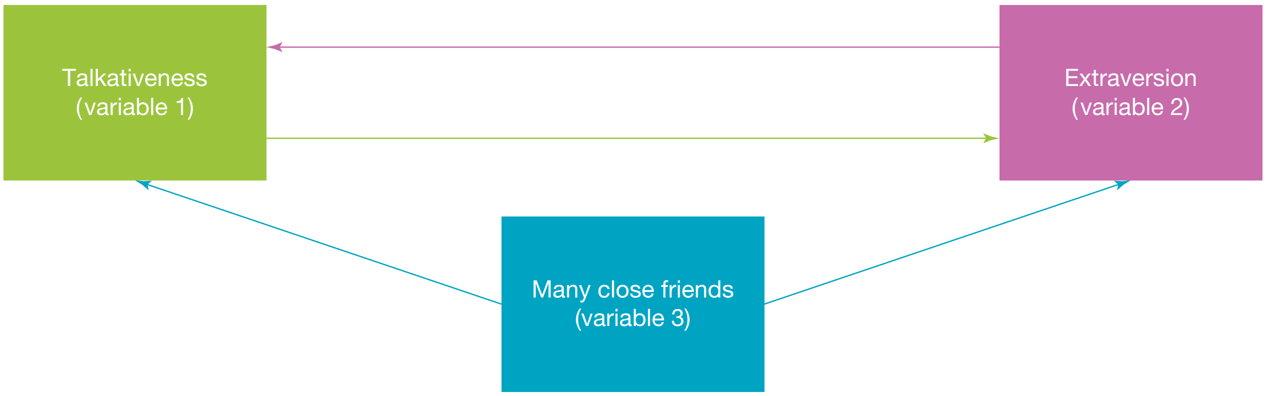

Figure 1.32 The third variable problem. The correlation between talkativeness and extraversion suggests a causal relationship but it may actually be explained by a third variable that hasn't been measured and therefore accounted for. The third variable may be influencing both talkativeness and extraversion.

on Resources

Weblinks Examples of false correlations supported by data
TedX video presentation on the danger of mixing up causality and correlation 5 m 57 s

1.5.2 Using correlations to identify important factors and to make predictions

Even though causality cannot be concluded from the results of correlational research, however strong the correlation, correlational studies are still valuable regardless of the fact that one variable does not necessarily cause the other.

First, correlational studies can be used to rule out some variables and identify other factors that are important or worthwhile for further study and investigation. For example, correlational studies have been used to investigate numerous behavioural and psychological factors thought to be associated with the incidence of heart attacks. Some factors have been found to have a strong (high) correlation with heart attack whereas others have a weak or negligible correlation. Consequently, correlational studies have been of value in identifying which factors contribute the most or least to heart attacks.

In much the same way, correlations have been used to identify more or less important factors in a diverse range of other areas of psychological interest. Furthermore, this approach has enabled researchers to target those factors with high correlations and select them as variables for further investigation through controlled experiments. With this research method, the researcher can assess whether they actually cause a change in the thought, feeling or behaviour of interest.

Second, it is sometimes possible to use the results of correlational studies to make meaningful predictions. Very strong or high correlations enable researchers to make quite accurate predictions about the scores on one variable when the scores on the other variable are known. This applies to both positive and negative correlations.

For example, there is considerable evidence demonstrating a strong positive correlation between stress and susceptibility to colds and infections. Thus, how much stress a person perceives they are under is a good predictor of susceptibility to colds and infections.

Of course, it cannot be concluded that stress causes colds and infections. Although the accuracy of a prediction increases as the strength of the correlation increases, only a perfect correlation between two variables would allow you to predict the exact value or outcome of one from knowledge of the other.

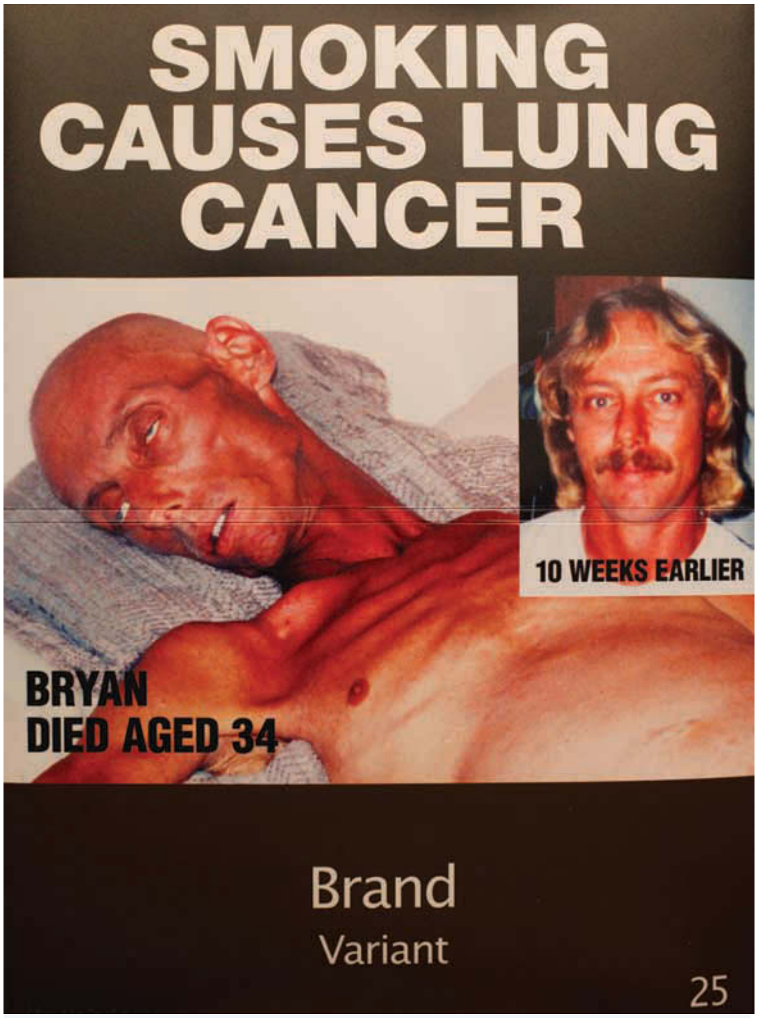

Figure 1.33 How accurate is the label on this cigarette packet? Prediction is possible when two variables are correlated. The stronger (or higher) the correlation between the variables, the better the prediction. However, predictions are estimates that refer to likelihoods, not guaranteed outcomes.

There are statistical procedures that can be used with correlational data to identify one or more ‘predictor’ variables and ‘outcome’ variables to predict the score of one from the other. These procedures can also take account of or rule out the potential influence of other variables.

This means that when the performance of an individual on one of two variables is known, then their performance on the second variable can be predicted quite accurately. At a personal level, knowing this type of information can allow us to reliably predict specific risks in important areas of our lives and make informed choices about our lives and behaviour.

Of course, there will always be people who are exceptions to a prediction when a correlation is not perfect. When a correlation is less than perfect, as it usually is in the real world, then a prediction will also be less than perfect. Predictions therefore refer to the likely effect of one variable on the other.

For instance, in relation to the stress example described previously, it would be predicted that stress increases the *likelihood* of colds and infections. Similarly, if correlational data shows that ATAR scores can reliably predict success in tertiary courses, it does not mean that you are guaranteed to succeed in your tertiary studies if you choose that career path.

1.5.3 Advantages and limitations of correlational studies

Correlational studies examine how variables are naturally related in the real world, without any attempt to change them or test for a cause–effect relationship. They can be used to test hypotheses in cases where it is not desirable or possible to experimentally manipulate the IV of interest.

For example, they may be a suitable alternative when an experiment is inappropriate for ethical reasons or impractical. Variables such as trauma, physical, sexual and emotional abuse, drug misuse and abuse, criminal offending and self-harm are among those of psychological importance. However, for ethical reasons, these cannot be studied experimentally by asking people to experience them in a true experiment. In many cases, researchers can rely on existing information available on the variables of research interest.

Likewise, an experimenter can’t actually change a person’s gender, cultural background, intelligence, personality, prejudices, leadership style, physical attractiveness, mental health, and so on. However, such variables and behaviours do occur in the real world so they can be studied through correlational research.

An associated advantage is that, unlike many psychological experiments, correlational studies on such variables can be conducted outside an artificial laboratory situation where the results may also be more realistic.

Correlational studies are also useful for discovering relationships between variables, even if not causal. In particular, they can identify variables that are more or less important or worthwhile for further study and investigation.

When strong relationships are discovered between variables, researchers can often make worthwhile predictions. The ‘quantification’ of relationships between and among variables so that they are expressed as numbers is also useful for describing, analysing and interpreting results.

Finally, correlations can indicate patterns or trends, thereby contributing to the development and testing of theories and models. In some cases, correlations can also suggest likely causal relationships that may be tested experimentally.

The major limitation of correlational studies is that they do not permit the researcher to draw firm conclusions about cause-and-effect relationships. Correlational studies may suggest or point to possible causes but they cannot demonstrate cause. They are not a legitimate research method for studying causality. Only controlled experiments can be used to clearly establish that one variable causes another.

Furthermore, unlike controlled experiments, it can be difficult or impossible to control unwanted variables, such as a third variable (or others) that may offer a possible alternative explanation.

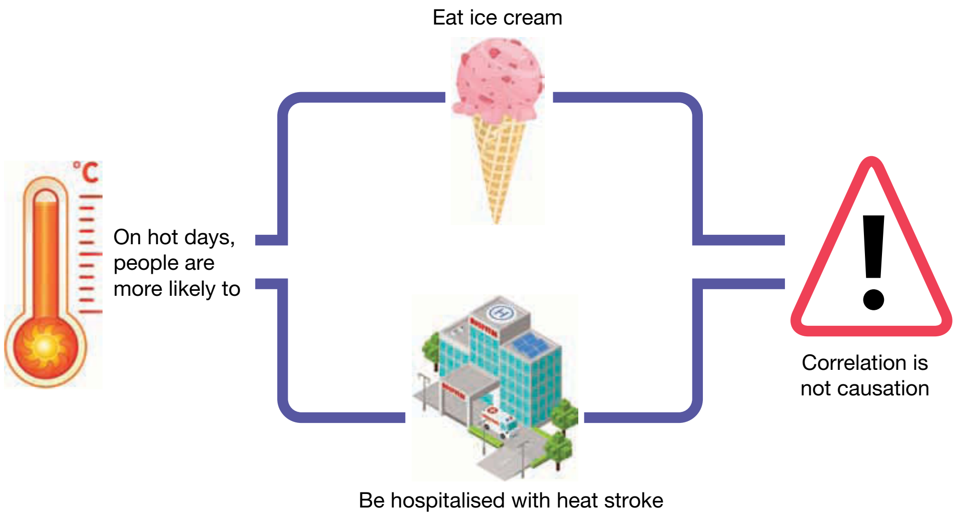

Figure 1.34 Ice cream sales and hospital admissions for heat stroke have a high positive correlation. Does this mean eating ice cream causes heat stroke? Both are influenced by a third variable — high air temperature. Correlation is not causation.

1.5 LEARNING ACTIVITY 1

Review

1. What is a correlational study? Explain with reference to a psychological example different from those in the text.
2. What is the main distinction between the findings of a controlled experiment and those of a correlational study?
3. What primarily determines the researcher's choice of correlational research instead of experimental research?
4. Name and briefly describe the three possible general types of relationships found between variables measured in a correlational study. Give a psychological example of each type of correlation, different from those used in the text.
5. What do the terms direction and strength of correlation refer to and how are they identified?
6. Explain whether a correlation coefficient with a positive value indicates a stronger degree of relationship than does a coefficient with a negative value.
7. What conclusion could be drawn from the following correlation coefficients?
   a. length of time spent studying for an exam and exam grade achieved: 0.78
   b. number of close friends and level of aggressiveness: –0.51
   c. maternal cigarette smoking during pregnancy and birth weight (–0.28)
   d. colour of socks worn in an exam and grade achieved: 0.06
   e. being breast-fed from 0–6 months of age and level of alertness (0.39) compared with being bottle-fed (0.28)
8. a. For (a) and (b) in question 7, suggest a third alternative variable that could account for either of the two variables.
   b. Is the third variable problem possible for negative correlations?
9. Write a research hypothesis that could be tested in a correlational study investigating the association between each of the following pairs of variables.
   a. intelligence and achievement
   b. car drivers' use of mobile phones and car accidents
   c. days absent from school and school achievement
10. Briefly describe two advantages and two limitations of correlational studies.

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1.5 LEARNING ACTIVITY 2

Multiple-choice questions

1. A correlation coefficient is
   A. a numerical value between –1.00 and 1.00.
   B. any variable in a correlational study.
   C. the variable manipulated by the researcher.
   D. the variable not manipulated by the researcher.
2. A researcher found that knowing an individual's score for Test A gives no information whatsoever about their score for Test B. This suggests that the correlation between Test A and Test B is close to
   A. –1.00.
   B. –0.50.
   C. 0.50.
   D. 0.00.
3. The direction of a correlation refers to
   A. whether a prediction can be made from one of the scores.
   B. whether the association is positive or negative.
   C. whether one variable is likely to have caused a change in another variable.
   D. where to look for possible third variables.
4. A university lecturer evaluated the first-year results and found that students in her class who got a good result had also achieved high grades for their VCE and those who hadn't done well had achieved low VCE grades. This suggests a
   A. causal relationship.
   B. low correlation.
   C. negative correlation.
   D. positive correlation.
5. Which of the following statements about correlation studies is correct?
   A. Correlational studies enable strict control of all variables of research interest.
   B. Correlational studies cannot be conducted in real-life field settings.
   C. Correlational studies can be used to make tentative predictions.
   D. Correlational studies enable manipulation of two variables to measure how they may be associated.

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1.6 Self-reports

For some investigations, it may be more appropriate to ask people about their thoughts, feelings or behaviour. To do so when conducting psychological research involves using a method that will prompt self-reports.

A **self-report** is a participant's answers to questions presented by the researcher (APA, 2022). For example, a self-report may be responses to questions about their beliefs or attitudes, feelings when experiencing certain emotions, how they behave in different situations, and so on. Answers may be spoken, in writing, or both. In some cases, a self-report may take the form of daily diary or journal records that are recorded by participants over a period of time.

Overall, self-report methods rely on research participants' accounts of their own experiences and behaviours. For many investigations, one person's self-report is compared with those of others responding to the same questions.

Assuming that the participants are honest, understand the questions, can accurately recall what they have been asked about and are able to give sufficiently detailed accounts of the behaviour or mental process under investigation, self-reports can provide useful data on virtually any topic of research interest.

Interviews and questionnaires are the most commonly used self-report methods. Both use questions requiring participant responses, but they are often distinguished in terms of how the questions are asked and answered. For example, a questionnaire usually involves asking and answering questions in writing, whereas an interview usually involves asking and answering questions orally. However, this is not a fixed 'rule'. Sometimes, a researcher may prefer to orally ask the questions in their questionnaire.

Although interviews and questionnaires can be used exclusively or in combination to collect self-reports, they are often used to collect additional data as a part of investigations using other research methods. For example, interviews and questionnaires are commonly used for correlational studies.

Free-response and fixed-response questions

When using an interview or questionnaire to collect self-report data, the researcher may choose to use free-response or fixed-response questions.

Free-response questions (also called *open-ended questions*) allow participants to answer entirely as they want to. They answer 'freely' in their own words, rather than choosing from options determined by the researcher. For example, the researcher might ask a question such as

What do you think about when deciding whether to go out or do homework?
How do you feel when pressured by a friend to do something you don't want to do?
How do you usually react when this happens?

These kinds of questions enable participants to provide detailed responses without being restricted to giving answers that fit into pre-determined categories. Furthermore, in an interview, free-response questions enable the researcher to ask questions of clarification or follow-up questions as participants give information about the behaviour or mental process under investigation.

With this, however, comes a limitation. Answers to free-response questions are often difficult to summarise or score. This makes it harder for researchers to statistically analyse, describe and interpret the data obtained.

To avoid or overcome this limitation, researchers may ask fixed-response questions. **Fixed-response questions** (also called *fixed alternative* and *fixed-choice*) present a number of 'fixed' alternative answers from which participants are required to choose. Like multiple-choice questions, the participant is asked to pick the correct response or the one that best matches their preference. Examples of this type of question are

'Which of the following most closely corresponds to your age: 20 to 39, 40 to 59, 60 to 79, 80 or older?'
'Have health warnings on cigarette packets led you to cut back on smoking: Yes, No, Undecided?'
'How much time do you usually spend on Facebook each night: 0–30 minutes, 30–45 minutes, 45 minutes–1 hour, 1–2 hours, more than 2 hours?'

Answers to fixed-response questions are usually easier to interpret than are answers to free-response questions. In addition, because fixed-response questions provide specific alternatives from which the participant chooses, the researcher can accurately and concisely summarise and describe the responses numerically. For example, a '0–30 minutes' response to the Facebook question can be assigned a score of 1, '30–45 minutes' a score of 2, and so on. Furthermore, the same scores can be reliably assigned to all other participants who give these responses and all responses can be efficiently analysed, described and interpreted using statistical procedures and tests.

Fixed-response questions are sometimes called 'closed-ended questions'. Although a closed-ended question may present a set of answer options for selection, the term may also be used to describe questions requesting a short definite answer, such as *'Are you a smoker?'*, *'How old are you?'* and *'What is the name of the medication you take?'* (American Psychological Association [APA], 2022).

1.6.1 Interviews

An **interview** involves questions that are asked by the researcher with the intention of prompting and obtaining specific information from an individual participant (the 'interviewee').

Interviews are most often conducted in a face-to-face meeting but sometimes online or by mobile phone using an app like Zoom, Microsoft Teams and FaceTime. They involve talking and usually require spoken answers to questions.

Interviews are rarely used with large samples as data collection would require a considerable amount of time. Unlike questionnaires, which are usually structured, interviews may be structured, unstructured or semi-structured (National Health and Research Council [NHMRC], 2007).

In a **structured interview** (also called *standardised interview*), the participant is asked specific, pre-determined questions in a controlled manner. The choice of answers tends to be fixed and determined in advance as well.

The most structured interview is when the interviewer simply reads fixed-response questions to participants in a set order and records their answers, for example, 'Have you ever been bullied at school or in the workforce?' with a predetermined answer such as 'Yes', 'No' or 'Not sure'.

The interviewer follows a script and the questions are read in a neutral manner with no comments or cues such as facial expressions. This is done to ensure that all participants are treated in the same way and thereby helping maintain standardised procedures.

A less structured interview may use free-response questions (such as 'How do you feel when bullied?'), but the researcher will follow a script to ensure consistency across all participants.

In an **unstructured interview** (also called *nondirective interview*), the researcher has an overall aim of what data should be collected but the questions asked may be generated spontaneously and the types of answers given can vary widely from participant to participant.

The interview is highly flexible and may even be driven by the participant. There is also freedom of discussion and interaction between the interviewer and participant. For example, the interviewer may ask additional questions to follow up on a participant's response and a participant may ask questions (NHMRC, 2007).

The unstructured interview is sometimes described as 'conversational', or 'interactional', to suggest that it is somewhat like the way in which a job interview may be conducted by a human resources professional.

A goal of unstructured interviews is to allow people to describe their thoughts, feelings and behaviour in their own way using their own words and to give more or less emphasis to relevant issues. This is different from structured interviews (and questionnaires) for which participants have to use the questioner's terms and concepts to describe how they think, feel or behave. However, this also means that the data collected through unstructured interviews is much more detailed, has far less structure, and is therefore more difficult to analyse, summarise and describe for reporting purposes.

In a **semi-structured interview**, the researcher uses an interview guide listing a set of issues to be explored. The researcher aims to cover all issues but there are no set questions to be asked. As with the unstructured interview, there is spontaneous generation of questions through interaction with the participant (NHMRC, 2007).

Figure 1.35 Answers to fixed-response questions in a structured interview by people about their risk-taking behaviour will be easier to interpret than answers to free-response questions.

Figure 1.36 An interview is often a face-to-face discussion between a researcher and an individual for the purpose of obtaining detailed information.

1.6.2 Questionnaires

A **questionnaire** is a written set of questions or other prompts designed to draw out self-report information from participants on a topic of research interest. It has a structured format and can be administered via surface mail, over the phone, in a face-to-face interview, in an app or over the internet.

Questionnaires are most often used when responses are required from a large number of participants; for example, as part of a survey. In such cases, they are an efficient way of collecting self-reports because a researcher can administer the questionnaire at the same time to a group who are located in the one place, such as in a school or workplace. For these types of investigations, the questions are usually answered by participants in writing, at their own pace and without supervision.

Written questionnaires are also a means of guaranteeing anonymity to participants. They can therefore be a useful way of collecting self-report data that people are not willing to disclose publicly, such as ambitions, motivations, fantasies, recreational drug use, sexual behaviour, addictive behaviour, socially unacceptable behaviour and illegal behaviour.

Questionnaires may also include prompts in the form of a rating scale. A **rating scale** uses fixed-response questions or statements for which participants rank ('rate') each item on a numerical scale by selecting from a number of choices. For example, participants may be asked to rate their level of happiness or sadness, how often they feel lonely, how much they like meeting new people, how tired they are when the alarm sounds in the morning, their level of anxiety when a bully approaches, their confidence or their attitude to climate change.

The items to which participants respond are usually related as they have been devised by the researcher for the topic or issue under investigation. Responses are typically assigned scores which enables answers to be quantified (converted to numbers) for summary, analysis and interpretation.

Figure 1.37 Surveys can be conducted electronically to administer a questionnaire to large numbers of people anywhere in the world.

The rating scale is like a multiple–choice test, but the answer options represent levels or degrees of a particular characteristic rather than a series of possibly correct answers. Furthermore, there is no correct answer for a rating scale item, other than what the participant decides to give.

The best-known and most commonly used rating scale is the *Likert scale*. This consists of about 20 questions or statements to which the participant responds using a 5-point scale. It is most commonly used to measure attitudes.

For example, in a study on attitudes to refugees and asylum seekers who reach Australia by boat rather than conventional means, a Likert scale statement could be '*Refugees and asylum seekers arriving by boat on Australian shores should be imprisoned until background checks are completed*'. Participants may then be required to rate their answers by selecting one response from five options ranging in strength, such as *strongly agree, agree, neither agree nor disagree, disagree* or *strongly disagree*.

Researchers have several choices in selecting how answers should be indicated on the 5-point scale — for example, ticking or crossing a blank space, circling a number or underlining a response. Each of the responses has a numerical value (e.g. from 1 to 5) and the respondent's attitude is defined as the sum (total) of these values. A Likert scale for measuring attitudes towards recreational drugs could include statements such as those shown in Figure 1.38.

When developing a Likert scale, half the attitude statements are worded in a positive way and half are worded negatively. For statements 1, 3 and 5, the answers would be scored as follows: SA = 1, A = 2, N = 3, D = 4 and SD = 5. For statements 2, 4 and 6, the answers would be scored in reverse: SA = 5, A = 4, N = 3, D = 2 and SD = 1.

When a respondent has completed the Likert scale, all of the responses are scored and a total is calculated. The result is a score on the attitude or whatever else was measured. Generally, the higher the score, the more favourable the attitude.

Questionnaire on attitudes towards recreational drugs

Recreational drugs are legal and illegal drugs used for enjoyment without medical justification for their effects on the mind, mood or behaviour. The following statements are about the use of recreational drugs.

Circle your response to each statement below.

1. The use of recreational drugs is a major social problem in Australia today.	SA A N D SD
2. There should be no restrictions on using recreational drugs as long as the individual using them does not harm anyone else.	SA A N D SD
3. Laws should be strictly enforced regarding the use of recreational drugs.	SA A N D SD
4. It is an invasion of privacy when law enforcement authorities search people suspected of carrying recreational drugs.	SA A N D SD
5. Individuals using recreational drugs should be punished severely.	SA A N D SD
6. In the privacy of their own homes, individuals should be allowed to use any recreational drug they desire.	SA A N D SD

SA = Strongly agree A = Agree N = Neither agree nor disagree D = Disagree SD = Strongly disagree

Figure 1.38 Sample questionnaire and items in a Likert scale for measuring attitudes towards recreational drugs. Note the questionnaire gives an overview of what it is about and instructions on how to answer.

learnON

learnMORE | How to construct a rating scale

Access learnON for a step-by-step description of how to construct a Likert scale.

1.6.3 Focus groups

A **focus group** is a small set of people, typically 8 to 12 in number, who share characteristics and are selected to discuss a topic of which they have personal experience. A leader conducts the discussion and keeps it on target while also encouraging free-flowing, open-ended debate (APA, 2022).

Participants are encouraged to talk to one another, ask questions, exchange personal experiences and points of view and comment on each other's experiences and opinions. This is different from a conventional group interview in which the researcher asks each person to respond to a question in turn.

Focus groups can be used to obtain information on all types of behaviour and experiences. For example, the impact of an advertising campaign, parenting, racism, climate change, bullying in schools, social media use, dating, the lived experience of being a victim of a violent crime, the experience of having a brain injury, the experience of services provided by mental health workers, the attitudes and needs of staff in an organisation, and so on. A focus group may also be used to generate a hypothesis or refine a questionnaire or rating scale for another research study.

A key idea behind the focus group method is that interacting with others in a group situation can help people to explore and clarify their own views in ways that would be far less possible in a one-to-one interview or a conventional group interview. To promote group discussion, the researcher (called a 'facilitator') uses free-response questions and encourages participants to discuss issues of importance to them in relation to the research topic, and even to generate questions for discussion with the rest of the group.

FIGURE 1.39 Group discussion and interaction are important features of focus groups.

A research study using multiple focus groups can consist of anything from a few to over 50 groups, depending on the aims of the research and the resources available. Even just a few groups can generate a large amount of data. For this reason, many studies using focus groups rely on a small number of groups.

Focus group sessions may last for around one or two hours or extend into a whole afternoon or a series of meetings. Sessions are relaxed, in a comfortable setting, with participants usually sitting in a circle to help establish an atmosphere that encourages open discussion.

Some studies combine the focus group method with other data collection techniques; for example, focus group discussion is useful when seeking to explain or explore survey results or to analyse observed behaviour that participants engaged in.

The main advantage of focus groups is the richness of the data that can be generated about the research topic. The groups are generally easy to organise and sessions are relatively inexpensive to conduct when compared to other research methods.

Focus groups are also useful for collecting information from people who have difficulty reading or writing, or have other communication difficulties. Communication difficulties may be a disadvantage in some studies or situations.

The 'safety in numbers' factor may also be an advantage within a group situation. It can encourage the participation of those who may normally be uncomfortable or anxious about revealing information about themselves to an interviewer in a one-to-one interview situation. Co-participants in the focus group can also provide support through their expression of feelings that are common to their group, but which they may consider to be very different or abnormal from those of people not in the group.

This is particularly important when researching very sensitive or 'taboo' experiences such as the death of a loved one or sexual violence. One limitation of focus groups related to this is that the presence of other research participants does not enable the confidentiality of more conventional research settings.

Of course, the process of analysing, summarising and reporting focus group data can be a painstaking and time-consuming process, especially when multiple groups are use. Some psychologists have also expressed concerns about the *reliability* of the results obtained from these types of focus group studies; that is, the same body of raw data can be interpreted differently by different researchers. For example, two different researchers working with the same data may not necessarily extract the same themes and key points, resulting in different conclusions.

1.6.4 Advantages and limitations of self-reports

Self-report measures, such as interviews and questionnaires, are widely regarded as useful techniques for collecting any type of data on how people think, feel and behave. In particular, they are especially useful for measuring behaviours or other characteristics that cannot easily be directly observed.

Another advantage of self-reports is that they can be an efficient means of collecting data from a large number of people in a relatively short period of time. When doing so, they can be cost-effective and relatively easy and quick to administer. They also have the advantages of making it relatively easy to compare responses among participants and to replicate a study, especially when structured measures (or 'measurement tools') such as surveys with fixed-response questions are used.

When anonymity of responses is guaranteed, questionnaires in particular provide a means of collecting self-report data on 'sensitive' or controversial topics that many people are not willing to disclose publicly, such as in an unstructured oral interview.

However, like other self-reports, they rely on the assumptions that people are self-aware of their personal experiences and behaviour, actually willing to answer all questions and that they will give honest answers. We cannot always reliably recall or communicate information about how we think, feel or behave.

Another limitation of self-reports is that participants can introduce bias into their self-reports. One type of bias involves a *social desirability* effect. Participants may intentionally give false or misleading answers to create a favourable impression of themselves. For example, with socially sensitive issues such as attitudes to 'boat people', Aboriginal land rights, same-sex marriage and climate change, people sometimes give socially desirable responses instead of reporting their true attitudes. They want to appear likeable, to have a 'social conscience', or to look good, so they present attitudes, beliefs and the like which encourage others to see them in a positive way.

Alternatively, the participants may be embarrassed to report their true attitudes or beliefs, especially for very personal topics. Furthermore, in self-reports based on interviews, especially face-to-face interviews, the interview situation and/or the presence of the interviewer can influence how questions are asked and how the respondent answers them.

Even when researchers make careful use of random sampling, they need to consider the possibility of a type of sampling bias known as *non-response bias*. For example, if only a small percentage of randomly sampled people agree to respond to a questionnaire, it is quite likely that those who did respond will be different than those who refused or did not bother to participate.

Self-reports are language dependent so there are limitations when used with young children, adults with English speaking backgrounds but with weak literacy skills, people from non-English speaking backgrounds who have yet to learn English well (unless translated) and people with a severe intellectual disability. Generally, they are best used with people who have well-developed language skills, although interpreters and skilful interviewing can help overcome communication barriers.

When comparing the advantages and limitations of different self-reports, it is important to take account of the type of data that will be collected and the type of question used. Generally, questions that allow free, open-ended descriptive responses give answers that are richer in detail. However, these answers are often difficult to summarise and statistically analyse. Questions with scoreable fixed responses enable more precise and efficient statistical summaries and analyses.

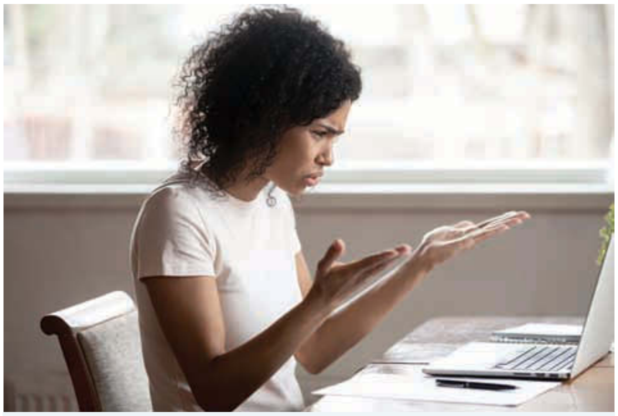

Figure 1.40 Self-report methods of data collection provide useful information about human behaviour and mental processes. However, they rely on participants having well-developed language skills and being able to accurately recall and state the information required of them.

1.6 LEARNING ACTIVITY 1

Review

1. Complete the following table to summarise the three self-report methods. Ensure you describe and review the interview method in general.

Self-report	Description	Advantages	Limitations
Interview • structured • unstructured			
Questionnaire			
Focus group			

2. For three of the following research aims, write an example of a free-response question and an example of a fixed-response question that could be used for self-report data collection.
   a. To find out whether increasing the tax on caffeine energy drinks would reduce their consumption by adolescents.
   b. To determine whether the number of children in a family affects how close siblings are to each other.
   c. To identify factors that contribute to happiness in older age.
   d. This research aims to investigate whether having a mental health disorder affects the number of friends a person has.
   e. The aim of this research is to compare gender differences in qualities desirable for a long-term friendship.

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1.6 LEARNING ACTIVITY 2

Multiple-choice questions

1. Data from self-reports are best described as participant responses
   A. that are anonymous.
   B. that are unprocessed.
   C. that are socially desirable.
   D. to researcher questions.
2. Which of the following is not a self-report data collection technique?
   A. rating scale
   B. interview
   C. experiment
   D. focus group
3. Self-report methods primarily rely on
   A. control of all variables that may affect the results.
   B. research participants' accounts of their own experiences and behaviours.
   C. comparison of research participants' responses to questions.
   D. free-response and fixed-response questions.
4. Which type of question in a test or exam is likely to be a free-response question?
   A. essay
   B. true–false
   C. multiple-choice
   D. fill-in-the blank
5. Which of the following is a fixed-response question?
   A. How would you feel if unfriended on Facebook by a close friend?
   B. What do you usually do on weekends for rest and relaxation?
   C. How would you rate your sleep quality on scale of 1–10?
   D. What are your three favourite foods?

To answer these and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

1.7 Observational studies

In our everyday lives we observe the behaviour of other people and draw conclusions about them from their actions. For example, if we notice that someone is always quiet in class, prefers to sit by themself and blushes when asked a question, we might conclude that the person is shy, lacking in confidence or withdrawn.

Researchers in psychology, however, use observation in a more precise and planned way. For example, they precisely define the behaviour to be observed, and do not jump to conclusions about beliefs, attitudes, intelligence, personality characteristics, motives or other factors that may underlie the observed behaviour.

An **observational study** involves collection of data by carefully watching and recording behaviour as it occurs without any intervention or manipulation of the behaviour being observed. The method is used to collect data in research when the behaviour under investigation is clearly visible and can be easily recorded. As you would expect for a scientific investigation, specially trained individuals record activities, events, or processes as precisely and completely as possible without personal interpretation (APA, 2022).

For example, the checklist shown in Figure 1.41 was used by American psychologist Mary Ainsworth (1978) to observe and record the behaviour of 12-month-old infants in an observational study of behaviour associated with attachment — the emotional bond that forms between an infant and its primary caregiver. Ainsworth's research findings and the attachment theory she developed are described in Topic 3.

The observational study as a research method should not be confused with the use of observation as a *technique* to collect data. For example, an experiment may use the observational technique to watch and record data of participants' responses following exposure or non-exposure to an IV.

One of the best-known examples is the series of Bobo doll experiments conducted by Canadian psychologist Albert Bandura in the 1960s to investigate whether young children can learn to be aggressive by watching

Coder name	Olive			
	Coding categories			
Episode	Proximity	Contact	Resistance	Avoidance
Mother and baby play alone	1	1	1	1
Mother puts baby down	4	1	1	1
Stranger enters room	1	2	3	1
Mother leaves room, stranger plays with baby	1	3	1	1
Mother re-enters, greets and may comfort baby, then leaves again	4	2	1	2
Stranger tries to play with baby	1	3	1	1
Mother re-enters and picks up baby	6	6	1	2

The coding categories are:
Proximity The baby moves towards, grasps or climbs on the adult.
Maintaining contact The baby resists being put down by the adult by crying or trying to climb back up.
Resistance The baby pushes, hits or squirms to be put down from the adult's arms.
Avoidance The baby turns away or moves away from the adult.

Figure 1.41 This checklist was used to observe and record the behaviour of 12-month-old infants in a structured observational study of attachment behaviour (as indicated by responses to strangers). The infants were observed playing in a room with two adults — the infant's mother and a stranger. The infants' behaviour in different situations ('episodes') was rated ('coded') on a 7-point scale according to fear categories. A rating of 1 meant 'The infant makes no effort to engage in the behaviour' and a rating of 7 meant 'The infant makes an extreme effort to engage in the behaviour' (Ainsworth et al., 1978).

adults behaving that way. Bandura observed children's responses after watching a movie showing an adult treating a Bobo doll aggressively (experimental group) and compared them with observations of a group of children who had not (control group). Photos taken with a hidden camera during one of the experiments are shown in Figure 1.42.

Generally, data collection in an observational study may be:

- *structured:* a prepared system is used to guide and record observations; for example, a checklist of items to precisely guide what to look for and to record or exclude
- *unstructured:* observations are made without a predetermined format
- *semi-structured:* a part of the observational study involves use of a predetermined format.

Most observational studies conducted in psychology are structured and use systematic data collection techniques in controlled settings, such as the checklist with predetermined criteria shown in Figure 1.41. These may also be referred to as *controlled observations* because of their systematic nature and because the researcher is exercising control over the setting (APA, 2022).

A structured study typically involves operationalising the behaviour of interest and variables that are involved. For example, a researcher might elect to observe 'laughing' as an indicator of a participant's level of enjoyment during a presentation or social interaction of research interest.

To do this, the precise facial and bodily responses to be measured must be specified to distinguish between 'laughing' and other similar behaviours, such as 'smiling' or 'chuckling'. It is important to clearly define the characteristics of each behaviour so that observers all agree and can record the occurrence and frequency of these targeted behaviours.

Sometimes an observational study might resemble an experiment. For example, to investigate roles and hierarchies ('pecking orders') in groups, a researcher might ask the members of a friendship group to discuss a controversial issue, then observe and record who starts the discussion, who changes the topic, who speaks, how often and for how long, and so on.

This study could occur in a controlled laboratory setting, or in a field setting such as a place where the group normally meets and interacts; for example, the school canteen or an area of the school grounds. The researcher might also observe roles and hierarchies

Figure 1.42 Photos from one of Bandura's Bobo doll experiments. The top series is from one of the movies used to show an adult being aggressive with the Bobo doll. The middle series shows a young boy imitating the adult. The bottom series shows a young girl imitating the adult.

in a group comprising strangers to make comparisons with the friendship group.

Although a particular observational study might use a between or within subjects design and all experiments actually involve observation of responses, an observational study is *not* a true experiment.

An observational study can reveal a relationship between two variables (e.g. group type and roles adopted by group members), but only a true controlled experiment can establish a cause–effect relationship because there is an IV that is manipulated along with the use of random allocation and strict control of other variables that can impact on the results.

In an observational study, there may be naturally occurring variables of interest but the researcher passively observes the behaviour of the participants without any attempt at intervention or manipulation of the behaviours (APA, 2022).

Sampling observations

One of the difficulties in observing and recording ongoing target behaviour is that there can be so much of it and/or it may be occurring within the context of lots of other behaviour. The researcher must therefore also decide in advance whether to record all occurrences of the behaviour and when observations are actually made during the study. For example, three behaviour sampling decisions for an observational study may involve:

1. *event sampling*: The researcher decides to focus on one or more specific types of behaviour ('events') and record all occurrences. All other types of behaviour are ignored. For example, in a study of bullying in the school grounds, only those acts involving intentional physical contact initiated by the bully. In some studies where relevant, the researcher may also record the antecedent (actions immediately prior to the event) and/or the consequences (what happens immediately after the event).
2. *time sampling*: The researcher decides that observation will take place only during specified time periods (e.g. 1 minute every 5 minutes per hour, or 10 minutes every hour, 1 hour per day) and records the occurrence of the specified behaviour during that period only.
3. *individual sampling*: Rather than trying to record the behaviour of all individuals at once, the researcher decides to focus on observing one individual (or group) at a time while ignoring the behaviour of others during the time period. One individual may be randomly selected to be the focus of an observational period and all others are ignored during that period. Over the entire period of the study, however, each individual may be observed. And, when dealing with a group's behaviour, the researcher might observe the entire group all at once, or only one group member for a certain time, then observe another, and so on.

1.7.1 Natural and contrived settings

Observations may be conducted within a participant's natural environment or in a contrived, 'unnatural' environment. In both settings, the researchers would passively wait for the target behaviour to occur voluntarily and to unfold as it usually does.

When observations are conducted within the participant's *natural* environment, the method is commonly called naturalistic observation. In **naturalistic observation**, the researcher watches and records behaviour in the natural, 'real-life' environment where it would ordinarily occur without manipulation of variables or other controls that occur in a laboratory setting. This is a situation where behaviour in its genuine form is most likely to be observed. In addition, the researcher conducts their observations in an inconspicuous or 'unnoticeable' manner so that their presence does not influence the behaviour of interest.

For example, in a study on the development of social behaviour, a researcher might observe children at play in a preschool centre's outside area at lunchtime. They would do so from the 'sidelines' so that the children are not aware that they are being observed to help ensure their presence does not interfere with the naturally occurring, voluntary play behaviour. The researcher may observe that younger children tend to play alongside other children but not actually interact with them, whereas older children tend to interact more in their play with other children.

On the basis of these observations, the researcher may assume that there are different types of play in

Figure 1.43 A researcher could use naturalistic observation to compare the effectiveness of different strategies employed by street beggars in tourist precincts. For example, the researcher may compare passive and active strategies such as use of eye contact vs no eye contact and direct requests for money vs no request, or other commonly used strategies such as presence of money in the donation container vs no money, presence of personal belongings vs no belongings and presence of a sign vs a child vs an animal.

which children may engage and that these types of play are age-related or age-dependent.

A *contrived* environment is one that the researcher creates or sets up for the specific purpose of conducting an observational study. It is an artificial 'non-naturalistic', 'controlled' environment for the behaviour of interest and may be referred to as a *controlled, structured* or *laboratory* environment because of the degree of control the researcher has over it or where the observations are made. It may also be referred to as a *controlled observation* in contrast to a naturalistic observation.

For example, the researcher conducting the study on social behaviour may decide to observe children at play in a room set up for that purpose at a venue outside the preschool centre. Specific playthings may be made available and strategically located together with a table and chairs. Observations could then be made from behind a one-way mirror so that the children are not aware that they are being observed. The children's behaviour might also be video recorded so that researchers can also record observations to help ensure reliability of the data.

1.7.2 Participant and non-participant observation

Sometimes, a researcher actually takes part in the activity being observed and may deliberately try to be mistaken by the participants as being part of the group or situation being observed. Therefore, a distinction is made between the participant and non-participant observation methods.

In **participant observation**, a trained investigator studies a pre-existing group by joining it as a member, while avoiding a conspicuous role that would change what occurs in the group and bias the data. The researcher's role may be known or unknown to the other members of the group (APA, 2022).

For example, in one study that used participant observation, the researchers had themselves admitted to several different psychiatric hospitals by imitating the symptoms of a serious mental health disorder. After they had been admitted, they kept records of their observations while in the hospital. Their record-keeping behaviour was regarded by the hospital staff as being a symptom of their disorder (Rosenhan, 1973).

When the researcher tries to conceal their presence so that their observations are made in entirely inconspicuous manner, it is commonly called **non-participant observation**. When observations of behaviour are made in the natural setting in which the target behaviour ordinarily occurs, psychologists will often conceal their presence by watching from the 'sidelines'.

For example, a researcher might sit on a nearby bench pretending to be absorbed in a book in order to observe people's reactions to street beggars such as those shown in Figure 1.43. Or they may observe queuing behaviour by attending an airport and positioning themselves where they can blend in with the crowd, concealing as best as possible what they are doing so as not to influence the target behaviour in any way. In other situations, psychologists might use a hidden video camera to record events.

1.7.3 Advantages and limitations of observational studies

Each type of observational study is useful under different circumstances and has advantages and limitations depending on the specific procedures used, particularly the degree of structure in the data collection technique and the observational setting.

The main advantage of observational studies, especially naturalistic observation, is that researchers can watch and record spontaneous, everyday behaviour without the need for any manipulation or intervention.

When people are observed in this way, they are not influenced by perceptions that can form in artificial, contrived environments and lead them to behave differently from how they normally do. Sometimes, merely being present in an artificial or unfamiliar environment can cause an unnatural change in behaviour. This is more likely when the participant knows they are being observed.

Thus, naturalistic observation often enables researchers to gain more accurate information about the typical behaviours of people (and animals), both immediately and over a longer period, than do other research methods. When compared to research methods that involve asking people about their behaviour, the researcher can observe what people actually do (or say), rather than what they say they do.

In addition, structured observations through use of checklists and specific criteria enhance the accuracy of data collection and therefore the results obtained. This is a more likely outcome when the observational setting is strictly controlled, as in a contrived laboratory-type situation.

Another advantage of naturalistic observational studies is that some types of human behaviour can only be studied as they naturally occur because it would be unethical or impractical to study them in a laboratory setting. For example, it would be unethical to severely deprive children in their early life in order to observe the effect of deprivation on behaviour in the future.

Similarly, some behaviours cannot be realistically reproduced in a laboratory. A researcher cannot, for

Figure 1.44 (a) An advantage of an observational study is that behaviour can be studied as it naturally occurs in a real-life setting without any intervention or the need for participant cooperation. For example, behaviour in a long queue could be observed and recorded from the sidelines. (b) A limitation is that participants may change their behaviour when they know they are being observed. For example, the driving behaviour of someone who sees a police car following them will probably be affected in some way.

example, study most aspects of true crowd behaviour in a laboratory. Nor could a researcher expect to obtain valid information about how people usually behave when they are in love by bringing a pair of participants into a laboratory situation and asking them to 'be in love' so that observations can be made. However, since the observer does not directly influence the behaviour of interest in an unobtrusive observational study, it sometimes requires a lot of time and patience to wait for the target behaviour to occur. Consequently, some observational studies can be very time-consuming.

A practical advantage of naturalistic observation is that it does not require the co-operation of participants being observed. However, this raises the ethical issue of not obtaining informed consent, particularly if participant observation is required.

When participant observation is used without informed consent, a person's expectation of privacy can be violated. This issue has to be weighed up against the fact that the participants are not informed that they will be observed in some special way so that their observed behaviour is more likely to be true to life.

A limitation of any observational study, particularly when unstructured, is that it cannot be used to determine the *causes* of the behaviour of interest that is observed, because many factors may influence that behaviour and there is a lack of control of such variables. This is especially the case in a natural environment. For example, a researcher could not determine through observation alone *why* some children become aggressive towards others in the school yard.

The true factors that influence a particular behaviour could be ones of which the researcher is not immediately aware. Consequently, an observational study may reveal a relationship between variables, but not a cause–effect relationship as does an experiment.

In addition, naturalistic observation studies often lack a representative sample. For instance, they may be biased in relation to participant variables such as age, sex, cultural and socioeconomic background. This means that the results may not readily be generalised to a wider population. The lack of control over a wide range of potentially influential variables, including the field setting itself, also makes it difficult for researchers to replicate the study to test the results.

A potential limitation of any observational study or technique is *observer bias*. It is possible, for example, that researchers sometimes unconsciously distort what they see so that it resembles what they hope to see, even when they are using structured formats. This is why researchers who collect the data are trained to observe and record accurately in order to minimise the influence of their personal biases. Furthermore, when recording participant responses or making detailed notes as part of the observation process, the researcher may neglect to record certain behaviours that they either judge to be irrelevant or do not actually see.

To overcome these limitations, researchers often use two or more observers for data collection and check for inter-rater ('inter-observer') consistency. This procedure usually results in a more complete and accurate set of data than one observer could obtain alone.

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learnMORE | Examples of studies using observation

- Using observation to develop a theory of children's play
- Studying gorilla behaviour using both participant and non-participant observation

Access learnON to read a description of a pioneering observational study used to build a theory about different types of children's play and/or a description of a classic observational study of gorillas spanning 18 years.

1.7 LEARNING ACTIVITY 1

Review

1. Define the meaning of observational study.
2. Distinguish between each of the following:
   a. a naturalistic and a controlled observational study
   b. structured and unstructured observations
   c. event sampling and time sampling
   d. participant and non-participant observations.
3. Explain the meaning of observer bias and how it could be controlled.
4. Briefly describe two advantages and two limitations of observational studies.

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1.7 LEARNING ACTIVITY 2

Multiple-choice questions

1. A researcher observes and records unsafe behaviours by students at the school's bus stop with reference to a checklist whilst seated in a car parked nearby. This investigation may be described as a _____ observational study in a _____ setting.
   A. participant; contrived
   B. participant; naturalistic
   C. non-participant; contrived
   D. non-participant; naturalistic
2. A researcher acting as a passenger observes and records how many school students on a crowded train stand and offer their seat to an elderly passenger. This investigation may be described as a _____ observational study in a _____ setting.
   A. participant; contrived
   B. participant; naturalistic
   C. non-participant; contrived
   D. non-participant; naturalistic
3. A researcher acting as a passenger observes and records the behaviour of other passengers on a train when an adult female appears to have a panic attack compared to an adult male. This investigation may be described as a/an
   A. experiment using an observation technique in a contrived setting.
   B. experiment using an observation technique in a naturalistic setting.
   C. participant observational study in a naturalistic setting.
   D. non-participant observational study in a contrived setting.
4. A researcher observes and records the behaviour of participants when alone, while smoke gradually fills the room, compared with when other people are present in the room. Observations are made from an adjacent room with a two-way mirror. This investigation may be described as a/an
   A. experiment using an observation technique in a contrived setting.
   B. experiment using an observation technique in a naturalistic setting.
   C. participant observational study in a naturalistic setting.
   D. non-participant observational study in a contrived setting.
5. *Source: VCAA 2003, Psychology 2, Section A, Q.31; © VCAA*
   In which of the following types of research study does the experimenter have the most **control** over the participants?
   A. in-depth interview
   B. correlational study
   C. experimental study
   D. naturalistic observation

To answer these and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

1.8 Case studies

Sometimes a researcher will collect detailed information on only a small number of people, perhaps an individual or a small group of two or three. A researcher may also choose to focus on a particular activity or event, possibly involving an organisation or some other setting. When any of these are done, the researcher is likely to be conducting a case study.

A **case study** is an intensive, in-depth investigation of some behaviour, activity, event or problem of interest in a single individual, group, organisation or situation. In psychology, the 'case' that is the subject of 'study' is usually a person. It may involve any type of behaviour and/or mental process, over a short period of time or even many years.

Case studies for scientific research purposes are often used when large numbers of participants are not available for an investigation; for example, to study a single individual with a rare or unusual disorder or ability. Such a case study may involve a combination of different data collection methods.

For example, an individual may be interviewed at length. Information may also be collected through interviews of family members, friends and teachers or coworkers. The individual's medical records and school reports may also be considered. Other sources of information can include extensive psychological testing and observations of the person's behaviour. The research may also continue for an extended period of time so that processes and developments can be studied as they take place.

Case studies have played an important role in psychology. For example, many of the early language researchers started out by keeping detailed diaries on the language development of only a few individual children. Some gained valuable insights by recording the vocalisations and speech of their own children over time. Psychologists have learnt about memory from studying rare individuals who can retain enormous amounts of information. Child prodigies, chess masters and other gifted or extremely talented individuals have been studied to gain insights into mental capabilities. Ideas about effective leadership have been picked up by analysing biographies of great leaders.

Psychologists have also learnt about behaviour in small friendship groups by conducting case studies in which they observe and record social interactions within the same group of people in different situations over a period of time. An assumption is that patterns of behaviour observed within the group may apply to other friendship groups made up of people of similar ages and backgrounds. Such case studies can also suggest hypotheses that could be tested using other research methods.

Theories in psychology have also evolved from case studies. For example, Sigmund Freud (1856–1939) used case studies of his patients sought his help with mental health problems to clarify his understanding of the origins of certain mental disorders. He also based his theories of personality development on these case studies. As new evidence came to him from his patients, he expanded and revised his theories.

The theory of cognitive development proposed by Jean Piaget (1896–1980) also has foundations on case studies. Most of these involved observations of his own children. Piaget's theory is examined in Topic 2 on the complexity of psychological development.

Table 1.3 Examples of case studies

Person	The study of a single individual, compiling information from a variety of sources
Group	The study of a single distinctive set of people, such as a family or small group of friends
Organisation	The study of a single organisation or company and the way that people act within it
Activity	The study of the creative thinking process in a group
Problem	The study of why a particular individual 'trolls' others on social media or why a specific group choose to not get vaccinated.
Event	The study of a particular social or cultural event and the interpretations of that event by those participating in it
Location	The study of a particular place and the way that it is used or regarded by people

Figure 1.45 A case study may be of small group who to choose to camp at an unusual location.

Much of what is known about the role of the brain in behaviour and mental processes has also come from case studies. Intensive study of individuals with different types of brain injuries has made it possible for researchers to gain detailed, valuable information about the role of the brain in all sorts of behaviour and mental processes — speech production and comprehension, perception, learning, memory, and so on. Some of these cases studies are described in Topic 5 on brain plasticity and brain injury.

Clinical psychologists who treat people with mental health problems and disorders routinely conduct case studies involving their clients. However, this research is usually for diagnostic and treatment goals (rather than for scientific research purposes). Therefore, when used in a clinical setting for therapeutic reasons, a case study is often referred to as a *case history* or a *clinical observation*.

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Access learnON to read a description of a case study of a young female with an impaired ability to recognise faces, including her own face.

1.8.1 Advantages and limitations of case studies

Case studies provide a useful way of obtaining detailed information on behaviour and mental processes. In particular, they often permit investigation of otherwise impractical (or unethical) situations such as when a large number of people with an unusual condition cannot be accessed. Their depth of analysis and the richness of the data are commonly described as their main advantage (or 'strength').

With case studies, there is usually no manipulation or control of variables, as with research conducted under strictly controlled experimental conditions (unless an experiment is used to collect some of the case study data). Consequently, case studies can avoid artificiality and provide a 'snapshot' of the actual or real-life experience of one or more individuals at a particular time in a particular situation.

Case studies are, however, not only useful for a 'snapshot'. They can be conducted over a prolonged period, even many years where relevant and practical to do so, and may therefore also be useful for tracking and describing experiences and change over time.

Case studies can also provide insights into how others may think, feel or behave under similar circumstances, especially when information from different case studies on the same topic or research question is compiled and knit together to help identify a general pattern or trend in the results.

Another advantage of case studies is that they can be a valuable source of hypotheses for further research or for data to support theory building or challenge a theory's assumptions.

A major limitation of case studies is that they cannot test or establish a cause–effect relationship as does a controlled experiment. Some experiments involve a person as the sole participant. However, a case study cannot be considered to be a single participant experiment because the method does not actually involve manipulation of any independent variable.

Their small sample size is another limitation. By their very nature, case studies usually focus on rare or unusual individuals, groups, events, problems or situations. This means that the sample is often a 'convenience sample' (rather than a random sample) and limited to a size of one. The results for such a sample can usually provide only very tentative and limited support for drawing conclusions.

Nor can generalisation of the results to others in a relevant population be done with any certainty. Generalising is a bigger problem when the case study involves a rare or unusual disorder or ability. Because the mental experiences, processes or behaviours of such individuals (or groups) are 'extraordinary', they may not reflect typical ways of thinking, feeling or behaving.

Similarly an activity, problem or event that is the focus of the case study may be a 'one-off' involving one or more people who happen to assemble at that time and place Therefore, the researcher can never be fully confident that the conclusions drawn from their study are representative of similar instances within the wider population or apply elsewhere over time. In addition, if a case study uses a rare or unusual sample this means that it often cannot be replicated to test the reliability of the results in the way that an experiment can.

Case studies also have other limitations. Because of the very detailed and comprehensive data usually obtained, the process of analysing, summarising and reporting these data can be painstaking and time-consuming.

In addition, case studies are often susceptible to biased information from the participants or the researcher. This can influence the accuracy of the information that is obtained and conclusions that may be drawn. For example, case studies usually rely on the individuals under investigation to provide a great deal of the required information. Some participants may not remember clearly what they actually experienced, or they may intentionally change or omit information that they do not wish to reveal for personal reasons.

Similarly, case studies are usually conducted by one researcher and are vulnerable to their bias. For example, it is possible that the researcher may see or hear what they expect or hope to see or hear. Furthermore, the researcher is also responsible for deciding what to include in their descriptions and what to leave out. In writing a report on the case, the researcher may select information that supports key points or conclusions they wish to make and omit other points that may be just as relevant and could have been included by another researcher interpreting the same information.

Figure 1.46 A case study may be an option when a large number of participants is not available. For example, eccentric behaviour has been investigated using the case study method. Eccentric behaviour refers to a pattern of human behaviour that is viewed as very odd or unusual without appearing to be maladaptive in the particular society or culture where it occurs. Researchers have found that despite their typically non-conforming behaviour, most eccentrics tend to be happy, well-adjusted people who are 'strange but sane' (Weeks & James, 1995).

1.8 LEARNING ACTIVITY 1

Review

1. List three key features that distinguish a case study from other research methods.
2. Give three examples of research findings or theories that have been derived from case studies in psychology.
3. There is an issue of productivity on a factory assembly line and the case study method will be used to collect and analyse detailed information to help understand the issue.
   List five items of information that could be collected for the case study.
4. Give an example of a case study in psychology of interest to you that is not described in the text.
5. Describe two advantages and two limitations of case studies when used for research purposes.

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1.8 LEARNING ACTIVITY 2

Multiple-choice questions

1. An intensive, in-depth investigation of some behaviour or event of interest in an individual, small group or situation, is called
   A. a case study.
   B. an interview.
   C. an observational study.
   D. a questionnaire.
2. *Source: VCAA 2014 Psychology, Section A, Q.29 (adapted); © VCAA*
   Fraser hit his head playing hockey and found he was unable to remember the events leading up to the hockey game.
   Fraser was asked by the hospital to take part in a case study to examine the effects of his injury on the functioning of his brain.
   In this situation, a case study would be useful because
   A. case studies can provide ideas for further research.
   B. a case study is a useful experimental method.
   C. a case study can only use one human participant.
   D. results from a case study are able to be generalised in most situations.
3. *Source: VCAA 2012 Psychology 1, Section A, Q.32 (adapted); © VCAA*
   A patient was about to have brain surgery. The patient gave informed consent to participate in a study using direct brain stimulation. The study involving direct brain stimulation is an example of
   A. a case study.
   B. an observational study.
   C. a self-report study.
   D. an experiment using the observational technique.
4. *Source: VCAA 2010 Psychology 1, Section A, Q.7 (adapted); © VCAA*
   A researcher was interested in the possible link between brain tumours and depression in elderly patients. She conducted an intensive study of six individual patients in a hospital using diagnostic tests, patients' interviews, and examination of the patients' medical records.
   One limitation of this method for her research is that
   A. the research does not enable strict control of all variables.
   B. the reliance on patients' reports will not produce very detailed information.
   C. the patients cannot be randomly allocated to the control and experimental groups.
   D. it is too easy to generalise the results of this type of research.

5. *Source: VCAA 2009, Psychology 1, Section A, Q.16 (adapted); © VCAA.*
Which of the following statements about case studies is the most correct?
  A. Case studies can provide ideas for further research.
  B. A case study is a useful experimental method.
  C. A case study can only use one human participant.
  D. Results from a case study are able to be generalised in most situations.

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1.9 Simulation studies

Sometimes a researcher cannot gain access to a particular setting or environment to conduct their investigation. For example, a researcher may be interested in decision-making processes used by jurors as they serve in actual cases. Undoubtedly, the researcher would not be legally permitted to enter the court room in which a jury is deliberating to observe how they decide whether the person standing trial is guilty, let alone to conduct a controlled experiment.

At other times, it may be too risky or dangerous to conduct an experiment with participants in certain settings and would therefore not be ethically permissible. For example, an experimenter interested in studying the effect of inattention among interstate truck drivers travelling long distances or by pilots during take off and landing would not be able to conduct such experiments in the real world.

In these cases, the researcher may conduct a simulation study. **Simulation studies** involve reproducing situations of research interest in a realistic way to investigate the behaviour and/or mental processes of individuals in that environment.

Generally, the situation is set up in way that is as similar as possible to that in the real world in terms of all the important features. Participants are then asked to behave 'as if' they were in the setting of interest. They usually pretend that they actually are in that situation and role play how they would behave so that the researcher can observe their behaviour and/or have them describe how they would behave. Because the situation is not real, physical or psychological harm is unlikely, which helps overcome ethical issues as well as the access problem.

A simulation is often an imitation of a real event in real environment. With psychological investigations, it often takes the form of a controlled presentation in a setting that can't reasonably be experienced by a participant in a real-world environment.

One of the best-known simulation studies is the 'Stanford Prison Experiment' conducted in the 1970s. In this investigation, participants were randomly assigned to play the role of either a prisoner or prison guard in a mock prison. Those assigned as prisoners were arrested at their homes by, taken to the prison, issued prisoner clothing and put in cells. The participants who became guards were given uniforms and clubs. Many 'guards' took their roles so seriously that the experiment was cancelled after a few days because of the psychological trauma experienced by 'prisoners'. This experiment is described in detail in Topic 7 when you study factors that influence individual and group behaviour.

Many simulation studies take advantage of existing technology to recreate the required environment. For example, simulators may be used to conduct the potentially dangerous research with truck drivers and pilots referred to previously. These devices resemble the environment of the actual operating situation and replicate the actual equipment used, such as steering wheels, brakes and flight controls.

Experiments in simulators are also suited to data collection using physiological measures such as heart and breathing rates, reaction times via button presses, brain wave activity via sensors and even eye movements to track what participants are actually looking at.

Importantly, the participant experience is safe within the simulated environment. Furthermore, such simulations allow researchers to not only test responses in settings that are dangerous, it also allows researchers to precisely replicate them. For example, they can assess how different drivers or pilots react to the same dangerous setting time and time again.

Through the development of virtual reality technology, it's now also possible to create almost any type of experience within any type of

Figure 1.47 A driving simulator used for experimental research. Participant responses to various stimuli may be electronically recorded to collect primary, quantitative, objective data.

environment. And many simulation studies using simulators are not merely confined to dangerous events and settings.

For example, to assess risk factors for problem gambling, the research may simulate money-free gambling in a pokie venue or casino. Or, to study helping behaviour, participants placed in virtual reality environments may actually see and engage in all kinds of scenarios in which they may decide to help or not help someone. They may, for example, be placed among a group of bystanders so a researcher may investigate whether the size of a crowd that is watching street violence impacts on the likelihood of intervening to stop it. This is not a situation that would be set up in the real world for research purposes.

Similarly, psychologists have studied mental processing and behaviour of burglars during robberies in homes that have been created using digital technologies. The controversial experiment on obedience to authority conducted in the 1960s by Stanley Milgram has also been recreated in an immersive, computer-generated virtual environment (Slater, et al., 2006). In Milgram's experiment, which is also studied in Topic 7, participants recruited through a newspaper ad obeyed the orders of an authority figure to cause pain to a stranger, sometimes to even administer what they believed was a lethal electric shock.

1.9.1 Advantages and limitations of simulation studies

An advantage of simulation studies is that they can be used to conduct experiments in social and other environments which investigators cannot easily access. This is achieved by reproducing those environments in a realistic way.

Simulation can also be used when an investigation is not ethically permissible; for example, when the environment or conditions of research interest are unsafe and therefore potentially harmful to participants.

Basically, a simulation study can be a suitable alternative when the real environment is not available or possible. This enables psychological investigations of many important research questions that would not be ordinarily possible.

Simulation studies using simulators or other technologies are not only confined to dangerous events and settings. The diversity of research questions that can be investigated means that they can be a valuable source of hypotheses for further research or for data to support or challenge a theory or model.

When a simulator and/or computer assisted technology is used, this may also be a time- and cost-effective alternative for researchers. Greater experimental control can also be used in these situations and a wider range of data may be collected relatively easily. The capability of reproducing an identical environment whenever needed also supports replication of experiments to test the results.

A significant limitation of simulation studies is that simulation environments are artificial and therefore the studies may lack realism. In particular, participants know that the environment they are in is fake. Therefore, they may behave differently than they would in that situation in reality. Even asking participants in a simulated environment what they think they would do often does not reflect what they actually do.

In turn, despite their strict control of situational variables, artificiality makes it difficult to generalise the results of many simulated studies to the population or other situations of research interest.

Although the development of virtual reality technology has broadened the scope of what can be studied through simulation, it's artificiality can be difficult to avoid. For example, it is unlikely that conditions such as those in the Milgram experiment can actually be exactly replicated in virtual reality since the participants will always know that the situation is unreal.

And, if eventually the experience of virtual reality became so indistinguishable from reality that the participants are unable to tell the difference between the two, then the ethics issue that led to the use of virtual reality would arise again (Slater et al., 2006).

Despite their limitations, simulation studies have provided valuable insights into a wide range of behaviour and mental processes within environments that otherwise would have been inaccessible.

Figure 1.48 Through the development of virtual reality technology, it's now also possible to create almost any type of experience within any type of environment. This virtual reality system is being used to study spider phobia. It contains eye tracking software to study a person's responses when exposed to virtual spiders in a simulated environment.

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1.9 LEARNING ACTIVITY 1

Review

1. Define the meaning of simulation study.
2. Give an example of a simulation study in psychology of interest to you that is not described in the text.
3. Describe two advantages and two limitations of simulation studies when used for research purposes.

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1.9 LEARNING ACTIVITY 2

VCAA exam questions

Question 1 (1 mark)

Source: VCAA 2021 Psychology, Section A, Q.46 (adapted); © VCAA

Ekon wants to join his local emergency volunteer group. The volunteer group has identified five risk factors that could potentially impair a volunteer's social and emotional wellbeing while they are in the role. Using an online questionnaire, Ekon rates himself against each of the factors on a rating of 1–10, with 1 indicating low risk and 10 indicating high risk.

The type of research method used in this scenario was a/an

A. interview.
B. self-report.
C. focus group.
D. online experiment.

Question 2 (1 mark)

Source: VCAA 2016 Psychology, Section A, Q.61 (adapted); © VCAA

When investigating naturally occurring behaviour, an advantage of using observational studies as a data collection technique is that

A. compared with experiments, observational studies do not require controlled variables.
B. unlike self-report methods, standardised procedures are not required in observational studies.
C. similarly to experiments, it is possible to control all variables in observational studies.
D. compared with case studies, experimental and control groups are not needed in observational studies.

Question 3 (1 mark)

Source: VCAA 2015 Psychology, Section A, Q.39 (adapted); © VCAA

Dr Rajesh is researching localisation of function in the brain. She asks Peter, one of her stroke patients, to undertake a series of tasks so she can observe the possible changes in localisation of function as a result of his stroke.

An advantage of this particular type of study is that

A. the results are easily generalised.
B. it produces highly detailed results.
C. all unwanted variables are easily controlled.
D. conclusions can be drawn about the effect of the independent variable on the dependent variable.

Question 4 (1 mark)

Source: VCAA 2004 Psychology, Section A, Q.38 (adapted); © VCAA

A study looking at sex differences in attitudes towards gun control

A. could use a within subjects design.
B. could not use an independent samples design.
C. could use a self-report design.
D. could not use a stratified sampling design.

Question 5 (1 mark)

Source: VCAA 2004 Psychology 2, Section A, Q.44 (adapted); © VCAA

Professor Von Trapp is studying how the length of time that a stimulus is exposed to a participant affects the participant's ability to recall the shape of the stimulus. She recruits 30 first-year university students, 15 male and 15 female. Each participant is presented with three sets of 10 shapes, which are exposed for: four seconds for the first set of 10 shapes, two seconds for the second set of 10 shapes and one second for the third set of 10 shapes. She then asks each participant to perform a memory recognition task for 50 different shapes, the 30 shapes previously seen and 20 distracters.

What research design was used in the professor's study?

A. within subjects
B. mixed design
C. between subjects
D. correlational

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1.9 LEARNING ACTIVITY 3

Review

For each aim, decide which research method(s) — controlled experiment, correlational study, observational study, interview/questionnaire, case study or simulation study — would be the most appropriate for the investigation that would be conducted and briefly explain why.

a. To describe how young adolescents behave with their partner at the school formal.
b. To determine why someone with great potential gave up their career for a job they didn't really like so that they could spend more time with their family.
c. To discover whether people learn better in noisy conditions or quiet conditions by testing the effect of noise on memory.
d. To compare the behaviour patterns of anaesthetists during a routine and critical incident in the operating theatre.
e. To find out whether boys and girls in primary school have different preferences for book reading when at home.
f. To investigate whether ATAR scores and university achievement are associated.
g. To compare sleep quality of adolescents who jog regularly and those who do not jog at all.
h. To compare how males and females react when directly exposed to a terrorist threat.
i. Identify differences in preferred game apps by 2-, 3- and 4-year-olds
j. To find out how students react when someone invades their personal space in a public setting.
k. To measure the relationship between scores on an aptitude test for a job and level of performance in that job.
l. To find out if supplementing the diet with vitamin C makes a difference in ability to see in the dark.

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1.10 Sources of error and their control or minimisation

Scientific research helps ensure that the data collected are accurate and reliable and that the conclusions drawn from the data are justifiable and can be trusted. Scientific research, however, is not completely free from error. Errors can creep in at any stage of an investigation. For instance, the researcher may not properly control or minimise the influence of all things that can impact on the results. It is therefore important to take into account potential errors when planning and conducting an investigation and when evaluating the data that are collected.

1.10.1 Random and systematic errors

Generally, there are two types of errors of particular concern to researchers when conducting an experiment and measuring participant responses on the dependent variable. These are called random and systematic errors.

Random errors are errors due to some chance factor or chance variation in a measurement (so they are also called *chance errors*). Random errors occur arbitrarily or indiscriminately when unknown or uncontrolled factors affect the measurement process or variable being measured.

They affect the *precision* of a measurement and are present in all measurements, except for measurements involving counting.

For example, consider all the things that might affect each individual participant's performance on a memory task in an experiment — their upbringing, how they go about learning and committing new information to memory, their personality type, health, motivation, mood, alertness, and so on. Perhaps one participant presents feeling ill, another arrives after an argument with their partner, another skipped breakfast and is hungry and another has to leave early for an appointment.

The list is almost endless when human participation is involved. Any one of these can affect performance on the dependent variable and produce a random error. Similarly, there may be an unexpected disturbance in the experimental setting that impacts on measurement of the DV for some of the participants.

Although specific random errors may be unknown and therefore unpredictable, the researcher needs to be aware of their potential occurrence and influence. Random errors may change the measurements and therefore results obtained in either of two directions — positively or negatively.

Many random errors cannot be eliminated but their influence can be controlled or minimised. For example, participant differences in an experiment may be cancelled out through random allocation to different conditions.

Random errors affect the precision of a measurement, whereas systematic errors affect the *accuracy* of a measurement.

Systematic errors are produced by some factor that consistently favours one condition rather than another (so they are also called *constant errors*). They are typically associated with a flaw in some aspect of the research design, its procedures or implementation, like an inbuilt fault.

For example, it could be a sampling error that has introduced sample bias favouring specially motivated participants, a faulty measuring instrument that repeatedly gives out the same false reading each time, or an uncontrolled order effect that has occurred because the order in which all testing is carried out consistently favours one group of participants rather than the other.

Unlike random errors, systematic errors affect all measurements in the same way so that the errors are always in the one direction — either positive or negative — and do not cancel out. Furthermore, unlike random errors that may remain unknown, most systematic errors are foreseeable and therefore a preventable source of bias. However, they can often be detected and corrected for during statistical analysis of the results.

In relation to measurement results, random errors are evident when the degree of error *varies* each time and systematic errors are evident when the measurement has the *same* degree of error each time.

For example, suppose you are conducting an investigation requiring measurements of participant reaction times. You use a stopwatch to time the same participant 5 times but overestimate or underestimate the reaction time on each trial because of the variation in the speed with which you press the start and stop button. That would be considered a random error because the value of the measurement error differs each time. But if your stopwatch had a bug so that it always overstated the reaction time by say 1 second, that would be considered a systematic error because the amount of error introduced into each measurement is constant. Similarly, a scale that repeatedly provides readings 0.5 g lower than the true weight would be demonstrating systematic error.

Of course, measurement tools or instruments (i.e. 'measures') that may be used in psychology, and therefore a potential source of measurement error, are not confined to stop watches and weight scales. They include questionnaires, interviews, aptitude tests, ability tests, intelligence tests, personality tests and measures or data collection tools for a virtually endless list of human behaviours and mental processes.

Since random and systematic errors occur with variables that are being measured, they need to be considered when evaluating the data that are collected. For example, random errors reduce both the consistency (reliability) and the accuracy (validity) of measurements or results; whereas systematic errors reduce accuracy (validity) but not consistency (reliability) as the error is always in the same direction (i.e. consistently too high or too low).

The effect of random errors can be reduced by making more or repeated measurements and calculating a new mean and/or by refining the measurement method or technique. However, the accuracy of measurements due to systematic errors cannot be improved by repeating those measurements (because they are due to some kind of flaw in the research design or measurement technique that was used).

Random and systematic errors are different from personal errors. **Personal errors** are faults entirely sourced with the researcher, which is why they are also called *human errors*.

Personal errors include mistakes, miscalculations, slip-ups and observer errors; for example, overlooking a participant's response, losing a questionnaire, using an early draft of a questionnaire instead of the final version, calculating incorrectly, misreading a score, using the wrong formula to calculate a score, running late or out of time, not taking enough care when making or recording observations, and so on.

Random and systematic errors are discussed in the report on the research, whereas personal errors are not.

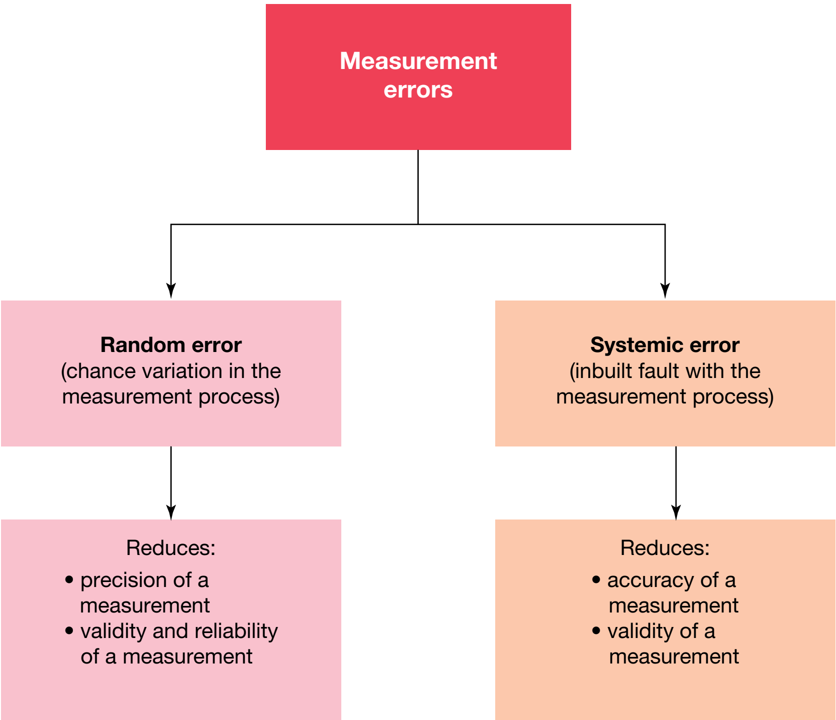
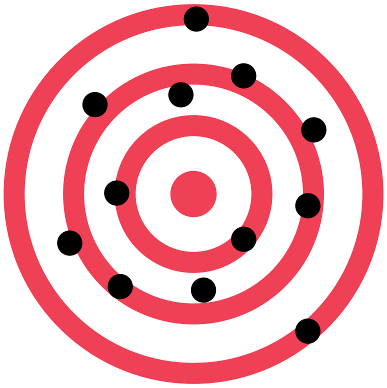


Figure 1.49 The two types of measurement errors when making observations to measure responses for the DV

Random errors



Systematic errors

Figure 1.50 A comparison of the effects of random and systematic errors when target shooting. With random errors, the shots are both inaccurate and inconsistent because they all miss the centre of the target in various directions away from the centre. With systematic errors, the shots are inaccurate but consistent because they repeatedly miss the centre and do so in the same direction.

Data and measurement — uncertainty, accuracy and precision

It is important not to confuse the terms 'error' and 'uncertainty', which are not synonyms.

The **uncertainty** of the result of a measurement reflects the lack of exact knowledge of the value of the quantity being measured. VCE Psychology requires only a qualitative treatment of uncertainty (no calculations). When evaluating personally sourced or provided data, students should be able to identify contradictory (incorrect data) and incomplete data (missing data-questions without answers or variables without observations), including possible sources of bias.

When analysing and discussing investigations, accuracy and precision also need to be considered. Accuracy and precision are closely related, but not the same. Accuracy describes how close measurements are to a specific value, while precision describes how close the measurements are to each other.

- **Accuracy**: The accuracy of a measurement relates to how close it is to the 'true' value of the quantity being measured. Accuracy is not quantifiable; measurement values may be described as being more accurate or less accurate.
- **Precision**: Refers to how closely a set of measurement values agree with each other. Precision gives no indication of how close the measurements are to the true value and is therefore a separate consideration to accuracy.

Source: *VCE Psychology Study Design (2023–2027),* p.19.

1.10 LEARNING ACTIVITY 1

Review

1. Complete the following table to compare the two types of measurement errors according to the criteria in the first column.

Criteria	Random error	Systematic error
a. Source of error		
b. Example of error type		
c. Direction of error		
d. Variability in degree or value of the error		
e. Preventability of error		

Criteria	Random error	Systematic error
f. Predictability of error		
g. Effect of error on DV		
h. Effect of error on accuracy (validity) of results		
i. Effect of error on consistency (reliability) of results		
j. Improvement of accuracy by repeating measurements		
k. How to eliminate, control or minimise occurrence or effect of error		

2. Consider each error listed in the left-hand column in the table. Assume the error impacts on the results. For each error, tick (✓) the appropriate column(s) to indicate whether you think it is a random, systematic or personal error.

Error	Random	Systematic	Personal
a. A participant in a visual perception experiment forgot their spectacles but responded as best as possible to each stimulus			
b. The experimenter forgot their spectacles and was unable to read some of the details in the participant instructions			
c. The experimenter's spectacles were cracked so they were unable to read some measurements			
d. Too many participants in the sample are very old			
e. Not enough choice in the rating scale so many participants are forced to agree much more than they would like to			
f. A participant keeps checking their phone screen throughout the experiment despite experimenter instructions that phones should be switched off			
g. Some participants deliberately give rude answers so the experimenter treats them harshly.			
h. The test used to measure the DV is too hard			
i. The experimenter ticks the wrong column in the observer checklist when distracted			
j. The fire alarm sounds before all participants have completed all tasks and all are forced to evacuate			
k. The fire alarm sounds before all participants have completed all tasks but the experimenter instructs participants to ignore it			
l. The experimenter makes a mistake when transferring data from one record to another			

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1.10.2 Extraneous and confounding variables

Random and systematic errors can have unwanted effects on the dependent variable and therefore the results of an experiment. Variables that may cause these errors are referred to as extraneous and confounding variables.

Extraneous variables

Consider an experiment that was conducted to test whether sleep deprivation causes headaches. The IV is the amount of sleep obtained and the DV is how often a headache is reported. As shown in Table 1.4 on the next page, data collected for this investigation suggest that the frequency of headaches is likely to increase if people experience 6 or fewer hours of sleep.

Table 1.4 Frequency of headaches reported and amount of sleep

Hours of sleep	Frequency of headaches reported		
	Never	Sometimes	Often
≥8	40	18	2
7	38	20	6
≤6	15	35	7

However, what would happen if participants who had 8 or more hours of sleep also took 'sleeping pills' which reduced the likelihood of headaches occurring? Or participants who had 6 or less hours of sleep were also experiencing considerable stress in their lives or were prone to getting headaches? Or participants had different perceptions of what a headache is and what was reported by one participant as a headache was not reported as a headache by another? These are variables in addition to the IV that may have influenced the results; that is, extraneous variables.

An **extraneous variable** is a variable other than the IV that may cause a change in the DV and therefore may affect the results. An extraneous variable is not intentionally studied (as are the IV and DV), nor does the experimenter wish to study this type of variable.

However, when one or more extraneous variables are present in an experiment, they can make it difficult to conclude with confidence that any change in the DV was caused solely by the presence of the IV. Therefore, the experimenter tries to identify possible extraneous variables when designing the investigation, then monitor and control (or keep constant) their influence by using procedures that will minimise such influence to an acceptable level.

In the sleep study described previously, extraneous variables that may have caused or contributed to headaches developing or not developing can include the amount of stress in the person's life, illness (such as a virus), eye strain, excessive alcohol consumption or use of particular medication. Therefore, in the group who had 6 or less hours of sleep, the greater likelihood of experiencing a headache may not have been a result of insufficient sleep if one or more relevant extraneous variables were present.

Sometimes the experimenter does not become aware of relevant extraneous variables until after the experiment has commenced; for example, during the experiment or when evaluating the experiment after it has been conducted. In some cases, the experimenter remains unaware of relevant extraneous variables until another researcher points them out after reading the report on the experiment.

There are potentially many extraneous variables that may affect the DV of an experiment and it can be difficult for the researcher to predict and control all of them. Consequently, experimenters tend to focus on controlling those variables that are likely to have a significant effect on the DV. For example, in an experiment to determine the softest noise a person can hear, it would be very important to control background noise. However, in an experiment to test the effect of caffeine on performance of some physical task, background noise may not be so critical.

Confounding variables

Every experiment used in psychological research is designed to answer the same basic question: *Does the IV cause the predicted change in the DV?* The researcher recognises that there are other variables that may affect participants' responses (i.e. the DV), such as all those variables collectively referred to as extraneous variables.

Extraneous variables are inevitable and do not pose a problem if controlled in an appropriate way. By strictly controlling unwanted effects of relevant extraneous variables on the DV, the effects of the IV on the DV can be isolated. If there is a measurable change in the DV, then the researcher can more confidently conclude that the IV caused the predicted change in the DV.

If a variable that can affect the DV is not controlled, then its effect on the DV may not be able to be clearly distinguished from that of the IV. When this happens, the uncontrolled extraneous variable has become a confounding variable.

A **confounding variable** is a variable other than the IV that has had an effect on the DV which cannot be separated from that of the IV. A confounding variable is not manipulated or controlled by the researcher (and therefore not intentionally studied).

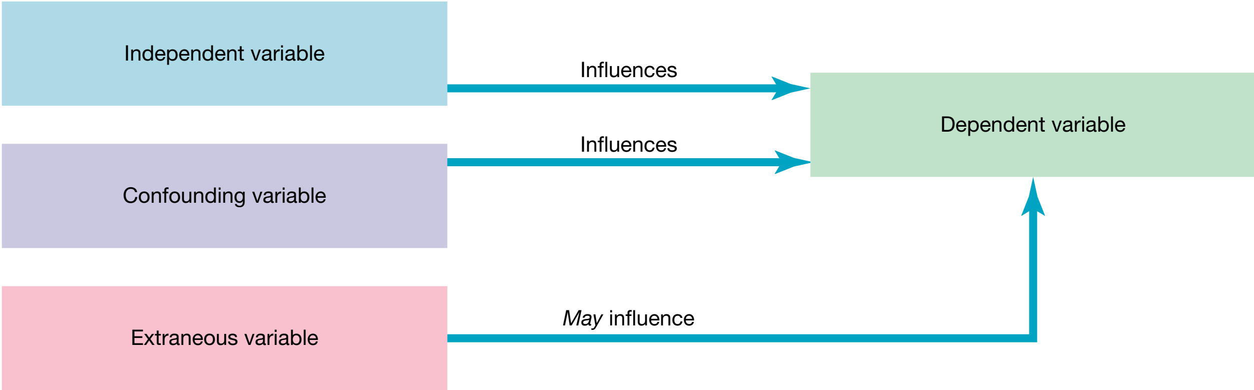

Figure 1.51 An extraneous variable is any variable that is not the IV that *may* affect the DV; whereas a confounding variable is any variable that is not the IV that *has* affected the DV, and therefore provides an alternative explanation for the results.

It has an effect (systematically changes) at the same time or together with the IV so the experimenter cannot tell which of the variables produced the predicted change in the DV.

This means that a confounding variable is like a second unwanted IV that has influenced the DV, and therefore the results. It is called a confounding variable because its effects are entangled and therefore confounded (meaning 'confused') with those of the IV, thereby preventing the experimenter from concluding with any confidence that the IV alone caused the predicted change in the DV.

Not all extraneous variables become confounding variables. Nor are all confounding variables initially extraneous variables. Confounding variables are typically built into the experiment itself, but unintentionally.

For example, suppose that a researcher interested in person perception aims to investigate whether facial attractiveness influences our first impression of someone. The researcher conducts an experiment to test a hypothesis that more attractive people will receive higher likeability scores than less attractive people. Participants rate photos of 'models' varying in attractiveness using a 7-point likeability scale.

The results show that models in the 'more attractive' group were given significantly higher likeability scores than models in the 'less attractive' group. This suggests that facial attractiveness (the IV) directly influenced likeability (the DV) and therefore accounts for the difference in scores.

However, suppose that coincidentally the more attractive models were also 'well-dressed' and the less attractive models were also 'poorly dressed'. Then, the researcher cannot tell which variable — facial attractiveness or dress style — actually accounts for the likeability scores. In such a case it would be said that 'dress style is a confounding variable' and that 'facial attractiveness and dress style are confounded'. This confounding is shown in Table 1.5 below.

In the left-hand column in Table 1.5 are likeability scores for the less attractive models and in the right-hand column are likeability scores for the more attractive models. The results provide support for the researcher's hypothesis that more attractive people will receive higher likeability scores but they also show that dress style may actually be the variable related to likeability instead of facial attractiveness.

Table 1.5 Results of facial attractiveness and likeability experiment

Intended IV →	***Less attractive models***	***More attractive models***
Confounding variable →	***Poorly dressed***	***Well-dressed***
Likeability scores →	*2*	*5*
	1	*6*
	2	*6*
	1	*5*
	3	*4*
	3	*6*

Furthermore, it is plausible that the groups of models could have been called 'well-dressed' and 'poorly dressed' rather than 'more attractive' and 'less attractive' and that an alternative hypothesis about dress style influencing likeability could have been tested (Heiman, 2002).

The presence of one or more confounding variables does not necessarily mean that the IV did *not* cause the changes in the DV. However, the presence of a confounding variable suggests that there may be one or more alternative explanations for the results.

For example, if there is a difference in the results for the experimental and control groups, it could be caused by the IV, the unwanted confounding variable or the combined effects of both. The more alternative explanations there are for the results, the less confident the experimenter will be that the IV alone was responsible for the results.

An experiment with one or more confounding variables compromises interpretation of the results and the validity (accuracy) of the experiment, specifically *internal validity* (which is described in section 1.15.5).

The more alternative explanations there might be for an observed result, the less confidence an experimenter will have in their research hypothesis, which states or implies that the IV *will* be the cause of a particular result.

Because humans are complex and there are often multiple causes of how they may think, feel or behave in any given situation, good experimental design involves anticipating potential extraneous and confounding variables and developing strategies to minimise their influence and ensure that extraneous variables do not become confounding variables.

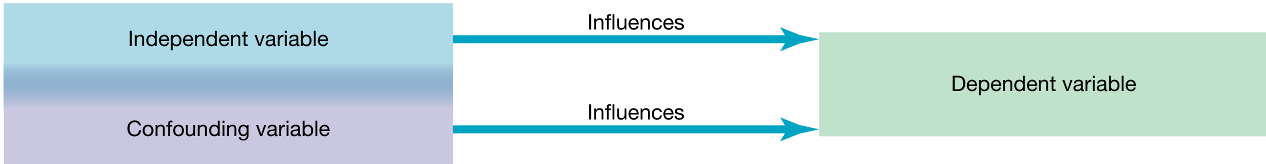

Figure 1.52 Confounding occurs when the effects of the IV on the DV cannot be separated from those of another variable — a confounding variable. The presence of a confounding variable provides an alternative explanation of the results. Not all extraneous variables become confounding variables. Nor are all confounding variables initially extraneous variables.

1.10 LEARNING ACTIVITY 2

Review

1. Distinguish between:
   a. extraneous and confounding variables
   b. controlled and uncontrolled variables.
2. In what two ways are extraneous and confounding variables alike yet different?
3. When is it best to identify extraneous variables? Explain your answer.
4. Explain why the presence of extraneous and/or confounding variables is problematic for the researcher.
5. Suggest an example of an extraneous variable that may be relevant in one experiment and therefore require control but irrelevant in another experiment and not requiring control. Explain your answer.
6. Consider the facial attractiveness and likeability experiment on page 85 (including table 1.5). Suggest two potential confounding variables that should have been controlled in addition to dress style.
7. For each of the following research hypotheses, identify the IV, the DV and three potential extraneous or confounding variables.
   a. Shyness affects the ability to make new friends at school.
   b. Meditation improves performance on a VCE English exam.
   c. Males are more willing than females to taste different foods.
   d. Students who have breakfast concentrate better in class.
   e. Having a pet in an aged-care nursing home improves the happiness of elderly residents.
8. Identify the IV(s), DV(s) and a potential confounding variable in the following experiment. Explain your choice of confounding variable.

An experiment was conducted to investigate whether young adults performed better on maths problems when working alone or when working in small groups.

Two groups of participants were used, ensuring an equal spread of mathematical ability and personal characteristics across both groups.

Because of a shortage of rooms, the participants working alone completed the problems in a small tutorial room with no windows in the corner of the school library. The participants working in small groups completed the problems in a large classroom with big windows on the first floor of the building (above the library).

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1.10 LEARNING ACTIVITY 3

Multiple-choice questions

1. *Source: VCAA 2013 Psychology, Section A, Q.23; © VCAA*
   In an experiment, it is essential to control for extraneous variables so that
   A. there is a probability that the results will be obtained by chance.
   B. a valid conclusion can be made about the effect of the independent variable on the dependent variable.
   C. a valid conclusion can be made about the effect of the dependent variable on the independent variable.
   D. the hypothesis is supported and the results of the experiment can be generalised to the broader population.
2. *Source: VCAA 2010 Psychology 1, Section A, Q.7; © VCAA*
   A researcher was interested in the possible link between brain tumours and depression in elderly patients. She conducted an intensive study of six individual patients in a hospital using diagnostic tests, patients' interviews, and examination of the patients' medical records.

   One limitation of this method for her research is that
   A. the research is not controlled for potential confounding variables.
   B. the reliance on patients' reports will not produce very detailed information.
   C. the patients cannot be randomly allocated to the control and experimental groups.
   D. it is too easy to generalise the results of this type of research.
3. Psychology researchers attempt to minimise or eliminate the impact of uncontrolled variables in experiments because the presence of these variables
   A. can affect the measurement of the dependent variable.
   B. means that only the uncontrolled variables are measured.
   C. do not enable the researcher to control the dependent variable.
   D. make it difficult to isolate and evaluate the impact of the independent variable.
4. To test the effects of a new fitness program on memory, the Friday morning gym group with Allan as instructor was put through the new program, while the Friday afternoon group, taken by Beth, continued with the old program. The results showed no difference between the two groups on a test of recall. On the basis of these results it may be concluded that
   A. the results were confounded by the variable of fitness instructors.
   B. recall can't be measured accurately after a workout at a gym.
   C. the new fitness program is probably better, but we can't prove it.
   D. because memory has nothing to do with fitness, the results were not significantly different.
5. To investigate the harmful effects of alcohol on driving performance, a researcher compared the number of driving errors committed on a standard driving test in a simulator by a group of males who had been given three standard drinks prior to testing. The researcher compared this with errors made by a group of females who had orange juice prior to their test. The males did significantly worse than the females. When reviewing the study, the researcher most likely concluded that
   A. alcohol impairs driving performance.
   B. alcohol does not impair driving performance.
   C. females are better drivers than males.
   D. gender may have been an uncontrolled variable and a confound.

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1.11 Types of extraneous variables and their control

Researchers have described different types of extraneous variables (that may also confounding variables). These include participant variables, situational variables, demand characteristics, experimenter effects and the placebo effect.

In this section, we describe these types of variables and procedures commonly used for their control and to keep their effects at an acceptable level in experiments. Extraneous variables, however are not limited to experiments. They may also be present and therefore require control in non-experimental investigations.

Although the different types of extraneous variables are described separately, they do not necessarily influence participant responses in isolation of each other. Any one or more of these variables can interact in affecting participant responses to produce further bias and stronger unwanted effects.

1.11.1 Participant variables

The personal characteristics that individual participants bring to an experiment and which could influence their responses are called **participant variables**. These may be biological, psychological and/or social in nature.

Some participants will be more or less easy going, anxious or motivated than others. Some will be curious about the experiment and have expectations about how they should behave. They will also differ in a wide range of mental abilities such as intelligence, learning, memory, reading comprehension and problem-solving skills, as well as physical abilities such as strength, athleticism, hearing, vision, eye-hand coordination and finger dexterity. Furthermore, they will differ in such variables as sex, age, diet, sleep patterns, responsiveness to medication, self-esteem, educational background, social relationships, ethnicity, cultural experiences and religious beliefs.

Any one or more of these variables in a virtually endless list can affect how participants behave in an experiment and therefore the results, including generalisations that may be made.

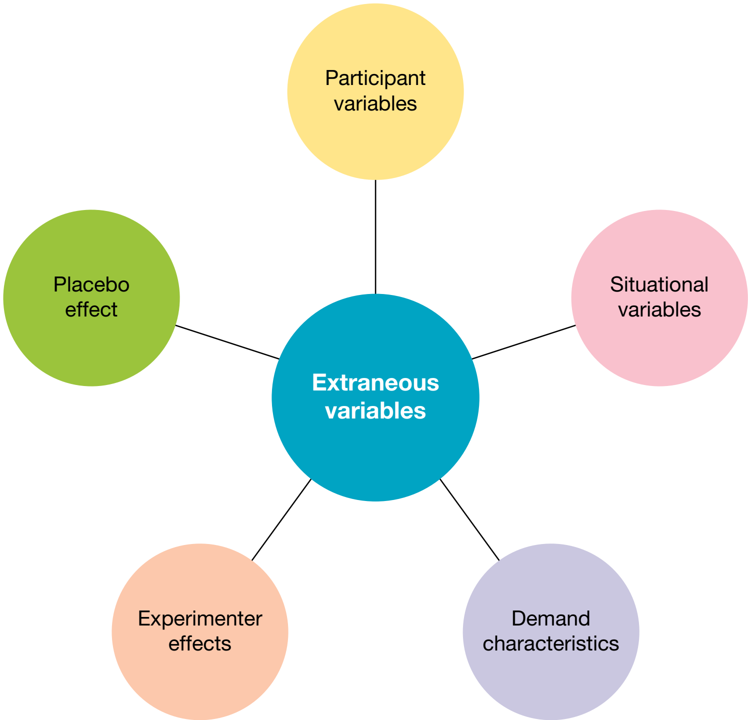

Figure 1.53 Types of extraneous variables

Control

The experimenter can control participant variables by ensuring, as far as possible, that participants in different experimental conditions (or groups) are as similar as possible in personal characteristics that may have an unwanted influence on the results.

An appropriate starting point is to obtain a sufficiently large number of participants and use a *random sampling* technique to help ensure the sample is representative of the population being studied. Random sampling is considered the ideal because it increases generalisability, however, it is not always possible. Therefore, it is vital that a random allocation technique is used once the sample has been selected, regardless of how biased or representative the sample may be.

Random allocation is a crucial feature of any controlled experiment so that any differences found between the groups or conditions can be confidently attributed to the effects of the IV. With a sufficiently large number of participants, it is reasonable to assume that each group (or condition) will end up with the same kind of spread of participant characteristics that may affect the DV and therefore the results.

Figure 1.54 Even if they share a common interest, participants will differ in all kinds of personal characteristics, abilities and backgrounds. Variables arising from such differences can become confounding variables if uncontrolled.

Use of an *appropriate experimental design* will also help control participant variables. The choice will be dependent on such factors as the hypothesis to be tested, the number of participants available, how the DV will be measured and various practical constraints. Either the within subjects, between subjects or mixed designs could be used. All controlled within- and between subjects experiments use random allocation. These designs (or a combination) are considered to control participant variables to an acceptable level.

Generally, the *within subjects* design tends to be the most effective for controlling participant variables because each participant performs under all conditions of the experiment so the effects of participant variables will balance out exactly.

Nonetheless, the *between subjects* design would also control individual participant differences. Random allocation to the different conditions will help ensure groups are well matched on participant variables and therefore much the same. Although random allocation does not guarantee that different groups are entirely equivalent in the spread of participant variables, it does greatly reduce the likelihood of differences. The bigger the groups, the more likely it is that a uniform spread of characteristics will be achieved.

1.11.2 Situational variables

In contrast to participant variables which occur within the individual, situational variables occur outside the individual. **Situational variables** are external factors associated with the experimental setting that may influence participant responses and therefore the results.

Situational variables include the physical features of the immediate environment such as its size and lighting conditions, background noise, time of the day, air temperature, presence or absence of other participants, and so on, depending on the hypothesis being tested. Any of these can affect the quantity and quality of participant responses.

Naturally, the experimenter and any research assistants are part of the experimental setting as well, and the manner in which they conduct the experiment and interact with participants are also associated with the setting.

For example, personal versus impersonal contact with the experimenter may affect performance and participants may respond differently in a group situation to the way that they would on an individual basis. If a test is used to measure the DV, participants may react differently to a digital presentation rather than a personal one. Likewise to test items requiring a written response as opposed to an oral response. The instructions and procedures used by the researcher can therefore also impact on how participants respond.

Suppose, for example, an experimenter will investigate the effect of taste expectation on food perception and eating. The experimenter sets up an experiment in which participants must eat different foods that are plated in novel ways but which they may refuse to eat. Figure 1.55 shows some of the test materials.

Imagine how the results could be affected if participants received different instructions on what the experiment is about, what eating actually means (as compared to tasting), how many foods there are, whether the foods are safe, whether they can refuse to eat, and so on. What if some participants arrived for the experiment just before they have eaten a meal and others just after? What if the experimenter was not too fussed about strict use of the procedures so that some participants complete the task alone while the rest have other participants present? What if the experimenter is amused by the facial gestures of some participants and laughs at or comments on their responses but not those of others?

Procedures not only involve what the experimenter does but also how the relevant research activities are conducted, including their sequence. When the research instructions and procedures are *non-standardised*, this means that they are not the same for all participants (except for exposure to the IV by participants in the experimental group).

Even small variations in instructions and procedures may affect participants' responses in unforeseen ways. An experiment that uses non-standardised instructions and procedures is not strictly controlling all of the possible extraneous and confounding variables that can influence the DV and therefore the results.

Order effects arising from the experimental design are also situational variables. In some experiments, participants may be required to perform the same type of task twice or even many times under the same conditions. In a within subjects experiment, they are required to perform a task first in one condition and then again in another condition.

An **order effect** occurs when performance on the DV is influenced by the specific order in which the experimental tasks are presented rather than the IV. Performing one task affects the performance of the next task, and so on if there are multiple tasks (or trials).

Order effects may change the results so that the impact of the IV may appear to be greater or less than it really is. This means that an order effect may cause a positive or negative performance change.

Two types of order effects that explain how this can occur are called practice effects and carryover effects.

- *Practice effects* are the influence on performance (the DV) that arises from repeating and/or prior experience with a task, including the test materials, procedures and settings.

  Practice effects can improve or impair performance. For example, in an experiment

Figure 1.55 (a) Would you eat soup out of this bed pan when assured that the pan is brand new and sterile? (b) Would you eat these insects on skewers when assured they are nutritious and considered a delicacy by millions of people worldwide? How might prior experience influence your expectations of how each food might taste?

measuring speed and accuracy, participants may become quicker or more accurate as they become familiar with the task and the response requirements. With even more trials, however, performance may worsen due to fatigue or tiredness (sometimes called a *fatigue effect*).

Similarly, their performance may be influenced by boredom due to repeating the same task, especially if the task takes a long time and does not change. Boredom is quite common in experiments in which participants are required to complete many trials or tests, especially when task requirements are not particularly interesting.

- *Carryover effects* are the influences that a particular task has on performance in a task that follows it. They arise simply from experiencing a task. The effect of experiencing a task has the potential to 'carryover' to the next task, regardless of whether the task is the same or different.

  As with practice effects, a carryover effect can help or hinder performance. For example, if a task happens to be very easy, difficult, frustrating or even anxiety-provoking, the feeling may 'carry over', improving or lowering performance in later trials. Whatever the carryover, this is an unwanted effect.

Order effects are of particular concern in experiments with a within subjects design because of their use of the same participants in all the experimental conditions. This means that the order in which participants are exposed to each condition can influence their responses in the next condition. There are, however, procedures that may be used to control order effects and other situational variables.

Control

The most effective way of controlling most situational variables is to hold them constant throughout the experiment. All participants in different groups or conditions must be tested in the same way *and* in the same situation (except for exposure to the IV where appropriate) in order for the experimenter to more confidently conclude that any change in the DV is the result of the IV.

An appropriate starting point is to consider situational variables when planning the experiment and ensure they are eliminated, minimised or occur in all experimental conditions if they can't be adequately controlled.

For example, if background noise is likely to affect the results of an experiment in an unwanted way, then its effects could be removed by conducting the experiment in a soundproof room. This would remove any unwanted influence it may have on the results. If background noise cannot be entirely eliminated because of the setting in which the experiment must be conducted, then the experimenter would attempt to ensure that background noise occurred at about the same level in the different experimental conditions.

There are potentially many extraneous situational variables that can affect experiments and it is difficult for an experimenter to predict and control *all* of them. Therefore, experimenters tend to focus on controlling those situational variables that are likely to have an influential effect on the DV. For example, in an experiment to determine the softest noise a person can hear, it would be very important to control background noise. However, in an experiment to test the effect of caffeine on performance of some physical task, background noise may not be so critical.

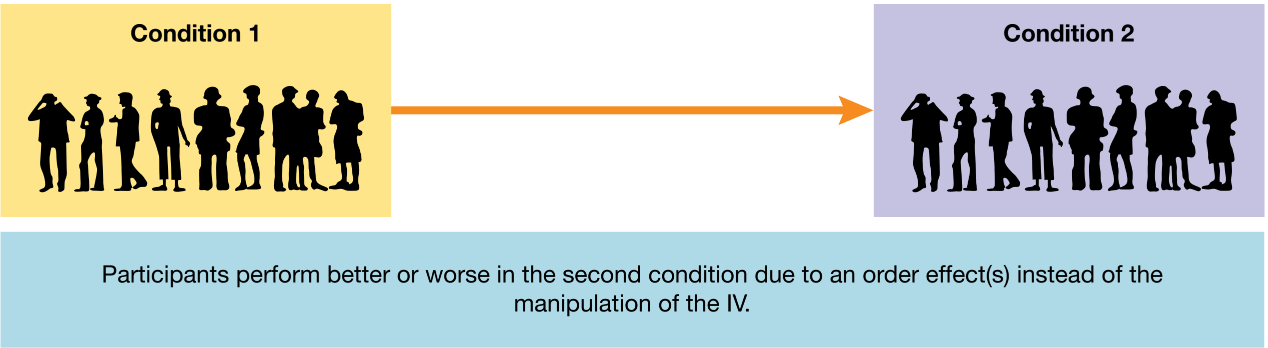

Figure 1.56 Order effect

An experimenter may also minimise the effects of situational variables by balancing or equalising their effects for all groups of participants involved in the research. For example, if experimenters testing the effectiveness of a particular reading program on children's reading skills used two different rooms to test the children, a way of controlling the possible effects of being in the different rooms could be to test half the participants in each group (that is, some using the reading program and some not using the reading program) in each room.

Another procedure for controlling situational variables is called *randomisation*. This would involve testing participants in random order, rather than testing all participants in one condition first, then all participants in the other condition. In this way, any variable which may change over time such as the temperature, time of day, or the functioning of the apparatus will affect the conditions approximately equally. Randomisation can be achieved simply by coin tossing for each participant to decide which of the two conditions they do first.

It is also essential that all participants experience the same environment and procedures, with the only exception being exposure to the independent variable. Variations in instructions and procedures that may be a source of extraneous or confounding variables can be controlled by standardisation ('consistency') across the different conditions. Using standardised instructions and procedures means that instructions and procedures are the same for all participants (except for variations required for participants exposed to the IV).

There are also specific procedures that can be used to control order effects. The choice depends on the type of effect(s) that is expected and how significant it will be. One way of dealing with practice, fatigue and boredom is to increase the time between measuring the DV in each condition. For example, participants might be in the one condition one day, then return a week later for the other condition.

If this procedure is inappropriate, inconvenient or impractical, the experimenter can use a counterbalancing procedure. **Counterbalancing** involves systematically changing the order of treatments or tasks for participants in a 'balanced' way to reduce or avoid ('counter') the unwanted effects on performance of any one order. Experiments with a within subjects (repeated measures) design are most vulnerable to order effects.

There are different ways of counterbalancing that vary in complexity. A simple procedure involves alternating the order in which participants are exposed to the IV (or different levels of the IV). Each group of participants is exposed to each condition of the experiment in a different order.

For example, consider the alcohol and driving experiment described previously to investigate whether alcohol consumption affects driving performance using a within subjects design. If there were 20 participants, counterbalancing could require half the participants (Group A) to undertake the driver test in the no alcohol condition first, followed by the test in the alcohol condition. The other half of the participants (Group B) would undertake the driver test in the alcohol condition, followed by the no alcohol condition. Participants would also be randomly allocated to experience one condition or the other first or second.

The results for all participants are then combined across the entire experiment to achieve counterbalancing. In this way, any order effect that impacts on performance, as measured by the DV, is controlled. This procedure is shown in Figure 1.57 below.

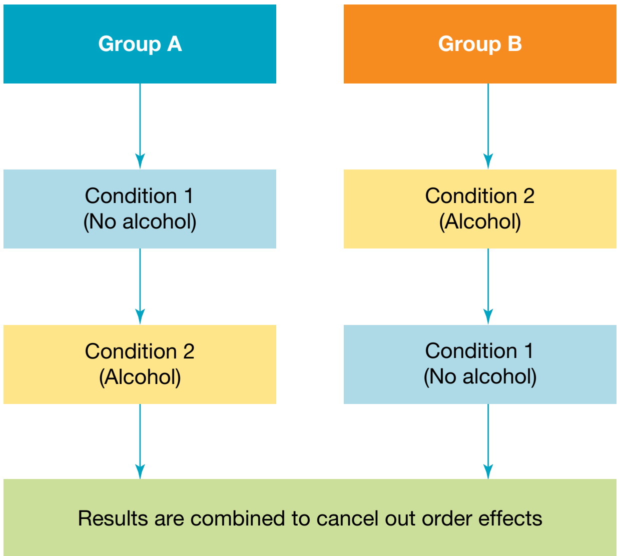

Figure 1.57 A simple counterbalancing procedure for a within subjects experiment testing the effects of alcohol on driving performance

1.11 LEARNING ACTIVITY 1

Review

1. Define the meaning of participant variable as an extraneous variable.
2. Consider each characteristic listed in the left-hand column in the table. For each characteristic, tick (✓) the appropriate column to indicate whether it is best classified as biological, psychological or social in nature.

Participant variable	Biological	Psychological	Social
a. motivation			
b. sex			
c. age			
d. mood			
e. family background			
f. type of school attended			
g. intelligence			
h. personality type			
i. eye-hand coordination			
j. physical health			
k. vision			
l. diet			
m. number of siblings			
n. number of close friends			
o. finger dexterity			
p. religious beliefs			
q. memory			

3. Why is random allocation considered an effective control for participant variables?
4. In what way can sample size influence the presence of unwanted participant variables?
5. Which experimental design is likely to be the most effective for controlling participant variables?
6. Define the meaning of situational variable as an extraneous variable.
7. Give three examples of factors within an experimental setting that may be situational variables.
8. Should an experimenter expect more situational variables in a field or laboratory setting?
9. Suggest two potential situational variables in experiments that will be designed to test a research hypothesis for each of the following aims.
   a. To find out whether a particular study technique improves performance on an exam
   b. To determine whether the level of anxiety experienced affects the ability to perform a complex motor task
10. a. Explain what counterbalancing is and which potential problems it attempts to control.
    b. A researcher will test whether playing violent video games increases aggressive behaviour among children. All participants will play a violent game for 15 minutes then be taken to a play area immediately after where they will be observed for 30 minutes. Aggressive behaviour will be defined as the number of times a child makes actual physical contact with another child. The participants will then play a non-violent video game for 15 minutes and again be observed in the play area for 30 minutes. Differences in aggressive behaviour in each condition will then be compared.

Identify a possible order effect and explain a counterbalancing procedure that could be used to minimise its influence.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

1.11 LEARNING ACTIVITY 2

Multiple-choice questions

1. *Source: VCAA 2019 Psychology, Section A, Q.25 (adapted); © VCAA*
   Dimitri conducted a within subjects experiment. He used lists of 15 four-letter words as the stimuli.

   In the first condition, after a list of 15 words was presented, a beep signalled the end of the list and the time for participants to start writing the words down using free recall.

   In the second condition later that day, using a different list of words, Dimitri added a distractor task for 30 seconds before the beep signalled that participants were to start writing down the words they remembered.

   Would Dimitri need to counterbalance the experiment?

   A. No, because he controls the order of the conditions.
   B. No, because he used a different list of words in the second condition.
   C. Yes, because the order of the condition might affect the number of words recalled.
   D. Yes, because the number of words recalled might be affected by the order of the words.

2. *Source: VCAA 2010 Psychology 1, Section A, Q.40 (adapted); © VCAA*
   A researcher who is interested in studying the effect of soft music on the sleep patterns of infants would find it an advantage to use a within subjects experimental design because

   A. she can avoid the use of random allocation.
   B. it would eliminate participant differences.
   C. it would increase the number of participants she could use.
   D. it would eliminate all uncontrolled variables.

3. When using a between subjects experimental design, control of participant variables is achieved through

   A. random selection to different conditions.
   B. manipulation of the independent variable.
   C. random allocation to different conditions.
   D. use of a single, independent variable.

4. When the gender of a participant is expected to affect the results of an experiment in an unwanted way, this variable would be best controlled by

   A. using random selection and allocation procedures.
   B. using standardised instructions and procedures.
   C. using both males and females as participants.
   D. repeating the experiment at least two times, once with females and once with males.

5. The presence of a/an _____ variable in an experiment creates uncertainty about whether the observed effects on the dependent variable are attributable to the effects of that variable rather than the effects of the independent variable.

   A. measurable
   B. experimenter
   C. participant
   D. confounding

To answer these and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

1.11.3 Demand characteristics

When people know they are in an experiment, they may behave in the way they think the experimenter wants them to. **Demand characteristics** are cues in an experiment that may influence or bias a participant's response, thereby distorting the results. These cues suggest the kind of response that the experimenter is wanting or expecting and leads them to believe that they should respond in that way. Consequently, participant responses influenced by demand characteristics are not their true responses.

A *cue* is some kind of stimulus, event, or object that serves to guide behaviour. A participant may use cues such as random noises, changes in lighting or even a broken pencil point to work out what is being investigated and how they should respond. Sometimes participants can work out whether they are in an experimental or control group and behave differently.

If a participant detects that they are in the 'special' experimental group, their interest and performance may increase. Furthermore, some may try to guess the hypothesis and attempt to act in ways that they think will support the hypothesis. It is also possible that some will respond in the opposite way. However, most tend to be cooperative.

Participants don't necessarily respond to demand characteristics intentionally or even consciously. However, demand characteristics typically result in reactions that are not natural responses to the variables under investigation, thereby influencing or even changing the results. In such cases, the experiment may be confounded because the experimenter can't be confident whether the results are due to the IV or to the effects of demand characteristics.

Each experiment is likely to have demand characteristics that are perceived by the participant. These may be produced by the experimenter or the setting. Consequently, demand characteristics are sometimes classified as a situational variable or an experimenter effect.

Figure 1.58 This participant is contemplating the possibility that she is being observed through a two-way mirror. This cue in the laboratory setting may be a demand characteristic that influences her true responses in the experiment.

Control

There are several ways of controlling demand characteristics to help ensure participants respond more naturally. The most commonly used procedures involve withholding information that may reduce the likelihood of participants working out the purpose of the experiment or how the experimenter may be expecting them to perform.

One way is through the use of *deception*. This means that the experimenter deliberately conceals the purpose of the experiment from participants by misleading or misinforming them. For example, the experimenter may provide a 'cover story' about what is being investigated. This may be partly or completely false.

The Milgram (1963) experiment on obedience to authority is one of the best-known examples of deception in research. Another example is the classic Asch (1951) experiment on conformity to group pressure also described in Topic 7 on factors that influence individual and group behaviour. Asch told participants that he was studying 'visual judgment'. It was simply not possible to inform them that he was conducting an experiment on conformity and expect them to behave naturally.

The use of deception has ethical issues associated with the requirement for all participants to give their informed consent. However, deception is considered acceptable if the potential benefits of an experiment justify its use and there is no feasible alternative to its use.

Another way of controlling demand characteristics is to use a blind procedure. The **single blind** procedure would keep participants unaware of ('blind' to) the experimental condition they are in. For example, they may know what the experiment is about, but they don't know whether they are in an experimental or control group.

In some experiments, a *placebo* may be used to achieve a single blind outcome. For example, consider an experiment with an experimental group and a control group to test the effectiveness of a new drug for use by people with a specific mental health disorder. All participants would be given details of the research for ethical and practical reasons. However, participants in the experimental group would be given the drug and those in the control group would be given a placebo substitute that would be identical in appearance and taste.

In this way, control group participants will not know which condition they are in so expectations have been controlled because all participants believe they are actually using the drug. This means that the placebo has provided the demand characteristics of the drug used in the experimental group so the control group has experienced the same demand characteristics as the experimental group. Use of placebos and the placebo effect are described in more detail later in this topic.

If there is concern that the experimenter could give cues about the purpose of the experiment or some other signal that could influence participant expectations then double blind could be used.

Double blind is a procedure in which both the participants and the experimenter(s) interacting with them are unaware of the conditions to which the participants have been allocated. Only a researcher who is removed from the actual research situation knows which participants are in which condition (or groups). Consequently, double blind would control possible experimenter cues while also controlling participant expectations.

Given that different extraneous variables may be intertwined, use of an *appropriate experimental design* may also help control demand characteristics. For example, in a within subjects experiment the same participants experience all conditions and therefore have more information about the experiment, especially information about the likely IV treatment. Depending on the hypothesis and other considerations when planning an experiment, an alternative experimental design may be more appropriate. Similarly, moving the experiment outside of the laboratory and conducting it unobtrusively in a real-world setting would control demand characteristics.

Careful attention to the preparation and implementation of *standardised instructions and procedures* may also help control demand characteristics. For example, the experimenter would ensure features of the experimental setting that can provide cues for demand characteristics are minimised, whilst also ensuring all participants in each condition have the same experience.

Instructions and procedures would also take account of the possibility that participants often discuss the experiment when they have the opportunity to do so. For example, a participant may discuss the experiment with future participants after they

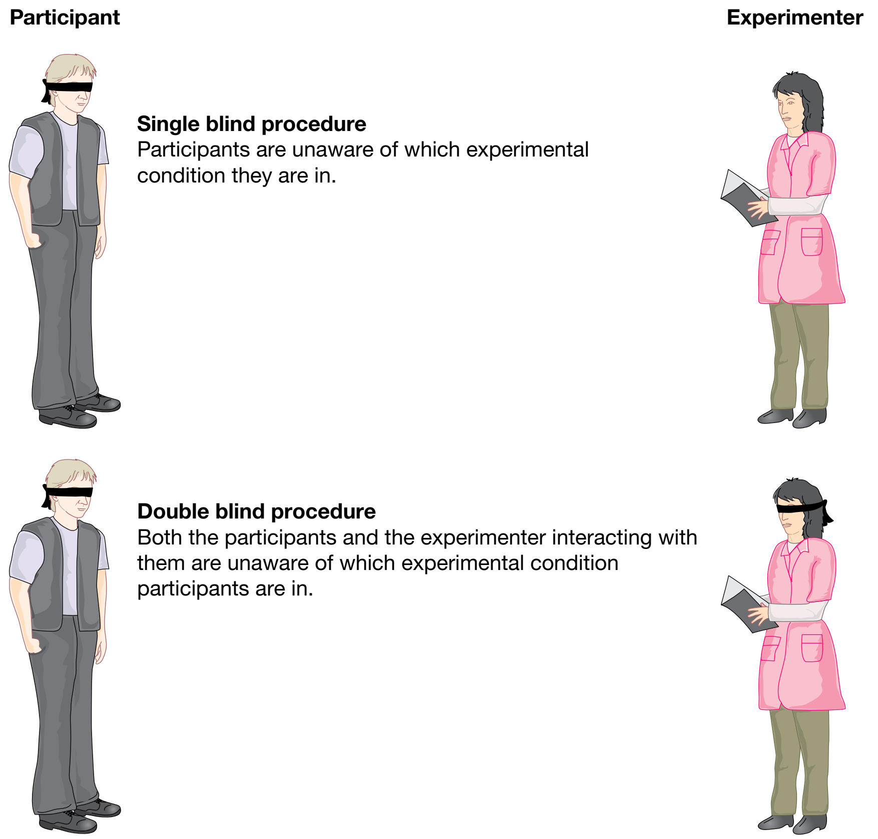

Figure 1.59 Examples of the single and double blind procedures

leave the experimental setting. In this case, new participants may arrive at the experiment knowing more about the experiment or research hypothesis than is desirable.

In some cases, the experimenter may choose to use a *self-report* measure such as a questionnaire or interview to ask participants what they thought the true purpose of the experiment was or to indicate the extent to which they were aware of the research hypothesis. This would be administered after the experiment and statistical techniques could be used to help measure the extent to which demand characteristics may have been influential.

1.11.4 Experimenter effects

Another extraneous variable that may affect the results of an experiment relates to the experimenter themself. Personal characteristics of the experimenter and their behaviour during the experiment may affect how participants respond. In addition, an experimenter may make a mistake when observing and recording responses or when interpreting the results. Each of these are examples of the experimenter effect.

The **experimenter effect**, sometimes called *experimenter bias* or *research bias*, refers to any influence the experimenter (or any other researcher) may have on the results of their investigation. An experimenter effect may be derived from or occur through:

- interaction with participants, or
- unintentional errors when making observations, measuring responses, when analysing or interpreting the results.

Although unintentional errors may have no direct effect on participant responses, they may indirectly distort the results, including conclusions that are drawn.

Personal characteristics of the experimenter that may contribute to the experimenter effect include their age, sex, ethnic appearance, cultural background, accent, attitudes, biases and expectations. In an experiment, the effect of such characteristics occurs when there is a change in a participant's response because of one or more of those characteristics, rather than the effect of the IV.

For example, an experimenter may treat participants differently depending on whether they are in a control or experimental group, which in turn influences the behaviour of the participants and how they respond to the DV. Similarly, if the experimenter is tired, in a bad mood or unwell it may affect the way the experimenter relates to the participants which, in turn, may lead the participants to behaving in a manner different from how they would otherwise behave, thereby influencing the results.

A commonly described experimenter effect is called experimenter expectancy. *Experimenter expectancy* involves cues the experimenter provides about the responses participants should make in the experiment.

In particular, the experimenter's non-verbal communication ('body language') can produce a *self-fulfilling prophecy* — the experimenter obtains results that they expect to obtain. The results may therefore be attributable to behaviour associated with the experimenter's expectations rather than the IV. Actions that can promote a self-fulfilling prophecy include:

- facial expressions, such as smiling at participants in one group but not at those in another
- mannerisms, such as shaking hands with participants in one group but not with those in another
- tone of voice, such as speaking in a monotone voice to participants in one group and in a more lively way to those in another.

An experimenter effect may involve not only the personal characteristics and actions of the researchers during the experiment, but also unintentional errors or biases in the treatment of data or when analysing or interpreting the results. For example, an experimenter may unknowingly make an error in reading or summarising the data in favour of what they want to show or to draw a conclusion that supports their hypothesis. These examples are not deliberate dishonesty. Instead, they are likely to be unconscious mistakes that can be made in because of the experimenter's close involvement with their research.

Experimenter effects have been studied extensively by German-born American psychologist Robert Rosenthal. He has found some kind of experimenter effect to be present in many experiments. For example, the experimenter's sex, physical attractiveness and whether they are well-dressed or casually dressed can affect the behaviour of research participants and therefore the results of the experiment (Barnes & Rosenthal, 1985).

In one of Rosenthal's best-known experiments, 12 university students taking a course in experimental psychology unknowingly became participants themselves.

The participants were asked to place rats in a maze. Some were deliberately told that their rats were specially bred to be 'maze bright' and would show 'learning during the first day of running' in the maze. The others were deliberately told that their rats were 'maze dull' and would 'show very little evidence of learning'. In reality, the rats were all standard laboratory rats and were randomly allocated to each group (Rosenthal & Fode, 1963).

As shown in Figure 1.60 below, the group of apparently 'maze bright' rats learned the maze significantly faster than the 'maze dull' rats (as measured by the number of errors in the maze). The rats seemed to perform just as the participants who observed them expected them to.

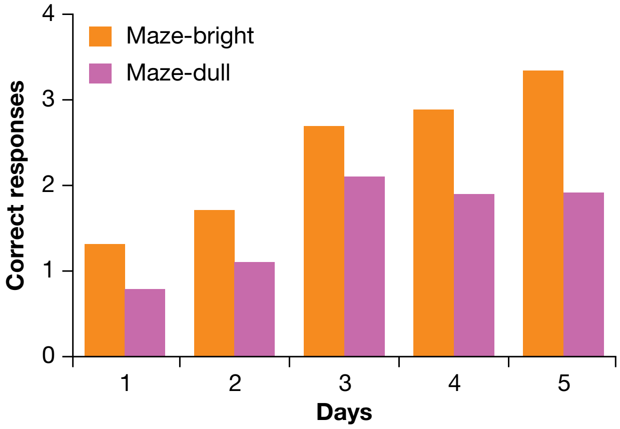

Figure 1.60 Mean number of correct responses per rat per day. The rats described as 'maze bright' learned to run the maze much faster than the rats described as 'maze dull'.

The experimenters concluded that the lower error rate had more to do with the participant's expectations of their rats than the rats' actual abilities. They suggested that 'experimenter expectations' about their rats' capabilities caused participants to subtly alter their training and handling techniques, which in turn affected the animals' learning. There was occasional cheating by prodding rats to run the maze but this occurred with both maze bright and maze dull rats so the effect was counterbalanced and did not influence the results. There were no instances of false data recording or manipulation of results by any participant.

Figure 1.61 Example of a maze used for 'maze running' laboratory experiments with rats

The participants were thought to have unintentionally and unconsciously influenced the performance of their rats, depending on what they had been told by the experimenter. Perhaps they subtly changed how they timed the rats during maze running or how they treated the rats, but without conscious awareness that they were doing so.

Control

The use of a blind procedure is the standard means of controlling experimenter effects. Double blind would help ensure both the participants and the experimenters interacting with them are unaware of the particular experimental conditions. Only a researcher or research assistant who has no personal contact with the research participants, is aware of this information.

In some cases, the experimenter may also be kept unaware of the results that are expected from the different experimental conditions or of the results themselves. Again, only a person not directly involved with the experimental situation would be aware of this information.

The double blind procedure has obvious value in experiments in which knowledge of the conditions might affect the behaviour of the experimenter as well as the participants; for example, when testing the effects of a drug. In drug testing studies, called 'clinical trials', use of double blind is a standard procedure. However, as with single blind, double blind is not always possible.

In some cases, triple blind may be used to enhance control of experimenter effects. **Triple blind** is a procedure in which the participants, experimenters, and research assistants only doing data analysis are all unaware of the particular experimental conditions. For example, a researcher conducting a vital data collection, recording or assessment procedure may intentionally be kept unaware of the condition to which participants are allocated in order to avoid bias or some other 'experimenter effect' on participant performance or results.

The use of digital and automation technologies can help keep experimenters and their assistants blind as to who is in which condition and the data associated with each condition during data collection and analysis. Automating data collection can also help ensure that the scoring system is consistently and accurately applied.

Figure 1.62 The use of digital technology such as computerised testing can help keep experimenters and their assistants blind as to who is in which condition and the data associated with each condition.

1.11 LEARNING ACTIVITY 3

Review

1. Define the meaning of demand characteristic as an extraneous variable.
2. Give two examples of possible sources of demand characteristics in an experiment.
3. Explain whether demand characteristics could be classified as a participant variable.
4. When would deception be considered ethically permissible to control demand characteristics?
5. a. In what way are the single and double blind procedures similar and different?
   b. Which of the two procedures gives more control and why?
6. a. What are standardised instructions and procedures?
   b. Explain how the use of standardised instructions and procedures could help avoid demand characteristics.
7. Define the meaning of experimenter effect as an extraneous variable.
8. Give two sources of experimenter effects.
9. What is the most commonly used procedure for controlling experimenter effects?
10. Consider the following summary of a classic experiment conducted by Rosenthal and Jacobson (1968), then answer the questions that follow.
    At the beginning of the school year some teachers were told that the children in their class had 'academic promise'. Other teachers were not given any information about the academic potential of their class. At the end of the year, children whose teachers were told they had 'academic promise' showed significantly greater gains in IQ scores than children whose teachers were given no information. The children had in fact been randomly allocated to each of the classes.
    a. Identify the IV and DV in this experiment.
    b. Explain the results in terms of an experimenter effect.

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1.11 LEARNING ACTIVITY 4

Multiple-choice questions

1. Demand characteristics are
   - **A.** a type of order effect.
   - **B.** cues in an experiment that bias participant responses.
   - **C.** demands made by the experimenter about how participants should respond.
   - **D.** demands made by participants about how they should respond.
2. When performance of one task by participants in an experiment affects their performance in a second experimental task, there is a potential extraneous or confounding variable that is commonly referred to as a/an
   - **A.** order effect.
   - **B.** counterbalancing effect.
   - **C.** participant effect.
   - **D.** participant variable.
3. *Source: VCAA 2019 Psychology, Section A, Q.11 (adapted); © VCAA*
   Ravi conducted research to find out whether the coping strategy people used would affect their baseline levels of stress. Twenty participants were exposed to simulations of two different stressful scenarios. In the morning, the participants were told to use Strategy A while exposed to the first simulation and, in the afternoon, they were told to use Strategy B while exposed to the second simulation. Electronic devices were used to measure levels of arousal before and during the simulations. Higher levels of arousal indicated greater stress.

   Which one of the following was a confounding variable in Ravi's research?
   - **A.** using the same participants in both conditions, as there may be practice effects
   - **B.** using only 20 participants, as this does not allow for generalisation of the results
   - **C.** telling participants to use a particular coping strategy, as this may bias participants
   - **D.** not allowing participants to use their own strategy in either condition
4. *Source: VCAA 2018 Psychology, Section A, Q.35 (adapted); © VCAA*
   Which of the following would most assist researchers with minimising extraneous variables in an experiment?
   - **A.** single blind procedures and use of a placebo
   - **B.** standardised instructions and procedures
   - **C.** standardised instructions and double blind procedures
   - **D.** counterbalancing to control order effects and experimenter bias
5. When performance of an experimental task is improved or impaired due to performance of a previous experimental task rather than the independent variable, a/an ______ is said to be a potential extraneous variable or confound.
   - **A.** uncontrolled effect
   - **B.** participant effect
   - **C.** order effect
   - **D.** demand characteristic

To answer these and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

1.11.5 Placebo effect

In an experiment, the **placebo effect** occurs when there is a change in a participant's behaviour due to their belief that they are receiving some kind of experimental treatment and they respond in accordance with that belief, rather than to the effect of the IV. Essentially, the participant's behaviour is influenced by their expectations of how they should behave.

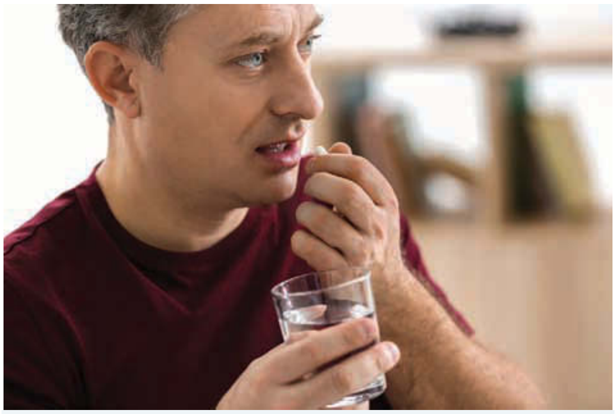

Figure 1.63 The placebo effect can be triggered by the belief that a substance or any type of treatment is real, even though it isn't.

For example, consider a between subjects experiment to test a hypothesis that drinking alcohol makes members of the opposite sex look more attractive. Participants aged over 18 are randomly allocated to either an experimental or control group. The experimental group are given drink containing orange juice with vodka and the control group drink orange juice alone. All participants are told whether their drink contains vodka. After enough time passes for the alcohol to take effect, participants are asked to rate the attractiveness of the faces of various individuals in a set of colour photos.

Suppose that the experimental group rated the photos as significantly more attractive than did the control group. The researcher would like to conclude that alcohol caused the difference in perceived attractiveness. However, alcohol consumption may not have been the only variable that impacted on the DV.

Participants who drank alcohol also knew they drank alcohol, and those who did not drink alcohol knew they did not. The act of being given an alcoholic drink by a researcher might have promoted expectations in participants about how they should respond. For example, experimental group participants might have thought that they were given alcohol because they were expected to perceive more people as attractive, so they did.

Because the experimental group received the alcohol and the control group did not, only the experimental group experienced the placebo effect. This means that a confounding variable is present. Therefore, the researcher cannot be certain whether it was the effect of alcohol or the placebo effect that caused the performance difference (Stangor, 2004).

Control

In order to control and minimise the impact of the placebo effect on the DV, the control group can be given a **placebo** — a fake treatment that is like the IV treatment used in the experimental group but which is actually neutral or has no known effect. In this way, control group participants should form the same expectations as the experimental group, thereby controlling the effects of this unwanted variable.

For example, consider a between subjects experiment with an experimental and control group to test a new herbal drink called Attendo Memoro that claims to improve concentration and memory. Participants in the experimental group could be given a daily drink of Attendo Memoro over a 6-week period and control group participants could be given a drink that looks, smells and tastes like Attendo Memoro but has no active ingredient.

At the beginning and end of the experiment all participants could be given tests to assess their concentration and memory. Because a placebo was used in the control group, any difference in the results could not be said to be due to participant expectancy effects.

Similarly, when testing drugs (or new medical therapies), researchers give placebo pills or injections to the control group so that all participants experience the same procedure and form the same expectations. And in studies that require the experimental group to perform, for example, a physically or mentally demanding task prior to making a response, the researcher could have the control group perform a similar placebo task to eliminate differences between the groups in terms of motivation or fatigue (Heiman, 2002).

A placebo can be any type of inert or fake treatment. It may be a drug or any other type of substance, an edible product such as a food, a special diet, a psychological therapy, a physical therapy, exercise or even surgery (such as incision and a procedure that is faked so that the participant doesn't know they actually had nothing done). When a placebo is given to a control group, the group is often referred to as the *placebo control group* or the *placebo condition*.

Another way of controlling a placebo effect is to use a blind procedure. The single blind procedure would keep participants unaware of the experimental condition they are in. They may know what the experiment is about, but they don't know whether they are in an experimental or control group and therefore whether they have been given the active treatment or the inert placebo.

Figure 1.64 In an experiment to test a new drug, a placebo would look and be used like the real drug but have no real effect.

on Resources

Weblink Media article on placebo surgery

1.11 LEARNING ACTIVITY 5

Review

1. Define the meaning of placebo effect as an extraneous variable.
2. Explain whether the placebo effect is a type of demand characteristic.
3. Explain what a placebo is and how it can be used to control the placebo effect.
4. Name another procedure that may be used to control the placebo effect.
5. In an experiment testing different levels of an IV (without a control group), participants know which condition they are in but the experimenter does not. Which blind procedure is the experimenter using, if any?

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

1.11 LEARNING ACTIVITY 6

VCAA exam questions

Question 1 (1 mark)

Source: VCAA 2020 Psychology, Section A, Q.41; © VCAA

Participants involved in research into mental health are informed that a placebo will be used. Which additional piece of information is most likely to be provided to these participants?

A. which condition they are in
B. that they could be in either the control group or the experimental group
C. that they should continue taking any other medications they have been prescribed
D. misleading information about the research in order to prevent the participants' expectations from affecting the results

Question 2 (1 mark)

Source: VCAA 2017 Psychology, Section A, Q.46; © VCAA

Dr Smith is one of 10 doctors who work at the Bayview Lodge Medical Clinic. He wanted to investigate the effect of a new brand of benzodiazepine on the progression of a specific phobia in patients at the clinic. Fifty of Dr Smith's patients volunteered to take part in the study.

Dr Smith randomly divided the participants into two groups and gave Group A the treatment and Group B the placebo. The participants did not know if they were receiving the treatment or the placebo. The participants completed a self-report phobic anxiety scale both before and after the treatment.

Group B was given the placebo to control for

A. participant error.
B. experimenter bias.
C. participant expectations.
D. experimenter expectations.

Question 3 (1 mark)

Source: VCAA 2009 Psychology 1, Section A, Q.44 (adapted); © VCAA

Harvey, a university researcher, designs a between subjects experiment. The experiment is testing the effect of a new drug on relieving symptoms of sleep apnea. He obtains informed consent from the participants. He uses a single blind experiment.

This means that

A. only one group of participants know whether they are receiving the placebo or the real drug.
B. the participants do not know about the nature of the experiment, unlike Harvey who does know.
C. Harvey does not know about the nature of the experiment, unlike the participants who do know.
D. the participants do not know whether they are taking the placebo or the real drug, unlike Harvey who does know.

Question 4 (1 mark)

Source: VCAA 2008 Psychology 1, Section B, Q.17b; © VCAA

Doctor Finlay is carrying out research into the causes of insomnia. She selects a sample of participants and randomly divides them into two experimental groups. Doctor Finlay uses a single-blind procedure.
Explain the benefit of using a single-blind procedure.

Question 5 (2 marks)

Source: VCAA 2007 Psychology 1, Section B, Q.16a; © VCAA

Tegan is planning to carry out a study that considers the effects of caffeine on sleep. She plans to have two independent groups of participants. One group will take a low dose of caffeine while the other will drink a high dose of caffeine.

Tegan does not want the participants to know to which group they have been allocated. Name and define the effect that could occur if participants knew to which group they had been allocated.

To answer these and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

1.12 Ethical considerations in psychological research and reporting

Is it appropriate for an experimenter to inflict pain on a person in order to study mental experiences associated with pain? Does your answer depend on the amount of pain, or is any amount of pain unacceptable? Does it matter if the pain is psychological rather than physical? Should a person know exactly what the research will involve before they participate; for example, the specific experimental procedures to which they will be exposed? Should a participant be allowed to opt out of a research investigation whenever they want to, regardless of their reason? What if the researcher has gone to great expense to conduct the investigation? What if the participant has been paid? What if the research has important benefits for humankind? Such questions raise important ethical issues that need to be considered by researchers.

1.12.1 Defining ethics and ethical standards

The term **ethics** refers to standards that guide individuals to identify good, desirable or acceptable conduct. Essentially, ethical standards help us to make moral judgments about what is right (or acceptable) and what is wrong (or unacceptable).

Figure 1.65 Ethical standards and guidelines for human research ensure all participants are given the respect and protection due to them, irrespective of who they are.

All societies and cultural groups have ethical standards that guide the behaviour of their members. In addition to these standards, most professions have their own standards of ethical conduct that must be followed. For example, just as it would be considered unethical for a medical doctor to discuss a patient's condition with anyone apart from the patient or people legally responsible for the patient, so too would it be unethical for a psychologist to reveal information discussed in a counselling session or the results of a psychological test to anyone apart from the client (or the guardians of the client if the client is a child under a guardian's care).

Ethical standards and relevant considerations also apply to any type of research or data collection method involving people (or animals). These help ensure that the wellbeing and rights of research participants are respected and protected before, during and following their involvement in the research. In addition, ethical standards and guidelines help prevent unnecessary research and promote research that is or will be of benefit to the wider community or humankind in general.

The Australian Psychological Society (APS) has a *Code Of Ethics* (2007) which provides standards and guidelines for all psychological research (and other areas of professional practice). The Code has been devised with reference to a national set of standards and guidelines for research in a document called the *National Statement on Ethical Conduct in Human Research 2007 (Updated 2018)*. This is simply referred to as the National Statement. Psychological researchers strictly follow these standards and guidelines.

1.12.2 Ethical concepts and guidelines

Ethical standards for psychological research described in the Australian codes of conduct (and international codes), are based on a common set of ethical concepts and principles. These are reflected in the ethical concepts and guidelines specified in the VCE Psychology Study Design (pp. 20–21) and therefore apply to any research undertaken as part of the course.

Ethical concepts

The five ethical concepts described in the Study Design are:

- **Beneficence**: The commitment to maximising benefits and minimising the risks and harms involved in taking a particular position or course of action.

  For example, the researcher must consider and maximise all possible good outcomes while minimising the risks of harm to participants and to the community in general. The potential benefits must justify any risk or harm or discomfort to participants.

- **Integrity**: The commitment to searching for knowledge and understanding, the honest reporting of all sources of information and results, whether favourable or unfavourable, in ways that permit scrutiny and contribute to public knowledge and understanding.

  For example, research that is conducted with integrity is carried out with a commitment to following recognised ethical principles and guidelines for conducting research, including accurate and responsible reporting of findings, whether the results are favourable or unfavourable.

- **Justice**: The moral obligation to ensure that there is fair consideration of competing claims; that there is no unfair burden on a particular group from an action; and that there is fair distribution and access to the benefits of an action.

  For example, the researcher must use fair procedures and ensure fair distribution of costs and benefits. In particular, the process of recruiting and selecting participants should be fair so the researcher must avoid imposing on particular groups an unfair burden of participation in their research. Similarly, the benefits of the research should be distributed fairly between the participants and the wider community.

- **Non-maleficence**: Involves avoiding the causations of harm. However, as positions or courses of actions in scientific research may involve some degree of harm, the concept of non-maleficence implies that the harm resulting from any position or course of action should not be disproportionate to the benefits from any position or course of action.

For example, the researcher must strive to ensure that there are benefits from their research and take care to not only avoid harm to all participants but to protect them from harm. If there is any potential for harm, then it must be justifiable and outweighed by the benefits.

- **Respect**: Involves consideration of the extent to which living things have an intrinsic value and/or instrumental value; giving due regard to the welfare, liberty and autonomy, beliefs, perceptions, customs and cultural heritage of both the individual and the collective; consideration of the capacity of living things to make their own decisions; and when living things have diminished capacity to make their own decisions ensuring that they are empowered where possible and protected as necessary.

  For example, the researcher must recognise that all individuals, both human and non-human, have value and importance. In relation to people, the researcher must take account of the rights, beliefs, perceptions and cultural backgrounds of all participants and the groups to which they belong. In particular, all participants have the rights to privacy, confidentiality and to make informed decisions about matters that affect them. People must be protected and empowered if they are vulnerable or their capacity to make informed decisions is impaired; for example, children and intellectually disabled people who depend on others.

Ethical guidelines

The following guidelines should therefore be considered when conducting and evaluating psychological investigations:

- **Confidentiality**: The privacy, protection and security of a participant's personal information in terms of personal details and the anonymity in individual results, including the removal of identifying elements.

  Confidentiality also includes the obligation of the researcher not to use or disclose private information for any purpose other than that for which it was given to them. Participants have a right to privacy, so the researcher must avoid undue invasion of privacy by collecting only information that is needed. Therefore, any information that may identify an individual or their involvement in research, such as personal data or test results, cannot be revealed unless consent has been obtained.

  The right to privacy and procedures for establishing and maintaining confidentiality must be explained to participants before the study commences. Confidentiality also applies to the collection, recording, accessing, storage, dissemination and disposal of personal information. If personal information about an individual is no longer needed, then the information should be destroyed or de-identified.

- **Debriefing**: Ensures that at the end of the experiment, the participant leaves understanding the experimental aim, results and conclusions. Any questions participants have are addressed, and support is also provided to ensure there is no lasting harm from their involvement in the study. Debriefing is essential for all studies that involve deception.

  Checking the wellbeing of the participant and addressing any harm that may have resulted from their participation in the study is another important requirement of debriefing; for example, providing information about counselling services and how to access them to help treat any distress resulting from the study. In extreme cases, participant wellbeing may be monitored after the research; for example, participants may receive questionnaires, be asked to complete diaries and/or have follow-up meetings with the research team.

- **Informed consent procedures**: Ensure that participants understand the nature and purpose of the experiment, including potential risks (both physical and psychological), before agreeing to participate in the study. Voluntary written consent should be obtained by the experimenter and if participants are unable to give this consent, then a parent or legal guardian should provide this.

  Consent is a voluntary choice for participants and must be based on sufficient information and adequate understanding of both the proposed research and the consequences of participation in it. In order for this to be achieved, information should be given about the purpose, methods, demands, risks and potential benefits of the research.

This information must be presented in ways suitable for each participant; for example, it should be in plain language (with the least possible technical jargon) and the researcher should take account of personal characteristics such as age, educational background, cultural background and any other possible barriers to understanding the information. There should be an opportunity for prospective participants to ask questions about the research.

It is essential that participants have the competence to give informed consent. A wide variety of symptoms, diseases, injuries and other conditions can affect a person's ability to understand information and the researcher must take this into account when seeking informed consent and providing documents or information relevant to informed consent. For participants who are legally unable to give informed consent (e.g. children and individuals with an intellectual disability), the researcher must obtain appropriate consent from the persons who are legally responsible for participants' wellbeing (i.e. parent or guardian).

Often, researchers obtain informed consent using a document like the sample consent form in the Ethical conduct and safety learnMORE section in learnON. Two copies are made so that one can be kept by the researcher and one by the participant.

Figure 1.66 The ethical concepts and principles specified in VCE Psychology are based on the NHMRC *National Statement* and the APS *Code of Ethics.*

on Resources

Weblinks *National Statement on Ethical Conduct in Human Research*
APS Code of Ethics

- **Use of deception in research**: Is only permissible when participants knowing the true purpose of the experiment may affect their behaviour whilst participating in the study, and the subsequent validity of the experiment.

  The use of deception is discouraged in psychological research and used only when necessary.

  By its nature, deception violates the ethical requirement of informed consent. Its use also means that the relationship between researcher and participant is not open and honest. However, deception is considered acceptable if the potential benefits of the research justify its use and there is no feasible alternative to its use.
- **Voluntary participation**: Ensures that no coercion or pressure is put on the participant to partake in an experiment, and they freely choose to be involved. Therefore, the researcher must ensure all participants voluntarily consent to be involved in an investigation. The researcher must also ensure that prospective participants do not experience negative consequences if they choose not to be involved in a study.
- **Withdrawal rights**: Involves a participant being able to discontinue their involvement in an experiment at any time during or after the conclusion of an experiment, without penalty. This may include the removal of the participant's results from the study after the study is completed. Participants also have the right to withdraw without giving a reason for doing so.

  Withdrawal rights must be explained to participants before the study commences and the researcher must ensure that participants suffer no negative consequences as a result of withdrawing from the study.

Figure 1.67 The National Statement requires that all research that carries more than a low level of risk to human participants must first be reviewed and approved by a Human Research Ethics Committee. Organisations such as universities and hospitals which conduct a considerable amount of research involving people usually set up their own ethics committees to meet National Statement guidelines.

learnon

learnMORE | Ethical conduct and safety

- Human Research Ethics Committees
- Sample consent form for research participants
- Australian Privacy Principles
- Safety and wellbeing in VCE Psychology
- Animals in psychological research

Access learnON for additional information about ethical conduct and safety of wellbeing for VCE Psychology students.

1.12 LEARNING ACTIVITY 1

Review

1. Define the meaning of ethics in relation to research.
2. What is the primary purpose of ethical standards, concepts and guidelines for psychological research with human participants?
3. Name and briefly describe the five concepts underlying ethical standards and guidelines for all research with human participants.
4. List four essential informed consent procedures.
5. What is the ethical responsibility of a researcher who conducts research with human participants, but does not fully inform them of the true purpose of the research before the study begins because it may influence the participants' behaviour?
6. A research participant became distressed during an important investigation with some very significant potential benefits for the individual involved and all others. Based on your understanding of the ethics concepts and principles, what should the researcher do?
7. Explain the ethical relevance of the Australian Privacy Principles.
8. Which ethical research concept — *beneficence*, *integrity*, *justice*, *non-maleficence* or *respect* — is relevant to each of the following statements?

Statement	Ethical concept
a. The process of recruiting participants is fair.	
b. The researcher does not 'make fun' of a participant's unexpected responses.	
c. The researcher sees it as their duty to do no harm or allow any harm to all participants	
d. The researcher has a commitment to following all relevant ethical standards.	
e. The researcher does not put pressure on a participant to consent to study participation.	
f. The researcher is certain that what is likely to be learnt from their study justifies the risks of harm or discomfort to participants.	
g. The researcher ensures easy access to the results of the research when available.	
h. Every single human being has value in himself or herself.	
i. The researcher ensures all members of the research team are properly qualified to undertake their respective responsibilities.	
j. The researcher is willing and able to answers even the most trivial questions about the research.	

9. Suppose you have been asked to sit on a Human Research Ethics Committee. The following research proposals have been presented to your committee for approval. Your task is to evaluate the proposals in terms of whether they meet all ethical requirements, then write your recommendations, commenting on:
   a. whether the committee should approve or reject the proposal as it is presented
   b. if you recommend that the proposal should be rejected, on the basis of which ethical concept(s) and/or principle(s) it should be rejected.

Proposal 1

Alexandra Robertson is a clinical psychologist who is interested in how parents cope with the death of a young child. She proposes to investigate grieving parents' use of support available through the internet.

Robertson is particularly interested in chat rooms dedicated to parents who have lost a young child. In order to obtain realistic, detailed, 'unfiltered' data, she intends to pose as a parent who has recently lost a child and participate in discussions in several chat rooms. In the course of her chat room participation, she will raise issues for discussion and make judgments about the quality and usefulness of chat room support.

a. Should the committee approve or reject the proposal as it is presented?
b. If you recommend that the proposal should be rejected, on the basis of which ethical concept(s) and/or principle(s) should it be rejected?

Proposal 2

Sienna Amir plans to conduct an observational study to investigate behaviour in public rest rooms. This research method is expected to obtain more valid and reliable data than could be collected through a self-report measure. It is proposed that a team of male and female researchers will conceal themselves in vacant toilet stalls of the respective rest rooms and observe behaviours of men and women (adults only), such as flushing vs non-flushing, hand washing vs hand drying, mirror checking, clothing adjustments, littering and graffiti writing.

a. Should the committee approve or reject the proposal as it is presented?
b. If you recommend that the proposal should be rejected, on the basis of which ethical concept(s) and/or principle(s) should it be rejected?

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

1.12 LEARNING ACTIVITY 2

VCAA exam questions

Question 1 (1 mark)

Source: VCAA 2021 Psychology, Section A, Q.42; © VCAA

Which of the following outlines the informed consent considerations when researching children and adults with a mental disorder?

	Children	Adults with a mental disorder
A.	are not likely to understand complex research and are unable to give their own informed consent	are incapable of giving informed consent
B.	deception can be used in research with children if their parent/guardian has consented	a placebo treatment may be used with informed consent despite intentionally denying access to treatment
C.	children can be studied at school without informed consent	informed consent can be obtained from a legal guardian when an individual is incapable of giving it
D.	no informed consent is needed when studying children through observation	no informed consent is needed when adults with a mental disorder are admitted to the public health system

Question 2 (1 mark)

Source: VCAA 2019 Psychology, Section A, Q.37 (adapted); © VCAA

Cora, a university student, conducts an experiment in a classroom to test the effectiveness of bright light therapy on adolescent boys with a circadian phase disorder. She recruits nine 16-year-old boys from a suburban boys' school to participate in her experiment.

Before commencing this experiment, Cora is ethically required to collect informed consent from

A. the adolescents.
B. a parent/guardian.
C. the adolescents and their teachers.
D. the adolescents and their parent/guardian.

Question 3 (1 mark)

Source: VCAA 2018 Psychology, Section A, Q.7; © VCAA

A psychologist wanted to investigate people's responses to being pricked by a needle. Details of the investigation were provided to a group of 10 participants prior to the investigation. The investigation involved blindfolding participants and pricking each participant's finger over several trials.

When the psychologist first pricked her stem with the needle, Nerissa started crying and ran outside. She did not return and the psychologist was unable to contact her afterwards. Which ethical principle was potentially compromised as a result of Nerissa leaving the investigation before it had finished?

A. debriefing
B. confidentiality
C. informed consent
D. withdrawal rights

Question 4 (1 mark)

Source: VCAA 2017 Psychology, Section A, Q.49 (adapted); © VCAA

Dr Smith is one of 10 doctors who work at the Bayview Lodge Medical Clinic. He wanted to investigate the effect of a new brand of benzodiazepine on the progression of a specific phobia in patients at the clinic. Fifty of Dr Smith's patients volunteered to take part in the study.

Some of the patients had a legal guardian. In order to obtain informed consent from these patients, Dr Smith needed to ensure that

A. only the patient was informed about the nature, purpose and risks of the study.
B. only the guardian was informed about the nature, purpose and risks of the study.
C. the guardian provided consent and the patient understood to the best of their ability the nature, purpose and risks of the study.
D. the patient provided consent and their guardian understood to the best of their ability the nature, purpose and risks of the study.

Question 5 (1 mark)

Source: VCAA 2009 Psychology 1, Section A, Q.18; © VCAA

Dr Hart wishes to undertake a case study of some patients who have suffered brain damage. Several of the patients cannot speak English. Dr Hart translates the consent document into the patients' first language and ensures that it is fully explained to the patients before asking them if they wish to participate. The ethical principle Dr Hart has adhered to is

A. justice.
B. privacy.
C. beneficence.
D. respect for persons.

To answer these and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

1.13 Types of data

All psychological research involves collection of information. In research, the information which is collected is called **data**. The data is evidence that will form the results of the investigation and be the basis of the conclusions that will be made.

Data can take different forms. The type of data collected is determined by the specific kind of research method used. For example, questionnaires and interviews often provide data in the form of words, whereas data collected in experiments correlational studies is usually in the form of numbers.

There are many ways of classifying data. We consider the distinctions between primary and secondary data and quantitative and qualitative data in relation to psychological research.

1.13.1 Primary and secondary data

Primary data is information collected directly from the source by the researcher (or through others) for their own specific purpose. It is collected from the original source for the first time by the researcher, which is why it is sometimes described as 'first hand' data. For example, you will collect primary data when you conduct your own scientific investigations.

If you use an experiment to collect data then the primary data will be the participants' responses for your measure of the dependent variable. Their original responses may also be called *raw data* because they have not been processed from their original state. Raw data is a type of primary data.

When you summarise your data as a table or convert it to percentages, it will still be primary data because you are the researcher who originally collected and processed it. You have also retained control over it.

When someone else accesses your primary data, you lose control over it because they can manipulate or use it in whatever way they want for their own purpose. It will be secondary data for the other person.

Secondary data is information that was not collected directly by the current researcher but was collected at an earlier time by someone else. It has already been collected by some other individual, group or organisation and will not be used for the first time, which is why it is referred to as 'secondary' (like second-hand).

The Australian Bureau of Statistics is a widely used source of secondary data, as are the results reported by researchers in journal articles. Of course, the same lot of secondary data can be collected multiple times by multiple researchers.

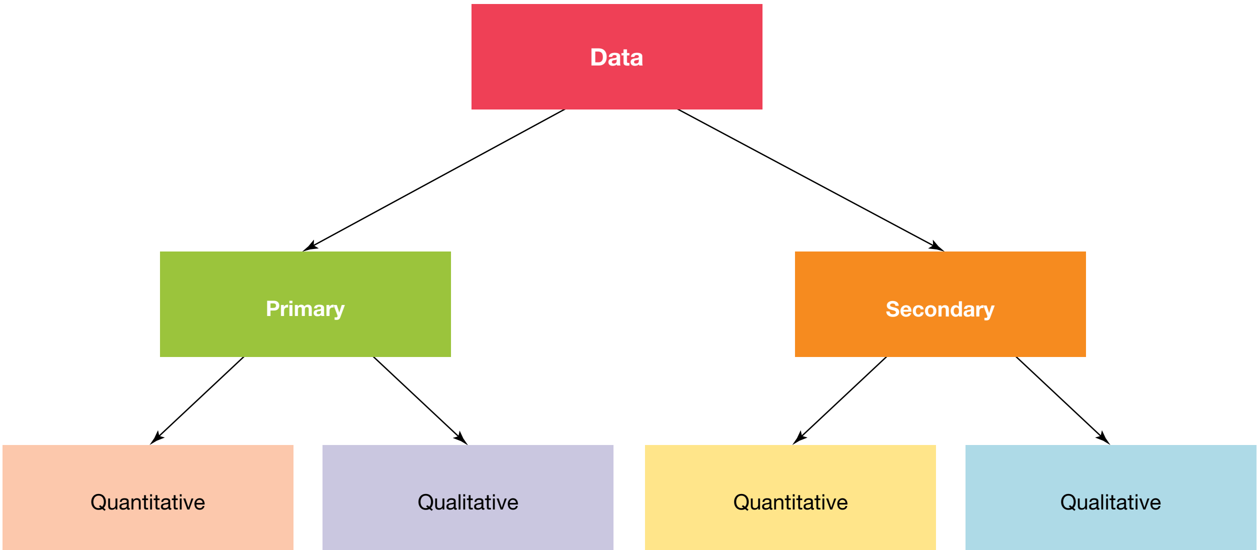

Figure 1.68 A classification system for different types of data

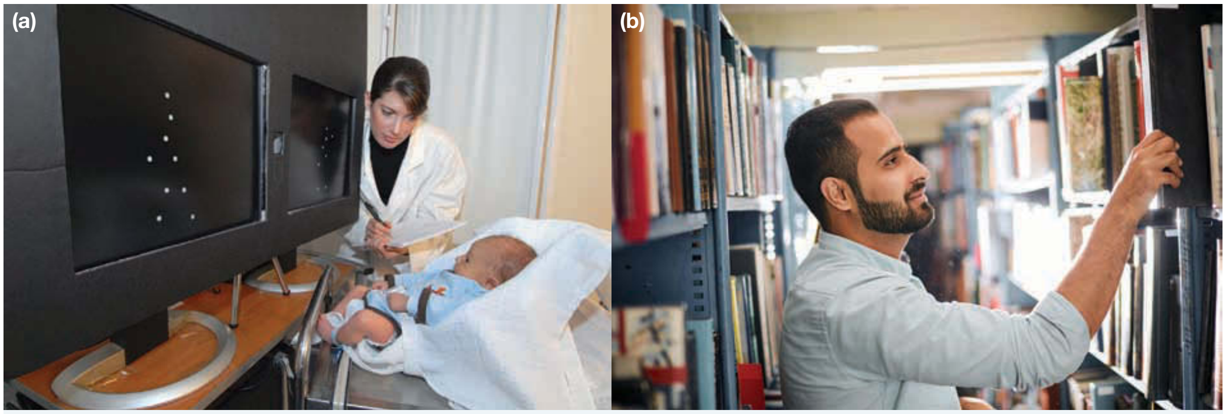

Figure 1.69 Researchers are shown collecting (a) primary data and (b) secondary data

The main difference between primary and secondary data is in who collects the original data, whether it originates with the researcher specifically to address a research question or whether it has already been collected by someone else. Both types of data have their advantages and limitations.

Primary data offers tailored information sought by the researcher to test a hypothesis for a research question of their choosing. To the researcher, there is little doubt about the quality of the data collected. They are also responsible for the quality of their data, but it can be time-consuming to collect and process.

Secondary data tends to be readily available and can usually be accessed in less time, especially if you know where and how to look. There can be uncertainty about its quality because it is usually collected for another purpose and there is often a need to comb through it to find what you're looking for.

1.13.2 Quantitative and qualitative data

Primary and secondary data may be quantitative or qualitative. The majority of investigations referred to in this text use quantitative data. This reflects the preference for quantitative data in most psychological research.

Quantitative data

Quantitative data is information that is expressed numerically. As suggested by the term, it is information about the 'quantity' or amount of what is being studied; that is, how much or how many of something there is.

It may be raw data that have not been analysed in any way, such as lengths or weights of prematurely born infants, or percentages of participants who respond with 'Yes' or 'No' to survey questions, or the mean reaction time of participants when a light is flashed onto a screen in an experiment, and so on.

All types of mental experiences and behaviours can be described in quantitative terms as amounts or numbers. For example, a questionnaire might ask participants to use a five-point scale to rate their feelings on issues such as racial discrimination or the persuasiveness of a social media influencer.

Information about individuals' scores on a range of psychological tests such as intelligence tests, personality tests and various ability and interest tests are also provided as quantitative data. In addition, data collected during experiments, observational studies and correlational studies are typically collected in a numerical form and are therefore usually quantitative.

The use of numerical data makes it easier to summarise and interpret information collected through research. This is why quantitative data is often preferred to qualitative data, although this does not mean that qualitative data is less important or less useful than quantitative data.

Qualitative data

Qualitative data is information that is not expressed numerically. As suggested by the term, it is information about the 'qualities' or characteristics of what is being studied.

It may be in the form of descriptions, words, meanings, pictures and so on. It can describe any aspect of a person's mental experience or behaviour; more specifically, what something is like, how something is experienced or whether it was an X or Y type of experience.

Qualitative data may be collected as written or verbal statements made by participants, or as descriptions of behaviour observed and recorded by the researcher. For example, a researcher studying self-esteem in young children may collect qualitative data through an interview by asking children free-response questions related to their self-esteem.

Likewise, a researcher interested in learning about the factors that enable some people to cope better than others with personal trauma may collect qualitative data through a questionnaire with items about how they felt in a specific traumatic situation and how they dealt with their feelings.

Experiments can produce qualitative data as well as numbers. For example, consider the Stanford Prison Experiment conducted by Zimbardo (1972) which you will study in Unit 2. Zimbardo observed, described and reported common and unusual behaviour and verbal responses of 'prisoners' and 'guards' in a prison set up at a university, often referring to specific examples (qualitative data). However, Zimbardo also measured the extent to which the 'prisoners' were prepared to obey the demands of the 'guards' and reported his observations in the form of graphs and tables (quantitative data).

Although qualitative data is typically expressed in the form of words, it can be converted into a quantitative form. For example, participants' responses to free-response interview questions about their thoughts and feelings when they are anxious could be summarised as numbers based on the frequency ('how often') or intensity ('how strong') with which certain feelings are reported.

As you would expect, a research investigation that collects quantitative data is referred to as *quantitative research* and as *qualitative research* if qualitative data is collected.

1.13.3 Objective and subjective data

The terms 'objective' and 'subjective' are also used in relation to data — primarily, to refer to the way in which data are collected and the way they are described and explained.

Key science skills specified for VCE Psychology require you to evaluate data and to construct evidence-based arguments and conclusions. In doing so, you need to be able to make judgments about the quality of data and distinguish between opinion, anecdote and evidence, as well as scientific and non-scientific ideas.

It is therefore useful to understand the distinction between data that are objective and subjective and that quantitative and qualitative data may also be objective or subjective.

Objective data is information that is observable, measurable, verifiable and free from the personal bias of the researcher. For example, the data can be seen, heard or touched (observable), counted or precisely described (measurable), can be confirmed by another researcher (verifiable) and is factual (free from personal bias). In science, there is a strong preference for objective data.

Data collected through a strictly controlled experiment in which observations and measurements are planned, precise and systematic is considered objective. So is data collected using an assessment device that yields a score, such as an intelligence or personality test.

Automated, digital and mechanical devices can also be used to collect objective data. For example, an instrument that shows underlying physiological activity in measurable form, such as an EEG which records brain wave activity, provides objective data.

Sometimes researchers collect information about behaviour or mental processes that cannot be directly observed; for example, sexual behaviour or criminal acts. In these cases, researchers tend to rely on self-reports — participant responses to questions asked by the researcher. This information will be subjective.

Subjective data is information that is based on personal opinion, interpretation, point of view or judgment. Unlike objective data, this data is determined by the research participants and cannot always be verified by the researcher. It is often biased, can vary from person to person, day to day from the same person, and is not always entirely accurate.

When using subjective data, researchers assume that participants are honest, can accurately recall what they are asked to describe and are able to give detailed accounts about their thoughts, feelings or behaviour.

Although subjective data may be more detailed than that available from more scientifically rigorous methods under controlled conditions, it tends to be difficult to interpret accurately when compared with objective data (which is usually quantitative).

Figure 1.70 In this experiment involving animal learning, an electronic recording device is used to collect objective data on the frequency of responses made by the rat when a specific brain area is activated. Is the data also primary or secondary? Quantitative or qualitative?

1.13 LEARNING ACTIVITY 1

Review

1. Distinguish between primary and secondary data with reference to an example of each data type.
2. a. Define the terms qualitative data and quantitative data with reference to examples that are not used in the text.
   b. Give an example of a strength and a weakness of quantitative and qualitative data.
3. Indicate whether the data collected in each of the following research studies is primary or secondary data. Explain your answers.
   a. Audio recordings of a student's description of the effect of background noise on their ability to learn previously unseen material
   b. A student's ratings on a 7-point rating scale used to assess how much background noise affected their ability to learn previously unseen material
   c. A blog commenting on the findings of psychological research
   d. A documentary on a controversial psychological experiment narrated by the experimenter
   e. Records of whether people who wear spectacle can read more quickly than people who do not wear spectacles

4. Consider each of the following investigations. For each one, enter the correct letters in the space provided to indicate which 3 types of data are used: Primary data (Pr) or Secondary data (Sc); Qualitative data (Ql) or Quantitative data (Qn); Objective data (Ob) or Subjective data (Su).
   a. _______ Using existing data for correlational study
   b. _______ Conducting an experiment to investigate whether having regular rest breaks during a prolonged study session improves performance on a test
   c. _______ Observing the social interactions of students in a study group using pre-determined items on an observation checklist
   d. _______ Content analysis of media reports attributing causation to the results of correlational studies
   e. _______ Organising a small number of participants into a discussion group to collect self-reports on the experience of sexual discrimination in the workplace
   f. _______ Using a questionnaire with fixed response questions (e.g. Yes/No) to survey a large number of bushfire victims who may be experiencing post-traumatic stress disorder
   g. _______ Observing the effects of using a treat as a reward to teach a dog to sit on command
   h. _______ Analysing the brush strokes in paintings by research participants with a brain injury in the cerebellum
   i. _______ Studying the behaviour of newborn infants by observing and recording their second-by-second movements during their first 72 hours of life following birth
   j. _______ Investigating ways in which females are portrayed in the print media by analysing a random sample of newspaper and magazine advertisements
   k. _______ Measuring the relationship between scores on intelligence and personality tests completed by repeat offenders who go back to prison

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1.13 LEARNING ACTIVITY 2

VCAA exam questions

Question 1 (1 mark)

Source: VCAA 2021 Psychology, Section A, Q.46 (adapted); © VCAA

Ekon wants to join his local emergency volunteer group. The volunteer group has identified five risk factors that could potentially impair a volunteer's social and emotional wellbeing while they are in the role. Using an online questionnaire, Ekon rates himself against each of the factors on a rating of 1–10, with 1 indicating low risk and 10 indicating high risk.

The type of research method used in this scenario was

A. interview with objective data.
B. self-report with quantitative data.
C. questionnaire with qualitative data.
D. within subjects with experimental data.

Question 2 (1 mark)

Source: VCAA 2012 Psychology, Section A, Q.4; © VCAA

Maggie and Tom are two healthy 15-year-old high school students who participated in a sleep study. During the study, they had to record their respective number of hours of sleep. They submitted their sleep records to the researchers at the end of the study.

The type of data collected in Maggie's and Tom's sleep records was

A. qualitative only.
B. quantitative only.
C. counter balancing.
D. both qualitative and quantitative.

Question 3 (1 mark)

Source: VCAA 2019 Psychology, Section A, Q.50; © VCAA

Xuan is a researcher who wants to gather subjective and descriptive data from people who have been diagnosed with a mental illness in order to understand what living with a mental illness is like.

Which of the following identifies the type of data Xuan is collecting, the best method for collecting this data and the best sample size?

	Type of data	Data collection method	Sample size
A.	qualitative	interviews	small
B.	quantitative	interviews	large
C.	qualitative	questionnaire	large
D.	quantitative	online questionnaire with rating scales	small

Question 4 (1 mark)

Source: VCAA 2020 Psychology, Section A, Q.36 (adapted); © VCAA

Parminder compared the effects of consumption of alcohol on reaction times in people at various stages of life. His stratified sample included participants aged 18 to 70 years. In the within subjects experiment, participants consumed one standard drink of alcohol at half-hourly intervals until they reached 0.10% blood alcohol concentration (BAC). Participants completed a series of computer-based tests for reaction times at BACs of 0.00%, 0.05% and 0.10%.

Additionally, once participants reached 0.10% BAC, Parminder asked all participants to write down on a lined piece of paper their immediate feelings, thoughts and memories, and to provide an estimate of how long they thought the tests ran for.

Which of the following accurately describes the two types of data Parminder was gathering during the testing period and after the last test?

A. subjective and qualitative
B. self-report and qualitative
C. objective and quantitative
D. quantitative and qualitative

Question 5 (1 mark)

Source: VCAA 2011 Psychology 1, Section A, Q.13; © VCAA

Jason was taking part in a study of the sleep patterns of adolescents. From the ages of 11 to 24, he was required to keep a sleep diary for one month each year. In the sleep diary he described how tired he felt during the day. In the same month he also wore an electronic device that recorded the amount of time he spent asleep.

The researcher was collecting

A. correlational data.
B. only qualitative data.
C. only quantitative data.
D. qualitative and quantitative data.

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1.14 Data organisation and presentation

When data have been collected to test a hypothesis, the researcher must decide whether the results support or do not support the hypothesis. The first step is to organise and present the data in useful and meaningful ways.

Tables, bar charts, line graphs and scatter plots may be constructed to assist this process, especially with quantitative data. Importantly, they may provide the basis of identifying trends and patterns in the data, including relationships between the variables that were investigated. They may also be used to help describe the data, which is why tables and graphs are called 'descriptive statistics'.

Suppose, for example, that a researcher is interested in studying whether body image changes during puberty and adolescence. The researcher might give a body image rating scale to ten 10-year-olds, ten 12-year-olds, ten 14-year-olds, ten 16-year-olds, ten 18-year-olds, ten 20-year-olds and ten 22-year-olds.

Each participant would be required to make a judgment about their physical appearance using a rating scale ranging from 1 to 10, with 1 being equivalent to very unattractive, 5 to neither attractive nor unattractive and 10 to very attractive. In all, there would be 70 bits of data (i.e. ratings) about the body image of participants in different age groups.

It is difficult to draw conclusions about whether (and if so, how) body image changes with age by looking at 70 individual ratings. Thus, in order to compare the body image ratings of the seven different age groups to determine whether there is a change with age, the data for each group could be summarised and presented in a table.

Tables are an effective means of recording data, but they may not be the best way to show trends, patterns or relationships. Often, a graphical representation of the data is best for this purpose.

1.14.1 Tables

A **table** is an orderly arrangement and display of data in columns and rows. The columns and rows are usually identified by names (or 'headers') that assist in making comparisons. Guidelines for constructing appropriate and useful tables include:

- All tables should be consecutively numbered, e.g. Table 1, Table 2.
- Each table should have an individual title
- The title should be a clear statement which explains what the table is about without being too long e.g. Mean body image ratings of each age group.
- Each column should be identified using a descriptive header.
- The first letter of each header in the table should be capitalised.
- The reader should be able to quickly work out what the table is about and comparisons of data should be easy to make.
- In the research report, essay or other document, the word table is capitalised whenever referring to it, e.g. '. . . as shown in Table 1'.

Table 1.6 below provides some order to the data on body image ratings by organising the ratings into different age groups.

However, comparison of ratings across the age groups is still difficult because the data have been inadequately summarised. To enable the ratings of different age groups to be compared, a single number that summarises all the data for each age group would be calculated.

Table 1.6 Raw data from participant ratings

Age group (years)	Participant ratings									
10	5	2	8	7	5	6	10	3	6	7
12	7	3	6	7	5	4	2	8	4	1
14	9	7	5	5	3	1	1	4	2	9
16	6	7	4	3	8	2	1	9	4	2
18	4	1	7	2	3	8	6	1	9	4
20	6	8	7	8	2	9	7	8	7	7
22	8	7	4	7	7	7	8	6	8	8

For this investigation, the researcher could calculate the mean rating for each age group. The mean scores could be used to describe the 'average' body image rating for each age group and would enable the researcher to compare the different age groups. This is shown in Table 1.7 below. The use of the mean for simplifying comparison between groups is discussed further in the next section.

Table 1.7 Mean body image ratings of each age group

Age group (years)	Mean scores
10	5.9
12	4.7
14	4.6
16	4.6
18	4.5
20	6.9
22	7.0

1.14.2 Graphs

A **graph** is a pictorial representation of data. Graphing or plotting data typically involves the use of two lines (axes) drawn at right angles to one another. The horizontal line is the *x axis* and the vertical line is the *y axis*. The point where the axes intersect is called the *origin* (0).

When constructing a graph for experimental research data, it is essential that the IV is represented on the horizontal (*x*) axis and the DV is represented on the vertical (*y*) axis.

Graphs are best used to determine and communicate trends, patterns or relationships in the data collected; for example, how often a response is made, how aspects of behaviour change over time or as a participant's experience changes, and how one variable may be related to or change in relation to another.

Among the more commonly used graphs in psychology are bar charts and line graphs. Scatter plots may be used to display correlational data.

In psychology, graphs are more formally referred to as 'figures' (along with drawings, photos and any type of illustration). Guidelines for constructing appropriate and useful graphs include:

- All graphs should be consecutively numbered, e.g. Figure 1, Figure 2.
- Each graph should have an individual title
- The title should be a clear statement which explains what the graph is about without being too long, e.g. Reaction time of each age group.
- The number and title are both on the same line and usually shown below the graph.
- Both the horizontal and vertical axes must be labelled clearly and indicate what is plotted (and, as stated above, the IV is represented *x* axis and the DV on the *y* axis).
- The reader should be able to quickly work out what the graph is about.

Bar charts

A **bar chart** is a graph which uses a series of separate bars or rectangles next to, but not touching one another, to enable comparisons of different categories of data (called 'categorical data'). The bars can be positioned horizontally or vertically. One axis is used to show the types of categories (e.g. age, sex, type of response) and the other axis is used to show the frequency with which each category occurs (e.g. how often, how much).

One important feature of a bar chart is that each of the categories shown in the graph is separate and there is no continuation between one category and the next; for example, there would be separate bars for data about female participants' responses and male participants' responses. Each bar is the same width and has a small space between it and the next bar.

Figure 1.71 on the next page shows an example of a bar chart. Researchers who studied the type of play in which four- to five-year-old children engaged recorded the type and amount of time children spent participating in each type of play at a kindergarten over a one-week period. A graph was used to highlight differences between the play categories.

Sometimes a bar chart is used to present values or scores for two different categories within each bar. For example, Figure 1.72 on the next page shows mean scores on a test of recall from memory obtained by males and females of different ages.

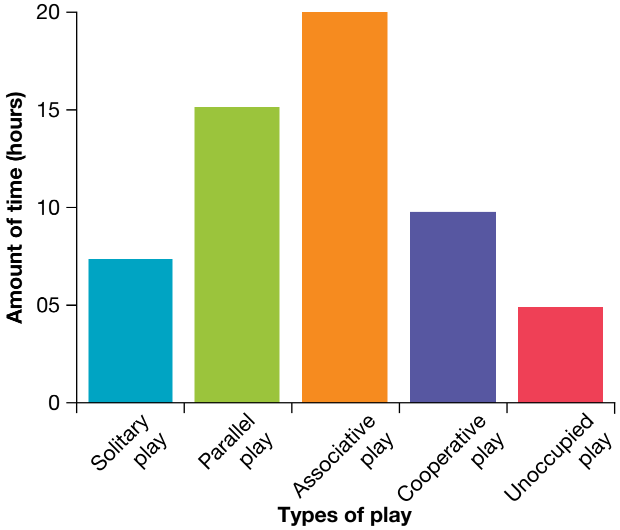

Figure 1.71 Example of a bar chart displaying categorical data for play types

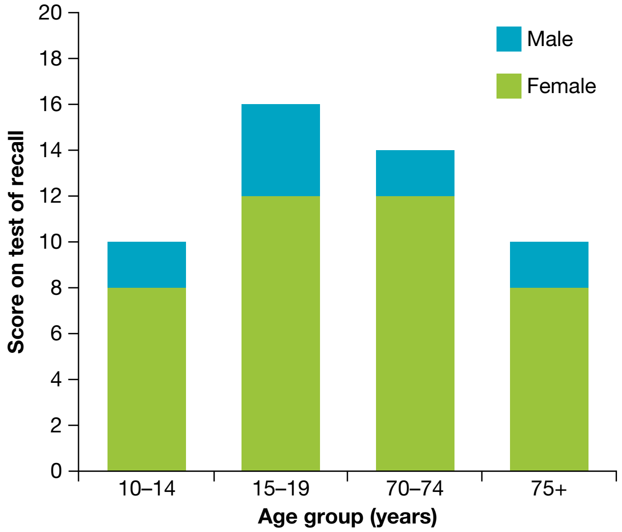

Figure 1.72 Mean scores on a test of recall obtained by males and females of different ages

1.14 LEARNING ACTIVITY 1

Review

A researcher obtained data from a group of university students on the relaxation technique they each they found to be most effective for minimising anxiety experienced prior to exams. The raw data are shown in the table below.

Participant	Relaxation technique	Participant	Relaxation technique
1	meditation	11	exercise
2	drinking coffee	12	sleeping
3	drinking coffee	13	meditation
4	listening to music	14	drinking coffee
5	exercise	15	exercise
6	meditation	16	exercise
7	sleeping	17	meditation
8	listening to music	18	sleeping
9	exercise	19	sleeping
10	listening to music	20	listening to music

a. Construct a title for the table.
b. Present these data:
  i. in another table that summarises the raw data according to the relevant categories (or 'categorical variables')
  ii. in a bar chart.

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Line graphs

A **line graph** uses points connected by lines to show how one variable changes (e.g. reaction time) as another variable changes (e.g. group size) as shown in Figure 1.73.

When used to show the results of an experiment, the IV is plotted on the *x* axis, with the numerical value of the data increasing from left to right along the axis.

A line graph that describes the relationship between group size and time taken to complete a task would list the group size in terms of the number of members of the group on the *x* axis, in intervals; for example, beginning at two, then three, four people and so on.

One important feature of a line graph is that the variable plotted on the *x* axis is a continuous variable, so there is a series of progressively increasing values that can be listed.

The *y* axis has the dependent variable (the measure of performance) plotted along it. A line graph that described the data from the experiment on group size and time taken to complete a task would record the amount of time taken along the *y* axis, in intervals; for example, beginning at zero (which is a convention or 'rule' for graphs), then 1, 2, 3, 4 and 5 minutes where 5 minutes is slightly higher than the maximum time ever taken by any group to complete the task.

Various points on a line graph represent the score on one axis that corresponds with a value on the other axis. The intersecting point can represent a corresponding IV/DV score on the two variables by one research participant, or the mean score of a group of participants.

A number of different sets of data can also be plotted on the one graph. For example, in Figure 1.74 there are three sets of data showing age-related performance in a problem-solving task following different amounts of sleep deprivation. To identify the results of different age groups, a different kind of line has been used for each set of data. Note too the use of colour and shapes to identify the points of intersection between data for the *x* and *y* axes.

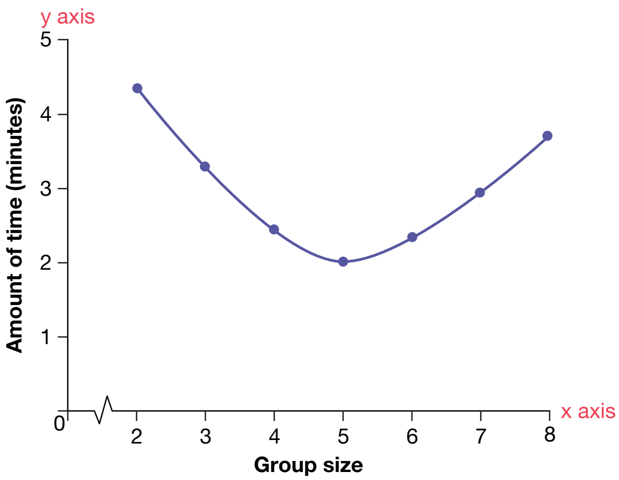

Figure 1.73 Example of a line graph showing the relationship between reaction time and group size

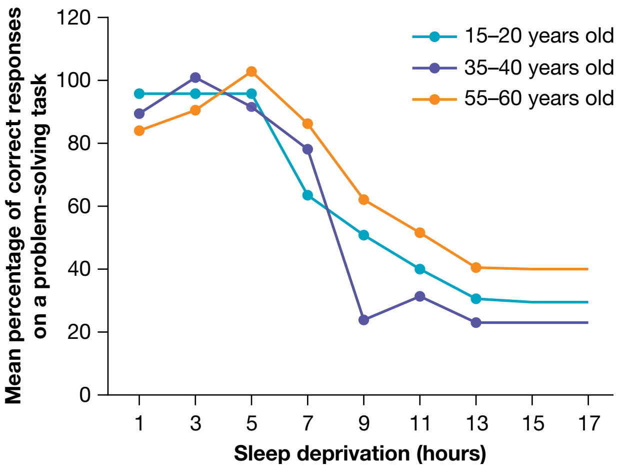

Figure 1.74 A line graph showing three sets of data so comparisons can be made

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Scatter plots

Correlational data are often displayed in a scatter plot (also called a *scattergram* or *scatter diagram*). A **scatter plot** shows the scores (or other values) on two different variables measured in a correlational study. The values of one variable are shown on the vertical *y* axis and the values of the other variable on the horizontal *x* axis. Each pair of scores is plotted as a single point (or dot) in the scatter plot.

The spread of the dots on a scatter plot gives an idea of the *strength* of the correlation — the extent to which the two variables are related (or associated). Widely spread dots in the scatter plot in Figure 1.75 suggest that the two variables, attractiveness and reaction time, have little or no relationship. This would be represented by a correlation close to 0. In a zero correlation, individuals with high scores on one variable may have high, middle or low scores on the other variable. Figure 1.75 shows that participants with high scores on attractiveness have high, medium and low reaction times.

Figures 1.76 and 1.77 both show a moderate correlation as the dots cluster together in a cigar-shaped pattern. Figure 1.76 shows a positive correlation and Figure 1.77 shows a negative correlation.

Figure 1.75 Scatter plot showing data for 12 participants obtained from a correlational study that investigated the relationship between physical attractiveness and reaction time

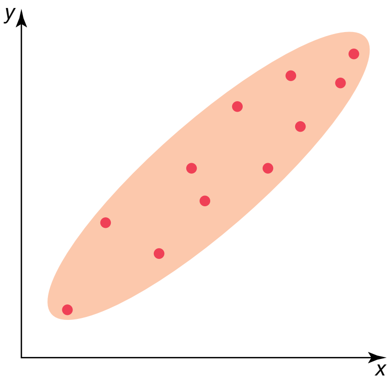

Figure 1.76 Moderate positive correlation

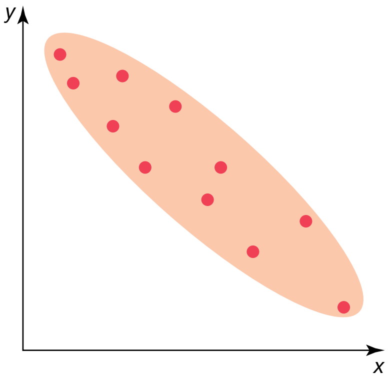

Figure 1.77 Moderate negative correlation

The *direction* of the correlation — whether the correlation is positive or negative — is indicated by the slope or 'lean' of the dots, that is, whether they slope upwards or downwards (or neither). For example, in Figures 1.78 and 1.79 on the next page, a line has been drawn through the middle of the dots to help identify the slope.

In Figure 1.78, the upward sloping line indicates a positive correlation, whereas the downward sloping line in Figure 1.79 indicates a negative correlation.

Note that in both Figures 1.78 and 1.79, the dots are closely clustered around each line, indicating a strong positive correlation in Figure 1.78 and a strong negative correlation in Figure 1.79.

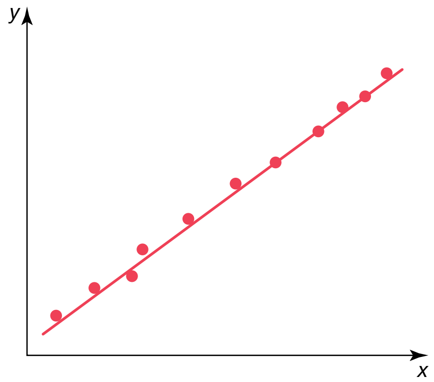

Figure 1.78 Strong positive correlation

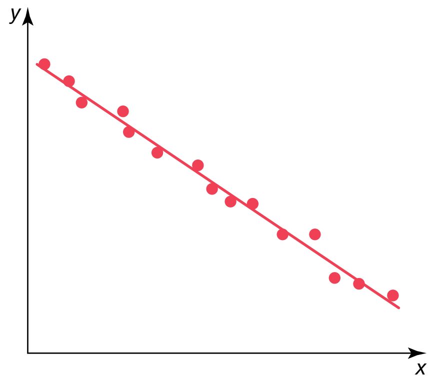

Figure 1.79 Strong negative correlation

on Resources

Teacher digital document Practical activity — estimating the correlation between heredity and height (doc-36949)

1.14 LEARNING ACTIVITY 2

Review

a. Using the data in the following table, draw a scatter plot to estimate the correlation between level of self-esteem (shown by ratings of 1–10, with 1 representing extremely low and 10 representing extremely high) and fear of riding on a roller coaster (shown by ratings of 1–10 with 1 representing extremely low and 10 representing extremely high).

Participant	Level of self-esteem	Fear of riding on a roller coaster
1	3	5
2	2	6
3	9	1
4	8	1
5	2	9
6	4	9
7	5	6
8	3	3
9	3	8
10	5	4
11	7	2
12	9	2

b. State the strength and direction of the correlation between the two variables.
c. Write a conclusion describing the relationship between level of self-esteem and fear of riding on a roller coaster, as shown by your scatter plot.

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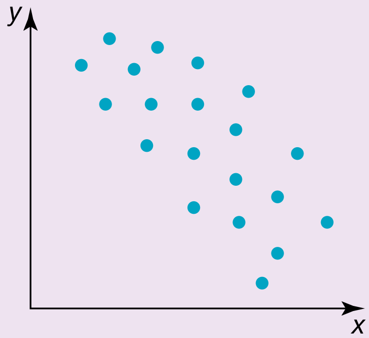
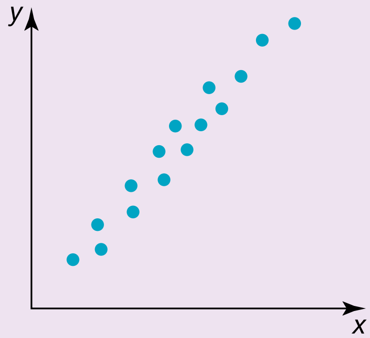
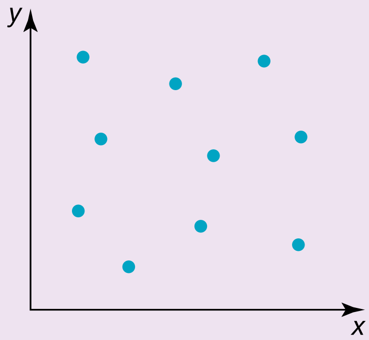
1.14 LEARNING ACTIVITY 3

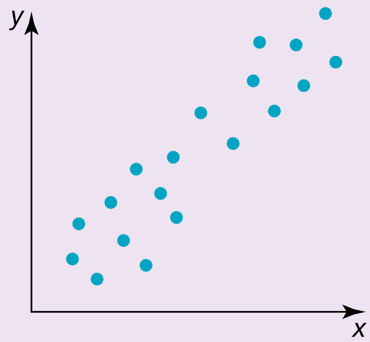
Review

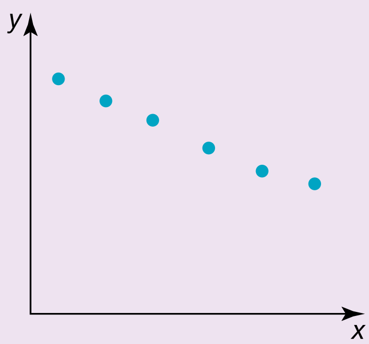
State the direction and strength of the association between variables *X* and *Y* in each of the following scatter plots.

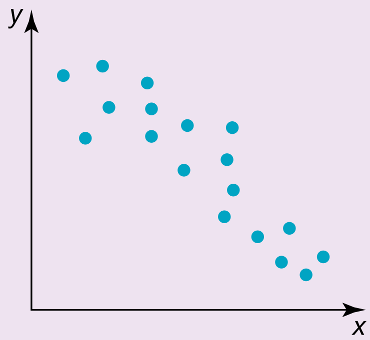
(a)


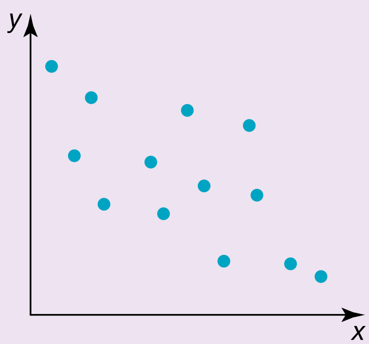
(b)


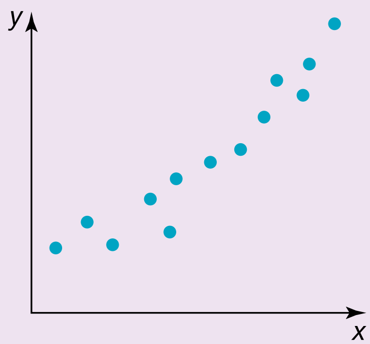
(c)


(d)


(e)


(f)


(g)


(h)


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1.15 Evaluation of data and research

Organising and presenting data in meaningful ways assists interpretation and evaluation. Some additional processing of the data is also useful, both for your own investigations and for interpreting data presented elsewhere.

In VCE Psychology, you need to be able to process quantitative data through calculations of percentages and measures of central tendencies. You also need to demonstrate an understanding of standard deviation.

As with tables and graphs, calculations such as percentages and mean scores will help you describe the data as these are descriptive statistics. Standard deviations are also descriptive statistics but you do not need to calculate this measure of variability.

1.15.1 Percentages

Suppose you conduct an observational study to find out whether boys are more aggressive than girls during lunch time in the prep area of the school grounds at a local primary school. You want to obtain quantitative data, so you work out a list of observable behaviours that you consider to be aggressive, such as pretend fighting and intentional pushing or shoving.

Whenever you see a boy or girl demonstrating one of the aggressive behaviours on your list, you record your observation with a tick and shift your attention to another child. Of the 25 boys you observe, 6 use an aggressive act and are therefore judged as aggressive, and 4 of 16 girls observed are judged as aggressive.

The data clearly shows that more boys than girls were aggressive. However, more boys than girls were also observed. In order to reach a valid conclusion, you need to work out whether $6/25$ is more than or less than $4/16$. This can be achieved by calculating the percentages of boys and girls who were aggressive, then making a comparison.

A **percentage** is a statistic that expresses a number as a proportion (or fraction) of 100. The term *per cent* means 'per hundred', or 'for every hundred'. It is shown using the percentage sign (%). For example, 65% is equal to $65/100$ and means 65 parts out of 100; 100% of something means *all* of it.

A percentage is calculated using the formula

$$\% = \frac{\text{subtotal}}{\text{total}} \times \frac{100}{1}$$

It is easy to calculate a percentage when the original amount is 100. For example, if you complete a 100 item speed and accuracy test and correctly answer 90 items within the time limit, then your percentage score is:

$$\frac{90\ (\text{subtotal})}{100\ (\text{total})} \times \frac{100}{1} = \frac{90 \times 100}{100} = \frac{9000}{100} = 90\%$$

For the data obtained in the observational study of aggressive behaviour:

$$\text{boys: } \frac{6\ (\text{subtotal})}{25\ (\text{total})} \times \frac{100}{1} = \frac{6 \times 100}{25} = \frac{600}{25} = 24\%$$

$$\text{girls: } \frac{4\ (\text{subtotal})}{16\ (\text{total})} \times \frac{100}{1} = \frac{4 \times 100}{16} = \frac{400}{16} = 25\%$$

This means that the proportion of boys (calculated 'out of 100') who were aggressive in the school grounds is slightly less than the proportion of girls. The main problem in making a comparison of the boys and girls based on the raw data is that the two groups were of unequal size. Calculating a percentage for each group overcame this problem and enabled a more precise comparison of the scores for boys and girls.

Percentages are commonly used in psychology to describe data; for example, scores on a test, categories of scores, changes or trends in scores, the percentage of people who respond in a particular way (such as correct or incorrect, agree or disagree, do something or do not do something) and the percentage of people in a sociocultural group (such as gender, age, income level, educational qualifications and ethnicity).

Common percentages and short cuts

There are many percentages that are commonly used in everyday life. These include 10%, 20%, 25%, 50% and 75%. Similarly, there are various fractions that often need to be converted to percentages. These include ½, ⅓, ¼ and ¾.

It is useful to remember the fraction equivalents of commonly used percentages to make calculations involving them quicker and easier.

The table below shows the fractional equivalents of some commonly used percentages and how to use these to speed up calculations.

Percentage	Fraction	How to calculate this percentage
1%	$\frac{1}{100}$	Divide by 100
5%	$\frac{1}{20}$	Divide by 20
10%	$\frac{1}{10}$	Divide by 10
$12\frac{1}{2}\%$	$\frac{1}{8}$	Divide by 8
20%	$\frac{1}{5}$	Divide by 5
25%	$\frac{1}{4}$	Divide by 4
$33\frac{1}{3}\%$	$\frac{1}{3}$	Divide by 3
50%	$\frac{1}{2}$	Divide by 2
$66\frac{2}{3}\%$	$\frac{2}{3}$	Divide by 3, then multiply by 2
75%	$\frac{3}{4}$	Divide by 4, then multiply by 3

Calculating percentage change

Percentage change occurs when quantities increase or decrease.

There are many times in psychological research reporting when a calculation of percentage change is required. For example, the percentage change in mean scores, reaction times, or some other variable.

To calculate percentage change, first calculate the net increase or decrease and then express it as a percentage of the original quantity.

$$\text{Percentage change} = \frac{\text{increase or decrease in quantity}}{\text{original quantity}} \times \frac{100}{1}$$

For example, when 50 increases (by 20) to 70, the

$$\begin{aligned}\text{percentage change} &= \frac{20\ (\text{increase amount})}{50\ (\text{original quantity})} \times \frac{100}{1}\\ &= 40\%\ \text{increase}\end{aligned}$$

Note that percentage increases of more than 100% are possible; for example, the increase from 30 to 45 is an increase of 150%.

1.15 LEARNING ACTIVITY 1

Review

1. Calculate percentages for the following raw data. Round your answer to the nearest whole number.
   a. Sixteen out of 62 participants observed in the library broke a rule at least once during a 10-minute observation period. What percentage of participants broke a rule at least once?
   b. Data collected through an online survey show that 52 out of 75 VCE students check Facebook before school. What percentage of students check Facebook before school? What percentage do not check Facebook before school?
2. A researcher gave parents a 50-item questionnaire on child-rearing practices. There were 28 fathers and 44 mothers in the sample. The raw data were first organised in the table shown below to enable comparison of scores achieved by fathers and mothers. Complete the table by calculating each percentage to the nearest whole number.

	Fathers		Mothers	
Scores	Raw score	%	Raw score	%
0–9	4		4	
10–20	9		7	
21–30	10		10	
31–40	3		12	
41–50	2		11	
Total	28	100%	44	100%

3. Calculate the percentage change in each of the following:
   a. The mean weight of a group of 25 people decreased from 81 kg to 75 kg following completion of an exercise program for stress management purposes.
   b. Participants in an online, reaction time experiment had to press the space bar on a keyboard as quickly as possible whenever a red box turned green, and their reaction times were electronically detected and recorded. For the first trial, the mean reaction time was 432 milliseconds and after 10 trials the mean reaction time was 273 milliseconds.

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1.15.2 Measures of central tendency

Data are often summarised by calculating a single numerical score that can be used to describe the data for the whole group(s). This score, called a **measure of central tendency**, describes the 'central' or 'average' value of a set of scores. When a measure of central tendency is calculated, it often provides a 'typical' score for a set of scores.

Suppose, for example, you collected data for a practical activity which involved comparing males and females on a test for speed and accuracy on a visual perception task. The participants are in five Year 7 classes, each of which has 25 students. Data for each of the 125 students — 65 girls and 60 boys — are obtained.

To help determine which group performed best, a measure of central tendency could be calculated. This would provide a single score for girls and a single score for boys. Scores could then be compared to estimate which group of participants, boys or girls, performed best on the visual perception test.

The most commonly used measures of central tendency are the mean, median and mode.

Mean

The **mean** is the arithmetical average of all the individual scores (or values) in a set of scores. It is calculated by adding all the scores together and dividing the total by the number of scores.

For example, ten 4-year-olds were required to complete a seven-piece jigsaw puzzle. The length of time (in seconds) it took each child to complete the puzzle is listed below:

$$26, 17, 21, 18, 12, 17, 18, 24, 25, 17$$

The mean for the group is calculated by adding the scores together (195), then dividing the total by the number of scores (10). The mean is 19.5 seconds. The formula for calculating the mean is shown as:

$$\overline{\text{X}}(\text{mean}) = \frac{\sum(\text{sum or total of all scores})}{\text{N(number of scores)}}$$

In this example, the mean provides the most exact measure of central tendency. However, in other sets of data, the mean may not always provide the most accurate measure, especially if the scores cluster at the extreme ends of the set of possible scores. For example, if a set of scores consisted of 140, 140, 140, 140, 180, 180, 180, 180, the mean would be 160.

Suppose that these data referred to the height (in centimetres) of players in a girls' netball team. A manufacturer of netball skirts would be surprised when the players attended for fitting of their skirts, having been informed that the mean height is 160 centimetres. The skirts would not fit any of the players — they would be either too short or too long. Thus, when a mean is provided for a set of data, it doesn't necessarily follow that any of the individual scores will be the same as the mean or even approximate it.

Often the mean is calculated to several decimal places. In many instances this does not create a problem. However, sometimes the mean score may become meaningless in real life. For example, if the mean number of children per family in Australia is 1.75, it is difficult to imagine what 0.75 of a child would look like or what this value actually means.

When scores in a set of data cluster closely around a central score, the mean is a fairly accurate indicator of the 'typical' score as it would be representative of the scores. If, however, the scores are very widely spread, unevenly distributed or cluster around extreme values, then the mean can be misleading.

For example, a few high or low values ('outliers') within a relatively small set of data may inflate (increase) or deflate (decrease) the mean. In such cases, assuming the outliers are true scores that cannot be dismissed, another measure of central tendency will be a more accurate measure of the 'typical' score and would therefore be used.

Two other measures of central tendency which can be considered are the median and the mode.

Median

Another way of obtaining a score that may represent the central point in a set of scores is to arrange the scores in order of size and select the score that falls in the middle as being typical of the whole set of scores. This score is called the median.

The **median** is the middle score (or mid-point) of a set of scores. For example, the time taken (in seconds) for each child to complete a jigsaw puzzle in rank order (from lowest to highest) is:

12, 12, 17, 17, 17, 18, 18, 21, 24, 25, 26

In this example the median is 18. When there is an even number of scores, the median is the average of the two middle scores. For example, if the two middle scores are 20 and 21, the median would be 20.5.

The median is a particularly useful descriptive statistic if there is a limited amount of data, but if there is a large amount, determining the median can be time consuming and often impractical. The median is also a useful statistic when many very high or very low scores occur in the set of scores because the median is not affected by extreme scores. For example, the test scores shown in Table 1.9 were obtained when a psychology teacher gave her class of 10 students a test on research methods in psychology.

The calculation of the mean score on the test does not provide an accurate impression of the average score on the test, because the inclusion of three very high scores inflates the mean figure. When such outliers are present in a set of scores, the median is a more accurate reflection of the 'typical' score on the test as it is closer to the majority of scores in the set of data.

Table 1.9 Test scores

Rank	%
1	98
2	91
3	91
4	60
5	59
6	57
7	57
8	57
9	56
10	54
Total	680
Mean	68
Median	58

Mode

A third measure of central tendency is the mode. In everyday language, the word mode means 'common'. This term accurately describes what the statistical mode is; that is, the **mode** is the most frequently occurring score in a set of scores.

Figure 1.80 The mean does not always give a completely accurate picture of scores. Extremes scores called 'outliers' can influence its accuracy.

Consider the scores again for the children completing the jigsaw puzzle:

$$12, 12, 17, 17, 17, 18, 18, 21, 24, 25, 26$$

The mode would be 17 because it occurs three times.

The mode is infrequently used in statistics because it is often not typical or representative of a complete set of data. For example, if a set of scores is 1, 1, 6, 7, 8, 10, the mode would be 1, which is not a representative score of the entire group. If one of the scores of 1 is changed to 10, the mode shifts completely to the opposite end of the scale.

Thus, a single score can alter the mode dramatically, which is in contrast to the median, and to a lesser extent the mean, where individual score changes tend to have less of an effect.

When to use the mean, median and mode

Generally, when most of the scores in a set of data cluster around a central score or value, the *mean* is a fairly reliable indicator of a typical score and therefore usefully represents the data.

The median is not affected by extreme scores. Therefore, when these are present in a set of data, the *median* tends to be a more representative measure of central tendency.

The *mode* provides a useful indicator of a 'common' or 'usual' score because it is the most frequently occurring score. It describes what happens most often in a set of scores — what is the 'typical' score for that group. However, the mode can be very misleading because only the most frequent score is used. The mode does not provide any information about the other scores. The mean and the median make greater use of all the scores — the evidence that is available.

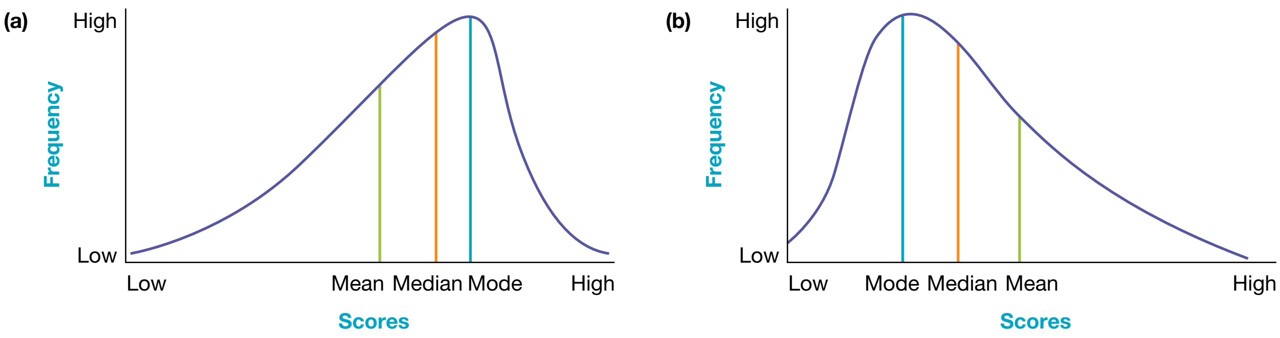

Figure 1.81 Note how the value of mean, mode and median can vary according to the distribution of scores. For example, (a) shows a distribution with a large number of high scores (called a negatively skewed distribution) and (b) shows a distribution with a large number of low scores (called a positively skewed distribution). The median is often a more accurate measure of central tendency when there is a skewed distribution of scores.

1.15 LEARNING ACTIVITY 2

Review

1. a. What is a measure of central tendency and what does it indicate?
   b. When would a researcher use a measure of central tendency to describe data in preference to a summary of the data in a table or graph?
2. When is the mean more likely to represent a set of scores quite accurately?
3. Give an example of when the mean is unlikely to be a particularly useful measure of central tendency. Briefly explain your choice of example.
4. a. What is a median score?
   b. When is the median more likely to be a useful alternative to the mean for representing a set of scores?
5. a. What is the mode in a set of scores?
   b. What is the main limitation of the mode when compared to the mean and median?

6. A researcher studied the effects of stress during pregnancy on the birth weight of infants. The following data on the birth weight (in kilograms) of infants whose mothers stated they were stressed for the majority of their pregnancy were obtained:

2.8, 3.3, 2.5, 3.0, 2.9, 4.4, 3.5, 2.7, 3.2, 4.4.

a. What is the mean weight of the infants?
b. Is the mean weight an accurate representation of the infants' weights? Explain your answer.
c. What is the median weight of the infants?
d. What is the mode value?
e. Which measure of central tendency is most representative and therefore best describes the data? Explain your answer.

7. The birth weight (in kilograms) of infants whose mothers stated they were not stressed during their pregnancy were also obtained. These data were:

3.8, 5.4, 4.3, 4.2, 3.5, 4.1, 4.0, 4.4, 3.9, 5.4.

a. What is the mean weight of this sample?
b. Is the mean weight an accurate representation of the infants' weights? Explain your answer.
c. What is the median weight of the infants?
d. What is the mode value?
e. Which measure of central tendency is most representative and therefore best describes the sample? Explain your answer.

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1.15 LEARNING ACTIVITY 3

VCAA exam questions

Question 1 (1 mark)

Source: VCAA 2020 Psychology, Section A, Q.39; © VCAA

The mean is a measure of central tendency often used in psychological research. The mean can be a misleading representation of data if

A. the frequency of each score has not been calculated.
B. the range of the scores is much greater than anticipated.
C. it contains outliers, very small or large values in the scores that are not typical.
D. there is not an equal number of scores whose values lie above and below its value.

Question 2 (1 mark)

Source: VCAA 2019 Psychology, Section A, Q.13 (adapted); © VCAA

Ravi hypothesised that use of an avoidance strategy to cope with stress would be more likely to result in a bigger increase in levels of stress. Which of the following supports Ravi's hypothesis?

	Mean change score for avoidance strategy	Mean change score for approach strategy
A.	+2.2	+6.2
B.	+6.2	+1.5
C.	–2.2	–3.2
D.	+2.2	–1.5

Question 3 (1 mark)

Source: VCAA 2016 Psychology, Section A, Q.17; © VCAA

Rylee decided to use the mean as a statistical measure to examine the effect of the consumption of energy drinks on the time taken to complete a jigsaw puzzle. The use of the mean is suitable if the scores are

A. clustered around the extreme values.
B. clustered around a central score.
C. unevenly distributed.
D. widely spread.

Question 4 (1 mark)

Source: VCAA 2015 Psychology, Section A, Q.61; © VCAA

As part of an experiment, a psychologist records the number of correct responses on a memory test.

He records the following scores:

11, 15, 17, 24, 19, 28, 27, 28, 15, 15, 15, 19, 16.

The mode for this set of data is

A. 15
B. 17
C. 19
D. 27

Question 5 (1 mark)

Source: VCAA 2015 Psychology, Section A, Q.62; © VCAA

As part of an experiment, a psychologist records the number of correct responses on a memory test.

He records the following scores:

11, 15, 17, 24, 19, 28, 27, 28, 15, 15, 15, 19, 16.

The median for this set of data is

A. 15
B. 17
C. 18
D. 19

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1.15.3 Standard deviation as a measure of variability

Variability

If you collected data on the ages of a sample of year 7 or 8 students, there would be very little variability. However, if you collected data on the heights or other physical characteristics of the same students there would be much greater variability. Most research data are made up of measures or values (such as scores) where there is some **variability**. There is a spread of scores and not all scores are the same.

Suppose, for example, that two psychology teachers discussed the abilities of their respective classes. The teacher of Class A explained that the mean of her students' scores for a test was 78%. The teacher of Class B replied that the mean of his students' results for the same test was 68% and that his students must therefore be less capable than his colleague's. 'But how do you know I'm not just an easy marker? One of my students got 97%. Then again, another student got 18%,' responded the Class A teacher. The Class B teacher was surprised: 'The lowest mark in my class was 53%, but my highest mark was only 81%,' he said, 'so how do we know which class has the better abilities?'

The discussion between the teachers indicates that a mean, on its own, doesn't provide a complete description of the data. The mean describes the 'central' value of a set of scores. In order to more accurately represent the data, a measure of variability may be used.

Measures of variability

A **measure of variability**, also called *variation*, indicates how widely scores are distributed or scattered around the central point. For example, the sets of scores in Figure 1.82 both have the same mean, but they differ in variation; that is, how far the scores are either side of the mean. The distribution of Class A scores shows that it is tightly packed around the mean, indicating *low variability* (or *variation*). The distribution of Class B scores is more widely spread from the mean, indicating *high variability* (or *variation*).

Consider variability in relation to the results of research. Suppose, for example, an experimenter tests a hypothesis that texting when studying produces lower performance in a test of the material being studied than does studying the same information without any distraction. Two groups of students participate in the experiment — one group study while texting with five friends over a 30-minute period (experimental group) and the other group study without any distraction (control group).

Calculating a mean score on the test for each group of participants will assist the experimenter in deciding whether their hypothesis is supported. So why should the experimenter look at the variability of the scores?

Measuring the variability of the scores provides researchers with information about how *reliable* any difference between two means is (such as the difference between the experimental and control group).

If the sets of scores are highly variable (widely spread) then any difference between the means of the two groups is less reliable and is more likely to have occurred by chance. However, if each set of scores has a low variability (with scores clustered around the mean), any difference between the means of the two groups is more likely to be due to the effects of the independent variable (rather than chance).

There are several different ways of measuring variability. The more precise and therefore widely used measure of variability is standard deviation.

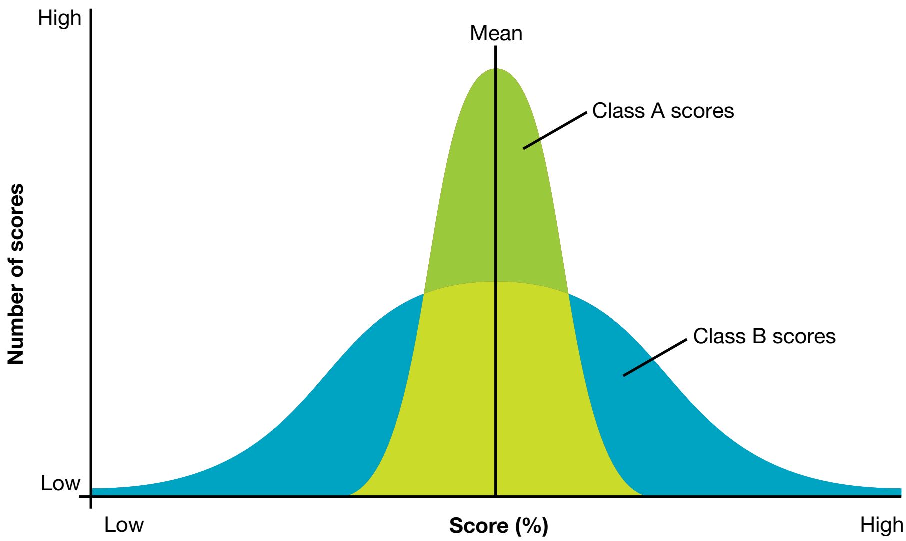

Figure 1.82 Class A and Class B both have the same means. The distribution of scores for Class A (green) shows low variation, as indicated by the clustering of scores around the mean. The distribution of scores for Class B (blue) shows high variation, as indicated by a greater spread of scores from the mean.

Standard deviation

The **standard deviation** summarises how far scores within a set of scores spread out, or 'deviate', from the mean for those scores. If all the scores in a set of scores were the same, there would be no variation and the standard deviation would be zero because none of the scores would be spread out from the mean.

A low standard deviation indicates that there is little variation in the scores and that most scores are clustered around the mean. In this case, the mean represents the scores well, as does the mean score for curve C in Figure 1.83. The higher the standard deviation, the greater the variation there is among the scores. For example, in Figure 1.83, curve A has the highest standard deviation.

The standard deviation is a particularly useful statistic in that it provides a point of comparison between the means and the spread of two or more different sets of scores. For example, suppose a replacement teacher comes to a new school hoping for an easy day's work. The replacement teacher is offered either of two classes, both of which have a mean IQ score of 100. There appears to be no difference between the two classes.

The teacher is then informed that the standard deviation of IQs in one class is 1 and the standard deviation in the other is 3. Since a higher standard deviation means more variability, the class with the standard deviation of 3 may take more effort to teach because students vary more in ability.

In sum, when considering standard deviations, it is important to recognise that:

- although two or more different sets of scores (or data sets) may have the same mean, they may not have the same degree of variation (or 'spread') in the data; and
- a higher standard deviation represents a greater variation (or 'spread') in a set of scores (and vice versa).

Note also that, in a normal distribution of any set of scores, 68.26% of the scores lie within one standard deviation of the mean and 95.44% of the scores lie within two standard deviations of the mean. These and other standard deviation values are shown in Figure 1.84. For example, 68.26% of the scores will fall within one standard deviation either side of the mean; 95.44% of the scores will fall within two standard deviations either side of the mean. These percentages apply consistently in a normal distribution curve, irrespective of the size of the standard deviation.

Although you need to be able to calculate percentages, percentage change and measures of central tendency in VCE Psychology, calculation of standard deviation is not required. But you do need to demonstrate an understanding of standard deviation as a measure of variability (VCE Psychology Study Design p. 13).

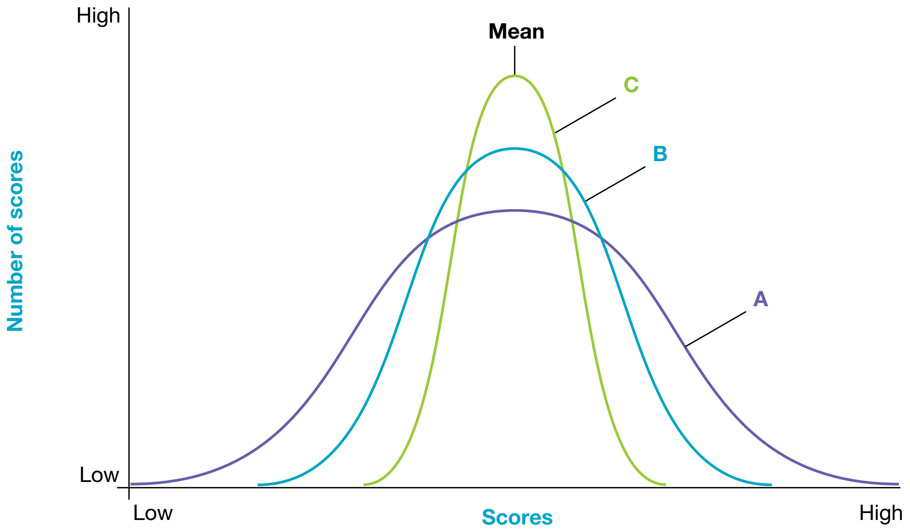

Figure 1.83 This graph shows three distributions of scores, each with a different standard deviation. The purple curve (A) has the highest standard deviation and the green curve (C) has the lowest standard deviation.

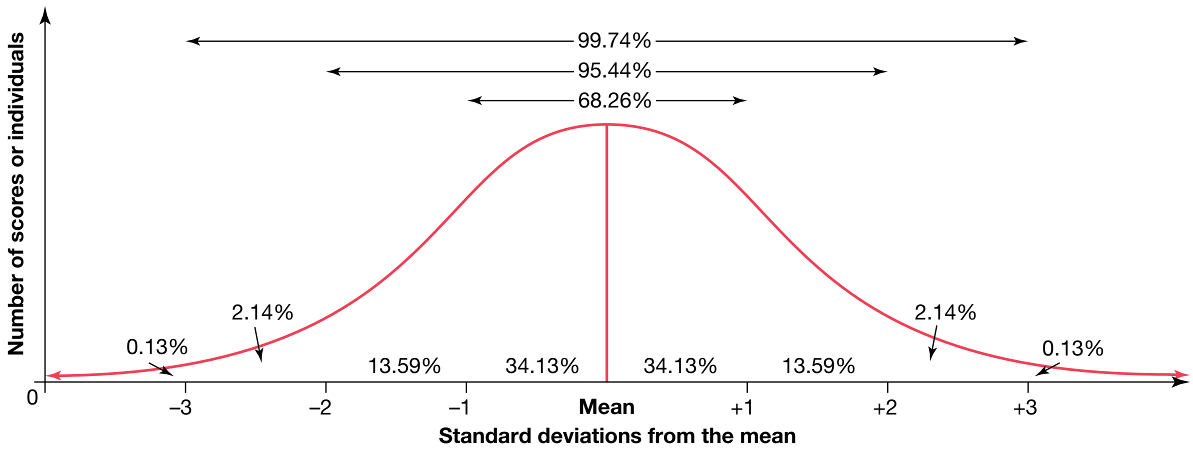

Figure 1.84 Standard deviations in a normal distribution. When standard deviations are represented on the *x* (horizontal) axis of a normal distribution curve, the percentage of scores falling between the mean and any given point on the axis is always the same.

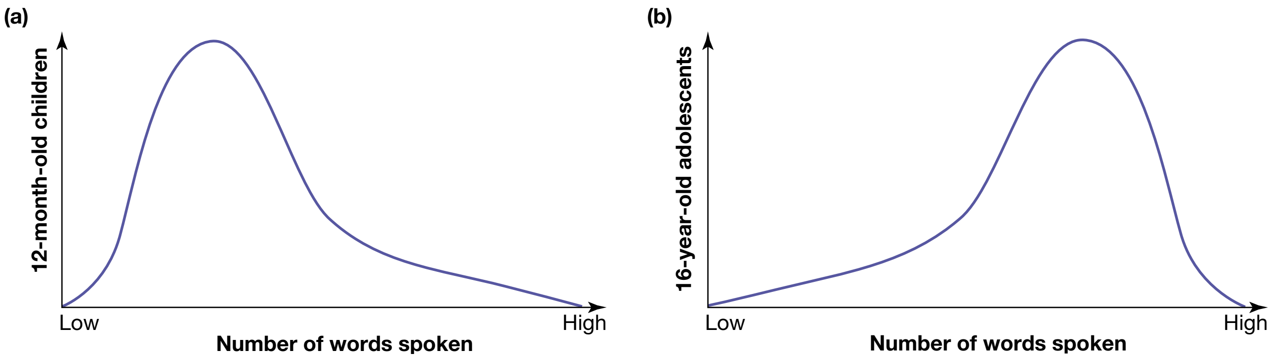

Figure 1.85 The normal distribution curve in Figure 1.84 is a 'theoretical ideal' and rarely occurs. Often, the scores or other values are unevenly distributed and cluster to the left or the right ends of the graph in a skewed distribution. This may occur naturally for a sample. For example, as shown in (a), if the number of words 12-month-old children spoke were plotted, it is highly likely that many of the scores would cluster towards the lower end (left) of the graph producing a positively skewed distribution with a disproportionate number of low scores. In contrast, as shown in (b) if the number of words 16-year-olds know were plotted, many of the scores would cluster at the higher end (right) of the graph producing a negatively skewed distribution with a disproportionate number of low scores.

1.15.4 Outliers

An **outlier** is an extreme measurement, one that significantly differs from all others in a data set. For example, suppose an experimenter administered a test with a maximum possible score of 20 to a randomly selected sample. If most individuals obtained a score near the mean of 11 but one has a score of 19 which is way higher than the mean, then that latter score would be an outlier.

Outliers may be found in the results for any measurement, especially when there is a larger sample.

Identifying an outlier

When evaluating data and research methods, you need to be able to identify outliers. The examples previously described in relation to measures of central tendency and variability show how they can greatly influence results. For instance, the mean and standard deviation can be pulled severely towards outliers and distort the true results and the validity of the research. Correlations are also sensitive to the effect of outliers.

Outliers are not typical of the rest of the measurements in a data set. They mostly look unusual or out of place, unlike the other scores.

In many cases, they can be spotted though a simple visual assessment, especially if it's your own data because you're likely to know it well and the variables to which it relates.

In VCE Psychology you are required to use 'data visualisation' to 'recognise whether outliers are present' in a set of measurements. You also need to be able to 'reflect on how these outliers would affect the testing efforts and validity of the research' (VCE Psychology Study Design p. 21).

Note the examples of outliers shown in Figures 1.86, 1.87 and 1.88. Graphing your data helps spot outliers. So does organising the data, as compared to sifting through unprocessed raw data.

The presence of one or more outliers does not necessarily mean that there is an error or something wrong with the data or the investigation. An outlier may occur due to chance and it may be true score. There may be inherent, 'naturally occurring', variability in the data. For example, a participant can perform way better or worse than all others in the sample entirely because of their ability on that measure. However, any outlier needs to be checked to identify a possible error or underlying cause.

Outliers must be accounted for rather than automatically dismissed. In VCE Psychology, you are expected to point out outliers and consider them as part of your discussion and evaluation of data in the report of your investigation.

Generally, an outlier will be due to a random error, a systematic error or a personal 'human' error. For example:

- a measurement error, e.g. a mistake or oversight when making an observation
- a recording error, e.g. a mistake when recording the data or transferring the data from one record to another
- a data processing error, e.g. a mistake when calculating a percentage or mean
- a naturally occurring unusual but true score
- a skewed distribution of scores, e.g. the test used to measure the DV was too easy or too hard
- sample size, e.g. increases probability of an outlier through random chance — the larger the sample size, the more it resembles its population, so the more likely it is that there will be outliers
- sample bias, e.g. unintentionally sampling from a different population or selecting a sample who do not represent the target population (such as too many highly able students in a school sample required to complete a problem-solving test)
- non-standardised instructions or procedures, e.g. the measurement is taken in a manner that is inconsistent with all others or there is unexpected interference during the measurement procedure due to a random event

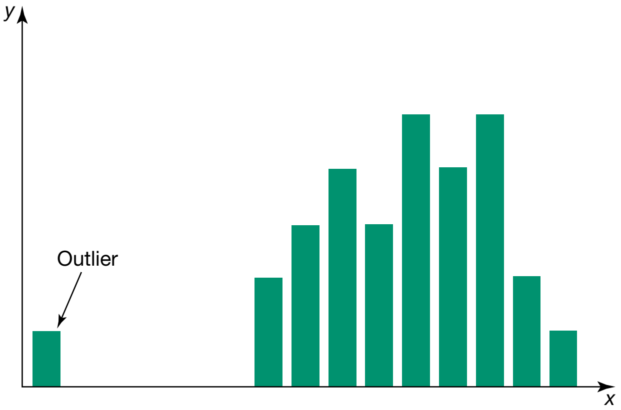

Figure 1.86 Example of an outlier in a bar graph

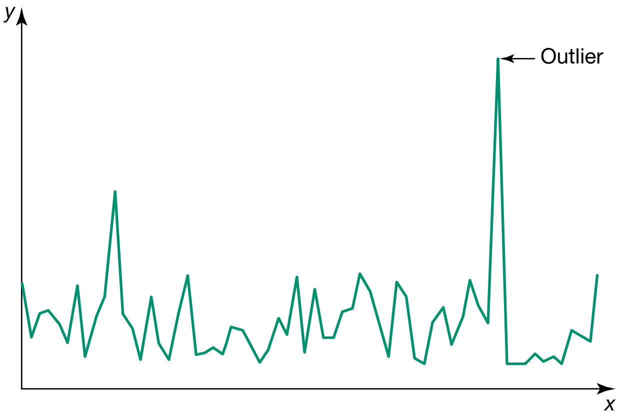

Figure 1.87 Example of an outlier in a line graph

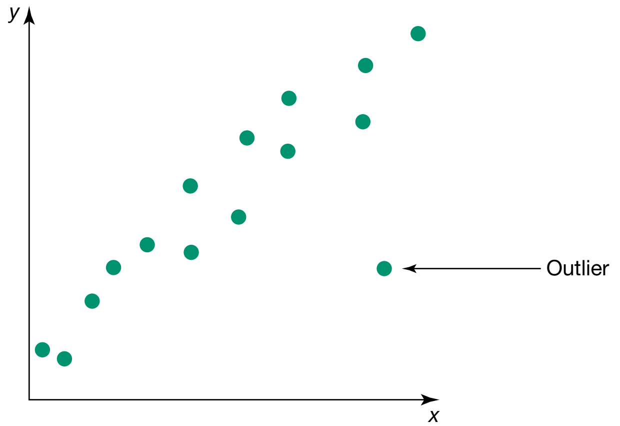

Figure 1.88 Example of an outlier in a scatter plot

What to do about an outlier

When an outlier is identified a decision must be made as to what to do about it. Three possible actions are to

- fix the error that caused the outlier
- include the outlier in the data
- exclude the outlier from the data.

Other than closely examining possible causes and effects of its presence, there are no 'rules' for what should be done.

Generally, the action will depend on the cause of the outlier and the nature of the research investigation and its data. For example, if an outlier is due to a miscalculation, then the correction can be made to the data. This 'fix' is due to a personal error and would not have to be referred to or discussed in your report. However, if an outlier is due to a measurement error, then repeating the measurement may be an option.

If a faulty measurement cannot be repeated, then it could be excluded from the data because it's an incorrect value. This may also apply to other known incorrect values, such as a score due to an unexpected random event that adversely affected a participant's responses. However, this would have to be accounted for in the report. The reason for deletion would have to be explained.

In some cases, the researcher may provide results with and without the outlier(s). This may occur when there is uncertainty about whether an outlier should be excluded. Again, an explanation for doing so would be included in the report. And a discussion that compares both sets of results could be useful.

If an outlier is due to natural variation in the data for the sample, then it should not be excluded. This extreme value may provide a valuable insight about the variability of the target population which could be discussed in the report.

An outlier is sometimes deleted when there is large set of scores and deletion will not affect the results. For example, excluding the outlier in Figure 1.88 would not have as big an influence on the correlation coefficient as it would with a small sample. Of course, the score and reason for deletion would to be mentioned in your report.

1.15 LEARNING ACTIVITY 4

Review

1. For each of the following examples, indicate whether you believe there is likely to be high or low variability among the data from Australian samples.
   a. The amount of alcohol consumed to reach a blood alcohol content level of 0.05%
   b. The amount of alcohol consumed by young adults on a weekly basis
   c. The age at which adolescents go to their first party as a 'teenager'
   d. The age at which children speak their twentieth word
   e. The amount of bullying incidents across secondary schools
   f. The amount of nightly sleep obtained by people of all ages
   g. The number of people with a phobia
   h. The number of people aged 75+ years who have experienced the death of a friend
   i. The reaction times of young adult participants to a visual stimulus presented on a computer monitor
   j. The ability to recall a recently learned list of 10 words in their correct order on the first attempt
2. What does a measure of variability indicate?
3. What information does the standard deviation provide about the distribution of scores?
4. a. Two classes sat the same practice Psychology exam. The following descriptive statistics were calculated from the students' results in each class:
   Class A: mean 70%
   Class B: mean 70%
   On the basis of the mean scores alone, what might teachers of these classes conclude about the knowledge of students in each Psychology class? Explain your answer.

b. Suppose the teachers then calculated the standard deviations for their respective classes and obtained the following results:
Class A: mean 70%; standard deviation: 0.5
Class B: mean 70%; standard deviation: 2.3
On the basis of this additional information, what conclusions might the teachers now draw about the knowledge of the students in each Psychology class? Explain your answer.

5. a. How do outliers affect the standard deviation, if it all?
b. What is a simple and often accurate way of recognising an outlier?
c. List three possible causes of outliers.
d. If you recognise an outlier in one of your own investigations for which you are required to submit a report, what are three actions you should take?

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1.15.5 Reliability and validity

An important goal of research is to obtain results that are both reliable and valid. This will mean that the results are dependable and accurate. It also means that the results are of value and use. Reliable and valid results can be achieved when the research, its data collection procedures and measurement tools are also reliable and valid.

Reliability and validity are not necessarily 'present-or-absent' features of a research design, its measurement tools or the results. Instead, they are considered to vary in degree on a scale ranging from low to high. Both are ways of assessing the quality of a research investigation, the specific tools or procedures used to collect data, and the results obtained.

Reliability

In everyday language, the word reliability is used to refer to something that is dependable and will be 'around about the same' or give the same outcome every time. For example, we may refer to a car as reliable when we are confident that it will start every time and get us to and from wherever we want to go whenever we use it. Similarly, we may refer to a friend as reliable when we trust that they are dependable. They have proven to be consistent and stable in character and behaviour over time and are unlikely to change suddenly for no good reason.

In research, reliability involves the same qualities. **Reliability** refers to the extent to which a measure (or 'measurement tool') produces results that are consistent, dependable and stable. For example, if your blood alcohol content is measured using a breathalyser and is double-checked straight away, you should expect to get the same result. If so, the measurement tool and its data are reliable.

Similarly, if you take a reaction time, vocabulary, intelligence or personality test two times under the same conditions, your scores on the two occasions should be very similar. If so, the test can then be described as reliable. If more than one person is observing behaviour or some event in an observational study, all observers should agree on what was observed and recorded. If so, the data are reliable.

In sum, the reliability of any measure used in psychological research is the extent to which it gives consistent measurements for any individual or group. The greater the consistency of the tool each time it is used, the greater its reliability.

At a more general level in relation to a research investigation, if you conducted an experiment on a group of participants to measure some behaviour of interest and repeated it again with a similar group under the same conditions, you should expect the results to be very similar on each occasion the experiment is conducted.

Because conducting an experiment with multiple participants is a more complicated process than measuring the blood alcohol content of an individual, it is not likely or expected that the results will be identical each time the experiment is repeated. The main reason is individual differences within another sample. However, if the results are to be considered reliable, then they should be similar (e.g. within a narrow range of values) each time the experiment is conducted in the same way.

Figure 1.89 This person would be alarmed if their BAC reading was well above 0.05 but 5 minutes later was well below 0.05. The general idea behind reliability is that significant results must be more than a 'one-off' finding and therefore be repeatable. Reliability means that a measure is free of random error and will produce around about the same results across multiple applications to the same sample.

The researcher does not want to obtain significantly different results whenever they repeat a study and measure the same event under the same conditions. This will lead to different conclusions each time so that they will not know which conclusions are correct. Unreliable data or results are 'untrustworthy' in the sense that they reflect error and lead to inconsistent conclusions.

A researcher always sets out to conduct reliable research, use reliable measures and to obtain reliable results. However, when their study is repeated, it may be found that the results are not reliable. This is more likely to occur when, for example:

- the study uses a measure of relevant variables that produces random errors,
- the sample size is too small,
- there is an insufficient number of trials, and/or
- when the study is not repeated in the same way in which it was first conducted.

Repeatability and reproducibility

The VCE Psychology Study Design emphasises that the data and results for a truly scientific investigation must be more than one-off findings. They should be repeatable and reproducible so that reasonable conclusions can be drawn. Irreplicable results may lack credibility.

Both repeatability and reproducibility indicate reliability. Furthermore, the results are considered to be stronger when the research investigation can be both repeated and reproduced.

Repeatability refers to the degree to which a specific research investigation obtains similar results when it is conducted again under the *same* conditions on all occasions. Conditions that should be the same include:

- the observer, e.g. the same researcher
- the instructions
- the measurement instrument, e.g. data collection tool
- the measurement procedure, e.g. research method, type of experimental design, number of experimental and control groups
- the setting, e.g. laboratory or field
- the location, and
- repetition over a short period of time.

Reproducibility refers to how close the results are to each other when an investigation is replicated under *changed* conditions. Conditions that should be different include:

- the observer, e.g. a different independent researcher
- the measurement instrument, e.g. data collection tool
- the measurement procedure, e.g. research method, type of experimental design, number of experimental and control groups
- the setting, e.g. laboratory or field
- the location, and
- the time.

Validity

Validity refers to the extent to which a measure (or 'measurement tool') accurately measures what it is supposed to be measuring. For example, a breathalyser should measure blood alcohol content and report the level accurately to be considered a valid measure, an intelligence test should measure intelligence and not something else such as motivation, mood state or personality traits, and a VCE exam should actually measure the knowledge and skills it claims to measure. Similarly, if a research investigation is considered valid, this means that it has accurately measured the behaviour or mental process that it claims to have measured.

Validity also relates to the results obtained from an investigation and the conclusions (including any generalisations) the researcher makes. Validity means that the results represent true findings among similar individuals in the population from which the sample was drawn.

Furthermore, the conclusions are specifically based on those variables that the research was investigating and the results that were obtained. The variables that were measured and the data collected were based on valid measures and not unduly influenced by extraneous or confounding variables.

For example, if a researcher concludes that a new drug they tested in an experiment reduces symptoms of depression, or that participants in a taste-preference study preferred Coca-Cola™ over Pepsi™, the research is valid only if the new drug really works or if the participants really did prefer Coca-Cola™. These results should also apply to each sample's population (and better still, to similar individuals in the wider population).

As with seeking reliability, researchers always attempt to conduct valid research, use measurement tools that measure what they are supposed to measure, and to draw accurate conclusions from the data they collect. Yet often, despite a researcher's best intentions, their research lacks validity or is not as valid as it could have been. This can occur for a number of different reasons.

Sometimes a researcher may draw a conclusion from their data that cannot actually be drawn; that is, the data do not actually justify, support or 'back up' the conclusion. Another reason that research and its results may lack validity is because one or more extraneous variables have not been adequately controlled, have become a confounding variable, and have therefore influenced the results in an important way. For example, in an experiment, a confounding variable and the IV may both affect the results. When this happens, the researcher will find it difficult to separate the effects of the IV and the confounding variable and therefore cannot be certain whether it was the IV or the confounding variable that caused the change in the DV.

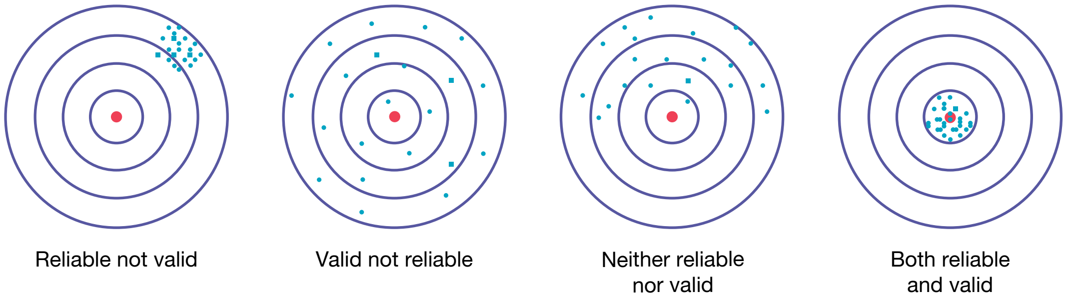

Figure 1.90 Researchers seek to conduct investigations that are both reliable and valid. Reliability is a necessary condition for validity.

Note that a measure can be reliable even though it is not valid, but a measure cannot be valid unless it is reliable. For example, if you measured your biceps with a cloth tape measure that had been left outside in the open weather for a long time and had become inaccurate through stretching, the result would not be a valid measure of your true bicep size. The inaccurate cloth tape measure, however, is reliable as it will give you the same result each time it is used (even if inaccurate). Similarly, it is possible to obtain a reliable measurement for skull size using a stretched cloth tape measure, but that would not be a valid measure for intelligence.

Internal and external validity

Researchers often distinguish between the internal and external validity of their investigations. They consider both internal and external validity in judging the overall validity of a study. Strengths and limitations of different types of investigations and their results can be discussed in terms of these aspects of validity.

Internal validity refers to the extent to which an investigation actually investigated what it set out to investigate and/or claims to have investigated. If an investigation is said to have internal validity, then it is free from flaws and the results obtained are actually due to the design of the investigation and its procedures and not some other factor. For example, if an experiment has internal validity, the experimenter can be confident that the measured change in the DV was produced solely by the IV and not by any confounding variable, nor was the change due to chance.

If an investigation has gaps or flaws in its procedures or measures, such as the use of a sampling technique that resulted in an unrepresentative sample when it was important to have a representative sample, then it may be considered as lacking in internal validity.

Similarly, if participants were required to rate facial attractiveness, then the researcher needs to be confident that the procedures or tools actually and only measured facial attractiveness. Internal validity may be lost if participants did not understand the rating procedure or their ratings partially reflected the style of dress worn by each person in a photo.

Internal validity can be improved in a number of ways, especially use of a research design that is appropriate for testing the research hypothesis and by controlling the potential impact of extraneous variables and confounding variables; for example, by using appropriate sampling techniques for selection and allocation of participants, as well as counterbalancing, blind procedures, placebos and standardised instructions and procedures when appropriate to do so.

External validity refers to the extent to which the results obtained for a study can be applied beyond the sample that generated them, specifically to individuals in a different setting and over time.

Lack of external validity means that the results of the research may not apply to individuals who are different from the study's population. For example, if research has been conducted with only male participants, it cannot be assumed that similar results will apply to female participants.

For external validity, it is also important that the results should not be time-dependent; that is, the results should apply across time and be found in the future if the research were to be replicated under the same conditions.

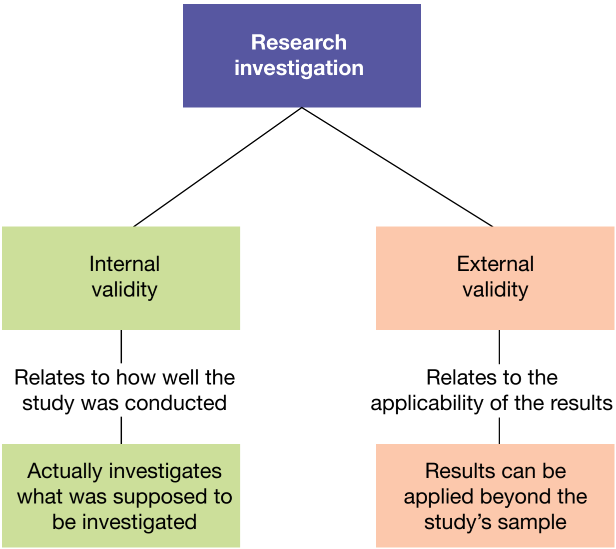

Figure 1.91 Distinguishing between internal and external validity

Generally, the bigger and more representative a sample is of the overall, general human population, the more confident the researcher can be in applying the results from the sample to the population. Conversely, the more specialised the sample, the less likely will it be that the results are highly generalisable to other individuals, situations, and time periods.

Conducting an experiment in a real-world setting that is appropriate to the research question of interest and more like an event in 'real life' can also improve external validity.

Internal and external validity are related. Internal validity is a precondition of external validity, which means that a study cannot have external validity without internal validity. Furthermore, a study that is said to have external validity is also said to have internal validity. It does not necessarily follow, however, that an effect observed in a strictly controlled laboratory experiment with a high level of internal validity will also have the same effect in a real-world situation.

1.15 LEARNING ACTIVITY 5

Multiple-choice questions

1. *Source: VCAA 2018, Psychology, Section A, Q.8; © VCAA*
   A psychologist wanted to investigate people's responses to being pricked by a needle. Details of the investigation were provided to a group of 10 participants prior to the investigation. The investigation involved blindfolding participants and pricking each participant's finger over several trials.

   The psychologist repeated the investigation on another group of participants using exactly the same procedure and obtained similar results.

   What do the similar results suggest?

   A. low validity
   B. high reliability
   C. no confounding variables
   D. few participant differences

2. Angela designed a test to measure the IQ of her students. The test included a mathematical skills section and scientific knowledge section. When her students completed the test, she noticed that the students who had very strong English skills performed quite poorly on the test. She had the students complete the test again 3 weeks later.
   The results achieved by the students were very similar both times the test was taken. She concluded that the test needed to be revised as it did not measure IQ but, instead, measured only mathematical ability and scientific knowledge. Therefore, this test would be said to have

   A. high reliability and validity.
   B. low reliability and validity.
   C. high reliability and low validity.
   D. high validity and low reliability.

3. A test that effectively measures the effect that an IV has on the DV under different conditions at different times is said to be

   A. correct.
   B. valid.
   C. reliable.
   D. both valid and reliable.

4. The term _____ is used to describe how close the results are to each when an experiment is repeated under changed conditions.

   A. reproducibility
   B. repeatability
   C. replicability
   D. precision

5. The term _____ is used to describe the degree to which an experiment obtains similar results whenever repeated under the same conditions.

   A. reproducibility
   B. repeatability
   C. replicability
   D. precision

To answer these and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

1.15.6 Conclusions and generalisations

When the results have been evaluated, conclusions need to be drawn. Generally, in relation to research, a **conclusion** is a decision about what the results obtained from a research investigation mean. All conclusions must be based on evidence (the results), be consistent with the evidence, relevant to what was actually investigated, and take account of the quality of the evidence and potential limitations of the research.

Limitations usually refer to the validity and authority of the data and sources of possible errors and bias. These should be identified, described and explained. Reasons must be suggested about why the particular results were obtained and what they mean, including whether they can be applied to other groups or situations. In addition, suggestions for further research and evidence are often made

One type of conclusion relates to whether the hypothesis is supported on the basis of the results obtained. This requires careful examination of the results so that an objective ('unbiased') decision can be made. Although the results alone may indicate that the hypothesis is supported, the DV and therefore the results may have been influenced in a significant way by one or more variables other than the IV (or in addition to the IV). Therefore, uncontrolled extraneous variables and potential confounding variables also need to be considered when drawing a conclusion. The researcher must be confident that any change in the DV was due to the IV alone and not any other variable.

The conclusion about the hypothesis is expressed as a statement in the research report. In psychology, when investigating behaviour and mental processes, the statement refers to whether the hypothesis is supported or refuted on the basis of the research results.

Another type of conclusion that can be made is called a generalisation. In research, a **generalisation** is a decision about how widely the results of an investigation can be applied, particularly to other members of the population from which the sample was drawn. Because the research usually tests a sample from a population of interest rather than the whole population, making a generalisation is a process of forming an idea about whether results obtained for a limited number of cases (the sample) can be extended to apply to the entire class of objects, events or people (the sample's population).

In experimental research, generalising the results from the sample to its population (or any other population, including the whole population) is risky if the sample is not representative of the population. Like any other conclusion, a generalisation must also be based on the results obtained and must consider the potential extraneous and confounding variables, as well as any other problems with the study.

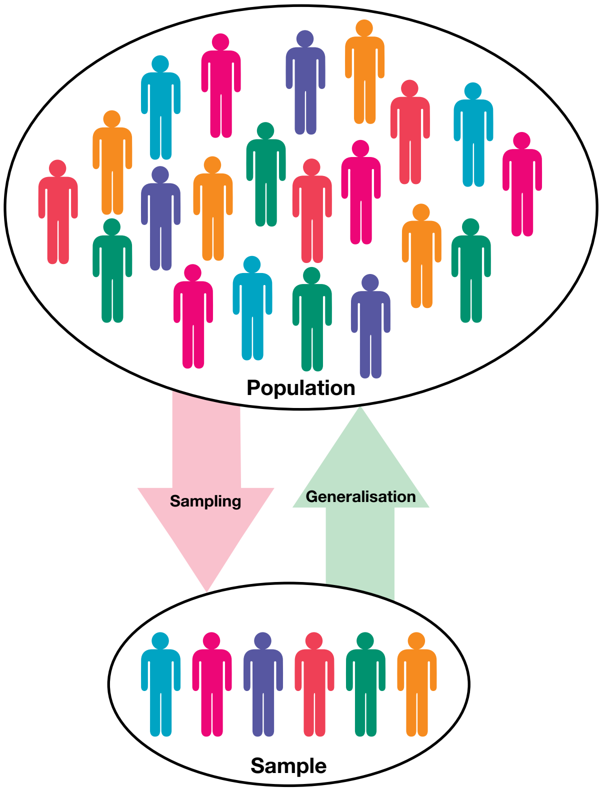

Figure 1.92 In research, generalisation is the process of applying the results from the sample to its population (or more widely if possible).

When drawing conclusions about the results and making generalisations, researchers try to avoid making errors or overstating what the results mean. For example, they attempt to ensure that:

- all conclusions are consistent with the results
- all conclusions are relevant to what was actually investigated
- any influential extraneous variables or confounding variables have not been overlooked (which means that possible random and systematic errors have been considered)

- analysis and interpretation of the results enables an accurate finding about whether the hypothesis is supported or refuted
- any gaps in the results and further evidence that may be required are identified
- limitations of the sample used in the study have been considered
- any generalisations are reasonable
- the explanation of the findings is reasonable and supported by the results.

All these aspects relate to the reliability and validity of their research. They also provide the basis of suggesting improvements for further research and evidence, in particular, possible ways of reducing the likelihood of random and systematic errors. For example, suggestions may refer to refinements or changes to the research design and its procedures, including sample size and composition, sampling techniques, measurement tools, data collection procedures and how stricter control may have been achieved if required.

Comments about personal errors should not be included in the report. These include personal errors at any stage of the investigation, from planning, through data analysis and evaluation to report writing. Comments on personal errors such as ‘I should have taken more care’, ‘I should have paid closer attention’, ‘I ran out of time’ and ‘I miscalculated the mean score’ are mistakes made by the researcher, not random or systematic errors associated with the research.

However, random and systematic errors, if any, must be discussed. As described previously, random errors reduce both the reliability and validity of the results, whereas systematic errors reduce the validity of the results (but not reliability).

Finally, keep in mind that a conclusion based on evidence derived from scientific research is different from ones based on opinion or anecdote. In VCE Psychology, it is important to understand the difference. It is also important to understand the difference between opinions and anecdotes.

Figure 1.93 Opinions and anecdotes are not necessarily based on scientific evidence.

An **opinion** is a point of view that is not necessarily based on verifiable evidence and are disputable. Opinions involve a judgment about a person, object, event and so on that may suggest it is based on at least some data or facts. However, they are vulnerable to change because they are not deeply based on unquestionable or overwhelming evidence.

For example, if someone holds an opinion that 8-year-old girls are taller than boys of the same age, then statistical evidence can be produced to show that this is incorrect. Similarly, early in the last century, various experts expressed opinions that heredity had little to do with the development of psychological characteristics. Over time, scientific research through correlational studies in particular, obtained evidence of the significant contribution of genetic influences on how we think, feel and behave.

In contrast, an **anecdote** is an informal verbal report of an event that has been casually observed. Anecdotes tend to be accepted as useful information but are not based on scientific evidence and are therefore considered to be scientifically inadequate.

In psychology, reports of young children's abilities early in the last century were largely based on anecdotes. Investigations using scientific methods subsequently found that children's mental abilities in particular had been largely underestimated.

Although anecdotes are personal accounts and not necessarily reliable or valid reports, they can offer clues about aspects of behaviour and mental processes that may be investigated through scientific research.

1.15 LEARNING ACTIVITY 6

Review

1. Distinguish between each of the following in relation to a research investigation.
   a. validity and reliability
   b. external validity and internal validity
   c. reproducibility and repeatability
   d. opinion and anecdote
2. What does reliability mean in relation to each of the following measures?
   a. a self-esteem test
   b. a thermometer
3. Give an example of when the results of a research investigation would not be considered reliable.
4. What does validity mean in relation to each measure in question 2?
5. A researcher concludes that their hypothesis is refuted. What does this mean?
6. Explain the meaning of generalisation in relation to the results obtained for an investigation.
7. List three procedures that could adversely impact on the internal validity of an experiment.
8. What is an important procedure to help ensure experimental results will have external validity?
9. Which of the three types of error — random, systematic and personal — should be discussed in a research report?
10. Explain, with reference to an example, why:
    a. reliability is possible without validity but validity requires reliability.
    b. internal validity is possible without external validity but external validity requires internal validity.

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1.16 Review

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anecdote p. 142
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Note: The **References** for the entire title can be accessed in learnON and are also available as a downloadable PDF.

on Resources

Digital documents Key terms glossary – Topic 1 (doc-36943)
Key diagrams PowerPoint – Topic 1 (doc-36946)

Exam question booklet Exam question booklet — Topic 1 (eqb 0068)

1.16 Topic 1 test

Section A: 40 marks **Section B:** 50 marks **Total:** 90 marks

Access learnON to answer the following test questions online and receive **immediate feedback**.

Section A – Multiple-choice questions

Choose the response that is **correct** or **best answers** the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Question 1

Source: VCAA 2013 Psychology, Section A, Q.11; © VCAA

Experimental research was conducted to trial medication for the management of schizophrenia. This medication was in a tablet that was given to participants.

Participants drew an odd or even number from a hat. Participants who drew odd numbers formed the control group; participants who drew even numbers formed the experimental group. A double-blind procedure with a placebo was used.

In this research, the placebo could be defined as

A. the effect of the medication.
B. the tablet containing no medication.
C. a participant's expectation of the effect of the medication.
D. the tablet containing the medication that was being trialled.

Question 2

Source: VCAA 2018 Psychology, Section A, Q.36 (adapted); © VCAA

A researcher was investigating the effects of a new medication agonist in the treatment of a specific phobia. Group A, the experimental group, received the medication. Group B, the control group, received a placebo. Concerned about experimenter bias, the researcher used a double blind procedure with the help of a research assistant who worked directly with the participants.

Which one of the following identifies the double blind procedure used in this investigation?

A. Only the researcher knew who would receive the placebo.
B. Only the research assistant knew who would receive the medication.
C. Only the researcher and the control group knew who would receive the placebo.
D. Only the researcher and the research assistant knew who was in the experimental group and the control group.

Question 3

A researcher interested in the effects of anxiety on exam performance asked research participants to describe how they feel during an exam when they come across a question they know they will get wrong. The participants' responses were audio-recorded so that they could be analysed at a later time.

The type of data obtained by the researcher is best described as

A. secondary data.
B. quantitative data.
C. numerical data.
D. qualitative data.

Question 4

When the researcher replayed the audio recordings of participants' responses to the questions asked in the experiment described in question 1, it was decided to summarise the data using a table which showed the number of times certain anxiety-related words, such as 'worried' and 'scared', and non anxiety-related words such as 'nothing' and 'didn't care', were used.

This type of data is best described as

A. secondary data.
B. quantitative data.
C. qualitative data.
D. quantitative and qualitative data.

Question 5

Source: VCAA 2012 Psychology 1, Section A, Q.32 (adapted); © VCAA

A patient was about to have brain surgery. The patient gave informed consent to participate in a study using direct brain stimulation.

The study involving direct brain stimulation is an example of

A. a case study.
B. a double blind procedure.
C. a within subjects design.
D. a mixed design.

Question 6

The main purpose of ethical standards and guidelines for research is to

A. ensure validity and reliability of the results.
B. ensure that the research proceeds scientifically.
C. safeguard the rights and wellbeing of participants.
D. keep problems with participants to a minimum.

Question 7

A researcher studied differences in the behaviour of newborn babies who are breast-fed and newborn babies who are bottle-fed. The researcher conducted their investigation with 20 mothers and their newborn infants at the Royal Women's Hospital (RWH). The 20 mothers (and infants) were selected from a group of 45 mothers at the RWH who had all volunteered to participate in the investigation. There were another 50 mothers with newborn infants at the hospital, but these mothers did not volunteer to be in the investigation.

In this investigation, there were _____ mothers (and their infants) in the sample, and _____ mothers (and their infants) in the population.

A. 20; 95
B. 45; 50
C. 20; 45
D. 45; 95

Question 8

To test the notion that 'two heads are better than one', an experimenter measures how long it takes people working either in groups of two or working alone to solve a problem. The independent variable is

A. the problem.
B. the number of people working on the problem.
C. the time it takes to solve the problem.
D. whether or not the problem is solved.

Question 9

Which of the following procedures would be considered to be unethical when conducting research?

A. choosing only volunteers as participants in an experiment
B. disclosing a participant's extraordinary test results to the media without obtaining written consent to do so from the research participant
C. testing a child's ability to do algebra even though the child's ability to do algebra is already known
D. allowing a participant to discontinue being in the experiment, even though the experiment has started

Question 10

Minimising unwanted effects of variables other than the independent variable involves controlling

A. participant responses in the experimental condition.
B. participant responses in the control condition.
C. extraneous and confounding variables.
D. dependent variables.

Question 11

A research hypothesis is

A. a prediction about the results to be obtained for a study.
B. a very specific procedure the researcher must follow when conducting a study.
C. a statement about whether the results apply to the population of research interest.
D. a statement about the accuracy of the results of a study.

Question 12

In an experiment, the group of participants used for comparison purposes in order to measure any change caused by the IV is called a/an

A. independent variable group.
B. placebo group.
C. experimental group.
D. control group.

Question 13

The term _____ is used to describe how closely a set of measurement values agree with each other.

A. accuracy
B. precision
C. repeatability
D. reproducibility

Question 14

Which of the following series of steps is the most appropriate sequence for conducting psychological research using scientific method?

A. design the research, collect data, formulate hypothesis, analyse data, interpret data, report findings
B. formulate hypothesis, design the research, collect data, analyse data, interpret data, report findings
C. design the research, collect data, analyse data, interpret data, formulate hypothesis, report findings
D. formulate hypothesis, collect data, design the research, interpret data, analyse data, report findings

Question 15

To generalise from the results of a research investigation means

A. overstating the results.
B. stating whether the results can be replicated.
C. restricting the conclusion(s) to the results.
D. applying the results to the sampled population.

Question 16

Validity in research means that

A. the participants knew what they had to do.
B. the researchers knew what they were doing.
C. the research produced results that accurately measured what they claimed to have been measured.
D. the researchers obtained results that were consistent and dependable.

Question 17

A researcher evaluating their experiment asks the question: 'Did the IV actually cause the difference between the mean scores of the participants in the experimental and control conditions?' This question is most relevant to

A. debriefing.
B. reliability.
C. internal validity.
D. external validity.

Question 18

A researcher designs an experiment to test whether alcohol increases reaction time. Group A participants drink three orange-flavoured drinks containing a small amount of alcohol and Group B drink three orange-flavoured drinks that contain no alcohol. Both groups are told that the orange-flavoured drinks contain alcohol.

In this study, Group B is in the _____ condition.

A. experimental
B. single blind
C. placebo control
D. between subjects

Question 19

One way of controlling an experimenter effect is to ensure that

A. the experimenter is unaware of the experimental conditions to which participants have been allocated.
B. the experimenter explains the instructions clearly.
C. the experimenter is informed about which participants are in which groups.
D. only the research assistants know which participants are in the different experimental conditions.

Question 20

A researcher conducted an experiment and concluded that the students who used the memory aid called Memco achieved significantly better results on a VCE Psychology test than students who did not use Memco.

The researcher proposed that this conclusion is likely to apply to other VCE subjects (e.g. to Biology and History as well as Psychology) and should also apply to people beyond the sample in the study (e.g. all students).

The researcher is proposing that their experiment has a high level of

A. control.
B. reliability.
C. internal validity.
D. external validity.

Question 21

The ethical concept of non-maleficence involves

A. avoiding harm to participants.
B. consideration of the value of people.
C. avoiding deception in research.
D. commitment to searching for knowledge.

Question 22

Which of the following measures is most affected by extreme scores?

A. mean
B. median
C. mode
D. variability

Question 23

An extraneous variable is linked to the lack of motivation by participants in an experiment. This type of extraneous variable may be classified as a/an _____ variable.

A. experimental
B. experimenter
C. participant
D. motivational

Question 24

The standard deviation summarises the

A. differences in means of a set of scores.
B. scores that differ in variation.
C. most commonly occurring score in a set of scores.
D. spread of scores from the mean for the set of scores.

Question 25

A confounding variable is best described as

A. a second IV.
B. an extraneous variable that has become an IV.
C. an extraneous variable that may or may not affect the DV.
D. a variable apart from the DV that affected the results.

Question 26

A researcher is interested in studying why some people willingly give up their personal time to help others. She has seen people operating a hot soup outlet for homeless people after midnight and decides to survey the operators. The researcher's sampling procedure is best described as _____ sampling.

A. random
B. biased
C. stratified
D. situational

Question 27

When drawing a line graph for the results of an experiment,

A. the DV is represented on the horizontal axis, whereas the IV is represented on the vertical axis.
B. the IV is represented on the horizontal axis, whereas the DV is represented on the vertical axis.
C. a line of best fit can be used to illustrate the underlying relationship between the IV and DV.
D. the trend line must always show a causal relationship between the IV and DV.

Question 28

In one experiment, researchers exposed children to a video clip showing aggressive and non-aggressive adult models and then observed the children to measure the amount of `imitative learning' of aggressive behaviour.

In order to control individual participant differences in pre-existing aggression, which could distort the results if any of the groups contained a disproportionate number of children who were normally quite aggressive, the researchers pre-tested the children for aggressiveness.

On the basis of their test scores, participants were organised into groups of three. One member of each group was then randomly allocated to either of two experimental groups or to the control group.

This experiment was based on a/an _____ design.

A. within subjects
B. between subjects
C. counterbalanced
D. mixed

Question 29

The results of a research study are said to be reliable when

A. consistent and dependable.
B. an appropriate research method is used.
C. the researcher has drawn conclusions that are accurate.
D. the researcher has conducted an experiment that established a cause–effect relationship.

Question 30

Which of the following statements about measurement errors is correct?

A. Random errors are predictable and therefore controllable.
B. Systematic errors occur by chance and are therefore unpredictable.
C. Systematic errors affect all measurements to the same degree.
D. Random errors are faults entirely sourced with the researcher.

The following information relates to questions 31, 32 and 33.

In an experiment on memory, a psychologist collected the data shown below from 10 different participants. The data were scores on a test of the number of items in a list of 10 words that could be remembered one month after first learning the words.

1, 4, 7, 5, 7, 2, 3, 7, 1, 3

Question 31

The mean of the scores is

A. 30.
B. 3.8.
C. 7.
D. 4.

Question 32

The median for the scores is

A. 4.
B. 3.
C. 3.5.
D. 3.8.

Question 33

The mode for the scores is

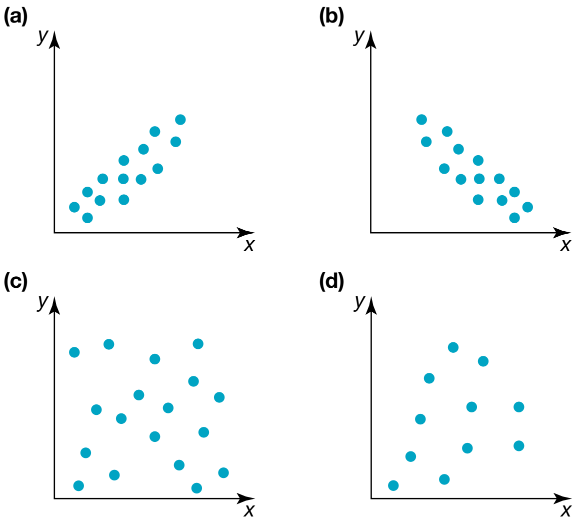
A. 10.
B. 7.
C. 3.8.
D. 6.

Question 34

The main reason for using random allocation of participants in a mixed design experiment is to ensure that

A. the sample is totally representative of the population.
B. the experimenter cannot influence the results.
C. different groups are as alike as possible in terms of participant characteristics.
D. extraneous variables relating to participant characteristics can be measured.

The following information relates to Questions 35 and 36.



Question 35

To prevent a biased sample and to control for participant differences in her experiment, Dr Tran would respectively need to use

Which scatter plot shows the strongest negative correlation?

A. Plot (a)
B. Plot (b)
C. Plot (c)
D. Plot (d)

Question 36

Which scatter plot shows the strongest positive correlation?

A. Plot (a)
B. Plot (b)
C. Plot (c)
D. Plot (d)

Question 37

Source: VCAA 2019 Psychology, Section A, Q.50; © VCAA

Xuan is a researcher who wants to gather subjective and descriptive data from people who have been diagnosed with a mental illness in order to understand what living with a mental illness is like. Which of the following identifies the type of data Xuan is collecting, the best method for collecting this data and the best sample size?

	Types of data	Data collection method	Sample size
A.	qualitative	interviews	small
B.	quantitative	interviews	large
C.	qualitative	questionnaire	large
D.	quantitative	online questionnaire with rating scales	small

Question 38

Source: VCAA 2013 Psychology, Section A, Q.54 (adapted); © VCAA

Dr Tran conducted a between subjects experiment on a technique for remembering nonsense syllables.

The experimental group used Dr Tran's learning technique and had a greater recall of nonsense syllables than the control group.

A. counterbalancing and random sampling.
B. random sampling and counterbalancing.
C. random allocation and random sampling.
D. random sampling and random allocation.

Question 39

A researcher is interested in investigating the extent to which education level can be used to predict political preferences. The researcher would most likely conduct

A. a case study.
B. a non-participant observational study.
C. a controlled experiment.
D. correlational research.

Question 40

A researcher conducted an experiment on the effectiveness of a new study technique for memorising Chinese characters used in reading and writing. Two groups of participants were used.

Group A were given instructions on how to use the new study technique, then required to memorise a list of 20 Chinese characters. Group B were simply asked to memorise the list of 20 Chinese characters. All participants in each group were given a test of recall on the list of characters.

A mean score of 14 correct responses was obtained for Group A and a mean score of nine was obtained for Group B.

In this experiment, the IV is _____; whereas the DV is _____.

A. use of the new study technique; the number of Chinese characters correctly recalled
B. Group A; Group B
C. the number of Chinese characters correctly recalled; use of the new study technique
D. Group B; Group A

Section B – Short answer questions

Question 1 (1 mark)

Source: VCAA 2019 Psychology, Section B, Q.5a; © VCAA

Year 12 student Steph was concerned about the possible adverse impacts that staying up late to study might have on the ability of drivers who are on their learner permit or probationary driver licence to accurately perceive visual stimuli while driving. To investigate this, Steph conducted research as described below.

Participants

Twenty people over the age of 18 from Steph's school community volunteered to participate.

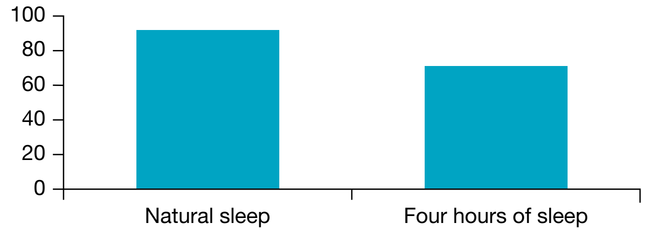
Method

Day 1 – Participants experienced one night of natural sleep and completed a computer-based visual perception test at 9 am the following morning. The test involved identifying 30 letters of varying sizes displayed for brief periods.

Day 2 – Participants were required to sleep for only four hours in total over a 24-hour period and completed a similar computer-based visual perception test at 9 am the following morning.

Results

The results were recorded and collated as the mean percentage of letters accurately identified by participants under each set of conditions.



What would be an appropriate label for the vertical axis of the figure above.

Question 2 (1 mark)

Source: VCAA 2013 Psychology, Section C, Q.3 (adapted); © VCAA

In 1964, for a high-school project, American student Randy Gardner and two classmates wanted to set a world record for staying awake.

Gardner stayed awake for 264 hours (11 days). To ensure that Gardner was not damaging his health, he received regular medical check-ups throughout the project. Gardner had been awake for several days when Stanford University sleep researcher William Dement heard about the high-school students' project. Dement became involved in the project during the last three days of Gardner's period of sleep deprivation. Once Gardner had reached the goal of 264 hours of wakefulness, he was given a medical check-up. He then slept for 14 hours and 40 minutes and awoke naturally.

Dement collected data on the effect of prolonged sleep deprivation on Gardner and later reported the findings of this research.

He collected some of the data by using an electroencephalograph (EEG), an electromyograph (EMG) and an electro-oculograph (EOG).

In terms of psychological research methodology, provide one reason to explain why the students' project is best classified as a case study rather than an experiment.

Question 3 (2 marks)

Describe one advantage and one limitation of a case study.

Question 4 (2 marks)

Explain an important consideration when drawing conclusions for an investigation that had a small sample size.

Question 5 (3 marks)

Source: VCAA 2021 Psychology, Section B, Q.3c; © VCAA

Effect of caffeine on Parkinson's disease

by F. Marrow

Drinking caffeinated drinks has been associated with reduced tremors in people with Parkinson's disease. A recent study of 284 newly diagnosed Parkinson's disease patients has gone one step further to explore if the gender of a person changes the effects of caffeine on the severity of tremors. The researchers interviewed the patients to understand their motor and non-motor symptoms and their caffeine consumption history.

Of the patients, 204 were classified as caffeine drinkers (three or more cups per day, including coffee, tea and energy drinks) and 80 were classified as non-caffeine drinkers (0 cups per day).

Results showed that, compared to non-caffeine drinkers, caffeine drinkers:

- had early onset of symptoms
- were younger
- had fewer motor and non-motor symptoms
- had lower resting tremor scores.

Interestingly, the relationship between caffeine consumption and tremor severity was only significant in males.

Source: Bang-Hoon Cho, Seong-Min Choi and Byeong C. Kim, 'Gender-dependent effect of coffee consumption on tremor severity in de novo Parkinson's disease', *BMC Neurology*, (2019) 19:194, https://doi.org/10.1186/s12883-019-1427-y.

Identify one extraneous variable that is evident in this study.

Outline how this extraneous variable might have affected the results of this study and how this variable could have been controlled.

Question 6 (4 marks)

A researcher will investigate whether memory of a crime by eyewitnesses is better when hypnotised. All participants will be shown a video of two robberies that are reasonably alike in detail, once when hypnotised and soon after when not hypnotised. For each condition they will be given a test of recall with 20 questions about the robbery. The number of correct answers given under each condition could then be compared.

a. What is a possible order effect that may occur in this particular experiment and why might it occur? 2 marks

b. Describe a counterbalancing procedure to control the order effect. 2 marks

Question 7 (2 marks)

Explain the difference between a conclusion that can be drawn from an investigation that uses an experimental design and an investigation that measures the correlation between variables.

Question 8 (4 marks)

Distinguish between:

a. experimenter effects and demand characteristics 2 marks

b. random sampling and random allocation 2 marks

Question 9 (3 marks)

List three key features that distinguish the controlled experiment from other research methods.

Question 10 (2 marks)

a. Name the procedure used to control extraneous participant variables in a between subjects experiment. 1 mark

b. Explain how this procedure controls the influence of these variables. 1 mark

Question 11 (1 mark)

Why are research procedures standardised?

Question 12 (10 marks)

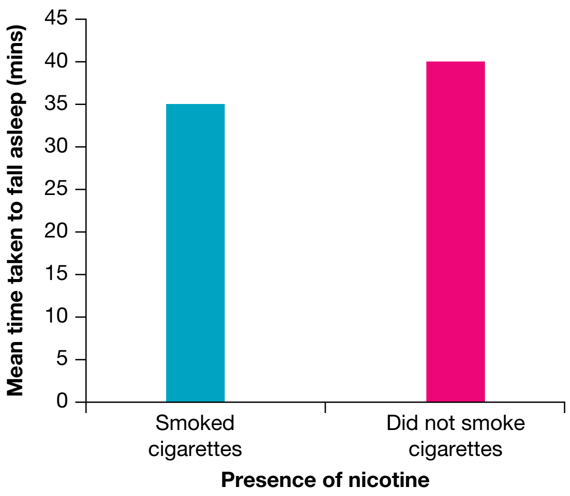
A researcher wanted to find out whether the presence of nicotine in the bloodstream is linked to sleep loss, specifically sleep loss resulting from spending more time trying to fall asleep.

To investigate this issue, one group of 15 volunteer students who were smokers and enrolled in the first year of the Psychology course at a Victorian regional university (Group 1) were required to attend the university's gym at 9pm on Tuesday evening, smoke ten 8 mg cigarettes during a 90-minute period while listening to classical music, and then go to sleep as quickly as they could in one of the standard single beds at the other end of the gymnasium.

On Friday evening later that week, the procedure was repeated with another group of 12 volunteer smokers who were also enrolled in the first year Psychology course (Group 2). However, participants in this group were not permitted to smoke any cigarettes in the one-hour period before being asked to go to sleep in one of the beds.

Both groups were carefully observed from outside the gym by two research assistants through a monitor hooked up to infrared cameras. The research assistants recorded the precise time when each participant was observed to fall asleep.

The results are presented in the graph below. The researcher concluded that neither smoking nor the presence of nicotine in the bloodstream cause sleep loss.



a. Identify the population for the experiment. 1 mark

b. Is the researcher collecting qualitative or quantitative data? 1 mark

c. Identify the independent and dependent variables. 2 marks

d. Identify the experimental and control groups. 2 marks

e. Explain whether the conclusion made by the researcher is justified. 2 marks

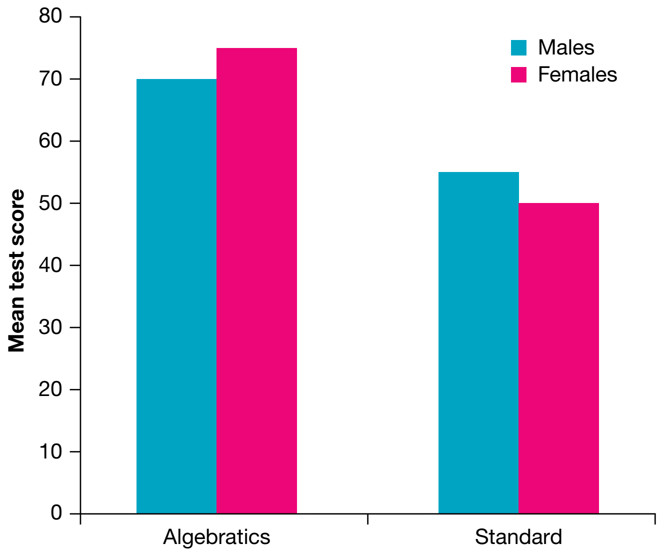
f. Describe one advantage and one limitation of the research method used for this particular investigation. 2 marks

Question 13 (15 marks)

A psychologist conducted an experiment to investigate a new online method of teaching algebra called Algebratics. She wanted to find out whether teaching young children using Algebratics is more effective than the standard textbook approach to teaching algebra in many schools. The psychologist predicts that children who use Algebratics will score higher on an algebra test.

To test her hypothesis, one class of year 6 students in a local primary school was taught a new algebra topic through Algebratics. This took place for one hour at 9 am on the first four days of the school week. Their teacher was trained in Algebratics to ensure the method was used correctly. Another year 6 class at the same school was taught the same topic, at the same time by their teacher through the standard approach. Both classes had 24 students, each with 11 males and 13 females. Informed consent was obtained for all participants.

On Friday at 9 am, all participants were given 30-minute test on the topic. Their classroom teacher administered the test under strictly controlled test conditions. The results are shown in the graph below.



a. Identify the experimental and control groups. 2 marks

b. Operationalise the independent and dependent variables in the experiment. 2 marks

c. Formulate a research hypothesis that would be supported by the results obtained. 1 mark

d. Construct a discussion containing: 10 marks
- a description and analysis of the results
- the conclusion(s) based on the hypothesis
- an explanation of whether the results can be generalised with reference to external validity
- a description of a limitation or weakness of the experiment.

Resources

Go to learnON to access answers to the Topic 1 test. A customisable Word version of the test can also be downloaded from the **Digital documents** tab of the Resources panel.

learnMORE | Outline of VCE Psychology

VCE Psychology is made up of four units, each with different content. Units 1 and 2 can be studied in any order and are not prerequisites for Units 3 or 4.

As a science study, there is an emphasis on the development of key science skills in all four units. These skills are described on pages 12-13 of the Psychology Study Design and covered in Topic 1.

There are different areas of study in each unit, including requirements to undertake scientific investigations, either individually or with others. The areas of study are described in a way that reflects the inquiry nature of VCE Psychology.

Units 1 and 2 course outline

The Units 1 and 2 areas of study are:

Unit 1: How are behaviour and mental processes shaped?

Area of Study 1 *What influences psychological development?*

- The complexity of psychological development
- Defining and supporting psychological development

Area of Study 2 *How are mental processes and behaviour influenced by the brain?*

- Role of the brain in mental processes and behaviour
- Brain plasticity and brain injury

Area of Study 3 *How does contemporary psychology conduct and validate psychological research?*

- Identify, analyse and evaluate secondary data to answer a research question related to a recent discovery relevant to Unit 1, Area of Study 1 and/or 2. The question may be one of your own or developed in conjunction with a group or the entire class.

Unit 2: How do internal and external factors influence behaviour and mental processes?

Area of Study 1 *How are people influenced to behave in particular ways?*

- Social cognition
- Factors that influence individual and group behaviour

Area of Study 2 *What influences a person's perception of the world?*

- Perception
- Distortions of perception

Area of Study 3 *How do scientific investigations develop an understanding of influences on perception and behaviour?*

- Adapt or design and then conduct your own investigation related to a topic in Unit 2, Area of Study 1 and/or 2.

Assessment

Each unit has a set of three learning outcomes that students are required to achieve in order to satisfactorily complete the unit.

All assessments for Units 1 and 2 are school-based using a variety of assessment tasks.

The assessment tasks available for Outcomes 1 and 2 in both Units 1 and 2 are:

- analysis and evaluation of an experiment or case study
- a data analysis of generated primary and/or collated secondary data
- reflective annotations of a logbook of practical activities
- media analysis of one or more contemporary media texts
- a literature review
- response to a psychological issue or ethical dilemma

- a modelling or simulation activity
- problem-solving involving psychological concepts, skills and/or issues
- a report of a scientific investigation, including the generation, analysis and evaluation of primary data.

For *Outcome 3 in Unit 1:*

- a response to an investigation into contemporary psychological research and discussion of how science can be used to explore and validate psychological research questions.

For *Outcome 3 in Unit 2:*

- a report of a student-adapted or student-designed scientific investigation using a selected format, such as a scientific poster, an article for a scientific publication, a practical report, an oral presentation, a multimedia presentation or a visual representation.

Schools must report each student's result for each unit to the Victorian Curriculum Assessment Authority (VCAA). The result is reported as either S (Satisfactory) or N (Not Satisfactory). The student's level of achievement (e.g. grade) for each unit is also determined by the school, but this is not reported to VCAA.

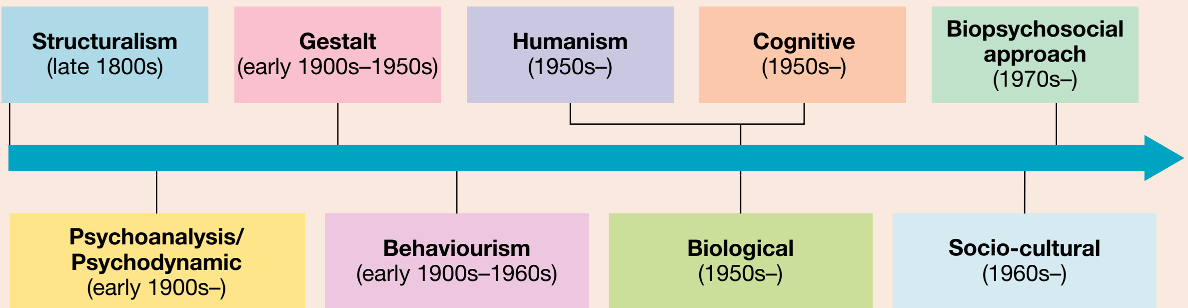
on Resources

Weblink VCAA Psychology

learnMORE | Classic and contemporary perspectives in Psychology

Throughout the history of psychology there have been different perspectives, or 'viewpoints', on how to best study, describe and explain human behaviour and mental processes. Some of the more prominent perspectives and what they focused on or emphasised are:

- *Structuralism* (late 1800s) — the structure of human consciousness ('awareness'), particularly the basic parts or building blocks that make up consciousness, how the parts are organised and how they are interrelated
- *Psychoanalysis/Psychodynamic* (early 1900s to present) — the roles of conflicts, childhood memories, drives and motives existing beneath the level of conscious awareness
- *Gestalt* (early 1900s to 1950s) — the importance of the whole experience of a person rather than their individual parts
- *Behaviourism* (early 1900s to 1960s) — how observable behaviour is learned and changed by experience, particularly rewards and punishments
- *Humanism* (1950s to present) — the uniqueness of individuals and their positive potential to fulfil their lives
- *Biological* (1950s to present) — bodily structures and processes underlying thoughts, feelings and behaviour
- *Cognitive* (1950s to present) — how we acquire, process, remember and use information about ourselves and the world
- *Socio-cultural* (1960s to present) — social and cultural influences on thoughts, feelings and behaviour.
- The *biopsychosocial approach*, which emerged in the late 1970s, is probably the most widely adopted perspective in contemporary psychology. Its viewpoint is that human behaviour and mental processes originate, develop and function due to the complex interaction of biological, psychological and social factors. This approach is used in VCE Psychology and therefore throughout the textbook and its learnON companion.



The discipline of psychology since its early establishment has moved its perspective from a study of the structure of consciousness under Wilhelm Wundt to one that focuses on the interaction of biological, psychological and social factors in influencing how we think, feel and behave.

learnMORE | How scientific is astrology?

Astrology is a system for explaining and predicting how we think, feel and behave based on the positions of the planets and stars at the time of a person's birth. It uses scientific-looking astronomical charts and technical terms and is often confused with the real science of astronomy.

Astrology has been practised in different cultures for many centuries, with astrological beliefs going back at least 2500 years. In more recent times, particularly given the regular inclusion of horoscopes in print media, and the production of horoscope apps, the public's exposure to astrology and astrological predictions has increased.

Astrology and its horoscopes currently enjoy wide appeal and many people read their horoscopes, even if they don't believe them or take them seriously.

Psychologists have conducted numerous scientific research studies to test astrology. These investigations have repeatedly found that astrology is non-scientific and lacking in valid evidence to support its claims.

Statements in horoscopes are usually vague (such as 'mistakes could cost you time and money', 'you can only discuss plans or argue points so much' and 'if you're patient you should be able to achieve a great deal') and highly applicable to most people, irrespective of their birth sign, as evident in the horoscope example below.

Furthermore, systematic procedures used by psychologists to check astrological predictions have repeatedly found that the predictions are usually wrong. The small percentage found to be correct tend to be very general; for example, statements such as 'you will meet someone new in the next 12 months' and 'there will be a political crisis in Australia during this year'. These statements describe events that are more likely to happen than not happen under the ordinary circumstances of everyday life.

Researchers have also found that many astrological descriptions of personality and behaviour tend to be made up of desirable, flattering statements. This increases the tendency to accept the description because people are less likely to accept negative and undesirable statements about themselves, such as 'you are insensitive, uncaring, unfriendly and hard to get along with'.

Our willingness to accept the descriptions of ourselves made by astrologers, palm readers, tarot card readers and the like has been called the *Barnum effect*, named after the American circus showman Phineas T. Barnum (1810–91), whose success and fame were reportedly built around the principle 'Always have a little something for everybody'. The Barnum effect has been viewed by some psychologists to refer to the tendency to believe that a personality description or a prediction about the future is accurate if it is stated in a vague or very general way.

Many people also believe in astrology because others do. For example, 'A lot of people I know believe in astrology so there's got to be something in it'. This influence is called the *bandwagon fallacy* — an error of assuming that a claim is correct just because many people believe it. Of course, popular opinion is not a dependable guide to the accuracy of an assertion.

STARS

with Katinka de Strunker

Aquarius
(Jan. 20–Feb. 18)

Plans with a colleague, friend or family member may become more involved as complications arise. Extra commitments may prove more expensive than you initially thought.

Pisces
(Feb. 19–Mar. 20)

A relationship may change significantly, causing you to relate differently to that person. A friend may need extra attention, so spend quality time with them. Make sure to leave the communication channels open.

Aries
(Mar. 21–Apr. 19)

Mars is yet to transect your sector, so be prepared — obstructions may come your way. The determination of the ram will push you through any problems you encounter, but take care not to tread on other people's toes, particularly your partner's!

Taurus
(Apr. 20–May 20)

Beware your bullheadedness, Taurus! Flexibility and openness are needed when problems arise, especially when they involve work colleagues or friends. A trip later in the month may see you in contact with family members or friends you haven't seen for some time.

Gemini
(May 21–June 20)

Unexpected complications on the home or work front require ingenuity and discretion. Be prepared for challenges. There may be an unexpected boost in your income, but take care, as extra funds will be needed towards the end of the year.

Cancer
(June 21–July 22)

Something important is about to happen to you or to a family member. Be open with your partner to encourage good communication. Working with your mate to achieve a common goal will strengthen your bond.

Leo
(July 23–Aug. 22)

Someone close to you may be going through a rough patch. This will require all of your diplomatic skills, Leo! Beware of impulsive spending, as unexpected outlays may dent your savings.

Virgo
(Aug. 23–Sept. 22)

A short trip or visit from a friend or family member will happen in the near future. You may pursue a course of study in a subject you've always been interested in. A new direction at work will bring fresh challenges and excitement.

Libra
(Sept. 23–Oct. 22)

Your mate will add sparkle to your relationship with a romantic interlude or surprise, injecting passion into your relationship. Planning for the future will see your hearts and souls aligned.

Scorpio
(Oct. 23–Nov. 21)

The budget may be strained by recent large outlays, so the opportunity to make extra money will be welcome. A statement of confidence that will come through a work colleague or reference will thrill you.

Sagittarius
(Nov. 22–Dec. 21)

Your creativeness will be put to good use when you redecorate your home or work space, creating a pleasant and happy place to be. Music may also feature this month. This will be a passionate time for Sagittarians!

Capricorn
(Dec. 22–Jan. 19)

Passion is in the air for you, Capricorn! A romantic interlude with your mate will inject sizzle into your relationship. Singles, a sudden call or invitation to a fun social outing may have happy results when a charming new person enters your life.

An example of a horoscope

learnMORE | Types of scientific investigation methodologies

- **Case study:** An investigation of a particular activity, behaviour, event or problem that contains a real or hypothetical situation and includes the complexities that would be encountered in the real world. Case studies can take various forms: historical, involving the analysis of causes and consequences, and discussion of knowledge learned from the situation; a real situation or a role-play of an imagined situation, where plausible recommendations are to be made; or problem-solving, where developing a new design, methodology or method is required.
- **Classification and identification:** Classification is the arrangement of phenomena, objects or events into manageable sets, whereas identification is a process of recognition of phenomena as belonging to particular sets or possibly being part of a new or unique set.
- **Controlled experiment:** An experimental investigation of the relationship between one or more independent variables and a dependent variable, controlling all other variables. This may include the use of control groups.
- **Correlational study:** Planned observation and recording of events and behaviours that have not been manipulated or controlled to understand the relationships/associations that exist between variables, to identify which factors may be of greater importance and to make predictions.
- **Fieldwork:** Based on inquiry or the investigation of an issue, fieldwork involves observing and interacting with a selected environment beyond the classroom, usually to determine correlation, rather than a causal relationship. It may be conducted through a range of methods, including direct qualitative and/or quantitative observations and sampling, participant observation, qualitative interviews, questionnaires, focus groups, and yarning circles.
- **Literature review:** Involves the collation and analysis of secondary data related to other people's scientific findings and/or viewpoints. Their purpose is to answer a question or provide background information to help explain observed events, or as preparation for an investigation to generate primary data.
- **Modelling:** Involves the construction and/or manipulation of either a physical model (such as a small- or large-scale representation of an object) or a conceptual model that represents a system involving concepts that help people understand or simulate the system.
- **Product, process or system development:** Design or evaluation of an artefact, process or system to meet a human need, which may involve technological applications in addition to scientific knowledge and procedures.
- **Simulation:** A process of using a model to study the behaviour of a real or theoretical system. The modelling and manipulation of variables in a real system is useful because often the variables cannot be controlled as the system may be too complex, too large or small, too fast or slow, not accessible, or too dangerous.

Source: 2023 VCAA Psychology study design, p. 14.

learnMORE | Convenience sampling

For some investigations, it is not practical, suitable or possible to obtain a representative sample. In such cases, a convenience sample may be used and the researcher may use anyone who is available or present.

Convenience sampling, also called *opportunity sampling* or *accidental sampling*, involves selecting a sample of individuals (or cases) who are readily available. For example, a representative sample of homeless teenagers or users of illegal drugs is not often readily available. Consequently, the researcher may go to locations known to be frequented by the required participants and simply select the first individuals they meet who are in the target population and who are willing and available to participate.

Similarly, a researcher conducting an observational study with drivers who do not obey red traffic lights at a particular intersection at a particular time would be using convenience sampling. Psychology students often use convenience sampling; for example, when selecting participants they can study, such as other students in their school, children at a local primary school, friends, parents or relatives.

Convenience sampling is governed by chance and, unlike random and stratified sampling, is not considered to be a systematic, orderly technique. In most cases, convenience sampling produces a biased sample because the way it is selected favours particular individuals or groups – only those people available at the time and location of the investigation will have a chance of being included in the sample.

If for example, a researcher used convenience sampling at a local shopping centre, they may select only those shoppers who look as if they will be cooperative to be in the sample and ignore those who appear uncooperative. Shoppers left out of the sample might think, feel or behave differently from those who are selected in the sample, yet these thoughts, feelings and behaviours will not be represented in the sample. Nor would the sample be representative if the researcher simply selected the first 50 people to exit a particular store. Since a convenience sample is not representative of the target population under investigation, the data obtained can be misleading and the results of the study cannot be legitimately generalised to or beyond that population.

Despite these limitations, convenience sampling is widely used in psychology. It is typically quick, easy and inexpensive. These are considered significant advantages when compared with other sampling methods. Convenience sampling can also be of considerable value when conducting research to pilot, or 'test', procedures or to gain a preliminary indication of possible responses (and therefore a possible hypothesis) before conducting the actual investigation.

Many researchers regard convenience sampling as an adequate sampling procedure when investigating aspects of mental processes or behaviour that are assumed to be similar in all 'normal' individuals, despite individual differences. For example, all 'normal' adults are capable of reflecting on their personal experiences and using language to communicate what they think or feel. Similarly, all normal adults are capable of seeing, hearing and responding reflexively.

learnMORE | How to construct a rating scale

How to construct a Likert scale

The following steps enable you to construct a Likert scale to collect quantitative data for your own research on an attitude or other topic of interest.

Correlational studies are used to understand the associations that exist between variables without manipulation by the researcher. Interviews and questionnaires are commonly used for correlational studies. The following steps will help you to construct a Likert scale to collect data for your own investigation through correlation research.

Although your scale is likely to be a useful measure for your research question, it will not be valid or reliable. This means that you will have to be careful with the conclusions you draw from the results obtained.

The steps are written with reference to attitude measurement and a scale varying in strength of agreement or disagreement. However, the steps can be adapted to construct a Likert scale for other research questions relevant to key knowledge in Unit 2.

Step 1

Identify an attitude towards an object, group, issue or event which is relevant to the Unit 2 Areas of Study 1 and 2 and of interest or importance to you.

Step 2

Write a list of different aspects of the attitude topic. For example, the Likert scale on recreational drugs in Figure 1.38 is based on aspects such as crime, punishment, civil liberties, privacy laws and impact on Australian society. If you have difficulties in generating a list, you may find it helpful to review your notes on the topic, conduct further research to enhance your understanding of the topic and/or discuss your research question with others.

Step 3

Use your list to develop a group of attitude items (questions or statements) on the topic. Although Likert scales usually contain about 20 items, you should consider a scale based on about six or eight items. Generally, the list should consist of items that deal with different points of view on the topic. Consider the following guidelines for writing Likert scale items.

- Write items that are unlikely to be agreed with by everyone or no-one. About half of your items should be favourable towards the topic and the other half unfavourable. The more effective items will be those that tend to push respondents towards the strongly agree or strongly disagree ends of the scale. Try to avoid including items that are neutral and likely to cluster responses in the uncertain category (that is, ‘neither agree nor disagree’).
- Use simple, clear language that is suited to the experience, age, and cultural and educational background of the participants whose attitudes you are measuring.
- Write your items in such a way that they are unambiguous and only one interpretation is possible.
- Write each item so it contains only one complete idea.
- Avoid using words such as ‘all’, ‘always’, ‘none’ and ‘never’.

Note that Likert scale items may also have other answer options, depending on what is measured. For example:

Level of concern	Frequency
• Not at all concerned • Slightly concerned • Somewhat concerned • Moderately concerned • Extremely concerned	• Always • Often • Sometimes • Rarely • Never
Belief	**Quality**
• Almost always true • Usually true • Occasionally true • Usually not true • Almost never true	• Excellent • Very good • Good • Fair • Poor
Level of awareness	**Effect**
• Extremely aware • Moderately aware • Somewhat aware • Slightly aware • Not at all aware	• Major effect • Moderate effect • Neutral • Minor effect • No effect
Knowledge of action	**Level of acceptability**
1. Never true 2. Rarely true 3. Sometimes but infrequently true 4. Neutral 5. Sometimes true 6. Usually true 7. Always true	1. Totally unacceptable 2. Unacceptable 3. Slightly unacceptable 4. Neutral 5. Slightly acceptable 6. Acceptable 7. Perfectly acceptable
Level of appropriateness	**Level of importance**
1. Absolutely inappropriate 2. Inappropriate 3. Slightly inappropriate 4. Neutral 5. Slightly appropriate 6. Appropriate 7. Absolutely appropriate	1. Extremely important 2. Very important 3. Moderately important 4. Neutral 5. Slightly important 6. Low importance 7. Not at all important
Level of difficulty	**Level of influence**
1. Very difficult 2. Difficult 3. Neutral 4. Easy 5. Very easy	1. Not at all influential 2. Slightly influential 3. Somewhat influential 4. Moderately influential 5. Extremely influential

Step 4

When you have written your items, trial ('test') them with people who will not be a part of your sample but who have personal characteristics in common with those likely to be in your sample. This will assist you to identify problems with your items that you may not have noticed.

- Form your items into a list, with columns for respondents to indicate whether, and to what extent, they agree or disagree with each item. Randomly distribute positive and negative items in the list to avoid a pattern of responses.

- Present the items in a questionnaire format. The questionnaire should have a short introduction that includes instructions for respondents. For example: 'Here is a list of statements about . . . Please read each statement quickly but carefully, then indicate whether you agree or disagree with each one by putting a circle around:
  SA = Strongly agree
  A = Agree
  N = Neither agree nor disagree
  D = Disagree
  SD = Strongly disagree.'

Step 5

- Make several copies of your questionnaire and test your questions again by asking two or three people with similar backgrounds to those in your sample to rate each response.
- Determine their scores for each response and then calculate their score for the entire scale. Score responses by allocating 1 for the most negative response, through to 5 for the most positive response for each item.
- Analyse the responses to determine which items you should include in the final scale. The best items are those that have a very high or very low relationship with the total score for all items. You may wish to rewrite or even replace items that seem to cluster responses in the neutral/unsure category.

Adapted from Grivas, J., & Lawrie, P. A. (1991). *Psychology: Experiments and activities*. Marrickville, NSW: Harcourt Brace Jovanovich. pp. 401–403.

on Resources

Weblink Survey Monkey

learnMORE | Using observation to develop a theory of children's play

The earliest system for classifying and describing children's play was devised by American researcher Mildred Parten (1932) through an observational study conducted for her PhD.

Parten visited a preschool centre over a period of 6 months and observed 40 children aged between 2 and 4 years. Each child was observed during free play time for 1 minute each day, with 60 observations per child being made. Parten's observations focused on how the children interacted during play. She found that older children spent more time in social play, whereas younger children were more likely to play alone.

Parten's sequence in the development of social play

Based on her results, Parten identified a sequence in the development of social play. The sequence starts with *solitary play* and culminates in *cooperative play*. It shows that children's play becomes increasingly interactive as they become older. However, this does not mean that children are unable to shift from one kind of play to another. For example, there are times when a child quite capable of cooperative play will choose to play alone even if there are playmates around, simply because they want to.

Solitary play (1–2 years)

The child plays alone and independently even if other children are nearby. The toys used are different from those of other children. There is no reference to what other children are doing, nor is any attempt made to get close to or interact with other children. This kind of play is common among children younger than 2 years of age.

Solitary play (1–2 years)

Parallel play (2–3 years)

The child plays alone and independently alongside other children but not with them. The toys used are like those of the other children nearby but the way they are used may be different.

The child makes no attempt to influence or interact with the other children.

This kind of play is at its peak among 2- to 3-year-olds. Although there is no interaction with other children, parallel play is viewed by some psychologists as a basic form of true social play because the child appears to prefer to play close to other children.

Parallel play (2–3 years)

Associative play (4–5 years)

The child plays with one or more other children in a similar or identical activity but in their own way. The child may speak with others and share playthings but there is no organisation of activity or division of labour. The child may sometimes attempt to control which children may or may not play in the group. Generally, the child's interest appears to be primarily in the association with others rather than the play itself. This kind of play usually starts to show up in 4-year-olds.

Associative play (4–5 years)

Cooperative play (5+ years)

The child plays with one or more other children at the same game or activity in a group situation.

There is direct interaction through sharing of ideas and playthings. The group is organised with a division of labour involving children in different roles.

One group member (or two) has a leadership role and directs the activity of others. The combined efforts of the children involved help ensure the goals of the game or activity are attained. This kind of play usually starts to show up in 5-year-olds.

Cooperative play (5+ years)

Source: Parten, M. B. (1932). Social participation among pre-school children. *The Journal of Abnormal and Social Psychology, 27*(3), 243–269.

learnMORE | Studying gorilla behaviour using both participant and non-participant observation

In a well-known observational study that spanned 18 years, American researcher Dian Fossey (1983) used both participant and non-participant observation. Fossey, whose work is featured in the 1988 movie *Gorillas in the Mist*, lived among gorillas in their remote African highlands habitat. After first using non-participant observation to learn about key aspects of gorilla behaviour, Fossey changed her method to use participant observation and started to interact with and behave like a gorilla. The more she learnt about the behaviour of gorillas, the more she was able to act like them. She imitated their feeding and grooming behaviours and even attempted to copy their vocalisations. By waiting for the gorillas to approach her, by avoiding actions that might threaten them, and by imitating their actions, Fossey gradually became accepted by them and was able to collect valuable data about their behaviour. Fossey was not formally trained in scientific research but her contributions to the understanding of gorilla behaviour (and gorilla conservation) are widely recognised. In 1985, she was found hacked to death at her campsite in Rwanda. It is believed that she was murdered by gorilla poachers.

Researcher Dian Fossey (1932–1985) engaging in participant observation with gorillas

Source: Fossey, D. (1983). *Gorillas in the mist.* Boston: Houghton Mifflin Company.

learnMORE | A case study of an individual diagnosed with prosopagnosia

In psychology, case studies are often confined to the study of a particular individual. For example, one early case study conducted by a neuropsychologist involved a rare disorder called prosopagnosia or 'face agnosia' (Bodamer, 1947). Prosopagnosia is an impaired ability to recognise faces. People with this disorder have difficulty recognising the faces of family and friends or famous personalities.

The case study involved a young female who was also unable to recognise her own face. She was referred to as S.T. in the case study report to protect her identity. Whenever S.T. looked in the mirror, she saw a reflection of a stranger. However, S.T. knew that she was the strange-looking person because she was the only person in front of the mirror. In one series of tests, S.T. was asked to speak in front of the mirror and make gestures such as a nod or a shrug. S.T. often recognised her voice and occasionally recognised gestures, but her face was always completely new to her. S.T. also had difficulty recognising animal faces. For example, she described a dog's face as 'a human face with funny hair'.

Although unable to recognise faces, S.T. knew what a face was and could recognise and name everyday objects such as furnishings, articles of clothing, trees, cars and so on without difficulty. This suggested that the area of the brain involved in facial recognition was different from that involved in recognising objects. Furthermore, the different brain areas probably interacted with language and memory in different ways.

When neuroimaging devices such as PET and fMRI scans became available, neuropsychologists were able to conduct experiments with individuals suffering from face agnosia. Such experiments over the past 30 years confirmed the conclusions of early case studies. They have also enabled researchers to pinpoint brain areas and structures that interact in facial recognition, object recognition, memory and language.

learnMORE | Cross-sectional studies – comparing groups at a single point in time

In a cross-sectional study, the researcher selects and compares different groups of participants on one or more variables of interest at a single point in time. It is commonly used in psychology to study age-related differences. For example, to study the use of rules in games played by children, groups of children representing each age group from 3 to 7 years inclusive can be selected and observed at about the same time. Or, to study age differences in how much information can be held in short-term memory, groups of people selected at 10-year intervals from 10 to 80 years old could be tested and the results compared.

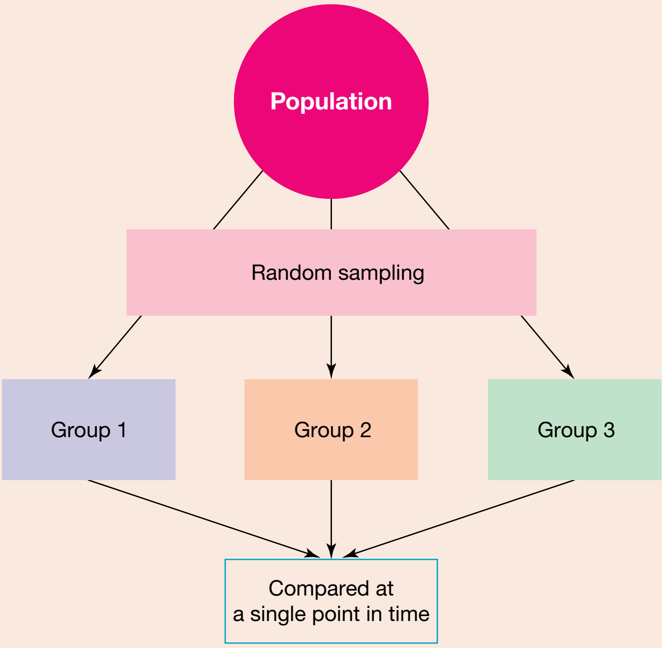
A cross-sectional study may also be used to determine the prevalence of some variable of interest; for example, the number of cases of a particular issue or problem in the population at a given point in time. In addition, it may be used to study differences between groups in any one of a wide range of variables at a specific time. For example, samples may be selected based on one or more mental abilities, personality types, family environments, mental health characteristics, sleep habits, cholesterol levels, dietary intake, drug use, physical health, social media use, cultural background and so on. In all such studies, the data will be collected at one point in time (or within a short time frame).

A cross-sectional study uses an independent groups design and is sometimes called a quasi-experiment because of its resemblance to an independent groups experiment. However, it is not a true experiment because participants cannot be randomly assigned to experimental and control groups. Instead, a cross-sectional study uses existing, naturally formed or occurring groups. For example, in a cross-sectional study investigating age-related differences, the researcher can select participants from different age groups of interest but cannot randomly assign people to be a particular age. In addition, the researcher observes and measures characteristics or events that already exist or occur naturally in a sample (or population), without manipulating any variables.

A cross-sectional study may be repeated periodically to study a trend. It may therefore also involve repeated measures but this does not mean it is the same as a repeated measure experiment.

A major advantage of a cross-sectional study is that multiple segments of the population can be compared on one or more variables relatively quickly. Compared to other research methods, it tends to be simpler to undertake, not too time-consuming and less expensive. For example, a researcher can study differences in one or more variables of interest in 5-, 10- and 15-year-olds at one time over a short period, instead of tracking them over 10 years to complete their investigation. In this way, a snapshot of age-related differences can be obtained without having to conduct follow-up studies and ultimately wait many years for the results.

Another advantage is that a cross-sectional study provides a means of researching certain topics that are unethical and/or impractical to conduct through experimentation. For example, to study the effects of exposure to a major stressor on mental health, the researcher could access one or more groups who have been exposed to a war zone or natural disaster and assess their mental health. Unlike an experiment, in a cross-sectional study, participants are not deliberately exposed to any IV treatment, so there are seldom ethical issues.



An example of a cross-sectional study that uses random sampling and an independent groups design. The cross-sectional study enables comparison of one or more variables in existing groups at a single point in time.

Cross-sectional studies also provide a useful means of determining the prevalence of a variable of interest within a population (or subgroups) and for identifying relationships that can then be more rigorously studied using other research methods. A major limitation of cross-sectional studies is that a cause–effect relationship between variables cannot be tested or determined.

In addition, when age differences are studied, variables other than age can influence the results. Differences found between age groups may be due to factors other than age such as the particular backgrounds and life experiences of participants in each age group. For example, genetic make-up, number of siblings, family environment and schooling can cause differences in a cross-sectional study of language development in young children.

learnMORE | Longitudinal studies – tracking changes over time

A longitudinal study tracks the same group (or groups) of people over an extended period of time, observing changes that occur in behaviour and/or mental processes at several points in time. Some longitudinal studies are relatively brief, lasting for 1 to 2 years; others can last a lifetime.

Usually, the same group(s) of participants is studied and re-studied at regular intervals, thereby involving a non-experimental, within subjects design. For example, *Growing up in Australia: the Longitudinal Study of Australian Children* is being conducted by the Australian Institute of Family Studies in conjunction with other organisations. The study commenced in 2004 and follows the development of 10 000 children and families from all parts of Australia. There are two groups with about 5000 in each — families with 4- to 5-year-old children and families with infants aged 0 to 1 years.

The study is investigating the contribution of children's social, economic and cultural environments to their adjustment and wellbeing. Parents, childcare providers, teachers and the children themselves provide information. Families are visited for a face-to-face interview every two years. Various aspects of the children's development are also measured, including their physical development, emotional wellbeing, and intellectual and social development.

The longitudinal method is particularly useful when studying development within certain periods or across the entire lifespan. These studies provide information to help psychologists understand changes in behaviour and mental processes over time. For example, whether intelligence test scores (IQ) change with age or remain stable, whether temperament remains relatively unchanging after birth, whether memory declines with age, whether regular physical or mental exercise inhibits the onset of a dementia such as Alzheimer's disease, risk factors that may be associated with parents not reading to their children at certain ages, how identical twins reared together or apart may differ on a variety of variables, or how symptoms of a mental health disorder may progress over time. Because longitudinal studies use the same group(s) of participants, they also allow researchers to study the ways in which early development *may* influence later development.

The longitudinal method also has limitations. For example, it can be expensive and take a long time to get results. Keeping in touch with the same group over a long period of time can also be difficult — participants may lose interest in a study and withdraw, move to another location where they are unable to be contacted, or even die.

						Cross-sectional study
						Participant's age
						5 years 10 years 15 years 20 years
Longitudinal study	Participant's age	5 years	10 years	15 years	20 years	25 years
	Year of testing	2005	2010	2015	2020	2025

In a longitudinal study, the same participants are tested at different points in time over an extended period (e.g. 2005, 2010, 2015, 2020, 2025). In contrast, for a cross-sectional study investigating age-related differences, different participants in different age groups are tested at a single point in time (e.g. 2025).

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Weblink Growing Up in Australia: The Longitudinal Study of Australian Children

learnMORE | Human Research Ethics Committees

The National Statement requires that all research that carries more than a low level of risk to human participants must first be reviewed and approved by an ethics committee. This type of committee is formally called a *Human Research Ethics Committee* (*HREC*).

A HREC has a minimum of eight members, with a mix of researchers and non-researchers (including community members). Its main purpose is to assess research proposals for approval purposes, and then monitor the conduct of the research (if approved) to ensure all relevant ethical standards are adopted and followed.

Generally, the roles and responsibilities of the HREC include:

- deciding whether a research proposal meets all the requirements of the National Statement and is therefore ethically acceptable
- deciding whether the researcher(s) is adequately experienced and qualified (or the researcher is supervised by a qualified person if there are concerns about their experience and qualifications)
- monitoring approved research (e.g. through progress reports, random inspections of research sites, interviews with participants)
- handling complaints (e.g. from participants, the wider community)
- ensuring the researcher is accountable (e.g. the researcher understands, accepts and maintains responsibility for all aspects of their research).

If the committee is satisfied that all ethical questions and issues raised by the research have been dealt with satisfactorily, approval will be given for the research to proceed. If the committee has concerns about some aspects, it can highlight these and return the application to the researcher so the concerns can be addressed, possibly with suggestions on how. If the proposal has ethical issues that cannot be addressed, then the research will not be allowed to proceed.

HRECs are usually established by organisations (public, not-for-profit or private) that conduct a considerable amount of research involving humans. Universities and hospitals are the most common of these organisations. Not all organisations which conduct human research, however, have their own HREC. Some organisations and individual researchers use the services of HRECs within another organisation.

Human research considered to be at a low level of risk, where the only foreseeable risk is one of discomfort, does not have to be submitted to a HREC. In such cases, a research proposal may be reviewed by ‘a competent person or group’ familiar with the National Statement and other relevant ethical standards.

The NHMRC also requires the use of ethics committees for research involving animals. These are called Animal Ethics Committees (AECs) and members have roles and responsibilities similar to those of HRECs.

learnMORE | Sample consent form for research participants

SAMPLE ONLY

CONSENT FORM TO PARTICIPATE IN RESEARCH

TITLE OF RESEARCH: ....

DESCRIPTION OF RESEARCH: Insert an outline of the research and other relevant information. Include:

- aim/purpose/reasons for the investigation
- method used to collect data
- how the data will be analysed, described and presented
- what the participants will need to do and time commitment
- how confidentiality will be maintained
- whether the participant will have a chance to see and comment on the final report
- what will happen to the final report
- who will read the report and have access to it
- withdrawal right
- name(s) of researcher(s), supervisor/teacher and school
- status of the researcher(s).

I, ..., consent to taking part in the research investigation described above. I understand my rights as a participant in this research. The aim and procedures of the study have been explained to me and I understand them.

[*Where deception is used a clause such as the following should be included.*]
I understand that it is sometimes essential for the validity of research results not to reveal the true purpose of the research to participants. If this occurs, I understand that I will be debriefed as soon as is possible after my participation and, at that time, given the opportunity to withdraw from the research and have records of my participation deleted.

I have been advised the results of the research will be presented in a formal written report but that my personal details will remain confidential.

I voluntarily consent to participate but I understand that I may discontinue participation from the study at any time without giving a reason.

If you have any questions, comments or complaints to make on this research, please contact [*insert the researcher's name and/or the Psychology teacher's name*] at [*insert the researcher's and/or the Psychology teacher's contact details, including phone number(s)*].

Name of Participant: ....

Signature: ....

Name of Researcher: ....

Signature: ....

Date: ....

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Teacher weblink Template for psychology research consent forms 1
Template for psychology research consent forms 2

learnMORE | Australian Privacy Principles

The *Privacy Act 1988* is an Australian law that regulates the handling of personal information about individuals. This includes the collection, use, storage and disclosure of personal information, and access to and correction of that information.

Personal information is information or an opinion about any individual who can be identified; for example, information about someone's racial or ethnic origin; health; genetics; political opinions; religious beliefs and sexual orientation or practices (Office of The Australian Information Commissioner, 2017).

The Privacy Act includes 13 *Australian Privacy Principles* (APPs) which set out standards, rights and obligations for the handling of personal information, some of which apply to psychology research. The APPs include requirements such as:

- *Open and transparent information management* — how personal information will be handled must be clearly expressed and made available
- *Anonymity* — ensure individual participants cannot be personally identified
- *Data collection* — collect personal information only if necessary; ensure informed consent
- *Data use* — use only for the purposes specified
- *Data quality* — ensure information is accurate, complete and up to date
- *Data security* — protect the information (e.g. from loss or unauthorised access) and destroy or permanently de-identify personal information if no longer needed.

learnMORE | Safety and wellbeing in VCE Psychology

As part of this study, teachers and students may be involved in teaching and learning activities that may include potentially sensitive topics. VCE Psychology is informed by a strengths-based approach and teachers should ensure students are supported to develop knowledge and skills that nurture their own health and wellbeing. Teachers should ensure that students have opportunities to consider topics systematically and objectively, and to become aware of the diversity of views held on such matters. Students should not be asked to disclose personal information about their own or others' health status and behaviours and students should be provided with information as appropriate about sourcing available support services within and outside school.

VCE Psychology engages students in critical inquiry processes that assist them to research, analyse, apply and appraise psychological knowledge and research. It is important however that students are clearly and specifically advised that they are neither trained nor equipped to diagnose problems, including their own, or offer any counselling or therapy. Teachers and students may consider different psychological assessments including standardised psychological tests, which are designed to be administered only by trained psychologists, but teachers must limit access to such tests and ensure that students understand that such tests should only be administered by a qualified psychologist.

It is the responsibility of the school to ensure that duty of care is exercised in relation to the health and safety of all students undertaking the study. Teachers and students should observe appropriate safety precautions when undertaking practical work. All laboratory work should be supervised by the teacher. It is the responsibility of schools to ensure that they comply with health and safety requirements.

Relevant acts and regulations include:

- *Occupational Health and Safety Act 2004*
- *Occupational Health and Safety Regulations 2017*
- *Occupational Health and Safety Management Systems (AS/NZ 4801)*
- *Dangerous Goods (Storage and Handling) Regulations 2012*
- *Dangerous Goods Storage and Handing Code of Practice 2000*
- *Hazardous Substances Code of Practice 2000*
- *Electrical Safety Act 1998*

Source: VCE Psychology Study Design: 2023-2027, pp.9

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Weblink VCAA Psychology Study Design

learnMORE | Animals in psychological research

Although psychology is primarily interested in people, about 7–8% of psychological research involves the use of animals. About 90% of the animals used have been rodents and birds, mostly rats, mice and pigeons. About 5% of the animals are monkeys and other primates. The use of dogs and cats is rare (APA, 2017).

Research with animals has and continues to have an important role in psychology. Discoveries through animal research have advanced our understanding of human behaviour and mental processes in a diverse range of areas. For example, behavioural and bodily changes that occur when stressed; basic learning processes; the neurobiology of learning and memory; processes of recovery after neural damage; brain plasticity; mechanisms that control hunger and thirst; behavioural and psychological effects of medications used in the treatment of various mental disorders; addiction to illegal drugs; how the senses function and physiological influences on perception; the critical role of early experience in development; attachment; aggression; emotion and cognition (APA, 2017).

About 7–8% of psychological research involves the use of animals.

The main reasons animals are used in psychological research to achieve the kinds of benefits described are:

- Some studies cannot be conducted with humans due to the risk of psychological and/or physical harm that may be caused, or because suitable human participants are unavailable. Various examples are included throughout this text.
- Bodily systems and/or behaviours of some animals are similar to those of humans; therefore, using animals can be a ‘starting point’ for learning more about human behaviour.
- Animals have practical advantages over people for use as research participants. For example, studying the effects of ageing from birth through to ‘old age’ is not generally practical in humans because most people live more than 75 years, compared with rats which have an average life expectancy of 2 years, or monkeys which live for 15–20 years. Another advantage is that some animal species breed a lot faster than humans. For instance, rats produce a new generation every three months and can be used to study the development of certain behaviours over successive generations within a relatively short period of time. Animals can also be kept for long periods of time in captivity in laboratories and it is easier to observe their behaviour under these conditions.
- The behaviour of animals can usually be controlled to an extent not possible with human participants. For example, a rat can be raised from birth in a cage. The rat can then be used in a learning experiment and the psychologist will have a good idea of what it has already learned before the experiment is conducted.
- When certain experiments require large numbers of participants who have, for example, the same genetic background, animals are more easily obtained than humans.
- Participant expectations can influence the results of an experiment; however, animals don’t usually have expectations and they are not able to guess the purpose of an experiment.

Many arguments have been presented against the use of animals in psychological research. One argument is that it is not possible to generalise the results of animal studies to humans because the species are not the same even though there may appear to be similarities. An issue for researchers is how far they can generalise about human mental experiences and behaviour from the results of animal studies. If laboratory animals die after prolonged sleep loss, would humans? If a drug causes a brain disorder in animals, should it be banned for human use? Another argument is that humans should respect animals and protect them from harm rather than use them in research. It is also suggested that humans do not have the right to dominate other species.

In order to ensure that all reasonable steps are taken to minimise the discomfort, illness and pain to animals used in research, ethical guidelines have also been established for the use of animals in research. The use and care of laboratory animals must be directly supervised by a person competent to ensure their comfort, health and humane treatment. Importantly, the care and use of animals in research in Australia is governed by the NHMRC *Australian code for the care and use of animals for scientific purposes 8th edition (2013).*

The purpose of the Code is ‘to promote the ethical, humane and responsible care and use of animals for scientific purposes’. An obligation to respect animals is central in the Code.

According to the Code (p.1), ‘This obligation brings with it a responsibility to ensure that the care and use of animals for scientific purposes is ethically acceptable, balancing whether the potential effects on the wellbeing of the animals involved is justified by the potential benefits to humans, animals or the environment. The use of animals for scientific purposes must have scientific or educational merit; must aim to benefit humans, animals or the environment; and must be conducted with integrity. When animals are used, the number of animals involved must be minimised, the wellbeing of the animals must be supported, and harm, including pain and distress, in those animals must be avoided or minimised.’

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Weblink NHMRC Code for research using animals

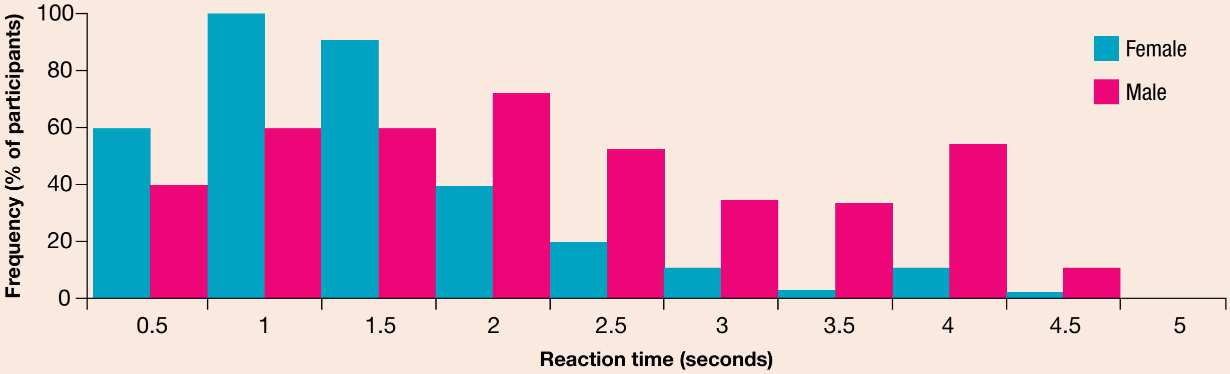
learnMORE | Histograms and pie charts

A histogram is a graph that shows the frequency with which a particular score (or range of scores) occurs in a set of data. It usually has the types of categories (e.g. sex, age groups) plotted on the horizontal (X) axis and the frequency (how often/many of each score) plotted on the vertical (Y) axis. Rectangular bars are used to indicate the frequency of a particular score and each rectangular bar is the same width, as shown below.

Histograms look like bar graphs but they differ in two main ways — first, in histograms the bars touch; second, the type of information or variables described on the X axis is continuous and usually numerical, such as age, time or the amount of something. Thus, the X axis of a histogram can be plotted as individual numbers (e.g. 0.5) or as intervals (e.g. 0.5–1, 1–1.5 etc.).

For example, a histogram could be used to show the data collected in an experiment on sex differences in reaction time. The experimenter wanted to find out if there are sex differences in how quickly information passes from the eye to the brain and then on to the hand, so they conducted an experiment. The experimenter measured reaction time for how quickly male and female participants responded to a red light appearing among written text on a computer screen. Participants were asked to press the space bar on the keyboard as soon as they saw the red light. The time taken from the appearance of the red light to pressing the space bar was electronically recorded. As shown below, the data collected for the two groups of participants was presented in the same histogram using a different colour or pattern to identify the responses of different groups.

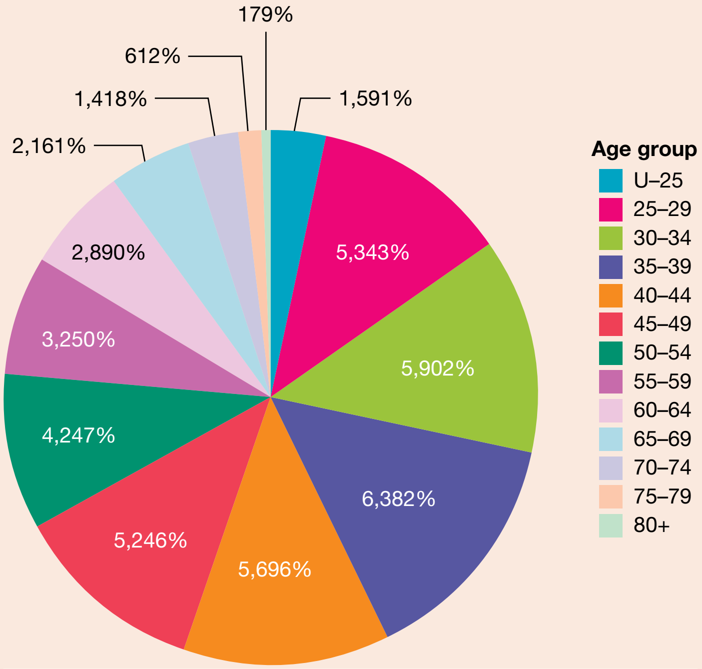
A pie chart (or pie graph) is a circular diagram that shows the proportions of values or scores for different categories of data. Each category is shown as a 'slice of the pie'. The different-sized 'slices' represent the differences between categories. As shown below, a pie chart doesn't use a set of axes to plot data and the data are usually shown as percentages.



An example of a histogram showing sex differences in reaction time.

A pie chart is best used to compare different parts of the same whole, particularly when there is a relatively small number of categories. The circle of a pie chart represents the whole, or 100%. Each portion ('slice of the pie') within the circle represents a part of that 100%. In this way, it is possible to see how something is divided up according to categories. In the example below, a key is used to indicate each category ('slice') of the graph and the percentage for each category is clearly shown.

A pie chart can easily be constructed with Microsoft Excel®, or similar software, to clearly show each category and its respective percentage. A pie chart can also be drawn by hand using a compass to construct the circle and a protractor for each portion of the circle. The circle is equivalent to 360° and each portion of the pie chart is calculated as a percentage of 360°, with 1% being equivalent to 3.6°. For example, if 20% needs to be represented in the pie chart, then 20% of 360° is 72° (or $20 \times 3.6° = 72°$). Within the pie chart, 72° would be a slice equivalent to 20% of the whole area of the pie.



An example of a pie chart showing the age groups of people registered as psychologists in Australia (on 30 June 2022).

UNIT

1 How are behaviour and mental processes shaped?

AREA OF STUDY 1

What influences psychological development?

2 The complexity of psychological development

3 Defining and supporting psychological development

AREA OF STUDY 2

How are mental processes and behaviour influenced by the brain?

4 Role of the brain in mental processes and behaviour

5 Brain plasticity and brain injury

On completion of this unit, the student should be able to:

OUTCOME 1

Discuss complexity of psychological development over the life span, and evaluate ways of understanding and representing psychological development

OUTCOME 2

Analyse the role of the brain in mental processes and behaviour and evaluate how brain plasticity and brain injury can change biopsychosocial functioning

Source: © VCAA, *VCE Psychology Study Design: 2023–2027.* pp.23–25.

Key knowledge

2 The complexity of psychological development

- the interactive influences of hereditary and environmental factors on a person's psychological development
- the biopsychosocial approach as a model for considering psychological development and mental wellbeing
- the process of psychological development (emotional, cognitive and social development) over the course of the life span
- the role of sensitive and critical periods in a person's psychological development

3 Defining and supporting psychological development

- the usefulness, and limitations, of psychological criteria to categorise behaviour as typical or atypical, including cultural perspectives, social norms, statistical rarity, personal distress and maladaptive behaviour
- the concepts of normality and neurotypicality, including consideration of emotions, behaviours and cognitions that may be viewed as adaptive or maladaptive for an individual
- normal variations of brain development within society, as illustrated by neurodiversity
- the role of mental health workers, psychologists, psychiatrists and organisations in supporting psychological development and mental wellbeing as well as the diagnosis and management of atypical behaviour, including culturally responsive practices

4 Role of the brain in mental processes and behaviour

- different approaches over time in understanding the role of the brain in behaviour and mental processes
- the roles of the hindbrain, midbrain and forebrain, including the cerebral cortex, in behaviour and mental processes

5 Brain plasticity and brain injury

- the capacity of the brain to change in response to experience and brain trauma, including factors influencing neuroplasticity and ways to maintain and/or maximise brain functioning
- the impact of an acquired brain injury (ABI) on a person's biological, psychological and social functioning
- the contribution of contemporary research to the understanding of neurological disorders
- chronic traumatic encephalopathy (CTE) as an example of emerging research into progressive and fatal brain disease

Source: © VCAA, *VCE Psychology Study Design: 2023–2027.* pp.23–25.

2 The complexity of psychological development

TOPIC CONTENT

2.1 Overview

KEY KNOWLEDGE

- the interactive influences of hereditary and environmental factors on a person's psychological development
- the biopsychosocial approach as a model for considering psychological development and mental wellbeing
- the process of psychological development (emotional, cognitive and social development) over the course of the life span
- the role of sensitive and critical periods in a person's psychological development

Source: © VCAA, *VCE Psychology Study Design: 2023–2027*. p.24.

Consider some of the things you do almost daily. You tell the time, make plans, check your social media, send a text message, go to an online site, buy something, use your imagination, interact with friends, acquaintances and others, wonder about what you might do in the evening, set an alarm and decide when to go to bed. All of these involve psychological, or 'mental', processes. When you were born, you were unable to do any of these.

So how did you acquire the knowledge and skills to engage in these activities and the many others of which you are capable? When did you develop these abilities? What role do biological processes such as your genetic make-up play in enabling you to engage in these types of activities? What role do environmental factors play; such as the influence of your family, friends, culture and society in general?

There are things about each of us that are like all other people, there are things about each of us that are like some others, and there are also things about us that are unique to each one of us, and like no others. What psychological characteristics do we share with others and what characteristics are unique to each one of us? What aspects of who we are remain the same for all of our lives and what aspects change? What influences our development in lasting rather than temporary ways? These are some of the many questions considered in the study of psychological development across the life span.

In this topic we consider normal processes of psychological development and functioning, focusing on aspects of our emotional, cognitive and social development. These are considered using the biopsychosocial approach as a model, which takes account of the diverse range of influences that shape our development and wellbeing.

2.1.1 Defining development

Psychologists generally use the term **development** to refer to changes in an organism (human or animal) that occur over time. Many who study development focus on **life span development** — from birth through to and including old age. Many changes also occur during the 9 months or so that the fetus is developing in the uterus. In humans, these are some of the most dramatic changes but they are primarily physical. Psychologists focus

Figure 2.1 Development involves change and takes place throughout the entire life span.

mainly on development after birth. However, this doesn't mean that in utero development is not important or that in utero experiences do not affect development after birth.

Psychologists who study life span development aim to understand, describe, explain and predict the many ways in which our thoughts, feelings and behaviour change throughout our lives. A change must be relatively permanent or 'lasting' to be considered a *developmental* change. For example, a short-term loss of memory as a result of a sporting injury, or an improvement in mood after receiving good news are not considered to be developmental changes. Both of these are changes, but they are only temporary and therefore not developmental changes.

In psychology, the study of life span development covers both relatively permanent changes which are common to all individuals, as well as changes which differ between individuals. Knowing the kinds of changes that might be expected at different times assists understanding of what is 'normal' (or 'typical'), what is 'not normal' (or 'atypical') and consequently whether professional assistance should be sought.

Psychologists also use the results from their research on human development to suggest how desirable changes can be best achieved and how undesirable changes can be avoided or overcome. For example, research studies with older people have found that keeping mentally active through regular reading and doing crossword puzzles, Sudoku puzzles and the like, can help maintain mental alertness. Undertaking a variety of novel (new), mentally challenging activities (and coupling with physical exercise) may also help reduce age-related decline in brain function, and possibly even delay the onset of Alzheimer's disease and other forms of dementia.

Although it is defined quite simply, human development is extremely complex. It involves many different aspects and is influenced by many different factors throughout the life span.

2.1 LEARNING ACTIVITY 1

Review

1. Define development as it is used in psychology.
2. Explain the meaning of developmental change compared to other types of change.
3. For each individual in the following table, state whether the thought, feeling or behaviour would be considered a developmental change (D) or would not be considered a developmental change (ND). Give a reason for each answer.

Person	Kind of change	Reason
a. An 8-month-old infant cries whenever her mother leaves the room		
b. A 6-year-old boy has learned to play chess		
c. A 10-year-old girl now feels confident about sleeping away from home without becoming homesick		
d. A 28-year-old male believes he is ready to move out of his family home and live independently away from his parents		
e. A 50-year-old male cannot remember anything while anaesthetised during surgery		
f. A 70-year-old female has learned how to use a smart phone to access the internet		

4. Give an example of a change you have experienced which would be considered a developmental change and a change that you have experienced which would not be considered a developmental change.

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2.1.2 Areas of development

Generally, psychologists classify changes which take place through the life span in terms of four broad areas: emotional, cognitive, social and physical.

Emotional development involves changes in how an individual experiences different feelings and how these feelings are expressed, interpreted and dealt with; for example, the way in which anger is expressed by a 2-year-old, compared with a 16-year-old or an 80-year-old person.

Cognitive development involves changes in an individual's mental abilities, such as reasoning, problem-solving, decision-making, perception, learning, memory and use of language.

Social development involves changes in an individual's relationships with other people and their skills in interacting with others, such as the ability to form and maintain close relationships with others in a group situation.

Physical development involves changes in the body and its various systems, such as development of the brain and its nervous system, bones and muscles, motor skills, and the hormonal changes of puberty and menopause.

Many of the changes associated with physical development, such as growth (height and weight), movement (crawling and walking) and changes in physical appearance (such as pimples and body hair), can be directly observed. In contrast, changes associated with emotional, cognitive and social development involve mental processes that occur within the individual and are therefore not directly observable. Psychologists are primarily interested in emotional, cognitive and social development and tend to refer to these collectively as *psychological development*.

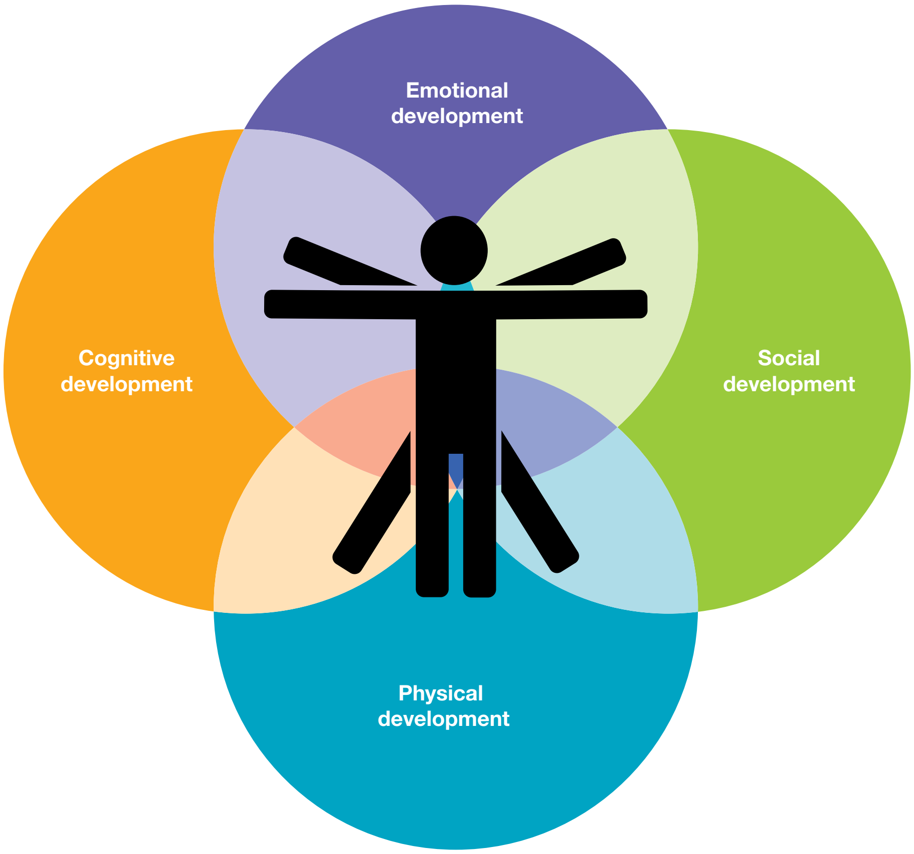

Figure 2.2 Human development is influenced by simultaneously occurring changes in emotional, cognitive, social and physical characteristics. Emotional, cognitive and social development are referred to collectively as psychological development. Many of the changes associated with physical development underlie and influence psychological development.

2.1.3 Interaction of different areas of development

VCE Psychology focuses on psychological development. However, physical development and psychological development do not occur independently of each other. How you think or feel can influence your physiological state in both subtle and more obvious ways. For example, consider people with the eating disorder anorexia nervosa, who may control their diet in dangerous ways because of the thoughts and feelings they have about their body image. The consequences of behaviours resulting from how they think and feel about body image can potentially have a harmful impact on their physical wellbeing, both in the short term and long term.

There are also times when your physical condition influences your thoughts and feelings, including how you think and feel about other people. For example, when you are feeling sleep deprived or stressed you may 'snap' at a friend or at a teacher in response to criticism, something you wouldn't do at a time when you were not feeling tired or stressed. Consider also cases involving people with physical disabilities and how having a disability may affect one's thoughts, feelings and social behaviour in lasting ways.

These examples highlight the complexity of human development, particularly psychological development. Although the different areas of development are interdependent and many changes occur simultaneously, psychologists often focus on specific areas and/or stages of development for research purposes. Similarly, textbooks such as this one usually present different areas and stages of development separately. This is intended to help simplify the study of how and why individuals change. However, you need to keep in mind that, in reality, divisions between different areas and stages of development are not so clear cut and that you are studying aspects of a *whole* person.

Figure 2.3 Inferences about underlying psychological processes are made from observable behaviour. What can be assumed about the cognitions or emotions being experienced by each child in this photo?

2.1.4 Stages of life span development

Psychologists specialising in the study of human development often divide the life span into age-based stages. This is mainly for the purposes of study, research or to describe age-related changes. Commonly used names of stages and estimates of their approximate time frames are:

infancy: birth–2 years

childhood: 2–12 years

adolescence: 12–20 years

early adulthood: 20–40 years

middle age: 40–65 years

older age: 65 years and beyond.

The age range for each stage provides only a very general idea of when each stage begins and when it ends. Each stage should not be considered as starting and ending precisely at the age shown. For example, a person doesn't suddenly move into early adulthood on their twentieth birthday. Individuals differ in terms of the age at which they move from one stage of development into the next. An individual's stage of development will also depend on the age-classification system used by the psychologist. For example, some psychologists define adolescence starting at age 13 and there is an increasing tendency to refer to it as ending in the mid-20s with full brain development.

While describing human life span stages in terms of labels and age ranges can be useful in understanding when in the life span particular changes tend to occur, some psychologists consider the age-related stages of limited relevance. They believe that individuals differ too much in their psychological development and that categorising psychological development into age-related stages does not reflect this.

Figure 2.4 Adolescence is not viewed as a distinct life span stage in all cultures. For example, in some indigenous cultures, a child is considered to become an adult as soon as puberty is reached and a series of initiation rituals has been performed.

For example, many psychologists prefer to refer to adolescence more generally as the time between puberty and adulthood. Furthermore, the 'older age' stage is often described as two different stages called 'old age' and 'very old age' to reflect the fact that people are living much longer in many societies with improved health care.

In learning about the various changes that occur in each stage of the life span, it is important to keep in mind that the changes identified for each stage apply to many individuals, but not all. In addition, the kinds of changes that occur in each stage can vary considerably in different cultures and sub-cultures.

2.1.5 Developmental norms

Based on extensive research findings, psychologists have described the usual development of various characteristics and abilities such as speech and language use, emotional expression and social abilities at different times in the life span. These descriptions are called developmental norms. **Developmental norms** show the typical characteristics or abilities and expected levels of achievement associated with a particular age or stage of development.

Developmental norms are compiled by measuring a characteristic or ability in a large representative sample of the population to whom the norm is relevant. Norms, such as average vocabularies, knowledge base or memory spans, are then determined, often based on a simple, mathematical calculation of the average, or mean.

For example, to establish the norms for intelligence of Australians aged 2- to 16-years-old, the IQ of large samples of 2- to 16-year-olds would be measured and the mean IQ calculated for each age group. Care must be taken to ensure the composition of the sample is representative of all Australian 2- to 16-year-olds. For instance, the sample for each age group would include people of different sexes, ethnic backgrounds, socioeconomic backgrounds, geographical areas, schooling experiences and other relevant characteristics in proportions similar to the target population from which the sample is drawn.

As well as describing patterns of development which reflect average developmental trends, norms provide a way of comparing an individual's development with that of others in the same age group. Comparison can give information on the progress of development in relation to what is 'the average' or 'typical' for people in an age group. This is useful to professionals such as psychologists, paediatricians and teachers who monitor the psychological progress of individuals.

If the normative sample is not representative, comparisons may not be valid. For example, it would be misleading to compare the language development of children of non-English-speaking backgrounds with norms based only on a sample of children with English-speaking backgrounds.

Nor would it be appropriate to compare the intelligence test scores of Aboriginal and Torres Strait Islander children against norms that exclude this cultural group. In addition, the intelligence test itself may be culturally biased in ways that produce inaccurate scores for Aboriginal and Torres Strait Islander people. For example, the types of items used in the test may discriminate against this group and therefore produce lower scores than for the normative group for reasons others than intellectual ability.

Norms do not tell us what is 'ideal development', nor do they explain development. They merely describe development, indicating what is the *average* developmental tendency for a large number of people. Norms are averages, but there is no 'average' child. Though a useful guide for comparison purposes, their usefulness for assessing the developmental progress of an individual is limited because of variations which occur due to the uniqueness of each individual.

When you look at normative charts with ages for when children crawl, walk, speak in sentences and so on, you must remember that deviations from the average are not unusual. Small variations should not be a cause for concern. Only large variations should be discussed with a doctor or psychologist. If a child's development is too far away from the average it may require some kind of intervention. For example, a child who is either well above or well below average in some important aspect of their development may benefit from being treated differently from the way they are usually treated.

Figure 2.5 Developmental norms show the typical characteristics or abilities, such as spoken vocabulary, and expected levels of achievement associated with a particular age or stage of development.

Table 2.1 Example of norms for spoken (expressive) vocabulary

Age	Average number of words
12 months	2 words plus mummy and daddy (or equivalent in languages other than English)
18 months	10–50 words
2 years	300 words
2.5 years	450 words
3 years	1000 words
4 years	2000 words
5 years	5000 plus words
17 years	36 000 to 136 000 words

Source: Department of Education and Training (2019). *Concept development and vocabulary: Key developmental milestones*. Retrieved March 9, 2022, from https://www.education.vic.gov.au/childhood/professionals/learning/ecliteracy/interactingwithothers/Pages/conceptsdevelopmentandvocabulary.aspx#link59

Table 2.2 Example of norms for early speech development

Age	Speech development
0–3 months	Communicate by crying, cooing, smiling, and making eye contact
3–6 months	Communicate by crying, cooing, smiling, making eye contact, pointing, blowing raspberries and laughing
6–9 months	Communicate by babbling, using sounds made with the lips (e.g. *b* and *m*) in sequences like 'baba' and later 'bamada'
9–12 months	Communicate by babbling, using more sounds (e.g. *d*, *m*, *n*, *h*, *w*, *t*); around 12 months begin to use words but often can't say words the same way as adults do and often simplify words (e.g. *biscuit* becomes '*bi*')
1–2 years	Huge development in speech sounds; by 2 years, can say a range of speech sounds when talking (e.g. *p*, *b*, *m*, *t*, *d*, *n*, *h*, *w*) and there is a tripling of number of words that can be said; at 2 years, family and friends should understand half of their speech
2–3 years	By 3 years, can say even more sounds (e.g. *k*, *g*, *f*, *s*, *ng*); at 3 years, family and friends should understand most speech
3–4 years	By 4 years, can say most sounds correctly, including many consonant clusters, which are combinations of two or more sounds (e.g. *tw*, *sp*, *gl*) and many vowel sounds in words (e.g. *ay*, *oh*, *ee*).
4–5 years	By 5 years, anyone should understand the child's speech nearly all of the time.

Source: Based on Speech Pathology Australia (2016). *The sounds of speech* [Fact sheets]. Retrieved February 2, 2022, from https://www.speechpathologyaustralia.org.au/

on Resources

Teacher digital document Practical activity — variations in development within individuals

2.1 LEARNING ACTIVITY 2

Review

1. a. Name and describe three broad areas of psychological development and give an example of a developmental change that occurs within each area.
   b. In which of the three areas of development would the collection of psychological characteristics called 'personality' be categorised, or should it have its own category? What about moral development which involves change over time in our understanding of right and wrong?
   c. Suggest another aspect of psychological development like those in (b) above which raise questions about their classification in one of the three areas.
2. Developmental changes occur simultaneously in different areas. Explain the meaning of this research finding with reference to an example.
3. Give an example of a developmental change you have experienced that could be described as quantitative and one that could be described as qualitative.
4. a. What are developmental norms?
   b. Outline a potential benefit and a potential limitation of organising and describing the development of human psychological characteristics in terms of age- or stage-related changes.

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2.1 LEARNING ACTIVITY 3

Data analysis — Comparing developmental data on two individuals

1. The following table contains data on the development of two individuals. These data show ages at which various developmental milestones were identified by the parents of each child.

Milestone	Annabelle	Habib
first social smile	4 mths	2 mths
first word	8 mths	10 mths
first cried in response to mother being out of sight	9 mths	11 mths
first counted	18 mths	22 mths
first sang a song	2 yrs	2 yrs 2 mths
played interactively with another child	3 yrs 10 mths	3 yrs 4 mths
read independently	4 yrs 6 mths	5 yrs 6 mths

Answer the following questions with reference to the data.

a. i. Which developmental milestones did Annabelle reach first?
   ii. Which developmental milestones did Habib reach first?
b. What do the data indicate about the variations in psychological development between individuals?
c. i. Categorise the data into the three areas of psychological development — cognitive, social and emotional, or use one or more other categories of your own.
   ii. Compare the data of the two children. What conclusions might be drawn when comparing each child in terms of cognitive, social and emotional development (or any other category you may have used)?
d. What are some possible explanations of differences in terms of sociocultural factors?
e. Would it be accurate to explain the differences in terms of sex? Give a reason to explain your answer.
f. To what extent could the data be said to apply to other children of about the same age as Annabelle and Habib? Give a reason to explain your answer.

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2.2 Interactive influences of hereditary and environmental factors

Human psychological development is a complex process that is subject to many different influences throughout the entire life span. The various factors influencing development of our psychological characteristics have traditionally been classified into one of two broad areas — heredity (nature) and environment (nurture).

2.2.1 Hereditary and environmental factors

Heredity involves the transmission of characteristics from biological parents to their offspring via genes at the time of conception. At conception, the male's sperm cell fertilises the female's egg cell (ovum). Both the sperm and ovum have chromosomes which carry the genes from each parent. During fertilisation, the sperm and ovum combine to form a new cell (zygote) with a unique combination of genes.

It is well established that the genes we inherit from our parents influence many aspects of our physical development; for example, our blood type, eye and hair colour and the likelihood of developing certain physical diseases or disorders. Our genes also influence less obvious aspects of our physical development, such as the rate at which our brain and nervous system will grow and mature, the course of their growth and maturation, our brain's chemistry and functioning, and when certain hormones will be produced, such as those that trigger the onset of puberty.

Given the important roles our brain, nervous system and hormones play in our thoughts, feelings and behaviour, it is evident that our genes also influence our psychological development. For example, it is clear that the more complex psychological characteristics, such as intelligence and personality, have a genetic component and are therefore influenced to some extent by heredity.

As with physical diseases and disorders, genes are also believed to influence the onset of some psychological or 'mental health' disorders. For example, schizophrenia, depression and addictive use of certain types of drugs have all been linked to changes in brain chemistry and functioning. And, brain chemistry and brain functioning are genetically determined in a significant way. This suggests that these disorders probably have a genetic component.

However, this does not mean, for example, that a child born to a parent with schizophrenia *will* inherit schizophrenia. Rather, research evidence suggests that having a biological parent with schizophrenia will increase the *likelihood* of developing this disorder, compared with someone who does not have a biological parent with schizophrenia (Gottesman, 1991; Plomin et al., 1998).

Environmental factors also play an important role in shaping psychological development. In psychology, the term **environment** is used to refer to all the experiences, objects and events to which we are exposed throughout our entire lifetime.

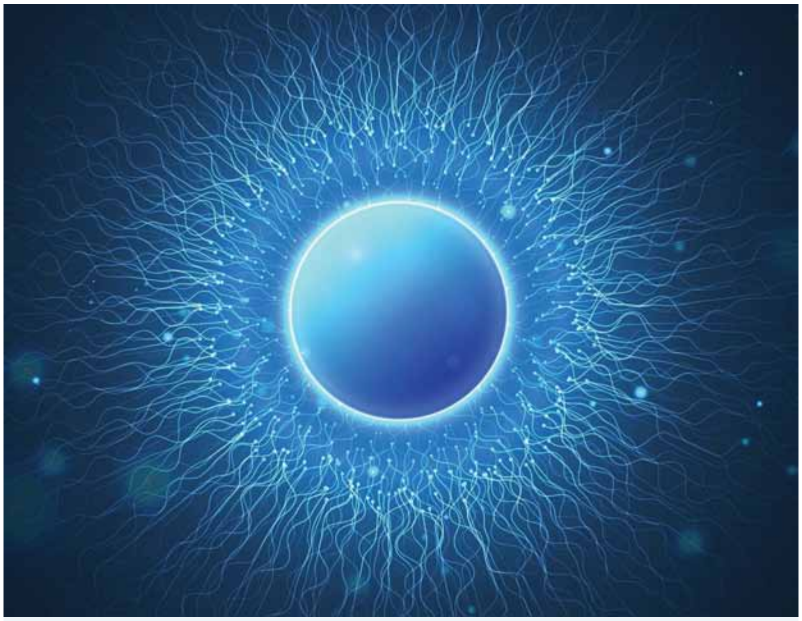

Figure 2.6 When one of the millions of sperm that surround the ovum penetrate it, conception occurs.

Environmental factors that influence psychological development include whether you have brothers and sisters, how you are brought up, your friendship groups, schooling, job, income level, housing, whether you have a partner, your religion, ethnic origins, what you are exposed to in the print or electronic media, your use of social media, whether you experience a major stressful life event, your health, and other personal and sociocultural factors.

The influence of some environmental factors is less obvious or significant than others, but all can impact both individually and collectively on the kind of person we become and the psychological changes we experience during our lifetime.

2.2.2 Nature versus nurture

Many of the early psychologists believed in *either* the hereditary (nature) *or* the environmental (nurture) view of development. Those who adopted a 'biological' perspective believed that heredity primarily determined our psychological development. Some even believed that, like physical development, *every* aspect of our psychological development was determined by our genes. They believed individuals, for example, inherited their social skills, musical ability, personality and intelligence. Although some acknowledged that environmental factors could influence development of psychological characteristics, essentially who we become was considered to be 'locked in' by our genes at the time of conception.

Another group of psychologists believed that heredity had little to do with the development of psychological characteristics. These psychologists adopted a strict 'behaviourist' perspective. They believed that the environment in which an individual is raised and lives, which includes all their experiences, was primarily responsible for determining what they would become.

Behaviourists almost totally ignored the influence of genes in development. Their basic assumption was that the mind of a newborn is totally empty and the development of all thoughts, feelings and behaviour could be explained in terms of a person's learning throughout their life. Any differences between people were seen to be the result of differing environmental experiences. Most behaviourists believed that, given the 'right' environment, anything was possible; for example, someone with the abilities of Wolfgang Mozart, an Olympic gold medallist or a Nobel Prize winner could be produced, irrespective of their genetic make-up.

For many years psychologists debated whether it was heredity *or* environment that determined how we developed. This became known as the nature (*heredity*) versus nurture (*environment*) debate. Over time, research evidence has consistently shown it is neither one nor the other that is solely responsible for shaping development — *both* hereditary *and* environmental factors interact to shape human development.

Psychologists now consider the nature versus nurture debate to be resolved. They focus on trying to understand *how* hereditary and environmental factors combine or *interact* in influencing our thoughts, feelings and behaviour. Through their research, psychologists and other scientists also try to establish *how much* heredity and environment each contribute to the development of particular psychological characteristics.

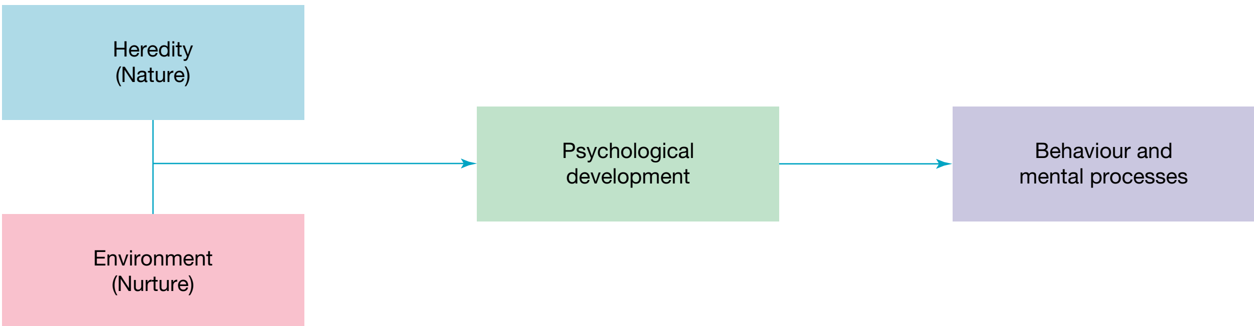

Figure 2.7 Hereditary and environmental factors interact in shaping psychological development and in influencing behaviour and mental processes.

Figure 2.8 John B. Watson (1878–1958), the founder of behaviourism. Watson (1930 p. 82) believed that anything is possible with the right environment. He is also well-known for stating: 'Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist I might select — doctor, lawyer, artist, merchant-chief and, yes, even beggar-man and thief, regardless of his talents, penchants, tendencies, abilities, vocations, and race of his ancestors.'

Psychologists are in general agreement that our individual development begins with the genetic instructions we inherit at conception and that these instructions provide the building blocks, or 'blueprint', for the development of our psychological (and physical) characteristics. The environment interacts with our inherited potential to determine how the genetic plan unfolds.

Genes do not directly activate any mental process or behaviour. Instead, they consist of DNA that contains the relevant information. The expression of this information will be influenced by numerous factors, especially environmental factors.

Almost every experience a person has in their life has the potential to impact in some way on their psychological development. However, some environmental factors exert a greater influence at some stages of the life span than in others.

The experiences that can influence one person's development may also have little or no impact on another person's development. For example, a person who has genes that may contribute to the onset of schizophrenia (called a 'genetic predisposition for schizophrenia') may not actually develop schizophrenia until they experience a major stressful life event, such as the loss of a loved one. Similarly, a person who loses a loved one and does not have a genetic predisposition for schizophrenia is less likely to develop schizophrenia (Kendler et al., 1995). The two-hit model of schizophrenia shown in Figure 2.9 was devised to illustrate the interaction between hereditary and environmental factors in the onset of schizophrenia.

As yet, the technology available to researchers is not able to detect exactly how much of a particular psychological characteristic or behaviour may be attributable to either heredity or environment. Nor do psychologists know the specific environmental factors required to interact with genes to produce a particular psychological characteristic or behaviour (Plomin et al., 1998).

However, they do know that what was the nature *versus* nurture debate is now the nature *and* nurture debate which considers the extent of the contribution of *both* nature and nurture to development. Both are essential to all aspects of psychological development. We are all active players in the process of psychological development, starting at birth. As infants, for example, we are not passive recipients of the environment, like a blank sheet of paper on which the environment writes. All the abilities and potentials with which we are born will influence our environmental experience which may then modify our development in significant ways.

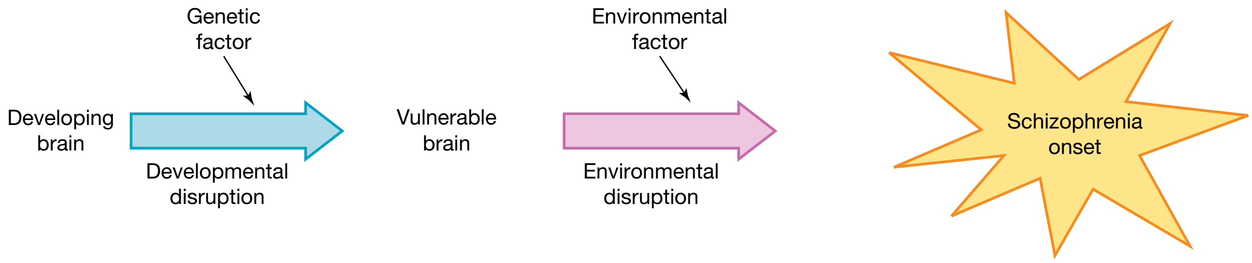

Figure 2.9 According to the two-hit model for schizophrenia, a disruption in the development of the brain can produce a vulnerability to schizophrenia, but onset of symptoms must be triggered by an environmental factor, specifically a major stressful life event such as ongoing exposure to a dysfunctional family environment, experiencing abuse and being involved in a traumatic event. Of course, there are other models and theories that have been devised to explain schizophrenia, with the most useful ones taking account of both hereditary and environmental factors.

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learnMORE | Nature vs nurture

- Twin studies and adoption studies
- Role of maturation in development

Access learnON to read about how researchers have investigated the relative influences of heredity and environment and/or to read about the role of maturation in development.

on Resources

Weblink	Mini-documentary demonstrating the interaction of nature versus nurture in development 6 m 15 s
Teacher weblink	TEDx video presentation on the relative influences of nature and nurture 13 m 51 s

2.2 LEARNING ACTIVITY 1

Review

1. Define heredity and environment as used in psychology.
2. Briefly explain, with reference to an example, how hereditary and environmental factors can influence psychological development.
3. What is the main focus of contemporary psychologists interested in the role that heredity and environment play in shaping psychological development?
4. Construct a table with two columns, one with the heading 'Heredity' and the other with the heading 'Environment'. In each column, list several psychological characteristics which you think are more likely to be influenced by either heredity or environment.

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2.2 LEARNING ACTIVITY 2

Multiple-choice questions

1. Psychological development is best described as
   - A. increasing maturity over time.
   - B. the process of learning something new.
   - C. a series of changes that occur over the life span.
   - D. all temporary and permanent changes that occur over the life span.
2. Progressive improvement in the ability to solve Maths problems throughout the primary school years is an example of ______ development.
   - A. emotional
   - B. cognitive
   - C. social
   - D. physical
3. Psychological development is
   - A. the same for all individuals.
   - B. determined by the age of the individual involved.
   - C. genetically determined at the time of conception.
   - D. varies within and between individuals.
4. Developmental norms will show
   - A. whether an individual is able to complete a task at a specific age.
   - B. whether an individual is making progress in their psychological development.
   - C. the relative influence of hereditary and environmental factors on development.
   - D. the typical performance of a group or of an individual of a certain age against which comparisons can be made.
5. In psychology, the term nature refers to
   - A. the natural tendency to control one's own development.
   - B. the influence of genetic inheritance on development.
   - C. the influences within an individual's natural environment.
   - D. the influence of an individual's experiences throughout their lifetime.

To answer these and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

2.3 The biopsychosocial model

The wide variety of hereditary and environmental factors that influence our psychological development can be organised into three different domains (or areas) within a framework called the biopsychosocial model. The model emerged in the late 1970s as a broader approach to the study of mental health and specific mental health disorders. It has since been applied to many aspects of human behaviour and mental processes, including the study of development.

As suggested by its name, the **biopsychosocial model** is an approach to describing and explaining psychological development and wellbeing through the interaction of biological, psychological and social factors. The model is based on the idea that all human behaviour and mental processes, including our development and wellbeing, are best understood by considering specific factors or influences from within each domain and how these may combine and interact.

Figure 2.10 The biopsychosocial model considers psychological development and wellbeing as occurring through the interaction of biological, psychological and social factors.

- **Biological factors** involve physiologically based or determined influences, often not under our control, such as the genes we inherit, our age, sex and race, balances or imbalances in brain chemistry, brain and nervous system functioning, hormonal activities, physical injury, illness or disease, sleep patterns, how our body responds to medications and bodily responses to stress.
- **Psychological factors** involve all those internal, mental processes and influences such as the effects of our prior experiences, memories and ways of thinking, how we learn, how we understand and experience emotions, our attitudes, beliefs, expectations and perceptions of ourselves, others and our external environment, and our resilience and skills for coping with stress and emotional challenges.
- **Social factors** involve influences from the external social environment in which we interact with others, such as the range and quality of our interpersonal relationships with family, friends and others, the amount and type of support available from others when needed, our social media use, our schooling and other educational experiences, our employment history, economic circumstances, housing situation, access to health care, exposure to stressors in everyday life and specific cultural influences such as our beliefs, values and traditions that are tied to our cultural background.

In practical terms, it is not always easy to decide which domain a specific factor or influence belongs to. For example, religious beliefs occur within the individual and are psychological in nature but also greatly influenced by social and cultural factors external to the individual.

Similarly, career choice primarily involves psychological processes but is also greatly influenced by social factors, possibly biological factors too if the individual has an inherited disability that limits the range of careers from which they may choose. This classification problem highlights the fact that there is often overlap between factors influencing development, in addition to the overlap between developmental changes.

The biopsychosocial model reflects a *holistic* view of development and wellbeing — the individual is considered as a 'whole person' functioning in their unique environment. The focus is not just on the individual's development and state of wellbeing ('within the individual'), but also on their wider social setting and circumstances ('outside the individual'). This recognises that development is not only the result of internal factors but is also greatly influenced by external factors such as their physical surroundings, social interactions and cultural exposure.

In addition, focusing on the influence of factors from one or two domains, rather than all three, is likely to give an incomplete and therefore inaccurate picture of a person's psychological development and wellbeing. This also applies to a mental health problem or disorder an individual may have and the treatment that may be required.

According to the model, factors from each of the three domains are equally important for psychological development and wellbeing. All three domains are important at every age. However, it is recognised that specific factors may have more or less influence on an individual's development and put the individual at more or less risk for having good mental health or developing a mental disorder.

Factors from within each domain *affect* and are *affected* by one another. For example, factors within each domain may combine with other factors in the same domain, as well as with factors in the other two domains. This complex interaction of multiple factors helps account for individual differences in development and wellbeing, as well as mental health problems and disorders.

For example, as shown in Figure 2.11, depression could be explained by the combined effects of genes and brain chemistry (biological), negative ways of thinking and prior learning experiences (psychological) and environmental conditions (social).

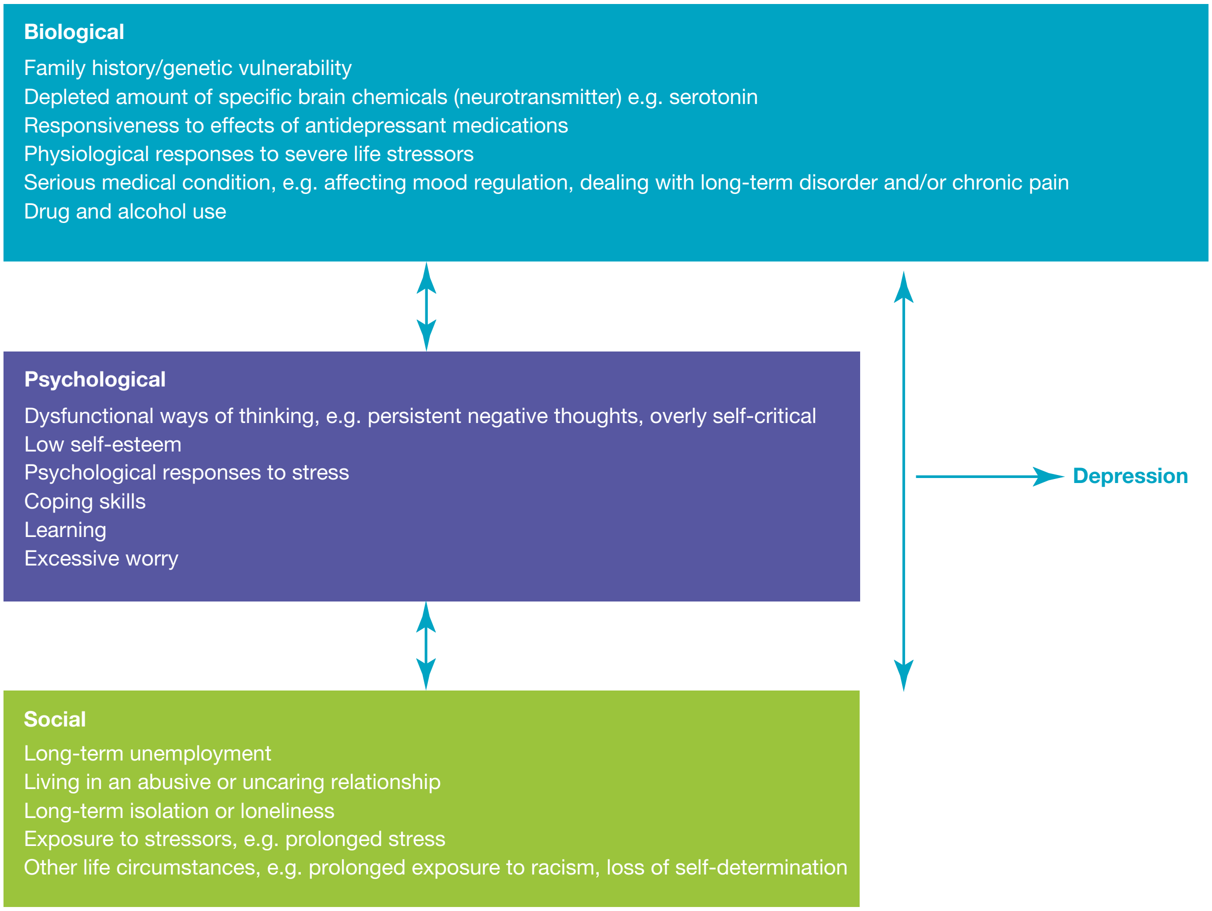

Figure 2.11 An explanation of depression using the biopsychosocial model. Note how factors from within each domain affect and are affected by one another. Nor is there an even number of factors from each domain.

2.3 LEARNING ACTIVITY

Review

1. What is the biopsychosocial model?
2. a. Name and describe the three domains in the model with reference to relevant examples.
   b. For each domain, give two examples of additional factors or influences not referred to in the text.
3. Briefly describe three key characteristics of the biopsychosocial model's explanation of psychological development and wellbeing.
4. Write a series of questions a psychologist who has adopted the biopsychosocial model may ask a client who presents with a problem associated with their psychological development and wellbeing.
5. Consider a recent time when you were feeling stressed. You do not have to identify the source of your stress. Identify a factor from each domain that may have contributed to:
   a. the onset of stress
   b. stress management or recovery

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2.4 Emotional development

Consider some of the feelings you may have experienced at some time: *surprise* at seeing a close friend unexpectedly, *fear* in an encounter with a stranger, *sadness* about the serious illness of a family member, *anger* about something that was said about you, *happiness* when your favourite team won a final, *disgust* about eating something that looks extremely distasteful. Each of these experiences is an emotion.

There are many different kinds of emotions and the same emotion can be experienced in different ways by the same person on different occasions. For example, an individual can be more or less happy or more or less angry about something at different times. The way in which emotions are experienced, what emotions mean for a person, and how emotions are expressed in behaviour varies considerably from one person to another.

Emotions are reactions to a personally significant matter or event. The stimulus may be *external*, such as a comment made by a person or some event which is observed. They can also be aroused by *internal* factors such as needs and thoughts, for example, the need for comfort from a family member or thoughts about someone important to us whom we are missing.

The type of emotional response triggered by a particular set of circumstances often depends on the situation we are in. For example, we may fear a snake if we encounter one on a bushwalk but not if we see it in an enclosure at the zoo. Similarly, a specific emotional reaction can be influenced by who we are with at the time. Two men at a football match together might laugh at comments about the umpiring from nearby spectators. However, had either of the men been in the same setting with another person such as their wife, mother or young child, the emotion may have been disgust, embarrassment or anger.

2.4.1 Defining emotion

Although most people find it easy to recognise an emotion, psychologists have generally found it difficult to provide a simple definition of the concept of emotion. However, most agree that any emotion has at least three elements, generally referred to as physiological responses, subjective feelings and expressive behaviour.

For example, consider the fear of someone who is being followed by a stranger on a dark night. Their heart might beat quickly (*physiological response*), they may have an intense, unpleasant mental experience (*subjective feeling*) and their eyes might start darting around in different directions (*expressive behaviour*). Each of the three elements vary in intensity and pleasantness (or unpleasantness) each time we experience an emotion.

Since most psychologists agree that an emotion has physiological, subjective and behavioural elements, formal definitions of emotion usually include these three elements. Therefore, an **emotion** can be defined as a complex reaction pattern to a personally significant event or matter that involves a mixture of physiological responses, subjective feelings and expressive behaviour (APA, 2022). Although psychologists often study these elements separately, all three elements combine to form a complex pattern of physical and psychological changes associated with the experience of an emotion.

Figure 2.12 Happiness and sadness are two of the more easily recognised emotions.

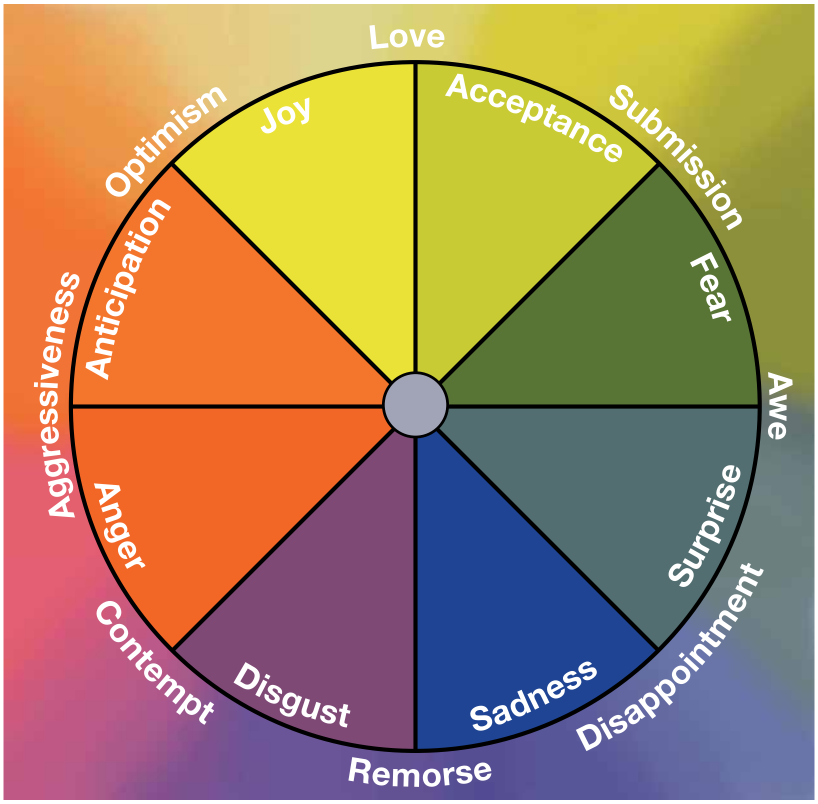

Figure 2.13 Psychologists have proposed various theories and models to identify, describe and explain the different emotions people experience. In the 1970s, American psychologist Paul Ekman (1972), identified six 'basic' emotions which he found through research to be experienced in different cultures and were therefore 'universal'. These were *happiness*, *disgust*, *surprise*, *sadness*, *anger* and *fear*. Other psychologists have since identified many more, but tend to include these six in their lists. In the 1980s, another American psychologist, Robert Plutchik (1980) identified eight 'primary' emotions in the model of an 'emotional wheel' shown above. The eight *primary* emotions comprise the sectors of the wheel, while the *secondary emotions* around the perimeter arise from the blending of two primary emotions which are next to each other. There have since been various updates of this model.

Source: Plutchik, R. (1980). A language of emotions, *Psychology today*, 13 (9), 68–78.

2.4.2 Common elements of different emotions

Subjective feelings

Every emotion is accompanied by an awareness of the feelings associated with it, even if those feelings are difficult to describe. **Subjective feelings** refer to the inner, personal experience of an emotion, for example, how an individual experiences 'being in love', their understanding of it and their attitude to the object of their love. Similarly, someone who is happy may experience a bouncy energetic feeling which seems to be present in everything they do whilst they are in this state of happiness. Or, if someone is embarrassed, they might feel as if they want to shrink and disappear out of sight.

Subjective feelings associated with different emotions cannot always be directly observed because they often do not reveal themselves in externally expressed behaviour. Consequently, psychologists often use the self-report method to collect data about an individual's subjective feelings. In this case, a self-report might simply involve asking the person to describe how they are feeling.

Expressive behaviour

Expressive behaviour refers to the many overt expressions of behaviour which communicate emotions. Expressive behaviour is an outward sign that an emotion is being experienced and such behaviour can be either intentional or unintentional.

The most common behavioural expressions of emotions are facial expressions such as smiles, frowns, lip pouts and so on. The way we use our eyes is another facial expression which can communicate an emotion. For example, love can be expressed by a prolonged gaze and a wide-eyed expression can communicate fear or surprise.

Emotions are also expressed by changes in body posture. For example, by slouching or standing erect, the way we hold our head, the way we sit and whether we fold our arms or not can be signals of emotions.

In addition, the vocal qualities of speech often give signals of the emotional state being experienced; for example, qualities such as speed, pitch and volume. If a person is happy, they tend to speak more quickly, the pitch of their voice tends to become higher and the volume louder. When they are sad their voice tends to be lower, the rate of speech is often much slower and the volume quieter.

Figure 2.14 Expressive behaviour is an outward sign that an emotion is being expressed.

Sometimes a particular expressive behaviour occurs in isolation of other expressive behaviour. At most times, however, a combination of expressions occur. For example, when we are sad we tend to slouch our shoulders and speak in a slower, quieter, less variable pitch than when we are angry or afraid

Although overt expressions of emotions can often be observed, relying solely on such observations does not always lead to an accurate interpretation of the emotion that underlies the observed behaviour. For example, crying can be an overt expression of different emotions such as sadness, happiness or fear.

Another problem with relying on expressive behaviour to interpret an emotion is that the behaviour which is observed may be associated with a combination or mixture of underlying emotions rather than a single emotion.

In addition, observation of expressive behaviour may lead to an inaccurate interpretation because people can sometimes hide their emotions by controlling their expressions. For example, someone who is angry may either not show a directly observable expression or they may respond in a way differently from how they are really feeling.

Although expressive behaviour can indicate the experience of an emotion, the interpretation of such behaviour may not always be accurate.

Physiological responses

Physiological responses, or bodily changes, which also occur when we experience an emotion involve changes such as heart rate, blood pressure, breathing rate and perspiration. When the intensity of an emotion is strong, the bodily changes can be quite pronounced and the individual involved may notice these bodily changes.

For example, when we are very angry or afraid, our heart rate may accelerate from its normal rate of about 70 beats per minute to as much as 180 beats per minute, breathing may become rapid and irregular, and blood pressure may rise significantly. When the intensity of an emotion is weak, the physiological changes tend to be slight and therefore less noticeable.

2.4 LEARNING ACTIVITY 1

Review

1. Define the meaning of emotion.
2. Describe the three common elements of an emotion.
3. Identify an emotion which might be experienced in each of the situations listed in the first column of the table below.
   For each emotion, give examples of the elements that may be parts of that emotion.

Situation	emotion	subjective feeling	expressive behaviour	physiological response
death of a family pet				
a relationship breakup				
winning TattsLotto				
waiting outside the room where an important exam will soon be undertaken				
being caught breaking a school rule				
having a close friend betray your trust				

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2.4.3 Importance of attachment in emotional development

Around the middle of the twentieth century, some psychologists observed that children who had spent their early years in Eastern European orphanages where they received minimal care and attention often experienced emotional difficulties in their later years and into adulthood.

For example, some of the children in the orphanages had very limited physical contact with a permanent or even a temporary caregiver. Their contact was seldom with the same person. If they did have physical contact, it was for very short periods of time and only for practical purposes, such as to be bathed, fed or have their clothes changed.

Observations such as these led psychologists to hypothesise and develop theories about the importance of early experiences and the relationship between infants and their caregivers in emotional development.

From the moment of birth, infants depend on the people around them for their survival. Their caregiver, who is usually a parent(s), responds whenever the infant indicates, often by crying, that it is hungry, cold, tired, uncomfortable or has other needs. Over time, the infant develops an emotional connection with the people who respond to its needs. This connection is called **attachment** — the emotional bond which forms between an infant and another person.

Infants form attachments with those people who regularly care for and are most deeply involved with them, usually the main caregivers such as the mother and father. Many infants develop strong attachments to both parents. However, it is not uncommon to have a strong attachment to the mother but not the father, or vice versa. Infants are also capable of developing different and separate attachments with other people who have significant involvement in their lives, for example, an older sibling, a grandparent or child care worker in a day care centre.

Generally, infants under 6 months of age do not fully recognise their caregivers on an individual basis from visual cues alone. In the same way that they smile indiscriminately, they happily accept comfort from anyone who provides it to their satisfaction. Although from about 2 months of age they may show negative reactions when their main caregiver departs or turns their attention elsewhere, nearly anyone who provides the desired comfort or attention will quickly be accepted as a substitute.

Figure 2.15 Infants are capable of developing different and separate attachments with a range of people who have significant involvement in their lives; for example, an older sibling or grandparent. Attachment is observed in all cultures, but there can be cultural differences in the nature of the attachment relationships.

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Between about 6 and 8 months of age there is usually a dramatic departure from the earlier pattern of accepting comfort from just about anyone. This period marks the development of a special attachment to the main caregiver who is usually the mother. Infants are likely to cry and cling when their main caregiver leaves and to react with aversion to anyone else who tries to comfort them. At this stage infants are in the process of developing their first meaningful attachment to another person. The attachment will be specific for this person, or stronger for that person than for others.

There is considerable research evidence that the attachment(s) formed during infancy, particularly in the first 12 months of life, influences the individual's emotional development, both in the short term and into adulthood. For example, early attachment is linked to the development of trust and security, whereas absence can result in anxiety and inner turmoil. Furthermore, some people remain emotionally aloof and distant or more emotionally aware and competent depending on the type of attachment relationship formed in infancy.

Individual differences in emotional sophistication between children of the same age have also been linked to the type of attachment relationship the child forms. Children who have formed a healthy attachment tend to be more skilled in reading and interpreting emotions in others (e.g. from facial expressions) when compared to children who have not.

Similarly, children with a healthy attachment tend to have more emotional control, to be more emotionally resilient than others and therefore more able to easily adjust to and recover from events that cause upset, stress or anxiety. In contrast, children without a healthy attachment at the age of 12 months are more likely to develop elevated levels of aggression at age 2, have a higher rate of disruptive behaviour at age 5, and to be more impulsive and have difficulty regulating their emotions. These early differences can persist throughout the life span (Bachman & Zakahi, 2000; Fearon et al., 2010; Meins, 2011; Mathews et al., 2016; Kamperman et al., 2020).

2.4.4 Ainsworth's theory of attachment

American psychologist Mary Ainsworth (1913–1999) is one of the best-known researchers and theorists on attachment. Ainsworth and her colleagues (1978) devised a method for assessing attachment in a laboratory setting that has since been used by many other researchers. They used the term Strange Situation to describe their procedure.

The **Strange Situation** is a standardised test for measuring the attachment relationship a child has with their parent. It is typically conducted during infancy between 9–18 months of age. The infant and caregiver are taken into an unfamiliar room containing some age appropriate toys. Then the infant is exposed to a series of separations and reunions involving the caregiver, the infant and a stranger. Typically, the room is equipped with a one-way mirror, and the entire procedure is video recorded for later scoring.

An example of the sequence of separations and reunions is shown in Table 2.3 below. The infant's behaviour in each episode is observed and recorded; for example, the infant's willingness to play with the stranger, their behaviour when left alone in the room and their reactions to the caregiver leaving and returning.

Ainsworth conducted many research studies on attachment using the Strange Situation procedure. She found that infants show attachment through behaviour that promotes closeness or contact with the person to whom they are attached. These behaviours included crying to attract the caregiver's attention, crying when held by someone other than the caregiver and stopping when taken by the caregiver, clinging physically to the caregiver, particularly in the presence of a stranger, looking at the caregiver when separated but in sight and lifting arms to be picked up by the caregiver. She also identified different types of attachment.

Figure 2.16 American psychologist Mary Ainsworth (1913–1999). (Photo credit: Dr Patricia M. Crittenden)

The Strange Situation continues to be used in child development research. It has further enhanced understanding of attachment and has highlighted more than just attachment types. For example, its use has identified the patterns of attachment-related behaviour called stranger anxiety and separation anxiety, both of which are considered to be a normal part of emotional development.

Table 2.3 The stages of the Strange Situation test

Stage	Time frame	Episode	People in the room	Attachment behaviour observed
1	30 seconds	Experimenter leaves caregiver and infant to play	Caregiver, infant, experimenter	
2	3 minutes	Caregiver sits while infant plays	Caregiver, infant	Use of Caregiver as secure base
3	3 minutes	Stranger enters and talks to caregiver	Stranger, Caregiver, infant	Stranger anxiety
4	3 minutes	Caregiver leaves; stranger lets infant play offers comfort if needed	Stranger, infant	Separation anxiety
5	3 minutes	Caregiver returns greets infant offers comfort if needed; stranger leaves	Caregiver, infant	Reactions to Caregiver's return
6	3 minutes	Caregiver leaves	Infant	Separation anxiety
7	3 minutes	Stranger enters and offers comfort	Stranger, infant	Stranger anxiety; ability to be comforted by stranger
8	3 minutes	Caregiver returns greets infant offers comfort lets infant return to play	Caregiver, infant experimenter	Reactions to Caregiver's return

Source: Adapted from Ainsworth, M.D.S., Blehar, M.C., & Walters, E. (1978). *Patterns of attachment: A psychological study of the Strange Situation*. Hillsdale, New Jersey: Lawrence Erlbaum.

Figure 2.17 A mother, infant and stranger in a Strange Situation experimental setting.

Stranger anxiety refers the distress and uneasiness experienced by young children when they are around people who are unfamiliar to them (i.e. ‘strangers’). Stranger anxiety usually begins around 8 or 9 months of age and typically lasts into the 2nd year.

Separation anxiety is indicated by the distress and uneasiness when away (or facing the prospect of being away) from the person or people to whom they are attached. It is most common between 6 and 10 months of age but may also be experienced in later years when separated from a loved one (APA, 2022).

According to Ainsworth (1982), infants can form different types of attachment with a caregiver. These can vary in terms of how strong the connection is and the kind of connection. The strength of each attachment also depends to a large extent on how sensitive and responsive the caregiver(s) is to the infant’s needs. The infant’s responsiveness is also a factor in the type of attachment that is formed.

Following extensive research on attachment types, Ainsworth and her colleagues (1978) proposed that there are two main categories of attachment — secure and insecure attachment. Ainsworth further separated insecure attachment into two types — resistant attachment and avoidant attachment. Consequently, when Ainsworth described attachment types, she did so in terms of three types — *secure attachment, insecure resistant attachment* and *insecure avoidant attachment*. An additional insecure attachment type called *disorganised attachment* has since been identified by other researchers.

Types of attachment

Secure attachment

An infant who has formed a secure attachment shows a balance between dependence and exploration. The infant uses the caregiver as a ‘home’, or safe base from which to venture out and explore an unfamiliar environment, but shows some distress and decreases exploration when the caregiver departs. When the caregiver returns, the infant is enthusiastic and seeks physical contact with them.

Securely attached infants feel safe and are able to depend on their caregivers. The infant's moderate distress at their caregiver's departure suggests that they feel confident that the caregiver will return. About 65% of one-year-olds are securely attached.

Insecure avoidant attachment

The infant does not seek closeness or contact with the caregiver and treats them much like a stranger. The infant rarely cries when the caregiver leaves the room and ignores the caregiver upon their return. Research findings suggest that this attachment type may be the result of neglectful or abusive caregivers. About 20% of one-year-olds are in this category.

Insecure resistant attachment

The infant appears anxious even when their caregiver is near. They become very upset when separated from the caregiver. When the caregiver returns, the infant approaches them, cries to be picked up, then squirms or fights to get free, as though it is not sure about what it really wants.

This attachment type is thought to result from caregivers who are not very responsive to their infant's needs. It is assumed the infant feels they cannot depend on their caregiver to be available to them if needed. About 12% of one-year-olds are in this category.

Ainsworth (1982) found that the patterns of behaviour associated with each type of attachment tend to not change over time unless there are significant changes in life circumstances for either the caregiver or the infant. However, she believed the nature of the attachment may change if the caregiver substantially changes the way in which they interact with the infant, particularly the way in which they respond to the infant's expressed needs.

Ainsworth's different attachment types have been linked to different outcomes in the short term and long term. For example, research findings suggest that adults who formed secure attachments as infants tend to have good self-esteem, seek social support when they need it, have trusting, lasting relationships and are comfortable sharing feelings with their friends and partners. Those who have had insecure early attachment may experience anxiety, inner turmoil, lack trust in others and are reluctant to form close relationships with others (Bachman & Zakahi, 2000; Kamerman, 2020).

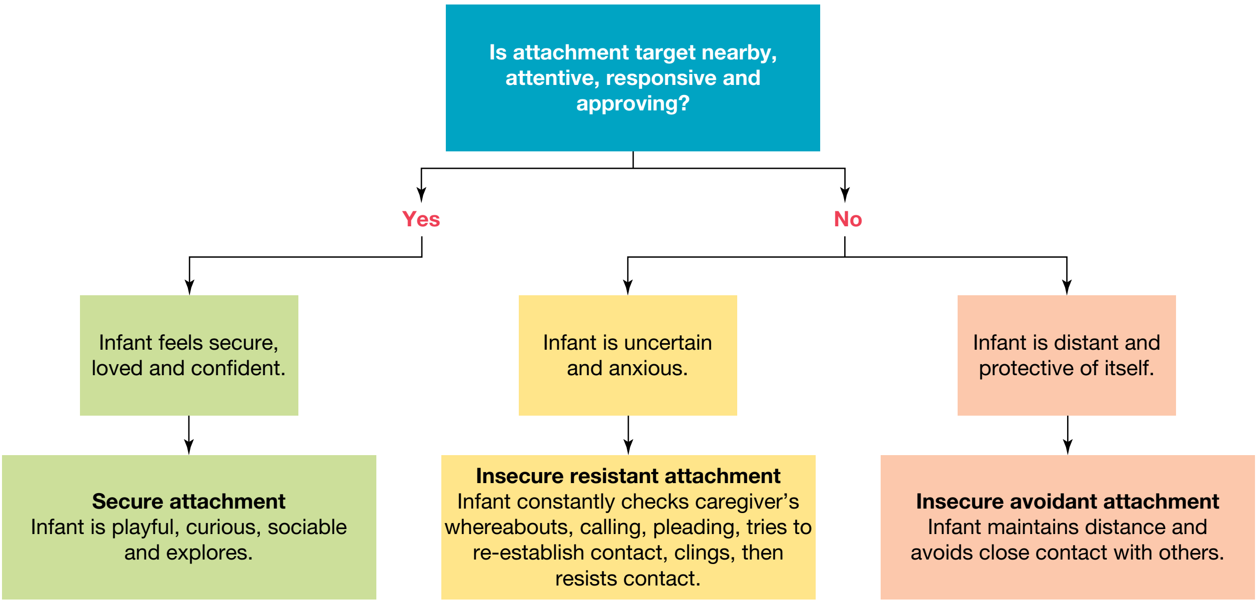

Figure 2.18 Ainsworth's attachment types and behaviours

Disorganised attachment

In 1986 American psychologists Mary Main and Judith Solomon identified a fourth attachment type, now called disorganised attachment. **Disorganised attachment** is a form of insecure attachment in which infants show inconsistent or odd and contradictory behaviours during separation from and reunion with their caregivers.

For example, when reunited with a caregiver they might seek close contact but would do so by moving slowly back towards the caregiver or approach with their head turned in another direction as if avoiding eye contact. In some cases, they may impulsively start to run up to the caregiver, then immediately pull away.

Infants who have formed a disorganised attachment also tend to respond to reunions with their caregiver with fearful or odd behaviours such as rocking themselves, ear pulling, 'freezing' or going into a trance-like state. They tend to lack organised strategies for achieving physical proximity with a caregiver, particularly when distressed or frightened (Main & Solomon, 1986; 1990).

In adulthood, people who formed a disorganised attachment tend to find it difficult to have close relationships, to open up to others or to seek out help or other forms of support. They often have difficulty trusting people, as they were unable to trust those they relied on for care and safety when growing up. They may struggle in their relationships or when parenting their own children because of their personal experiences and lack of exposure to a suitable role model. They may also find it difficult to form and sustain solid relationships because they struggle with poor skills for regulating their emotions. They often have difficulty managing stress and may even demonstrate hostile or aggressive behaviours. Because of their negative early life experiences, they may see the world as an unsafe place. In addition, disorganised attachment has been found to be a risk factor for the development of a mental health disorder (Catlett, 2021).

Researchers who investigated early life experiences associated with disorganised attachment have linked it to factors such as infant maltreatment, hostile caregiving, post-natal depression and the mother having an unresolved trauma or experienced loss through separation, divorce, and death.

However, researchers have also found disorganised attachment among infants in families where none of these variables is evident and the 'middle-class family' lifestyle appears 'normal'. So, psychologically inappropriate parenting practices do not fully explain disorganised attachment in an infant. The origins of this attachment type seem to be highly complex and the challenge remains to untangle the influence of different variables.

Figure 2.19 In adulthood, people who formed a disorganised attachment early in life tend to find it difficult to have close relationships, to open up to others or to seek out help or other forms of support.

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learnMORE | Biopsychosocial model of attachment

Access learnON to read about biological, psychological and social factors that can influence development of attachment.

on Resources

Teacher weblinks Video overview of Ainsworth's theory and the Strange Situation 4m 38s

Video demonstration of the Strange Situation with research participants 3m 14s

Video of a researcher identifying the three attachment types in Strange Situation experiments 3m 38s

2.4 LEARNING ACTIVITY 2

Review

1. What observations first led psychologists to investigate the effects of early attachment on emotional development?
2. Define the meaning of attachment.
3. When do attachments form?
4. Why can attachment be described as a two-way relationship?
5. Briefly describe the relationship between attachment and emotional development.
6. Name and briefly describe four attachment types.
7. a. What is the Strange Situation?
   b. List three infant behaviours that could be used as indicators of attachment within and outside the Strange Situation.
8. a. Consider Ainsworth's research studies using the Strange Situation. Given her research had the potential to cause psychological distress to infants, what ethical guidelines are of particular relevance to her investigations? Explain your selection of each guideline.
   b. Do you believe Ainsworth's research should have been allowed to proceed? Explain your answer with reference to relevant ethical concepts.
9. Eleven-month-old Madeline cried when picked up by her aunt who was visiting from overseas. She stopped crying when handed back to her father and he cuddled her. Suggest two possible explanations for why Madeline stopped crying.

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2.4 LEARNING ACTIVITY 3

Multiple-choice questions

1. An emotion is best described as
   A. a complex reaction pattern to a personally significant concern.
   B. a physiological response to a personally significant event or matter.
   C. a subjective feeling about a personally significant event or matter.
   D. expressive behaviour in response to a personally significant event or matter.
2. How many basic, primary or universal human emotions are there?
   A. 5
   B. 7
   C. 8
   D. The number depends on the theory or model.
3. How many stages are there in Ainsworth's attachment theory?
   A. 0
   B. 2
   C. 3
   D. 4
4. Attachment is best described as
   A. an emotion.
   B. an emotional bond.
   C. expressive behaviour.
   D. a Strange Situation test.
5. Which attachment type was not described by Ainsworth?
   A. insecure resistant attachment
   B. insecure avoidant attachment
   C. disorganised attachment
   D. secure attachment

To answer these and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

2.4.5 Experiments on attachment in monkeys

At around about the same time Ainsworth was developing her theory on attachment in human infants, American psychologist Harry Harlow was undertaking research on attachment in rhesus monkeys. Harlow conducted a number of experiments to investigate factors influencing the development of attachment by infant monkeys to their mothers.

In one of his best-known experiments, Harlow (1958) investigated the role of breastfeeding in infant–mother attachment. He used eight infant rhesus monkeys which had been separated from their mothers at birth.

The monkeys were individually reared in cages, each of which contained two surrogate mothers. A **surrogate** is anyone or anything which 'substitutes for' or 'plays the part of' something else.

As shown in Figures 2.20 and 2.21, the surrogate mothers were made of wire mesh and were roughly the same size and shape as real monkey mothers.

Figure 2.20 American psychologist Harry Harlow (1905–1981)

One of the surrogates was covered in terry-towelling cloth and the other was left uncovered. A feeding bottle was attached to one of the surrogates in the same area where a breast would be on a real mother. Half of the animals were in cages with the feeding bottle on the cloth surrogate and the other half were in cages with the feeding bottle on the wire surrogate.

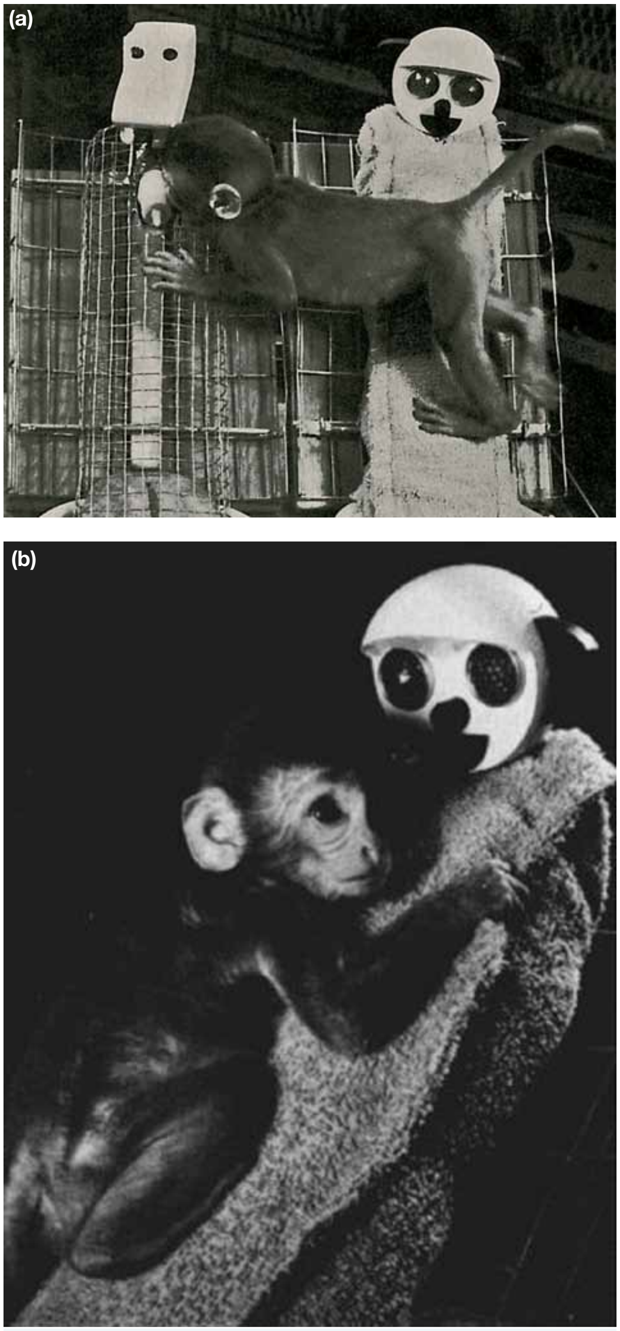

Figure 2.21 (a) Monkey feeding from wire surrogate mother (b) Monkey clinging to cloth surrogate mother

Harlow proposed that if an infant's attachment to its mother was based primarily on feeding, the infant monkeys should have preferred and become attached to whichever surrogate mother had the bottle.

Harlow found that regardless of which surrogate provided the nourishment, the infant monkeys spent more time with the cloth surrogate than the wire surrogate. Although the infants in the two groups drank the same amount of milk and gained weight at the same rate, all eight monkeys spent far more time climbing and clinging to the cloth surrogate than they did the wire surrogate. By the age of about 3 weeks, all of the monkeys were spending around 15 hours a day in contact with the cloth surrogate. No animal spent more than an hour or two in any 24-hour period on the wire surrogate.

The monkeys' preference for the cloth surrogate was particularly evident when they were emotionally distressed. In order to create a stressful condition, Harlow put various frightening objects in the monkeys' cages; for example, a mechanical forward-moving spider (as shown in Figure 2.22), or a teddy bear that beat a drum. The frightening object was placed repeatedly in each monkey's cage and set in motion.

Harlow found that the majority of infant monkeys sought first contact with the cloth surrogate, regardless of whether or not it had the feed bottle. The terrified monkeys were observed to cling to the cloth mothers, rubbing their bodies against the cloth surrogate. Those monkeys who first sought contact with the wire surrogate through blind terror soon left it for the contact comfort of the cloth surrogate, even if the wire surrogate had the feed bottle.

On the basis of these results, Harlow concluded that 'contact comfort', which was provided by the softness of the cloth covering, was more important than feeding in the formation of an infant rhesus monkey's attachment to its mother. He generalised his findings to suggest that contact comfort was also likely to be a crucial factor in human infant–parent attachment.

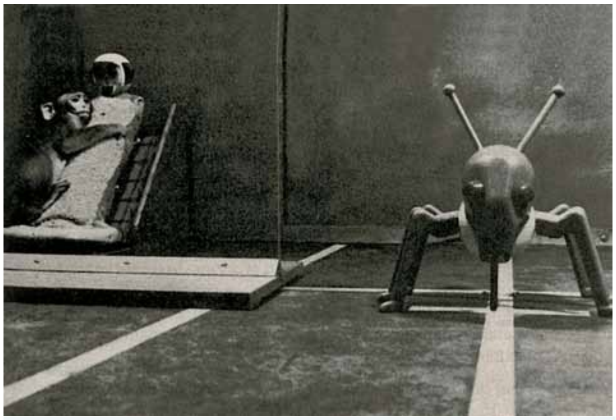

Figure 2.22 When a frightening toy spider was placed in their cage, infant monkeys tended to seek comfort from the cloth surrogate, even if the surrogate did not have the feed bottle.

Aim
To find out whether provision of food or contact comfort is more important in the formation of infant–mother attachment

Participants
Eight newborn rhesus monkeys separated from their mothers immediately after birth

Procedure

Group 1
Four monkeys isolated in cages where a cloth surrogate mother provided food and a wire surrogate mother did not

Group 2
Four monkeys isolated in cages where a wire surrogate mother provided food and a cloth surrogate mother did not

Independent variable
Provision of food by either a cloth or wire surrogate mother

Dependent variable
Amount of contact time spent with cloth and wire surrogate mothers

Results
All monkeys in both Groups 1 and 2 spent far more time with their cloth surrogate than they did with their wire surrogate, regardless of which provided food.

Conclusion
Contact comfort is more important than feeding in the formation of infant–mother attachment in rhesus monkeys.

Generalisation
Contact comfort is likely to be a crucial factor in human infant–caregiver attachment.

Figure 2.23 A flow chart of Harlow's (1958) experiment

Although these findings were based on monkeys, they considerably influenced the views of psychologists in relation to human infant–caregiver attachment. Until this time, many psychologists believed that infants became attached to their mothers through the simple kind of learning called classical conditioning whereby the mother became associated with food. In Harlow's experiment, attachment of the monkeys was not based on food association or any food reward associated with mother contact. Instead, contact comfort emerged as a more important factor in attachment.

2.4.6 Harlow's experiments on effects of privation on emotional development

In further experiments, Harlow found that contact comfort was not the only important variable in attachment. For example, Harlow, Dodsworth and Harlow (1965) privated a group of rhesus monkeys to prevent them from having any social contact.

Privation involves the absence of the opportunity to satisfy something that is needed or desired, in this case, the need for social contact. Privation is different from *deprivation*, which involves the initial presence and then removal of what is needed.

The monkeys were taken from their mothers just after birth and totally isolated in cages. One group of infant monkeys was isolated for 3 months, another group for 6 months and a third group for 12 months. There was also a fourth group, a control group of infant monkeys who were 'normally reared' (in cages with their mothers and other monkeys).

The use of a control group enabled the three groups who experienced different periods of isolation to be compared with one another and with a group that had not experienced any social isolation. Otherwise the effects of isolation could not be measured accurately.

Harlow and his colleagues found that after 3 months privation, the infant monkeys were emotionally disturbed and their social behaviour was impaired. When released individually into the company of 'normally reared' same-age monkeys daily for 30-minute periods, they crouched in the corner of the cage with their heads buried under their arms, avoiding any contact and social interaction. Gradually, however, their individual and social behaviours improved. After about 12 months, their behaviour was almost the same as that of the monkeys in the control group.

The monkeys privated for 6 months were much more severely impaired in terms of their social behaviour. They isolated themselves even more than the 3-month group, spending more time crouched in the corner avoiding social interaction. They had also developed self-destructive behaviour such as biting themselves and pulling out clumps of their own hair.

Compared to the control group monkeys, they were severely withdrawn and socially incompetent. When released into the company of 'normally reared' monkeys they preferred to be alone and would not join in the playful activities of the other monkeys. Over time, their behaviour improved until it resembled that of monkeys in the control group. But improvement occurred more slowly than that of the group privated for 3 months.

The infant monkeys isolated from all social contact for the first 12 months of life were extremely socially and emotionally impaired. They were totally withdrawn, unable to relate socially to other monkeys, self-destructive and completely disinterested in anything going on around them. In the company of the 'normally reared' monkeys they were fearful, rarely moved about and avoided all contact and interaction. When they were housed with normally reared monkeys, their behaviour improved very slowly, but not in all areas.

Harlow also used rhesus monkeys to investigate factors influencing maternal behaviour in attachment. In a series of experiments, he discovered that private, female rhesus monkeys reared in total isolation for the first 12 months of life and then artificially impregnated (called 'motherless mothers') became completely inadequate mothers.

Each of these monkey mothers consistently avoided her baby and did not appear to care at all when separated from it. The mother would also violently abuse her baby when it approached her for contact or feeding. For example, one mother 'sometimes bit her infant' and 'occasionally crushed the infant's face and body to the floor'.

However, not all of Harlow's 'motherless mothers' behaved in this way. Some reared their infants in an adequate manner. These mothers had experienced some limited contact with other baby monkeys when growing up, whereas the others had not. It appeared that positive social experience with same-age mates had limited the potential harmful effects of growing up motherless (Harlow, et al., 1963; Seay, et al., 1964).

Harlow's experiments with rhesus monkeys have enabled psychologists to better understand factors which influence attachment, and the effects of different attachment experiences on emotional and social development. However, rhesus monkeys and humans are psychologically different in many ways. Care must be taken in generalising about human experience based on animal experiments.

(a) (b) (c)

Figure 2.24 (a) Infant monkeys isolated for 3 months showed disturbed social and emotional responses; (b) 'Motherless mother' monkey pushing her infant's face against the floor; (c) 'Motherless mother' showing disinterest in her infant.

on Resources

Teacher weblinks Video on Harlow experiments narrated by Harry Harlow 6 m 7 s

2.4 LEARNING ACTIVITY 4

Review

1. Harlow (1958) found that contact comfort was more important than feeding in the formation of an infant rhesus monkey's attachment to its mother. Suggest two other potential influences on the formation of the attachment relationship.
2. Distinguish between privation and deprivation with reference to an example from your own experience or someone you know.
3. Consider the Harlow et al., (1965) experiment on privation.
   a. Identify the independent and dependent variables in this experiment.
   b. What was different about the monkeys in the control group?
   c. What was the purpose of the control group in this particular experiment?
   d. What do the findings of the experiment suggest about the development and importance of infant–parent attachment among humans?
   e. Outline one advantage of the research design. For example, why did Harlow choose to use the experimental method for this study, specifically a controlled experiment, rather than some other method?
   f. To what extent can the findings of research studies with animals be applied to humans? Explain your answer.

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2.5 Cognitive development

Children view the world very differently from adolescents and adults. For example, it is not unusual for a young child to believe that the sun follows them from place to place when they walk outside, or that dreams come through the window at night.

As with other areas of psychological development, cognitive development cannot be directly observed. Infants and young children who have not yet adequately developed their language skills are unable to report what they are thinking or explain their actions. Therefore, much of what psychologists know about cognitive development, particularly in early infancy, must be inferred from observable behaviour.

Figure 2.25 Because he cannot tell us what he is thinking, should we assume that he is not capable of thought?

Many early psychologists believed that infants were not capable of much thinking. Infant behaviours were seen as random and occurring without purpose. Some psychologists saw infants as 'empty vessels' — as unresponsive organisms with limited perceptual abilities and little capacity to learn, remember or think.

Psychologists have since learned a great deal about the capabilities of infants and children in many areas of development. The changed view of the cognitive capabilities of infants was mainly initiated as a result of the pioneering work of Swiss psychologist Jean Piaget. His theory on the development of cognitive abilities was first translated into English in the 1920s but did not attract a great deal of attention until the late 1950s. Since then, researchers have tested and refined various elements of his theory and many current views about how thinking develops are based on Piaget's descriptions and explanations.

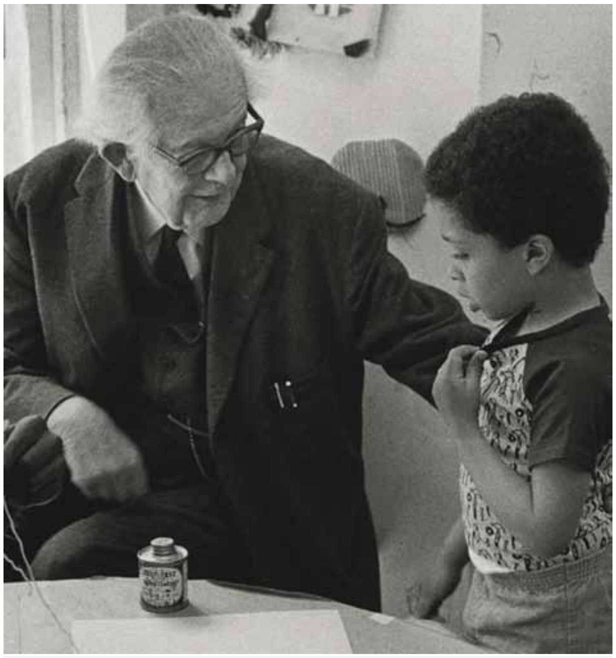


Figure 2.26 Swiss psychologist Jean Piaget (1896–1980).

However, Piaget's interpretation of some of his research findings has been challenged by psychologists. It is now believed that he probably described children as having more limited cognitive abilities than they actually do and that they can think and reason in more sophisticated ways in particular stages than Piaget proposed. For example, some of the key cognitive accomplishments described by Piaget in different stages of his theory have been found to occur much earlier in development than he suggested.

on Resources

Teacher weblink Video presentation outlining cognitive development, and Piaget's theory, including criticisms and a brief comparison with an alternate theory 9 m 49 s

2.5.1 Piaget's theory of cognitive development

Piaget (1952, 1960) viewed cognitive development as a process of adaptation to the changing world around us. On a daily basis, **adaptation** involves taking in, processing, organising and using new information in ways which enable us to adjust to changes in our environment. According to Piaget, this happens through two closely related processes which he called assimilation and accommodation.

Assimilation

Assimilation is the process of taking in new information and *fitting* it into and making it part of a pre-existing mental idea about objects or experiences. Through assimilation, we explain or make sense of new information in terms of what we already know. For example, a young child may see a truck and call it a car, simply because a car is the only type of vehicle for which the child has a pre-existing mental idea.

Similarly, if the child is given a toy hammer for the first time while using a wooden spoon for stirring in a pot, the hammer may also be used to stir the pot because the child has assimilated the hammer into a pre-existing mental idea. Through assimilation, both the truck and the hammer have become part of what the child knows about the world and the child will be able to recognise them in the future. However, the child will also eventually learn that a hammer is used to do things other than stirring. Pre-existing mental ideas can change through experience and doing so is evidence of adaptation.

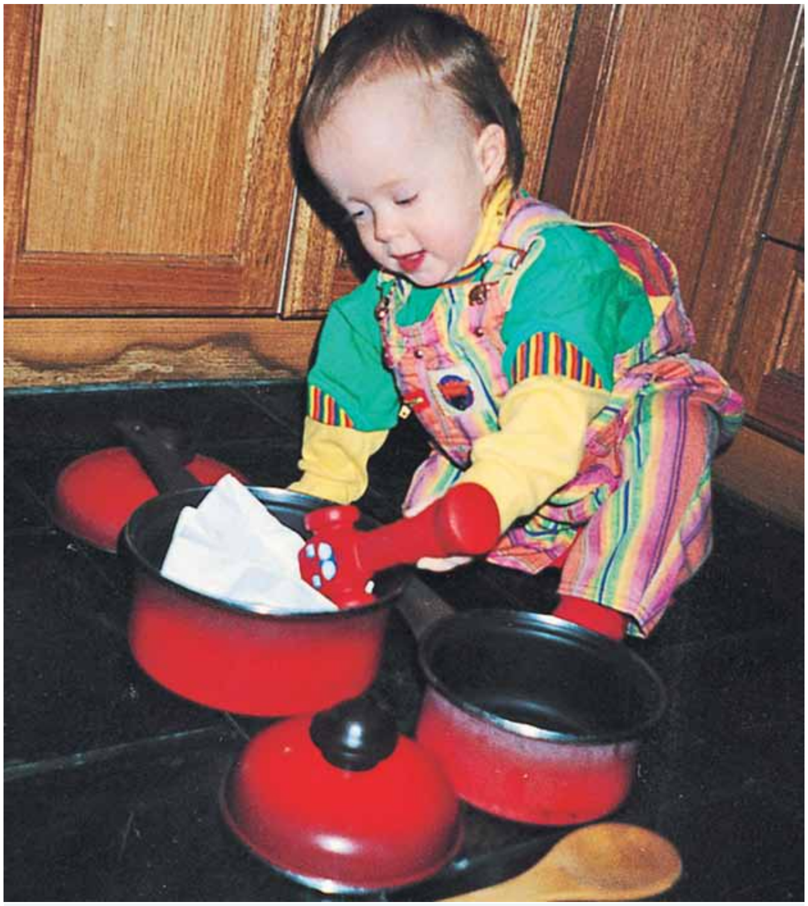


Figure 2.27 The child has assimilated the new object of a toy hammer by using it for stirring in the pot, as she does with a wooden spoon. This demonstrates the infant's attempt to understand new information (a hammer) by applying existing information (using the hammer like a wooden spoon).

Accommodation

Sometimes we cannot assimilate new information into a pre-existing mental idea, regardless of how hard we try. It simply won't fit because we can't change it in any way to link it in with what we already know. In this case, we are forced to adjust a pre-existing mental idea to deal with the new information.

Accommodation involves *changing* a pre-existing mental idea in order to fit new information. This is a more advanced process than assimilation. Whereas assimilation is used to fit new information without changing it, accommodation involves changing pre-existing information (or mental idea) so the new information may be included.

Piaget (1952) illustrated the relationship between assimilation and accommodation with an example of an infant's sucking behaviour. Infants can suck at birth. Sucking is an innate (inborn), reflexive behaviour, so it does not need to be learned. The sucking reflex is important for survival because it enables the infant to feed from a nipple on a breast.

When placed on a nursing mother's breast, infants demonstrate *assimilation* by using a nipple in the activity of sucking. However, not all objects can be sucked in exactly the same way. For example, when presented with a teat on a bottle, infants try to assimilate the teat in the activity of sucking because this new object (and situation) is like a nipple (and the situation of sucking from a nipple).

If they are unsuccessful in achieving the result they require (i.e. obtaining milk), infants have to modify their behaviour by changing the shape of their mouth, the placement of their gums, the amount of suction used, the rhythm of the activity and so on. These changes demonstrate *accommodation*.

Consider the case of 18-month-old Alexandra who points to a full moon and says 'ball'. She has assimilated the object of the moon into her existing mental idea of circular-shaped objects which is built mainly around her experience with balls. When she is older, she will be able to understand that there are differences between a full moon and a ball, even though they are both circular. When she recognises the moon as being different from a ball, she will have accommodated it.

Figure 2.28 Trying to drink milk from her rattle (assimilation), this infant will eventually develop an understanding that rattles only make noise (accommodation).

According to Piaget, assimilation and accommodation are interrelated. Cognitive development involves an ongoing attempt to achieve a balance between assimilation and accommodation — a state of equilibrium through a process he termed *equilibration*.

Schema

Assimilation and accommodation also enable a child to form a **schema** — a mental idea of what something is and how to act on it. Piaget called these the basic building blocks of intelligent behaviour which we use both to understand and to respond to situations.

Schemata (the plural of schema) can be thought of as 'units' of knowledge, each representing some aspect of the world. For example, your schema for Christmas may include presents, Christmas tree, Santa, shopping, money, summer and holiday. Someone else may have a different schema that includes church, Jesus, birth, family, giving and so on.

We learn and develop schemata for all kinds of things — ourselves, other people, objects, school, university, jobs, actions, experiences, events and so on. For example, you might have a schema about catching a train to travel to the Melbourne CBD. The schema is in the form of a pattern of behaviour stored in your memory. It may include checking the relevant timetable, getting to the train station, validating a Myki, boarding the train when it stops at the station, and so on. Whenever you want to catch a train to the CBD, you retrieve this schema from memory and apply it to the situation.

According to Piaget (1952), we are born with some basic schemata for survival purposes, such as the sucking and grasping reflexes. These are *action schemata* which are ready for use and interaction with the world at birth. We modify these schemata and develop new schemata through everyday life experiences.

Our schemata become more and more sophisticated as we mature and our environment expands. They are continually modified as we adapt to the changing world through assimilation and accommodation. This ongoing process underlies cognitive development throughout the entire life span. When Piaget described the development of a person's intellectual ability, he was referring to increases in the number and complexity of the schemata that a person had learned.

Figure 2.29 A schema is a mental idea of what something is and how to act on it. We learn new schemata for all kinds of things, including how to use a Myki machine.

on Resources

Teacher weblink Video featuring Piaget outlining aspects of his theory 13 m 4 s

2.5 LEARNING ACTIVITY 1

Review

1. a. What does cognitive development involve?
   b. Give examples of general and specific abilities which are likely to be associated with cognitive development.
2. a. Explain the meaning of adaptation in relation to Piaget's theory.
   b. Name the two vital adaptation processes identified by Piaget.
3. a. Explain what assimilation involves with reference to an example, but not an example used in the text.
   b. Give two examples of a situation when you were required to assimilate new information.
4. a. Explain what accommodation involves with reference to an example involving a child, but not an example used in this text.
   b. Describe a situation when you were required to accommodate new information and thereby changed your view of the world or people.
5. a. Describe the relationship between assimilation and accommodation.
   b. Explain the difference between assimilation and accommodation.
6. a. Explain what Piaget meant by the term schema.
   b. Give two examples of inherited schemata.
   c. Describe two examples of schemata you have formed, one school related and one non-school related.
   d. What role do schemata play in cognitive development?

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

2.5.2 Stages of cognitive development

According to Piaget (1952, 1960), we all move through a predictable sequence of four different stages in developing our thinking and associated mental abilities. As we progress through these stages (and their various sub-stages), our thinking becomes increasingly sophisticated. It develops from being relatively basic and self-centred, through being able to use words and pictures to represent something (*symbolic thinking*), to not being reliant on being able to see, visualise, experience or manipulate in order to understand something (*abstract thinking*).

The same sequence is followed by everyone regardless of our culture. Each stage is linked to an approximate age range. But this does not mean that we move from one stage to the next on our birthdays. Nor can a stage be skipped.

Piaget proposed that individuals do not develop the mental capabilities of a later stage without first having acquired those of an earlier stage. Furthermore, the rate at which each person passes through the stages may vary. Some people may reach a stage more quickly or slowly. This is due to differences in biological maturation (e.g. brain development) and personal experiences, both of which interact in influencing each individual's cognitive development. However, everyone will pass through the four stages in the same order. In addition, not all individuals necessarily reach stage four. For example, some people with intellectual disability or severe brain damage may never proceed beyond the first or second stage.

As well as describing a predictable sequence of the four stages through which we progress, Piaget outlined key *cognitive accomplishments* that individuals achieve in each stage. He also described thinking styles typical of each stage. According to Piaget, what people know is not as important as the way in which they think and how they acquire mental abilities.

Sensorimotor stage

This first stage spans from birth to about 2 years of age. In the **sensorimotor stage**, infants explore and learn about the world primarily through their senses and motor (movement) activities, hence the term 'sensorimotor'.

During the first months of an infant's life, the various types of incoming sensory information and motor skills are not coordinated. The infant does not realise that they can reach for a toy or dummy which is less than an arm's length away. After the first 3 months, however, most infants begin to integrate sensory and motor information and can start to coordinate their behaviour to grasp an object or turn towards a noise.

With increasing mobility, the infant's world expands quickly. At about the same time as the infant begins to crawl (around 8 months of age), they learn the concept of object permanence (although researchers have since found infants as young as 3 months may have this ability). **Object permanence** is the understanding that objects still exist even if they cannot be seen, heard or touched. Before object permanence is understood, 'out of sight' really is 'out of mind' for infants; that is, if something cannot be seen, then it does not exist.

Prior to acquiring object permanence, the infant may follow an object with their eyes, but they stop following it when it disappears from view. For example, they will watch the family dog walk past them, but if the dog goes into another room they show no interest in where it might have gone. However, once they have acquired object permanence, they will search actively for an object of interest even if they can no longer see it. For example, they might look towards where they last saw the dog before it moved out of sight.

According to Piaget, object permanence may explain why a game of peek-a-boo is so much fun for infants. Each time the object disappears, it ceases to exist for the infant. Whenever the object reappears, it is as if a whole new object has been created out of nothing. In Piaget's view, object permanence is an ability which infants gain through coordinating their sensory input, but only after much trial-and-error learning.

Piaget proposed that object permanence is a key cognitive accomplishment of the sensorimotor stage. Older people take object permanence for granted — for example, you know this textbook still exists when you look away from it or put it in your school bag.

The sensorimotor infant also develops the ability to carry out **goal-directed behaviour** — to perform and successfully complete a sequence of actions with a particular purpose in mind. This ability becomes increasingly sophisticated as the infant's sensorimotor skills mature along with the ability to coordinate these skills. For example, the infant learns that a desired object located out of reach on a coffee table may be obtained by using the table to pull themself up to a standing position and therefore to where the object is reachable.

Figure 2.30 In the sensorimotor stage, infants construct their understanding of the world by coordinating their sensory experiences with motor abilities.

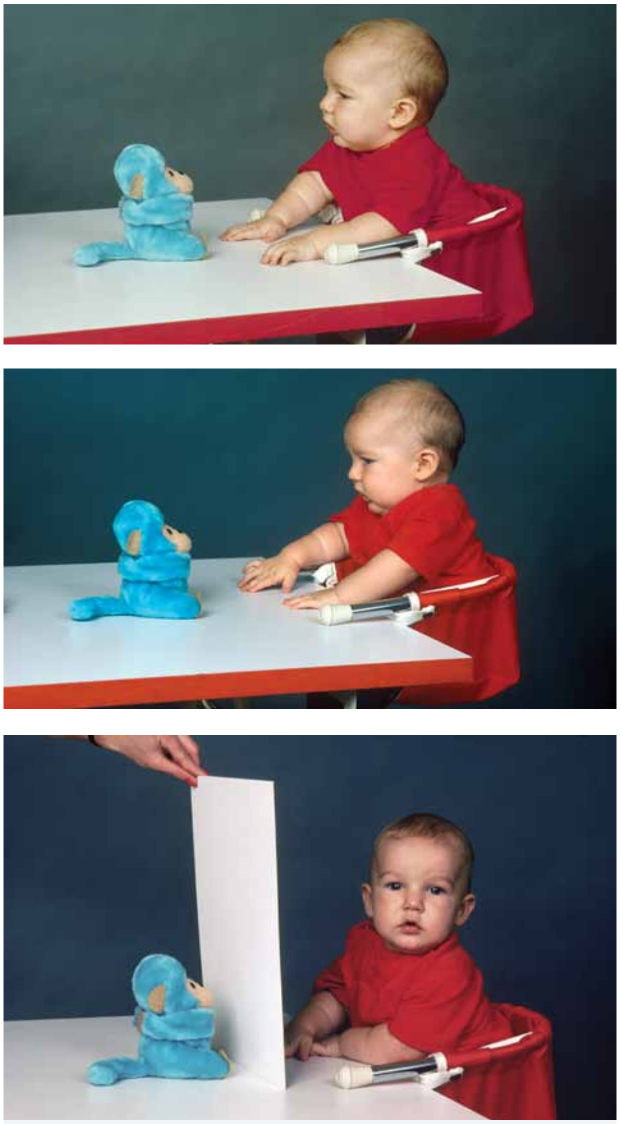


Figure 2.31 Object permanence at about 8 months of age is the key cognitive accomplishment of the sensorimotor stage. For younger infants, 'out of sight' is 'out of mind'.

Pre-operational stage (2–7 years)

At about 2 years of age, each infant moves from the sensorimotor stage to the pre-operational stage of cognitive development. This age marks the end of infancy and is also a time by which a significant amount of language acquisition has occurred. The thinking of the pre-operational child is much more sophisticated than that of 1- to 2-year-olds.

As children progress through the **pre-operational stage**, they become increasingly able to mentally represent objects and experiences; that is, to think about and imagine something in their own mind. This further develops their ability to think in more complex ways.

An important development during this stage is increasing use of **symbolic thinking** — the ability to use symbols such as words and pictures to represent objects that are not physically present. Evidence of symbolic thinking is seen in pretend play; for example, when a pile of sand becomes a turtle, a box becomes a television and endless numbers of make-believe friends share an imaginary tea party or adventure. Other examples of children engaged in symbolic thought can be seen in their use of language and production of drawings.

According to Piaget, children in this stage are unable to or have difficulty in considering another person's view. Piaget called this **egocentrism** — the tendency to perceive the world solely from one's own point of view. In using this concept, Piaget was not referring to selfish behaviour. He was indicating that pre-operational children are capable only of seeing the world from *their* point of view. When a young child stands in front of a television and blocks everyone else's view or asks a string of questions while you are concentrating on your homework they are not being selfish. They are demonstrating their egocentric thinking.

Figure 2.32 'Egocentric' children think others see the world in the same way they do. When told to hide they cover their eyes; because they can't see themselves, they think others can't see them either.

learnon

learnMORE | Egotism experiment by Piaget

Access learnON to read about how Piaget investigated egocentrism.

on Resources

Teacher weblink Video with demonstrations of Piaget's experiments 6 m 17 s

It is not until towards the end of the pre-operational stage that a gradual shift from egocentric to *decentred* thinking has occurred. They no longer see themself as being at the 'centre' of the world all the time. They can think about situations from multiple perspectives, not just their own.

Children in the pre-operational stage also use a thinking style called animism. **Animism** is the belief that everything which exists has some kind of consciousness. For example, a rusty tricycle may be thought of as 'sick', a tall tree may be described as 'old' and a child who hurts their knee after bumping into a coffee table may 'smack' the 'naughty' table.

Piaget proposed that animism was linked to egocentric thinking. Pre-operational children unable to see things from another person's point of view assume that everyone and everything is like themselves. They have emotions and can feel pleasure and pain, so they think objects can too.

Another key cognitive accomplishment in the latter part of the pre-operational stage is called **transformation** — understanding that something can change from one state (form or structure) to another. For example, earlier in the pre-operational stage, a child presented with an ice-block in a glass could identify both the ice-block in its solid state and the liquid after it had melted, but the child could not explain or understand the melting process.

While the thinking of a pre-operational child is significantly more sophisticated than that of one- to two-year-olds, the pre-operational child can focus on only one quality or feature of an object or event at a time. This process is known as **centration**. Five-year-old Jack's play with tokens demonstrates this.

When 12 tokens are arranged into two equal lines of six opposite each other, he can correctly identify the lines as being the 'same'. However, when the second row of tokens is bunched up as a group, Jack believes there are more tokens in the line than in the group, because 'it looks more', even though he had correctly counted the tokens in both original lines and watched the second line being narrowed into a tighter group. In this test, Jack is *centring* because he appears to be focusing on only the *length* of the row in judging the tokens and he seems unable to also consider *quantity* and *space*.

This example also highlights another of the key cognitive accomplishments of children in the latter period of the pre-operational stage — reversibility.

Figure 2.33 The snowman has collapsed and the three younger children are concerned about its welfare. One girl described it as 'sick', another as 'sore' and the other as 'hurt'.

Jack is incapable of mentally reversing the process he saw. **Reversibility** is the ability to mentally follow a sequence of events or line of reasoning back to its starting point. This includes being able to recognise that something can change and then return to its original condition. It is a more sophisticated mental process than counting backwards; for example, understanding that a deflated ball can be pumped up again and put back into play, or that an ice-block that melts is not necessarily gone forever — the liquid can be frozen again to re-create the ice-block.

The following example of egocentric thinking by three-year-old Alexandra also illustrates her *inability* to use reversibility.

Adult: *Do you have any brothers or sisters?*

Alexandra: *Yes, a sister.*

Adult: *What is her name?*

Alexandra: *Sienna.*

Adult: *Does Sienna have a sister?*

Alexandra: *No.*

Figure 2.34 Reversibility is the ability to mentally follow a sequence of events or line of reasoning back to its starting point, such as understanding that a deflated ball can be pumped up again and put back into play.

2.5 LEARNING ACTIVITY 2

Analysis of data on dreaming by pre-operational children

1. The following extract comes from a conversation between Piaget and a pre-school child aged 6 years and 6 months. The data was collected during a case study Piaget conducted with a small group of children to find out about their dreaming.

Piaget:	Do you know what a dream is?
Child:	When you are asleep and you see something.
Piaget:	Where does it come from?
Child:	The sky!
Piaget:	Can you see it?
Child:	Yes when you're asleep.
Piaget:	Could I see it if I was there?
Child:	No.
Piaget:	Why not?
Child:	Because you wouldn't be asleep.
Piaget:	What do you dream with?
Child:	The mouth.
Piaget:	Where is the dream?
Child:	In the night.
Piaget:	Where does it happen?
Child:	In the bed — on the pillow.

Source: Piaget, J. (1929). *The child's conception of the world.* London: Paladin. p.114.

a. What kind of data was collected in the case study — quantitative or qualitative, primary or secondary?
b. How does the child describe what a dream is?
c. Does the child think the dream comes from an 'internal' or 'external' source? Explain your answer with reference to the data.
d. What kind of thinking is the child using? In your answer, refer to Piaget's descriptions of thought processes of pre-operational children. Give evidence from the child's responses to support your view.
e. Is the thinking of the pre-school child typical of children in this stage of cognitive development? Explain with reference to Piaget's theory.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

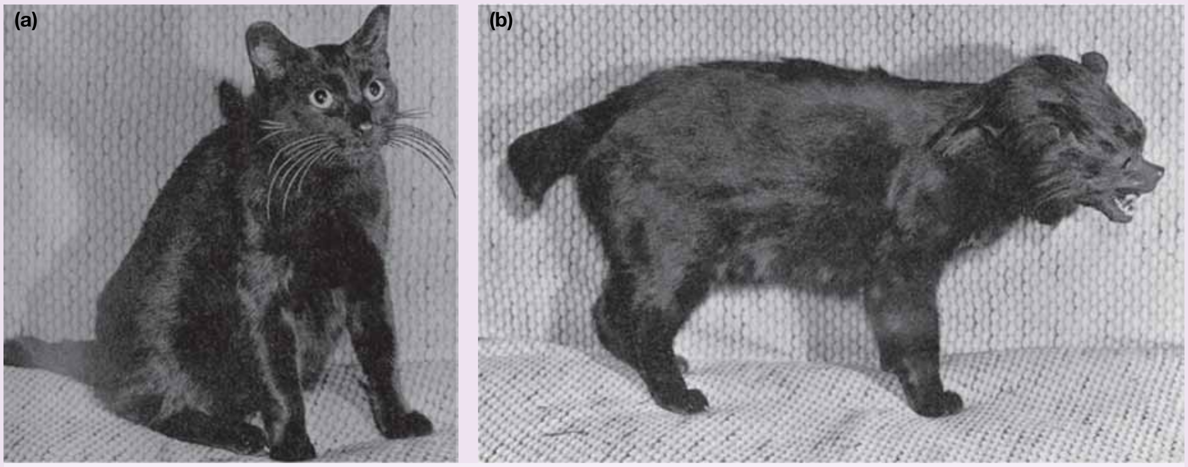
2.5 LEARNING ACTIVITY 3

Analysis and evaluation of research on the ability to distinguish between appearance and reality

A psychologist observed that her 2½-year-old son became frightened when an older child put on a Batman mask. The younger child behaved as if the mask had actually changed the wearer into Batman. The psychologist was intrigued by her son's apparent confusion between appearance and reality and decided to conduct research to find out the age when children have developed the ability to distinguish between appearance and reality.

The psychologist devised an experiment using Maynard, a well-behaved black cat. Her sample consisted of four children of friends and relatives. The children were aged from 3 to 6 years, with one child aged 3, another 4, and so on. At the start of the experiment, Maynard was presented to all the children and they all said that he was a cat. After they played with Maynard for 5 minutes, the psychologist hid the top half of Maynard's body behind a screen while she strapped a realistic mask of a ferocious dog onto his head.

As she removed the screen, the psychologist asked a set of questions to assess the children's ability to distinguish between the animal's real identity and its appearance: 'What kind of animal is it now?' 'Is it really a dog?' 'Can it bark?' The strength of the children's ability to distinguish appearance and reality was measured on an 11-point rating scale. Children who said that the cat had turned into a dog were given a score of one, while children who said that the cat only appeared to turn into a dog but could never really become one were given a score of 11.

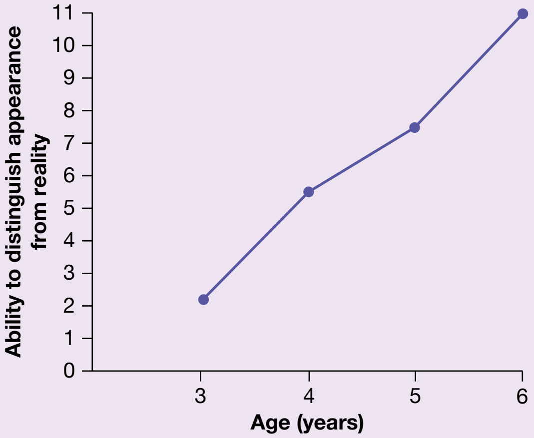


(a) Maynard the cat (b) wearing the ferocious dog mask.

As shown in the graph on the next page, the 3-year-old focused almost entirely on Maynard's appearance. The child said Maynard had actually become a ferocious dog and might bite them. The 6-year-old was amused by this, having understood that the cat only looked like a dog. The 4- and 5-year-olds showed considerable confusion. They didn't believe that a cat could become a dog, but they did not always answer the psychologist's questions correctly.

The psychologist concluded that young children experience confusion between appearance and reality but have a better understanding of the difference between appearance and reality by age 5. By the age of 6, it is likely that children will be able to distinguish between appearance and reality.

a. Suggest a relevant research hypothesis.
b. Identify the experimental design.
c. Describe the results of the research.
d. What criticisms can be made of the sample in terms of:
   i. size
   ii. representativeness?
e. Is the conclusion valid on the basis of:
   i. sample size
   ii. representativeness of the sample?
f. Can the results be generalised to other children aged 3 to 6 years? Explain your answer.
g. Suggest a sample and sampling technique that would better enable the results to be generalised to a specific population and have external validity.
h. Is this research ethical? Give reasons for your answer.



Age-related increase in children's ability to distinguish appearance from reality

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Concrete operational stage (7–12 years)

The child is now capable of true logical thought and can perform mental 'operations'. According to Piaget, a *mental operation* involves the ability to accurately imagine the consequences of something happening without it actually needing to happen. For example, at this age, the child can easily tell you that if it rains when on a family picnic everyone might get wet. Similarly, adding two numbers 'in your head' is an example of a mental operation.

In the **concrete operational stage**, however, mental operations can only be applied to 'concrete' objects or events that are immediately present and can therefore be touched, seen or experienced in some way through the senses. This is why Piaget used the terms 'concrete thinking' and 'concrete operational'.

A key cognitive accomplishment for a child in this stage is understanding conservation. **Conservation** refers to the understanding that certain properties of an object can remain the same even when its appearance changes. The concept of conservation can be applied to any form of measurement, including volume, mass, number and length.

Piaget's best known example is *conservation of volume* using liquid poured into different shaped containers. For instance, 8-year-old Olivia can recognise that if she pours cordial from a tall, thin glass into a short, wide glass, the volume (amount) of cordial remains the same (Figure 2.35). However, Olivia's 4-year-old brother Sam, who is still in the pre-operational stage, will believe that the short glass has less cordial than the tall one because it is shorter.

Even if Olivia pointed out that no cordial was subtracted when pouring, and even after she poured the cordial back into the original glass to demonstrate that the amount had not changed, Sam would still claim there is less liquid in the short glass (and more in the taller glass). Sam tends to focus his attention on a single property of the glass — its height. This means that he is *centring*, a characteristic of pre-operational thinking.

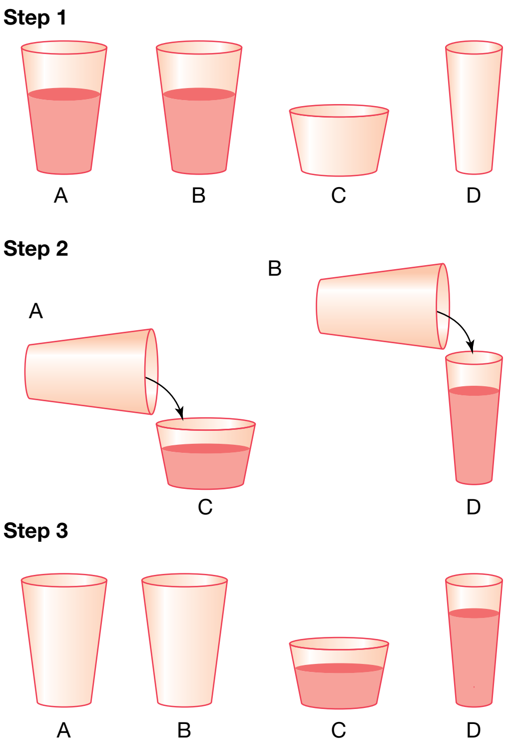

Figure 2.35 Conservation of volume. A child who understands this concept recognises at step 3 that, despite the different size of the glasses, C and D hold the same amount of liquid.

Conservation of mass involves understanding that the mass (i.e. amount of matter) of an object remains the same even when it changes its appearance. This means that children are able to deal with the fact that two identical play dough balls of the same size still have equal amounts of play dough even if one is changed into the shape of a sausage or flattened to look like a disk, as shown in Figure 2.36. Similarly, children who can conserve mass know that their body weight will remain unchanged when they move from sitting cross-legged on the floor to standing up straight.

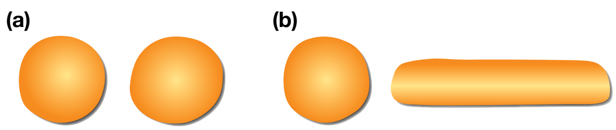

Figure 2.36 Conservation of mass. A child who can conserve mass will realise that, despite the changed shape of ball 2, in (b), balls 1 and 2 still have the same amounts of play dough.

Piaget also described a conservation in relation to number and length. In a *conservation of number* task, a child might be shown two rows of lollies, with each laid out as shown in Figure 2.37(a). The experimenter then makes one of the rows longer by spreading out the lollies, as shown in (b).

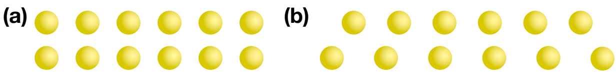

Figure 2.37 Conservation of number. (a) The child sees two identical rows of lollies (or other objects) and says there is the same number in each row. (b) The lollies in one row are spread out and the experimenter asks if the rows have the same number of lollies.

The child who can conserve number will realise that there are still just as many lollies in each row. In everyday life, they will also know that four biscuits or blocks will remain constant in number regardless of whether they are spread out on a table or stacked into a tower.

In a *conservation of length* task, a child might be presented with two objects such as pencils, as shown in Figure 2.38.

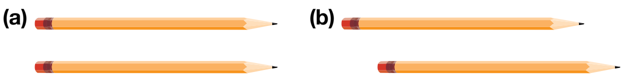

Figure 2.38 Conservation of length. (a) The child sees two identical pencils (or other objects) that are equal in length. (b) One of the pencils is moved slightly and the researcher asks if one pencil is longer than the other.

The child who can conserve length will realise that neither pencil has changed in length when one is moved as shown in (b). In everyday life, they will also know a skipping rope is the same length regardless of whether it is laid out straight or rolled up.

Recent research indicates that the different types of conservation are not all achieved at the same age during the concrete operations stage and there are also cultural differences. Generally, in non-Asian cultures, conservation of number tends to be achieved first, then conservation of length, mass and volume. But each type can be achieved earlier or later depending on experience and the type of test used.

Another key cognitive accomplishment in the concrete operational stage is the ability to organise objects or events into categories based on common features that set them apart from other categories. This is called **classification**.

To test this, Piaget showed children 20 wooden beads, 18 of which were brown and two were white, as in Figure 2.39. Each child was then asked three questions:

1. Are all the beads wooden?
2. Are there more brown beads or white beads?
3. Are there more brown beads or wooden beads?

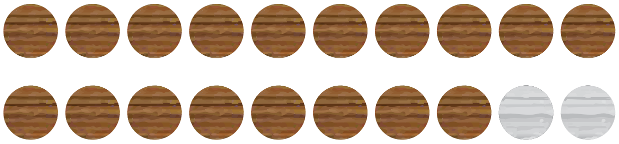

Figure 2.39 Assessing understanding of classification — are there more brown beads or wooden beads?

Pre-operational children usually answered the first two questions correctly but answered question 3 by stating there were more brown beads than wooden beads. Concrete operational children usually answered all three questions correctly. For question 3, they realised that there were more wooden beads because the white beads were also wooden. They had understood that the feature of colour was a sub-category of the overall category of wooden (which can have several sub-categories).

Formal operational stage (12+ years)

When many young adolescents enter secondary school at 12 or so years of age they are usually in Piaget's final stage of cognitive development. More complex thought processes are evident and their thinking becomes increasingly sophisticated through the combined effects of brain maturation and life experience.

Some of the tasks used by Piaget to assess formal operational thinking involved processes of scientific inquiry, as in the pendulum problem described in the Experiment by Piaget to assess formal operational thinking learnMORE section in learnON. He believed that formal scientific reasoning is one of the most important characteristics of formal operational thinking (Inhelder & Piaget, 1958).

A key cognitive accomplishment in this stage is **abstract thinking** — a way of thinking that does not rely on being able to see, visualise, experience or manipulate in order to understand something (as required in the concrete operational stage).

For example, someone in the **formal operational stage** will be able to achieve an accurate understanding of the concepts of time and distance — what it means for something to have happened in 200 BCE or how far 4000 kilometres really is. They will truly understand what freedom or fairness mean, the isms (such as racism, sexism and communism), the consequences of a parent losing their job, and why ethical issues need to be considered when conducting psychological research. They will also further develop their ideas about their own beliefs (such as whether reincarnation is possible reincarnation is possible), their values (judgments about what is important or worthwhile in life) and morality (distinguishing between actions on the basis of 'right' or 'wrong').

Formal operational thinking also involves the ability to solve problems systematically. For example, this occurs when you develop strategies to solve a problem, identify a range of possible solutions, formulate hypotheses as possible explanations and test different solutions in an orderly way.

This type of thinking makes it easier to solve algebra and geometry problems than in any previous stage. And when considering a casual work vacancy, you may weigh up possible clashes with homework and sport training, the kind of work to be done, the pay rate, the work location, transport options, how many hours you can work and whether you are qualified before you actually apply.

Figure 2.40 In the formal operational stage we can use abstract thinking to solve complex geometry problems at school.

Another type of logical thinking called deductive reasoning is also achieved. *Deductive reasoning* involves using logical rules to draw a conclusion from two or more pieces of information which are believed to be true. For example, consider the conclusion drawn below.

If Sam sleeps in she will be late for school.

Sam was late for school.

Therefore Sam slept in.

Deductive reasoning can be a useful way of solving some problems based on known information. However, the conclusion reached is not always correct even if it is logically reached. Consider this example.

All elephants have big ears.

My teacher has big ears.

Therefore my teacher is an elephant.

Idealistic thinking is also possible during the formal operational stage. For example, adolescents often think about the most desirable characteristics of themselves and others. They often compare themselves and others to a perfect standard and strive towards being like their ideal person. They have the ability to envisage alternatives to current national or global issues, but sometimes without fully considering what is realistically possible in a given time frame.

However, adolescents are able to realistically think about their future and what is possible, then make plans and set in place processes to achieve their goals. While a child at an earlier stage can identify that they want to be a truck driver or an astronaut, most children, prior to reaching the formal operational stage, do not have an accurate concept, or any concept at all, of what it means to be a truck driver or an astronaut. Nor do they have any real understanding of the steps involved in becoming either of these.

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learnMORE | An experiment by Piaget to assess formal operational thinking

Access learnON for a description of a formal operational thinking study.

2.5.3 Critical appraisal of Piaget's theory

Piaget's theory has had a great impact in psychology and his place in the history of psychology is significant. His research findings and theory stimulated considerable interest in the development of cognitive abilities and provided the impetus for thousands of research studies by other psychologists over many years.

Many of these research studies have confirmed various aspects of Piaget's theory or extended Piaget's theories into other areas of development. Important practical applications also come from Piaget's theory; for example, the idea that the 'developmental readiness' of young children for reading, writing, mathematics and other cognitive tasks needs to be considered before giving them such tasks. Some parents try to give their children a 'jump start' in life by enrolling them in academically demanding programs when they are quite young. On the basis of Piaget's four-stage theory, many child development experts warn that children should not be 'pushed' too early, before they have sufficiently 'cognitively matured'.

However, since the 1970s in particular, other researchers have also discovered that infants know a lot more, and know it sooner, than Piaget believed they did. It's not that the infants are 'smarter' now; rather, many researchers have found gaps in Piaget's research methods and findings. In refining Piaget's methods, they have found, for example, that key cognitive accomplishments described by Piaget for the different stages are often achieved by children much younger than the ages proposed by Piaget. Consequently, many psychologists now believe that the age ranges for each stage proposed by Piaget vary more widely than Piaget described.

For example, researchers have found that children are capable of concrete operational tasks such as conservation and classification at younger ages than described by Piaget. Pre-operational children in Piaget's studies may have been unable to do these tasks, not because they lacked these cognitive abilities, but because during testing they lost concentration, their attention wandered and they forgot parts of the problems they were given (Kail & Bisanz, 1992). It has been shown that when conservation problems are presented without distracting information, children as young as 4 and 5 years old can consistently complete them accurately (McGarrigle & Donaldson, 1974).

A further criticism of Piaget's theory is that Piaget may have overestimated young children's language ability, leading him to assume that wrong answers came from faulty thinking. An alternative explanation for a child's answer could be that the child misunderstood the task or did not explain their answer clearly (Donaldson, 1979).

Piaget's theory has also been criticised for the small number of participants in many of the experiments he conducted to test his ideas. In particular, Piaget often referred to examples involving his own children. Although qualitative data from observations of his own children provided useful descriptions not easily available using other research methods, some psychologists have expressed concerns about the generalisations Piaget made from such limited data.

A small sample size is rarely representative of the population to which the research findings will be applied. When a small sample is used, it is more likely that the participants will not match or reflect the population of research interest in personal characteristics that can influence the results of the study.

In the study of cognitive development using children (including infants) as participants, personal characteristics of individual children (such as social and ethnic or cultural background, environmental experiences, attention span, language, memory, temperament, personality, sociability, physical competence and so on) can influence their performance on the experimental task.

These variables can also be equally relevant to studies of cognitive development using adolescents and adults as participants. The small sample size in many of Piaget's experiments helps explain why researchers who tested his findings have found that children can acquire such abilities as conservation and classification at much younger ages than originally proposed by Piaget.

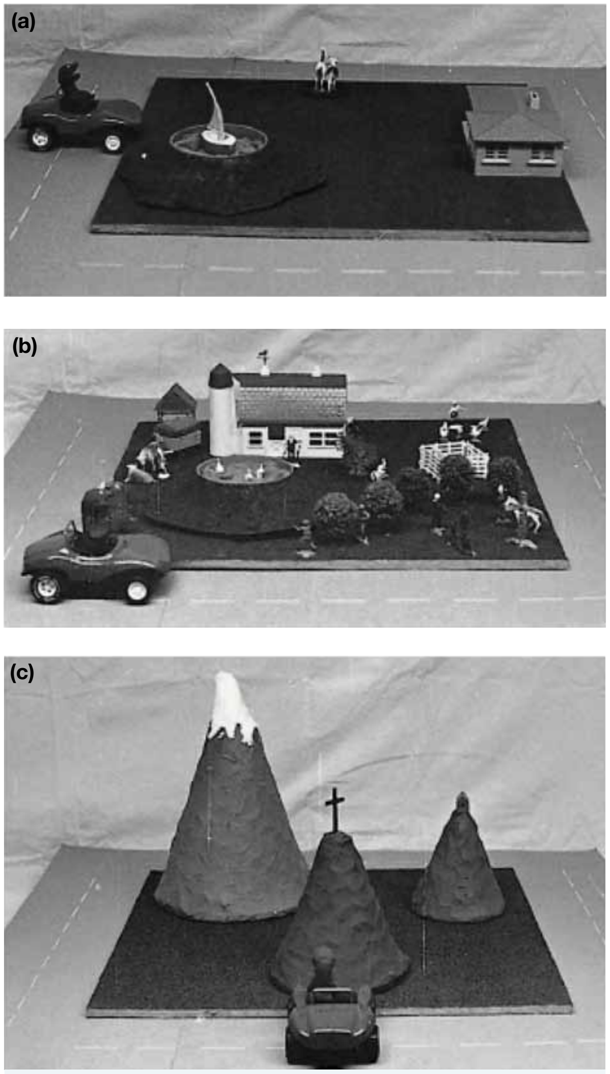

Figure 2.41 Poor performance on Piaget's test of egocentrism may have resulted from the fact that the spatial layout of his three-mountain task is unduly complicated. In a later study, 3- and 4-year-olds were shown various three-dimensional displays such as (a) and (b), as well as a three-mountain scene (c). Grover, a doll, was shown to drive a toy car around each layout. When he stopped the car, the child was asked to turn an identical display on another table until 'you are looking at it the same way Grover is'. The children did quite well with all displays except (c), the three-mountain scene. This one probably caused trouble because the children couldn't distinguish the mountains as readily as they could distinguish the toy objects in (a) and (b).

2.5 LEARNING ACTIVITY 4

Review

1. Complete the table to summarise the various age-related stages of Piaget's theory, common ways of thinking and key cognitive accomplishments in each stage. Include a brief description of each accomplishment.

Stage	Approx. age range	Common ways of thinking	Key cognitive accomplishments

2. Briefly outline three criticisms of Piaget's theory.
3. Search the internet for an example of a research study and its findings that shows children can perform a cognitive task at an earlier stage than described by Piaget.

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2.5 LEARNING ACTIVITY 5

Multiple-choice questions

1. Which of the following statements about cognitive development is correct?
   A. Cognitive development occurs in isolation of other areas of development.
   B. Cognitive development among all individuals occurs in the way described by Piaget.
   C. Cognitive development varies within and between individuals.
   D. Cognitive development cannot properly occur until the individual is old enough to attend school.
2. According to Piaget, schemata
   A. can only be learnt through experience in the environment.
   B. occur in a progressive way during different stages of cognitive development.
   C. cognitive accomplishments tied to specific stages of cognitive development.
   D. are bits of knowledge about different aspects of the environment that underlie and guide cognitive development.
3. Which term did Piaget use to describe the process of incorporating new information into pre-existing schemata?
   A. adaptation
   B. assimilation
   C. accommodation
   D. equilibration
4. Jack cried when his favourite stuffed toy tumbled down the stairs because he believed it was hurt. Piaget would argue that this belief has been influenced by way of thinking called
   A. animism.
   B. centricism.
   C. decentration.
   D. transformation.
5. Piaget proposed that the order in which people go through his stages is
   A. random.
   B. varied.
   C. fixed.
   C. sex-related.

To answer these and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

2.6 Social development

People need and seek interaction with others. For example, we rely on others to provide friendship, to relieve loneliness and boredom, to have fun, to communicate with, to provide physical comfort and to give emotional support. Similarly, others rely on us to provide these in return. Any behaviour which involves interaction between two or more people is generally considered to be social behaviour.

In psychology, **social behaviour** is defined more specifically as any action that is influenced, directly or indirectly, by the actual, imagined, expected, or implied presence of others (APA, 2022). This means that two people do not actually have to be present or interacting for social behaviour to occur. For example, if you do something to help an elderly neighbour without them even being aware of it, then that would be considered social behaviour. Similarly, interacting with someone through social media is social behaviour.

Most of our behaviour is social. As with other areas of development, its development is influenced by biological, psychological and social factors, from the time of birth. These include the individual characteristics and abilities associated with the genes we inherit, our temperament and personality traits, the attachments we form through our experiences with our parents and other caregivers, our experiences with friends and acquaintances, our experiences in educational settings and the wider community, and our exposure messages conveyed by different forms of media.

In this subtopic, we consider examples of early social behaviour, then one of the most widely described theories on the development of social behaviour through the life span.

2.6.1 Early social behaviour

Newborn infants will both smile and cry. In both cases, caregivers respond to these behaviours as if they were social. So it seems that infants can actually engage in social behaviour soon after birth. However, psychological research studies have found that smiling and crying are likely to have no social meaning to the newborn infant. Smiling and crying are important behaviours in an infant's life. They will continue to be important throughout the life span, but it takes some time to learn the social consequences of smiling and crying.

Smiling

Through smiling, infants can both respond to others and initiate responses from others. Although infants only a few hours old are able to produce the facial expression of a smile, it is assumed that this early smile is a spontaneous or reflexive smile which has no social basis.

The *reflex smile* is characterised by a simple turning up of the corners of the mouth. It is observed throughout the first month or so, especially when asleep (in a rapid eye movement state). It may also be observed when the infant is awake, possibly as a physiological response brought on by non-social stimuli such as a bubble of gas in the stomach ('wind'), being fed, or being stroked on the cheek. It seems that while many parents believe that their child actually smiles at them in a social way at various times in its first month of life, psychologists tend to think that this is probably not the case.

The *social smile* in response to social stimuli typically appears at about 4 to 6 weeks of age but is not frequent and unambiguous until about 3 months or so. Social smiling is 'true' smiling as we know it. However, many infants are not very selective in their use of the social smile until about 6 months of age or so. Until this time, the social smile can be brought on by almost any person or thing, such as the appearance of a caregiver, a voice, movement or the sound of a musical toy.

By around 6 months of age, infants can quite clearly distinguish between familiar and unfamiliar adults and between different sources of comfort. An infant's failure to show social smiling by 6 months or so is considered an early sign of autism (APA, 2022).

Figure 2.42 The social smile in response to social stimuli typically appears at about 4 to 6 weeks of age.

Even if the spontaneous, reflex smile is not actually a social behaviour, psychologists believe it provides the basis of an infant's first real positive social interaction in which it can have an impact on another person. For example, when an infant smiles, this usually brings great delight to caregivers who often interpret the smile as the child recognising them. While this is probably not true from a newborn infant's point of view, it tends to draw a response from caregivers, encouraging them to smile and be affectionate in return. In time, these social exchanges can draw an infant and caregiver closer together.

Crying

Like its first smile, an infant's first cry does not appear to have a social basis. For instance, the crying often observed at birth is generally believed to be a *reflexive* response with a survival function — it helps to supply the blood with oxygen and inflates the lungs so that independent breathing can commence.

After this initial function, crying is commonly used as an early form of communication. It conveys messages about various needs such as hunger and thirst, and various states such as pain and discomfort.

Infants also seem to use distinctive cries to communicate different needs and states. For example, American psychologist Peter Wolff (1969) conducted one of the earliest investigations on the cries of newborn infants and identified four crying patterns: the 'angry' cry, the 'in pain' cry, the 'hungry' cry and the 'cry of frustration'. His research also showed that most mothers are able to identify which type of cry their baby is using and that mothers can differentiate between these cries after only a very short period of time.

Other researchers have confirmed Wolff's findings on the ability of mothers to discriminate between neonate cries. For example, in one study, the researchers found that most mothers were able to correctly identify up to 24 infant cries (6 each of pain, birth, hunger, and pleasure) in a cry recognition task (Brennan & Kirkland, 1982).

Figure 2.43 Crying is used as an early form of communication. It conveys messages about various needs such as hunger and thirst, and various states such as pain and discomfort.

Like smiling, crying provides the basis of social interaction and the formation of social relationships with others. By the end of the second month of life, an infant's cry has many variations (for example, in intensity, tone and rhythm) and the infant has learned that crying is an effective way of getting attention and communicating needs. However, while smiling almost always brings about a positive and encouraging response from a caregiver, this is not often the case with crying.

A caregiver's response will usually be to attend to the crying infant's needs with the view of stopping the crying. This response can help strengthen an infant–caregiver relationship, but, if the crying persists with no apparent cause, a caregiver can become more and more frustrated with the distressed infant. This pattern of social interaction over a prolonged period of time can delay the formation of a close infant–caregiver relationship, or weaken the existing relationship (Ainsworth, 1969, Bowlby, 1969).

2.6 LEARNING ACTIVITY 1

Review

1. Define the meaning of social behaviour.
2. Give an example of social behaviour that may be initiated or influenced by each of the following:
   a. actual presence of one or more others
   b. imagined presence of one or more others
   c. expected presence of one or more others
   d. implied presence of one or more others
3. This one-week-old infant is imitating tongue poking by a researcher. Explain whether the infant is engaging in social behaviour.

4. Explain whether infant attachment behaviour is social behaviour.
5. List about 10 different behaviours in which you engaged during the past 24 hours, however simple or complex, brief or prolonged.
   a. Is your data quantitative or qualitative? Primary or secondary? Objective or subjective?
   b. Comment on:
      i. whether your data support the view that most of the behaviour in which we engage is social in nature
      ii. how you could collect valid and reliable data to test a hypothesis about the frequency of social behaviour.
6. Give an example of how emotional and cognitive development may each influence social development.

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2.6.2 Erikson's theory of psychosocial development

There is little doubt that early childhood experiences are important in the development of social behaviour. For instance, the nature of the attachment formed between an infant and its parent(s) or other caregivers is considered vital in social development as well as emotional development. Similarly, many of our social skills develop in early childhood through interaction with other children during play.

These are, however, just some of the experiences of early childhood which influence the course of social development. Experiences with other family members, adults, peers, school and various forms media such as books, movies and social media platforms significantly contribute to the development of social behaviour.

One prominent view of the way in which social and psychological development in general occur was described by German-born psychiatrist Erik Erikson (1902–1994). His theory describes the impact of certain social and cultural experiences on our social, emotional and personality development at various stages of the entire life span.

Erikson (1950) based his theory on extensive research mainly using case studies. He studied a range of people living in different cultures (for example, Denmark, Germany, wealthy American adolescents and indigenous Sioux Indians). He also made intensive studies of the lives of important historical figures (such as Martin Luther King Jr. who led the freedom movement for African Americans in the 1950s and 1960s).

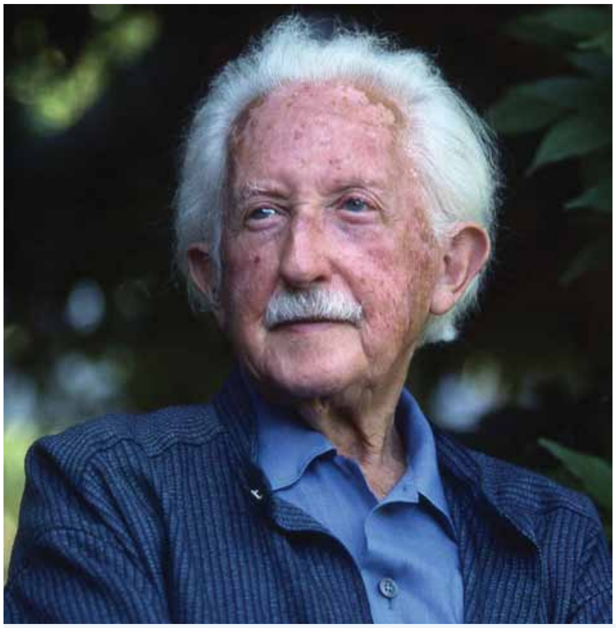

Figure 2.44 Erik Erikson (1902–1994)

Key principles of Erikson's theory

Erikson believed that social development occurs through the combined effects of psychological processes which take place within the individual (*psycho*) and their life experiences, particularly interactions with other people (*social*). This is why he called his theory psychosocial development.

Erikson viewed psychosocial development as a progression through eight sequential stages, with each stage corresponding with a different period in the life span. In each of these stages, the individual has to deal with a specific psychosocial crisis that is normal for people at that time in life.

Psychosocial crisis

A **psychosocial crisis** is a personal conflict an individual faces in adjusting to society. Each crisis involves a struggle between two opposing tendencies, one of which comes from our internal personal needs and the other from the demands of society, but both are experienced by the person.

According to Erikson, our psychosocial development is shaped by how we deal with or resolve each crisis. The satisfactory resolution of psychosocial crises leads to a healthy personality and a productive lifestyle.

In Erikson's theory, a *crisis* is not a catastrophe but a turning point in life. The way in which each crisis is resolved can have either a positive (good) or negative (bad) outcome, depending on the individual's ability to deal with that crisis.

Erikson used the term crisis in the way that doctors do. A crisis is like a patient being in a 'serious condition' for a period of time, at the end of which the patient takes a turn for the better or worse. However, Erikson did not believe that failure to resolve any psychosocial crisis will necessarily have consequences which are permanent or irreversible. He believed that setbacks in any stage can eventually be overcome with proper attention, care and love.

As shown in Table 2.4 below, each of the eight crises involves a conflict between two characteristics which are the opposite of one another. One is a positive aspect and the other a negative aspect. Erikson believed that successful resolution of each crisis should be in favour of the positive characteristic. Erikson added, however, that the opposite negative aspect must also exist to some degree if healthy psychosocial development is to occur. Therefore, resolution of the trust versus mistrust crisis in stage 1 involves developing the right mix of trust (to allow intimate relationships) and mistrust (for self-protection).

Aged-based stages

According to Erikson, the ages at which people go through each of the eight stages can vary because of each individual's unique life experiences. However, the order in which individuals progress through the stages is fixed. Erikson believed that it is necessary to experience each crisis (but not necessarily to resolve each crisis) before proceeding to the next stage.

Erikson also believed that different stages can overlap, so it is possible for an individual to be dealing with more than one crisis at any particular time. For example, the crisis of trust versus mistrust in stage one is not necessarily resolved during the first 18 months of life. It can arise again in each successive psychosocial stage. It is possible to gain basic trust in early infancy then lose it later because of a negative experience with someone in a later stage in life. In addition, an individual may fail to resolve a crisis at one time but resolve that crisis in a later stage.

Erikson's description of the eight psychosocial stages is a 'picture' of what is *ideal*. According to Erikson, the better an individual deals with a psychosocial crisis in any stage, the healthier their psychosocial development. However, not being able to resolve a crisis does not prevent the individual from moving into the next stage. Regardless of whether a psychosocial conflict is successfully resolved, individuals move into the next psychosocial stage because they mature and because of their changing social situations. However, according to Erikson, if a conflict is not resolved, it will have a negative effect on the individual's psychosocial development and adjustment to society.

Table 2.4 Erikson's eight psychosocial stages

Stage	Approximate age	Developmental period	Psychosocial crisis
1	birth to 18 months	early infancy	trust vs mistrust
2	18 months to 3 years	late infancy	autonomy vs shame and doubt
3	3 to 5 years	early childhood	initiative vs guilt
4	5 to 12 years	middle and late childhood	industry vs inferiority
5	12 to 18 years	adolescence	identify vs role confusion
6	18 to 25 years	young adulthood	intimacy vs isolation
7	25 to 65 years	adulthood	generativity vs stagnation
8	65+ years	late adulthood	integrity vs despair

2.6 LEARNING ACTIVITY 2

Review

1. Explain the meaning of psychosocial development.
2. b. What is a psychosocial crisis and why is it said to occur?
   c. Give an example of a psychosocial crisis.
3. What is meant by the idea that resolution of a crisis should include the 'right mix' of both the positive and negative aspects? Explain with reference to an example.
4. How often might a particular psychosocial crisis occur in the course of a lifetime?

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Stages of psychosocial development

Stage 1: Trust versus Mistrust (0 to 18 months)

Stage 1 involves a conflict between trust at one extreme and mistrust at the other. According to Erikson, to progress through this stage in the best way, the infant needs to develop the right balance of trust and mistrust.

Erikson used the term **trust** broadly to refer to the views and expectations that infants develop about their environment. He believed that when an infant has developed a basic sense of trust, they will view their external world as a predictable, safe, caring and happy place. When their environment is predictable, the infant can anticipate reactions; for example, being able to rely on being fed when hungry, knowing that a cuddle and care will be given when hurt, or that help will arrive if they are stuck under a chair while crawling around a room. A predictable environment also includes the knowledge that a frown or a firm 'no' will be a consequence of inappropriate behaviour.

According to Erikson, if an infant is to develop into a person who is trusting and trustworthy, the quality of care they receive is important. The infant whose needs are met when they arise, whose discomforts are quickly removed, who is cuddled, played with and talked to, forms a view of the world as a safe place and of people as caring, helpful and dependable. However, both trust and mistrust should be experienced to know how to truly trust.

Sometimes an infant's cry is answered immediately, sometimes it is ignored briefly then answered and sometimes the crying infant can be ignored and left for long periods. When infants' needs are not consistently recognised, their environment can become unreliable and unpredictable. When care is inadequate, irregular or even rejecting, **mistrust** can develop. According to Erikson, if infants develop a strong sense of mistrust, they will become anxious and insecure. They may become fearful and suspicious toward the world and people in it, and this may continue to later stages of psychosocial development.

Stage 2: Autonomy versus Shame and doubt (18 months to 3 years)

Stage 2 involves a conflict between autonomy at one extreme and shame and doubt at the other. Erikson believed that successful attempts by infants to establish their independence as they become increasingly mobile and competent contributes to a sense of autonomy.

Autonomy refers to the ability to do things independently and the feelings of self-control, self-confidence, self-reliance and competence which

Figure 2.45 Infants develop trust when their world is predictable; for example, being able to rely on being cuddled when they need it.

accompanies this. We have autonomy when we are in a position to make our own choices and act on those choices; for example, when we choose to stay where we are or to go somewhere else, or when we choose to do some particular thing or not do it.

Alternatively, a sense of being too dependent on others can lead to a lack of self-confidence, self-consciousness and feelings of **shame** and **doubt** about our capabilities.

Although it is desirable for autonomy to be developed in stage 2, Erikson believed that a certain amount of self-doubt about our capabilities is appropriate. Infants need to know the right balance between what they can do, what's safe to do and what they should do, compared with the activities for which they are not yet ready.

According to Erikson, the psychosocial crisis of autonomy versus shame and doubt is based on the infant's developing motor and cognitive abilities. This is the time when infants gain more and more control over their bodies and aspects of their behaviour. They learn to control some of their impulses and to feel pride in their accomplishments. Toddlers begin toilet training in this stage and exercise autonomy when they gain some control over their bowel and bladder. Both to toddlers and to caregivers this is an important achievement. Language skills are also important in developing autonomy. As infants get better at making themselves understood, they feel more powerful and become more independent.

During the second year of life, when infants can move about on their own and have discovered that they can cause events to occur, they begin to show their independence. They often want to explore, investigate and do things by themselves. The infant not only talks and walks, but also climbs, opens and closes things, pushes and pulls, holds and lets go. They take pride in these new accomplishments and often want to do things without help; for example, feeding themselves, buttoning clothes or flushing the toilet. In many respects, this second psychosocial stage is an 'all by myself' period.

Autonomy builds on the sense of trust developed in the first stage. Erikson believed that infants who have a well-developed sense of trust are also best prepared to become autonomous. This is because the caregiver is seen as a safe 'base' from which the infant can explore the world with increasing independence.

As time passes, these infants move further from their caregivers, often happily playing by themselves with only occasional glances to check that safety and security are nearby. By gently encouraging independence, by not immediately responding to every single request from the infant and by respecting the fact that the infant is an active, inquisitive person, caregivers promote the infant's development of autonomy.

If caregivers recognise the infant's need to do what they are capable of doing at their own pace and in their own time, then the infant develops a sense that they can control their muscles, their impulses, their behaviour and their environment — they have a sense of autonomy. However, when the infant's caregivers do for the infant what the infant is capable of doing themself, they reinforce a sense of shame and doubt.

When caregivers are consistently overprotective and restrict what the infant is permitted to do, make fun of unsuccessful attempts at independence and criticise 'accidents' such as wetting, dirtying, spilling or breaking things, infants can develop an excessive sense of shame with respect to other people and they begin to doubt their own abilities to control the world and themselves.

Erikson believed that if the infant leaves this stage with less autonomy than shame and doubt, they will find it more difficult to achieve autonomy later in life. In contrast, the infant who moves through this stage with a much greater sense of autonomy than feelings of shame and doubt is better prepared to be autonomous in later stages of development.

Figure 2.46 An infant's eagerness to dress themselves demonstrates their increasing autonomy.

Stage 3: Initiative versus Guilt (3–5 years)

The third stage involves a conflict between initiative at one extreme and guilt at the other. Having established a sense of trust and autonomy in infancy, children develop an increasing sense of their own power and now want to try new things and use their power. According to Erikson, **initiative** involves being able to plan, think for oneself and carry out various kinds of activities with purpose.

Children from 3 to 5 or so years of age are very active and increasingly have more control over their bodies. They can run, jump, wrestle, climb and ride a scooter, tricycle or bike. Their mental capabilities are also developing. They have good language skills, they are inquisitive, they participate in imaginative play, and they are beginning to understand that other people have different thoughts and feelings from them. They also start to realise they can make things happen.

Children in this age range no longer merely react. They plan and think for themselves, act with purpose, explore and follow their curiosity. They can therefore initiate and carry out various activities on their own, often just for the sake of being active. They no longer just respond to or imitate the actions of other children (Erikson, 1963).

Children in this age range also become increasingly aware that there are limits beyond which they must not go when showing initiative and using their powers. For example, they become aware of rules about what is (and what is not) permitted, what will (and what will not) be tolerated, and even questions they should not ask. Thus, along with initiative comes the potential for feeling **guilt** — about going too far, about overstepping boundaries, about asking too many inappropriate questions, about becoming the 'wrong kind of person' (Morris, 1990).

For example, consider the case of 5-year-old Sumi who feels so angry at her little brother that she wants to hit him. Sumi also realises that hitting her brother is wrong and that this action would upset her parents. She knows she has the ability to hit her little brother, but realises she cannot always do what she wants. She also realises that she will feel guilty if she fails to control her behaviour. In the autonomy stage (stage 2), children can be made to feel ashamed by other people; whereas in this third stage they learn to make themselves feel ashamed.

According to Erikson, whether or not a child leaves this stage with a stronger sense of initiative than guilt depends largely on the way in which caregivers respond to the child's self-initiated activities. Children who are given a lot of freedom and the opportunity to initiate play activities simply for the sake of doing them will have their sense of initiative strengthened.

Initiative is also strengthened when caregivers answer their children's questions and do not discourage or make fun of their fantasies. Asking questions is a type of 'intellectual initiative'. However, if children are made to feel that their play is silly and stupid, that their questions are annoying or a nuisance, and that fantasy is a waste of time, then they may develop a sense of guilt over self-initiated activities, feelings that may continue through later stages (Elkind, 1971).

Figure 2.47 Initiative involves being able to think for yourself and acting with a purpose. If made to feel stupid about her self-initiated 'dress-up' game, this child may develop a sense of guilt over self-initiated activities.

Stage 4: Industry versus Inferiority (5–12 years)

Stage 4 involves a conflict between industry at one extreme and inferiority at the other. During this stage, which corresponds with the primary school years, children have a desire to learn how things are made, how they work and what they do. According to Erikson, children will develop a strong sense of industry, unless they are restricted by feelings of inferiority or inadequacy.

In stage 4, children gain mastery over their bodies. It is also a period during which they become capable of logical reasoning, and of playing and learning by rules. For example, it is not until this stage that children are really able to 'take turns' at games that require them to obey rules, such as when playing tag or card games.

Although play continues to be important, as it is in all other stages, this is the period when the child must learn to work and become productive. According to Erikson, children must learn the technology or 'tools' which are important for being an industrious, productive worker in their society. In New Guinea, the Arapesh boy learns to make bows and arrows and traps, and the Arapesh girl learns to plant, weed and harvest. In Western, industrialised societies such as Australia, particularly in the capital cities and big towns, the basic tools required to become a productive, industrious worker later in life involve literacy (reading and writing), numeracy (using numbers) and digital competency (using apps on devices such as smart phones, PCs and tablets). For most children, these skills are mainly learned in school.

At school, the child also learns to be a worker and to earn recognition by producing things of quality, both by themselves and with others. Importantly, school also exposes the child to many peers with whom they cooperate and compete, and against whom they measure their abilities and accomplishments. To the 5-year-old child, entering school is like entering a new world which is different from home. In many respects, school is a social world with its own goals, rules, achievements and failures.

When children are encouraged in their efforts to get the most out of things they already have, to do practical things (whether it be to cook, assemble a jigsaw puzzle, achieve a new level in a computer game, or construct a cubby house), are allowed to finish their products and are praised and rewarded for their results, then their sense of **industry** is enhanced. But parents who see their children's efforts as 'mischief' and 'making a mess' promote the development of a child's sense of inferiority. When children feel less adequate than their peers in achievements, skills and abilities, they develop a sense of **inferiority**.

The child's school experience also affects their industry–inferiority balance. For example, a child who has difficulties with schoolwork can have a particularly unhappy school experience, even when their sense of industry is encouraged and rewarded at home. This child may be 'too bright' to be in special classes, but 'too slow' to compete with children of average ability. Consequently, the child regularly experiences failure in academic efforts and this reinforces their sense of inferiority. However, children who have their sense of industry 'squashed' at home can have it revitalised at school through a sensitive and encouraging teacher.

Therefore, whether the child develops a sense of industry or inferiority does not depend solely on the caregiving efforts of the parents (as it does in earlier stages), but on other significant adults in the child's life as well (Elkind, 1971).

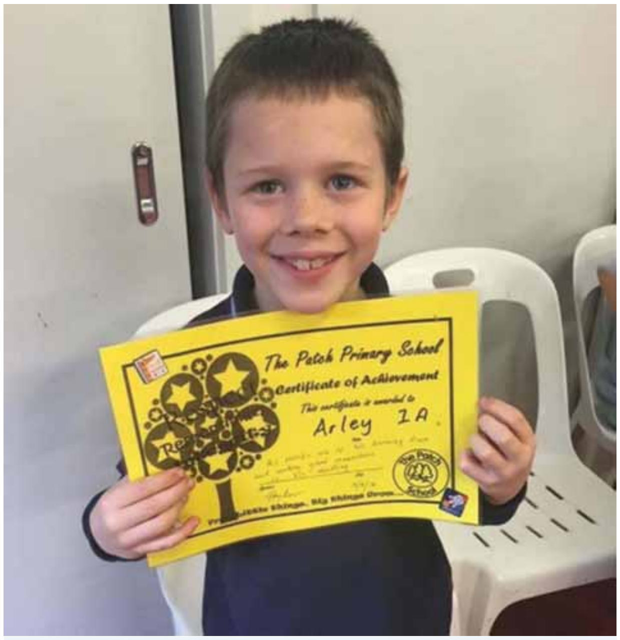

Figure 2.48 In stage 4, children learn the basic 'tools' that will enable them to become productive, industrious workers later in their lives. Reward for effort or achievement enhances our sense of industry.

Stage 5: Identity versus Role confusion (12–18 years)

Stage 5 involves resolving the conflict between identity at one extreme and role confusion at the other. During this stage, which corresponds with adolescence, the psychosocial crisis is about developing a sense of identity. Failure to resolve this crisis produces some degree of 'role confusion'.

Erikson used the term **identity** to refer to the overall image individuals have of themselves. He believed that identity is something all people seek and that the search for identity is a lifelong search. However, it first comes into focus during adolescence.

During adolescence, the individual matures cognitively as well as emotionally and physically. In addition to the new feelings, sensations and desires that are experienced as a result of bodily changes, the adolescent develops a variety of new ways of looking at and thinking about the world. Among other things, adolescents can think about how other people think and contemplate what others think of them. They can also form clear ideas about ideal families, religions, cultures and societies which they can then compare with their own experiences of family, religion, cultures and societies.

Erikson believed that the task of this fifth stage is for adolescents to use their cognitive abilities to bring together all the things they have learned about themselves in the various roles they have undertaken in life; for example, as a son or daughter, brother or sister, student, sportsperson, friend, leader, follower, musician, employee and so on. Experimentation with different social roles is common and may help with identity formation.

Eventually, the different images of the self — learned through these different roles — need to be combined into a complete image of the whole person that makes sense and that shows continuity with the past while preparing for the future. The adolescents who succeed at this task develop a psychosocial identity, a sense of who they are, where they have been and where they want to go in life.

If the person has reached adolescence with a healthy sense of trust, autonomy, initiative and industry, then their chances of developing a meaningful sense of identity are much better. The opposite is true for the person who enters adolescence with considerable mistrust, shame, doubt, guilt and inferiority. According to Erikson, preparation for a successful adolescence and forming an integrated psychosocial identity must, therefore, begin in infancy.

When young people do not attain a sense of personal identity, they show a certain amount of **role confusion** — a sense of not knowing who they are, where they belong, to whom they belong or where they are headed in life. According to Erikson, such confusion is often seen in 'delinquent young people'. Some young people seek a 'negative identity' opposite to the one that their parents and relatives would prefer them to have; for example, an identity as a 'goth', 'metal head' or a 'punk'.

Role confusion may also be evident when a young person takes an excessively long time to reach adulthood. However, a certain amount of role confusion is 'normal' and, according to Erikson, helps explain the inconsistency, or changeable nature, of much adolescent behaviour, as well as adolescents' self-consciousness about their appearance.

Failure to establish a clear sense of personal identity during adolescence does not mean that a person is a failure or will never establish a strong sense of who they are. People who attain a sense of identity in adolescence will still come across challenges to that identity as they move through life (Elkind, 1971; Harter, 1990; Grotevant, 1992).

Figure 2.49 Role confusion can cause some young people to adopt a 'negative identity', which is opposite to their parents' preferences.

Stage 6: Intimacy versus Isolation (18–25 years)

The sixth stage of psychosocial development involves a conflict between intimacy at one extreme and isolation at the other. Failure to resolve this conflict results in avoiding interpersonal relationships and experiencing a sense of isolation. Erikson used the term **intimacy** to refer to the ability to share with and care about another person without fear of losing oneself in the process. **Isolation** refers to the sense of being alone without anyone to share one's life with or care for.

During later adolescence and the early years of adulthood, it becomes possible for the first time to engage in a truly intimate relationship with another person outside the family; to love another person for their real qualities and not just for the satisfaction that can be obtained from the relationship.

According to Erikson, this kind of relationship cannot occur earlier in life because a person cannot establish true intimacy without first developing a strong sense of personal identity and independence and being secure in their place in the world. People who do not fully understand who they are find it difficult to deal with the complete and open sharing that is required in an intimate relationship.

Erikson's description of intimacy versus isolation may provide some insight into people who avoid commitment to another person in a relationship. Furthermore, a person without a strong sense of identity tends to frequently seek praise, flattery and adoration from others, and this interferes with the shared commitment and honest communication that are essential for an intimate relationship to develop and last. People who lack a sense of identity tend to isolate themselves, or form superficial or shallow relationships with others (Morris, 1990; Grotevant, 1992).

According to Erikson, intimacy does not necessarily involve sex and it includes the relationship between friends. For example, soldiers who have served together under the most dangerous circumstances often develop a sense of commitment to one another that illustrates intimacy in its broadest sense. If a sense of intimacy is not established with friends or a partner, the result, in Erikson's view, is a sense of isolation (Elkind, 1971).

Figure 2.50 Intimacy involves sharing and caring with someone else without fear of losing oneself in the process.

As with other psychosocial crises, the development of intimacy does not occur only during the stages of late adolescence and young adulthood. Nor do individuals stop seeking intimacy after the early adulthood stage. Intimacy, like identity, continually changes over time and is influenced by experiences later in life.

Stage 7: Generativity versus Stagnation (25–65 years)

Stage 7 corresponds with adulthood and involves a psychosocial crisis of generativity at one extreme and stagnation at the other. **Generativity** refers to a person's concern with others beyond their immediate family, with future generations and the nature of the society and world in which those generations will live. Basically, people who achieve generativity build their lives around doing things that help others, will leave a lasting mark on future generations and will make the world a better place in which to live.

Erikson believed that people go through this psychosocial crisis towards the middle of the seventh stage when they look ahead to the latter half of their lives and feel a need to participate in the continuation of life. If this need is not met, people develop a sense of stagnation. Stagnation refers to a sense of 'sameness', inactivity, boredom, too much concern with personal needs and comforts and a lack of personal growth.

According to Erikson, having children is an important part of generativity for many people. He did not believe, however, that everyone needs to become a parent in order to be generative. Nor did he believe that parenthood guarantees that someone will be generative.

Generativity is sometimes achieved by becoming involved in activities which promote the development of younger people; for example, as a sport coach, member of a school council or involvement with some other youth organisation.

Generativity can also be achieved by actively participating in groups concerned with social or environmental problems, such as youth unemployment and climate change. Similarly, work with community agencies, volunteer work for welfare groups and service on committees dealing with social or environmental problems provides opportunities for generativity. In all these examples, the act of helping is in itself satisfying and recognition or reward is not sought.

Many adults also achieve a sense of generativity through their paid work. Working creatively, skilfully or productively in a job that has a lasting influence on the lives of other people can help develop a strong sense of generativity and a lasting feeling of pleasure and satisfaction. This could apply to jobs in fields such as teaching, nursing, aged care, legal aid, social work, scientific research and engineering. Some people in middle adulthood change careers in an effort to find a job that provides a greater sense of generativity and lasting satisfaction (Morris, 1990).

According to Erikson, becoming generative is not always easy. It depends on the successful resolution of the crises in each of the previous six stages. Furthermore, the attainment of generativity can be difficult in a youth-oriented society that seems eager for older people to step aside and let younger, more 'technologically savvy' workers take over. Thus, older workers can lose opportunities for generativity by not being able to pass on the wisdom and skills they have developed over the years (Dacey & Travers, 1991).

As in Erikson's other psychosocial stages, it is the balance of the positive and negative aspects of the crisis which is important. For example, some stagnation can provide a break that leads to greater generative activity in the future. However, too much stagnation can result in an obsession with oneself, severe depression or despair in the next stage.

Figure 2.51 Generativity can be achieved through paid work, especially in jobs that influence the lives of others.

Stage 8: Integrity versus Despair (65+ years)

The eighth and final stage occurs when most of a person's life's work is nearing completion and there is time for reflection. The last psychosocial crisis to be faced is integrity versus despair.

According to Erikson, the sense of integrity arises from the individual's ability to look back on their life with satisfaction. **Integrity** refers to a sense of satisfaction with one's achievements in life and a belief that all that happened in the course of one's life has been useful, valuable and meaningful. The major part of life has been lived and the crisis of integrity involves an examination of that life and a judgment of whether that life, with all its ups and downs, gains and losses, good decisions and mistakes, pleasures and pains, was worthwhile.

At the other extreme is the individual who looks back on life with a sense of despair. **Despair** involves bitter feelings of hopelessness, involving lost opportunities, mistakes that were made and the sense that life has been meaningless and empty. In the latter years of life, the individual may realise with despair that time seems to have run out and it is too late to do all the things they want to do.

While a person must achieve a greater sense of integrity than despair for the successful resolution of the final crisis, Erikson believed that some despair is inevitable. For example, he suggested that even if someone felt completely fulfilled with their life, the fact that other people have suffered throughout their lives may make them feel some despair.

Figure 2.52 Integrity develops from looking back at achievements in life with satisfaction.

2.6.3 Critical appraisal of Erikson's theory

There is no prominent, comprehensive theory that encompasses human social development from birth to a very old age. Most theories cover specific developmental periods up to and including adolescence, rarely covering development between adolescence and old age. Although not exclusively focussing on social development, Erikson's psychosocial theory provides a useful approach to understanding some important aspects of social development which take place at different times throughout the entire life span.

Another positive feature of Erikson's theory is that it describes how healthy social development may be achieved. It does so in a balanced way, explaining how each stage of development can have a positive or negative outcome. Furthermore, Erikson's theory also offers an optimistic view of development. For example, failure to resolve a psychosocial crisis in one stage can be overcome in another stage.

In addition, Erikson's theory emphasises the role of the individual in their own social development but also takes account of the social world in which they live. The theory recognises other important influences in an individual's life, such as parents, siblings, other caregivers, the school, friends, peers, and people, objects and events in their wider social environment.

The most common criticism of Erikson's theory is the lack of experimental evidence to support it. The theory is developed mainly from case studies of people in a limited range of cultures and on Erikson's experiences with individuals he counselled in his psychiatry practice, rather than scientific research.

Research evidence for a number of stages in his theory has been difficult to obtain. For example, it is hard to define 'trust' or 'generativity' precisely enough or in universally acceptable ways for scientific investigation under controlled conditions. Alternatively, it would be impossible to obtain self-reports from infants on whether they are experiencing a crisis of trust or mistrust, nor reliable information about the same from their parents or another primary caregiver. However, various research attempts that have been made to test Erikson's theory using non-experimental methods have obtained evidence that tends to support some aspects of his theory, especially when older participants who are able to give self-reports are used.

Another criticism of Erikson's theory is that it does not consider how sociocultural influences can have differing effects on males and females. For example, Erikson tends to overlook female psychosocial development in general and his theory primarily describes development in males.

Criticisms have also been made about more specific aspects of the theory; for example, Erikson's belief that identity is found in adolescence. Many psychologists who work in counselling settings report that people continue their search for identity well into young adulthood. They also criticise Erikson's theory for overlooking the role of work in identity formation of the young adult. It has been suggested that this is a gap in the theory, especially as Erikson strongly argued about the importance of industry in childhood and the importance of career preparation in adolescence (Gething & Hatchard, 1989). Many recent studies of adult development have shown that undertaking a career during adulthood is a major path in the search for identity. Furthermore, experiences in the workplace can affect our social, emotional and personality development as much as people with whom we have relationships.

Erikson's theory states that *all* people experience a 'mid-life crisis' during adulthood. However, several research studies which have tested this proposal suggest that this is not always the case. Many adults do not experience a mid-life crisis, both in Western societies and in many non-Western societies and cultures (Costa & McCrae, 1994).

Although it is difficult to scientifically test Erikson's theory in general, many psychologists have still found aspects of the theory to be of practical use. Psychologists do not necessarily judge all psychological theories by the weight of scientific evidence supporting them. Rather, many theories tend to be judged by how useful they are. For example, if a theory can better explain or shed light on a behaviour that is of interest and/or not well understood, and if there are enough psychologists in agreement that the particular behaviour covered by the theory is important to understand, then the theory may be considered useful.

2.6 LEARNING ACTIVITY 3

Review

1. Complete the following table to summarise Erikson's theory by including a name and brief description of each psychosocial crisis.

Stage	Approximate age	Developmental period	Psychosocial crisis	Description of crisis
1	birth to 18 months	early infancy		
2	18 months–3 years	late infancy		
3	3–5 years	early childhood		
4	5–12 years	middle and late childhood		
5	12–18 years	adolescence		
6	18–25 years	young adulthood		
7	25–65 years	adulthood		
8	65+ years	late adulthood		

2. Identify the psychosocial crisis most likely to be unresolved in each of the following examples. Explain the person's feelings and behaviour in terms of Erikson's theory.
   a. A new employee is reluctant to do a task on their own for fear of making a mistake.
   b. A 38-year-old has had three broken engagements in the past 10 years.
   c. A solicitor decides to take up politics and runs for a state government seat in parliament because she is passionate about 'making a difference' to the environment.
   d. An adolescent boy is reluctant to develop friendships with females after his girlfriend was unfaithful.
   e. An adult wishes they could relive their working life so they could do it better.
   f. A 10-year-old continually misbehaves in class to avoid doing schoolwork.
   g. An adolescent always waits to be asked to join in social activities.
   h. An adolescent goes through a 'stage' of wearing only black clothes.
3. Outline an advantage and a limitation of Erikson's psychosocial theory as an explanation of social development.
4. Why is it important for a theory to be based on experimental research?
5. How useful is Erikson's theory in helping you understand your own social development, or that of someone else? Briefly explain with reference to a psychosocial crisis of most interest to you.

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2.6 LEARNING ACTIVITY 4

Multiple-choice questions

1. Which of the following statements about social behaviour is correct?
   A. Infants cannot engage in social behaviour until after about 12 months or so.
   B. People interacting in a large crowd cannot be said to be engaging in social behaviour.
   C. Social behaviour requires two or more people to be together and interacting with each other.
   D. Social behaviour can occur due to the belief that two or more people are present at the same time even though they may not be.
2. How many stages are there in Erikson's theory of psychosocial development?
   A. 6
   B. 7
   C. 8
   D. 9
3. The last stage in Erikson's theory of psychosocial development is called
   A. generativity vs stagnation.
   B. identity vs role confusion.
   C. integrity vs despair.
   D. integrity vs stagnation.
4. Erikson proposed that the order in which people go through his stages is
   A. fixed.
   B. variable.
   C. gender dependent.
   D. age dependent.
5. A psychosocial crisis is a
   A. mental health problem experienced by an individual in adjusting to society.
   B. personal struggle an individual experiences in adjusting to social demands.
   C. personal conflict an individual experiences with another person.
   D. All of the above are correct.

To answer these and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

2.7 Sensitive and critical periods in psychological development

There are particular times when environmental factors are more likely to have a greater impact on psychological development, either negatively or positively. These 'time windows' when we are 'open' to the effects of certain experiences are called sensitive and critical periods.

2.7.1 Sensitive periods

A **sensitive period** is a period of time during development when a person (or animal) is more responsive ('sensitive') to certain types of environmental experiences or learning. Within this period of time, we can most rapidly acquire a particular skill or characteristic. Outside this period of time, the same environmental experiences need to be stronger to produce the same positive or negative effects.

Sensitive periods occur frequently during pre-natal development before birth when the individual is going through rapidly occurring changes in physical growth and development.

Psychologists have also identified sensitive periods in psychological development during the post-natal period when developmental changes are not as rapid. For example, in humans, the first year of life is considered significant for the development of a secure, enduring attachment between an infant and caregiver (APA, 2022). Similarly, according to Erikson's theory, the first 18 months following birth may be viewed as a sensitive period for the development of basic trust.

Sensitive periods are sometimes described as 'windows of opportunity for learning' because they are the optimal, or best possible, times for the relevant learning to occur. For example, certain skills and knowledge, such as those of oral language acquisition, are believed to be more easily achieved during a sensitive period. If these skills and knowledge are not acquired during the sensitive period, they may be acquired at a later time, but it will usually take more time, be more difficult and the learning may not be as successful.

Generally, the sensitive period for learning to speak our native language is up to the age of about 12 years, with the window gradually closing from about age 7.

At birth, however, it seems that we are ready to learn to speak the language of whichever culture we happen to be born into. For instance, we are able to distinguish almost all the differences in sounds that are expressed in the various languages used throughout the world. By the age of about 1, this ability to perceive differences in language sounds is refined. We become more sensitive to the differences relevant to our language environment and less sensitive to differences important in other languages. Although we can learn to speak a second language at any time after childhood, if acquisition occurs before the ages of about 5 to 7 years, our competence will be like that of a native speaker (OECD, 2007; Kolb & Whishaw, 2015; Hartshorne, et al. 2018).

Generally, sensitive periods tend to last for relatively short periods of time for physical characteristics and longer periods for psychological characteristics. A significant positive or negative environmental experience which occurs during a sensitive period can have long-lasting effects on the individual's development.

This does not mean, however, that if disruption to development occurs during a sensitive period, any damage will necessarily be permanent and can never be made up. Lack of appropriate experiences during a sensitive period does not permanently and irreversibly affect development, as it would during a critical period, but rather makes the acquisition process outside the period more difficult (APA, 2022).

Figure 2.53 The sensitive period for learning to speak our native language is up to the age of about 12 years, with the window gradually closing from about age 7.

learnON

learnMORE | Case studies of Genie and Isabelle

Access learnON for two extraordinary case studies on children isolated for prolonged periods from a young age that provide insights into a sensitive period for learning language.

2.7.2 Critical periods

A critical period is also a specific period of time when we are especially open to specific environmental experiences. These experiences occur as a normal part of development, but will not recur at a later stage. If the environmental experience occurs, then we are responsive to the developmental change with which it is associated. However, unlike a sensitive period, if the appropriate experience does not occur during its critical period, then it can permanently and irreversibly affect development. A **critical period** may therefore be defined as a specific period in development during which a person (or animal) is most vulnerable to the deprivation or absence of certain environmental experiences.

Critical periods have identifiable start and end times, thereby tending to begin and end suddenly, rather than gradually (if at all) as do sensitive periods. For example, a brain injury or being deprived of a particular kind of environmental input at specific times after birth can significantly impact on the development of underlying nerve pathways and this becomes increasingly more difficult to correct later in life.

Experiments with animals raised from birth have demonstrated this. If, for a certain time after birth, one eye of a cat or monkey is kept closed or does not function properly because of some abnormality such as a cataract, that eye will be forever blind. The changes responsible for this loss of visual function occur in the visual cortex of the brain, the area responsible for processing incoming visual information. In cats and monkeys, the visual cortex fails to develop normally if one eye is kept closed after birth. Studies of infants born with an eye defect that keeps it closed and deprives them of visual experience through that eye have found the same, irreversible loss of visual function experienced by the experimental animals (Thompson, 2000; Kolb & Whishaw, 2015).

However, the critical period after birth during which closing one eye can produce permanent visual problems varies between species. In cats and monkeys, the critical period extends to about 6 months of age. Over this period, the effect of closing one eye (by stitching it closed) becomes progressively less. Closing it for the first 2 months after birth produces a much greater visual impairment than closing it for the fifth or sixth month. In humans, the critical period seems to last for about the first 6 years of life. Keeping one eye closed for only a few weeks in the critical period is believed to produce a measurable visual impairment (Thompson, 2000).

Imprinting

Imprinting, which occurs early in the life of certain animals, is the best-known example of a change that occurs during a critical period. **Imprinting** is a simple type of learning process in which a very young animal fixes its attention on or attaches to the first object with which it has visual, auditory or tactile experience and thereafter follows that object and seems to form an attachment to that object.

For example, a newly hatched mallard duckling will attend, attach to ('imprint on') and follow the first noisy moving object encountered after birth. Under natural conditions, this 'object' is the duckling's mother. Once it begins following the moving noisy object, it generally will not follow anything else but that object. After about 10 minutes of following the object, the duckling will have formed an ongoing attachment to it.

Imprinting in newly hatched chicks was first described in 1873 but Austrian zoologist Konrad Lorenz is credited with introducing the term in the 1930s. Lorenz was awarded a Nobel Prize in 1973 for his research on imprinting. He called imprinting 'object-fixation' and demonstrated that young birds would follow him everywhere if he was the first noisy moving object they observed. Lorenz also introduced the term critical period to describe the restricted period of time in which he believed imprinting took place (Lorenz, 1981).

Figure 2.54 These young ducklings imprinted on Konrad Lorenz and followed him everywhere. There is a critical period soon after birth during which this attachment behaviour will occur under natural conditions.

on Resources

Weblink Video showing Lorenz with imprinted birds 1 m 46 s

Some psychologists saw a similarity between imprinting in birds and the early behaviour of the human infant so interest in imprinting spread quickly. Research in natural and controlled laboratory settings confirmed that imprinting was confined to a critical period. For example, American psychologist Eckhard Hess (1958) found that if a mallard duckling is too young or too old, imprinting will not take place. But if a duckling between 13 and 16 hours old follows a moving object, then imprinting will occur. Thus, the critical period for imprinting in a mallard duckling is the 3-hour period when the bird is between 13 hours and 16 hours old. After this time, imprinting is difficult to achieve. Other research has since found that the imprinting process is not quite as rigid as reported by Lorenz and Hess but it does in fact occur most readily within a restricted period.

Although the attachment-like behaviour of imprinting has been observed in other birds and non-human animals, it is debatable whether any behaviour comparable to imprinting occurs among people. For instance, the behaviour would have to be evident in all human infants, occur within a specific period, and not be possible outside that period. Some researchers have likened human attachment to imprinting and proposed a critical period. Although human infants in all cultures do form attachments to mothers and other caregivers through prolonged experience with them following birth, people can form attachments at a later time in life, outside a 'critical period'. In sum, psychologists have yet to indisputably identify any specific critical period after birth for any human mental process or behaviour (OECD, 2007).

2.7 LEARNING ACTIVITY

Review

1. In what way is the timing of experience relevant to psychological development?
2. What do sensitive periods and critical periods have in common?
3. Distinguish between sensitive and critical periods in psychological development with reference to two key points.
4. a. Why is it important that infants and children are frequently exposed to proper speech?
   b. If a child has not acquired their native language by a certain age, is it possible that the child will never master the language? Explain your answer.
5. a. What is imprinting and what does it involve?
   b. Why is it described as occurring during a critical period rather than a sensitive period?

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

2.8 Review

Topic summary

- **Interactive influences of hereditary and environmental factors**
  - Nature versus nurture
- **The biopsychosocial model**
- **Emotional development**
  - Common elements of different emotions
    - Subjective feelings
    - Expressive behaviour
    - Physiological responses
  - Importance of attachment in emotional development
  - Ainsworth's theory of attachment
    - Secure attachment
    - Insecure avoidant attachment
    - Insecure resistant attachment
    - Disorganised attachment
  - Experiments on attachment in monkeys
  - Harlow's experiments on effects of privation on emotional development
- **Cognitive development**
  - Piaget's theory of cognitive development
    - Assimilation
    - Accommodation
    - Schema
  - Stages of cognitive development
    - Sensorimotor stage
    - Pre-operational stage (2–7 years)
    - Concrete operational stage (7–12 years)
    - Formal operational stage (12+ years)
  - Critical appraisal of Piaget's theory
- **Social development**
  - Early social behaviour
    - Smiling
    - Crying
  - Erikson's theory of psychosocial development
  - Erikson's stages of psychosocial development
    - Stage 1: Trust versus Mistrust (0 to 18 months)
    - Stage 2: Autonomy versus Shame and doubt (18 months to 3 years)
    - Stage 3: Initiative versus Guilt (3–5 years)
    - Stage 4: Industry versus Inferiority (5–12 years)
    - Stage 5: Identity versus Role confusion (12–18 years)
    - Stage 6: Intimacy versus Isolation (18–25 years)
    - Stage 7: Generativity versus Stagnation (25–65 years)
    - Stage 8: Integrity versus Despair (65+ years)
  - Critical appraisal of Erikson's theory
- **Sensitive and critical periods in psychological development**
  - Sensitive periods
  - Critical periods

Key terms

abstract thinking p. 200
accommodation p. 190
adaptation p. 189
animism p. 195
assimilation p. 189
attachment p. 177
autonomy vs shame and doubt p. 209, 210
biological factor p. 172
biopsychosocial model p. 171
centration p. 195
classification p. 200
cognitive development p. 160
concrete operational stage p. 198
conservation p. 198
critical period p. 220
development p. 158
developmental norms p. 162
disorganised attachment p. 182
egocentrism p. 194
emotion p. 174
emotional development p. 160
environment p. 166
expressive behaviour p. 175
formal operational stage p. 200
generativity vs stagnation p. 214
goal-directed behaviour p. 193
heredity p. 166
idealistic thinking p. 201
identity vs role confusion p. 211
imprinting p. 220
industry vs inferiority p. 212
initiative vs guilt p. 211
insecure avoidant attachment p. 180
insecure resistant attachment p. 180
integrity vs despair p. 216
intimacy vs isolation p. 214
life span development p. 158
mistrust p. 209
nature p. 166
nurture p. 166
object permanence p. 193
physiological response p. 176
pre-operational stage p. 194
psychological factor p. 172
psychosocial crisis p. 208
psychosocial development p. 207
reversibility p. 196
role confusion p. 213
schema p. 190
secure attachment p. 180
sensitive period p. 219
sensorimotor stage p. 192
separation anxiety p. 180
shame p. 210
social behaviour p. 204
social development p. 160
social factor p. 172
stranger anxiety p. 180
Strange Situation p. 179
subjective feeling p. 175
surrogate p. 184
symbolic thinking p. 194
transformation p. 195
trust p. 209

Note: The **References** for the entire title can be accessed in learnON and are also available as a downloadable PDF.

on Resources

Digital documents Key terms — Topic 2 (doc-37097)
Topic summary — Topic 2 (doc-37098)
Key diagrams PowerPoint — Topic 2 (doc-37100)

2.8 Topic 2 test

Section A: 20 marks **Section B:** 35 marks **Total:** 55 marks

Access learnON to answer the following test questions online and receive **immediate feedback.**

Section A — Multiple-choice questions

Choose the response that is **correct** or **best answers** the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Question 1

Which of the following can be considered to be a developmental change?

A. being in a good mood after getting back a maths test result
B. trying bungee jumping for the first time
C. having a good night's sleep after not having slept well for three nights
D. regularly speaking in public without getting anxious after having learnt a strategy to manage anxiety

Question 2

Psychological development

A. varies within and between individuals.
B. is primarily determined by the genes that are inherited.
C. is primarily determined by the age of the individual.
D. the same for all individuals who share environmental experiences.

Question 3

Psychological development is best described as

A. the psychological process of learning something new.
B. the gradual improvement in mature behaviour through experience.
C. a progressive series of changes in an individual that occur over the life span.
D. all changes experienced by an individual throughout their entire life span.

Question 4

In psychology, nature refers to

A. the natural tendency to control one's own development.
B. the influence of genetic inheritance on development.
C. the influences within an individual's natural environment.
D. the influence of an individual's experiences throughout their lifetime.

Question 5

Which of the following is not a cognitive ability?

A. perception
B. reasoning
C. reaching
D. object permanence

Question 6

Which of the following statements about the effects of heredity and environment on psychological development is most correct?

A. Heredity is more important than the environment in shaping psychological development.
B. The environment is more important than heredity in shaping psychological development.
C. Environmental influences are stronger than the influence of heredity in psychological development.
D. Genes provide the plan for how development will proceed and environmental influences determine how that plan unfolds in determining psychological development.

Question 7

The correct sequence of the stages of cognitive development described in Piaget's theory is

A. sensorimotor, concrete operational, pre-operational, formal operational.
B. sensorimotor, formal operational, concrete operational, pre-operational.
C. sensorimotor, pre-operational, concrete operational, formal operational.
D. pre-operational, sensorimotor, formal operational, concrete operational.

Question 8

According to Ainsworth's attachment theory, infants form the strongest attachment to

A. people most closely involved with them.
B. people they like.
C. people who spend the most time with them.
D. only one person.

Question 9

An infant who forms a secure attachment is likely to

A. treat their caregiver as a stranger.
B. feel safe and able to depend on their caregiver.
C. feel safe in the presence of all people.
D. show some distress but gradually increase exploration when their caregiver departs.

Question 10

An infant who demonstrates an insecure resistant attachment pattern of behaviour tends to

A. maintain a safe distance and avoid their caregiver at all times.
B. feel loved and confident when their caregiver is present.
C. avoid closeness with the caregiver and treat them much like a stranger.
D. appear uncertain and anxious when their caregiver is present.

Question 11

An infant who demonstrates a disorganised attachment pattern of behaviour tends to

A. actively try to be separated from their caregiver.
B. does not delay reunion with the caregiver following separation.
C. has a secure attachment to the caregiver and behaves unusually or unpredictably when reunited following separation.
D. has an insecure attachment to the caregiver and behaves unusually or unpredictably when reunited following separation.

Question 12

Trinh believes that the clouds 'look sad today'. Piaget refers to this way of thinking about objects as

A. animism.
B. centricism.
C. classification.
D. transformation.

Question 13

Research evidence suggests that Piaget may have underestimated children's abilities as shown by accomplishment of key cognitive tasks at younger ages than those described in his theory. This suggests that

A. children are not as capable as described by Piaget.
B. Piaget was too cautious when drawing conclusions.
C. some of Piaget's tests of cognitive accomplishments may have led to inaccurate results.
D. Piaget's theory is no longer relevant.

Question 14

Which of the following statements about human social behaviour is correct?

A. Smiling is the earliest social behaviour observed in a person.
B. Crying is the earliest social behaviour observed in a person.
C. Both crying and smiling are the earliest social behaviours observed in a person.
D. Both smiling and crying contribute to the formation of social relationships between people.

Question 15

According to Piaget, logical and abstract thinking are not consistently apparent until an individual has reached the _____ stage.

A. sensorimotor
B. pre-operational
C. formal operational
D. concrete operational

Question 16

In developing his theory of psychosocial development, Erikson primarily relied on evidence from

A. experiments.
B. case studies.
C. simulation studies.
D. observational studies.

Question 17

Bree and Emma's father bought them a strawberry Big M each while out shopping. He decides to pour the milk out of each carton into different glasses and his daughters watch him do this. Emma's glass is much wider than Bree's glass and she complains that Bree has been given more milk than she has.

It is likely that Emma has yet to develop an understanding of

A. classification.
B. conservation of mass.
C. conservation of volume.
D. conservation of length.

Question 18

How many stages are there in Erikson's theory of psychosocial development?

A. 5
B. 6
C. 7
D. 8

Question 19

Erikson proposed that the order in which people go through his stages is

A. varied.
B. fixed.
C. age-related.
D. sex-related.

Question 20

Developmental norms can be used to assess

A. the psychological development and mental competence of an individual.
B. whether individual can actually perform a task at a specific age.
C. the extent to which nature or nurture may influence development.
D. progress in some aspect of development by an individual compared to others of the same age.

Section B — Short answer questions

Question 1 (1 mark)

According to Harlow's research, _____ is a vital factor influencing attachment in rhesus monkeys.

Question 2 (1 mark)

The distress and uneasiness experienced by a young child when away from a person to whom they are attached is called _____ anxiety.

Question 3 (2 marks)

Explain the meaning of attachment in infancy.

Question 4 (2 marks)

Compare and contrast sensitive and critical periods in development with reference to two key differences.

Question 5 (2 marks)

How is social behaviour commonly defined in psychology?

Question 6 (5 marks)

a. What is the biopsychosocial model of psychological development and wellbeing? 2 marks
b. Describe three distinguishing features of the biopsychosocial model's explanation of psychological development and wellbeing. 3 marks

Question 7 (3 marks)

Emotion can be defined as a personal experience that involves a mixture of physiological responses, subjective feelings, and expressive behaviours.

Kim is asleep in bed when she is awoken by an unfamiliar sound in her living room. She suspects there is an intruder in the house. Using the above definition, describe Kim's emotional response in this situation.

Question 8 (3 marks)

Distinguish between Piaget's processes of assimilation and accommodation with reference to an example.

Question 9 (3 marks)

a. How did Piaget describe abstract thinking? 1 mark
b. Give an example of abstract thinking. 1 mark
c. In which stage of Piaget's theory is it accomplished? 1 mark

Question 10 (3 marks)

A child is unable to classify correctly. Explain this inability with reference to Piaget's concept of centration.

Question 11 (3 marks)

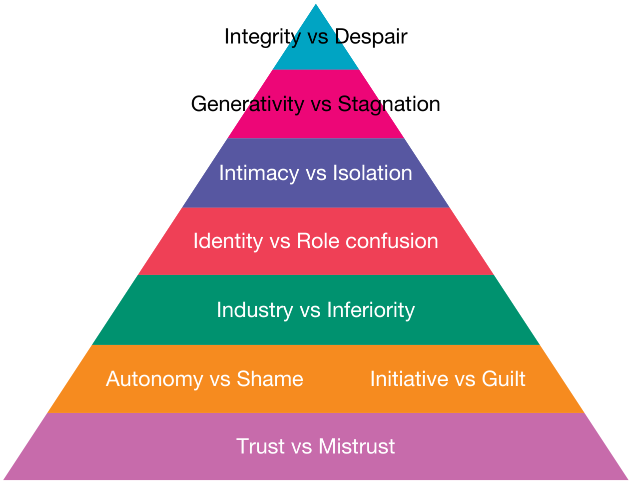
a. What is the Strange Situation procedure used for? 1 mark
b. Describe the Strange Situation. 2 marks

Question 12 (7 marks)

a. Explain what a psychosocial crisis is with reference to one of the crises identified by Erikson. Ensure you correctly name the crisis. 2 marks

b. How do psychosocial crises influence psychological development? 1 mark

c. Discuss how accurately the following diagram represents Erikson's theory. 4 marks



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Go to learnON to access answers to the Topic 2 test. A customisable Word version of the test can also be downloaded from the **Digital documents** tab of the Resources panel.

learnMORE | Twin studies and adoption studies

Investigating the relative influences of heredity and environment on some aspect of psychological development is challenging because of the need to strictly control genetic or environmental variables of research interest to measure their effects over time. For instance, it is impossible to isolate an individual from all environmental influences to investigate the influence of genes on a specific psychological characteristic. Even keeping a person locked in a bare room without any outside human contact, despite being unethical and illegal, still provides a type of environment. For example, if a newborn infant were placed in isolation for an extended period of time and seemed to be withdrawn when they were later assessed, would this indicate that being withdrawn is genetically determined or could it be the result of the unstimulating environment?

There are, however, ways of overcoming such difficulties to obtain valid and reliable research data. In an attempt to understand the relative influences of heredity and environment, psychologists have access to a number of different research methods to assist in their investigations. Two methods involve studying similarities and differences between people who share and do not share particular genes and environments. These research methods are commonly called twin studies and adoption studies.

Twin studies

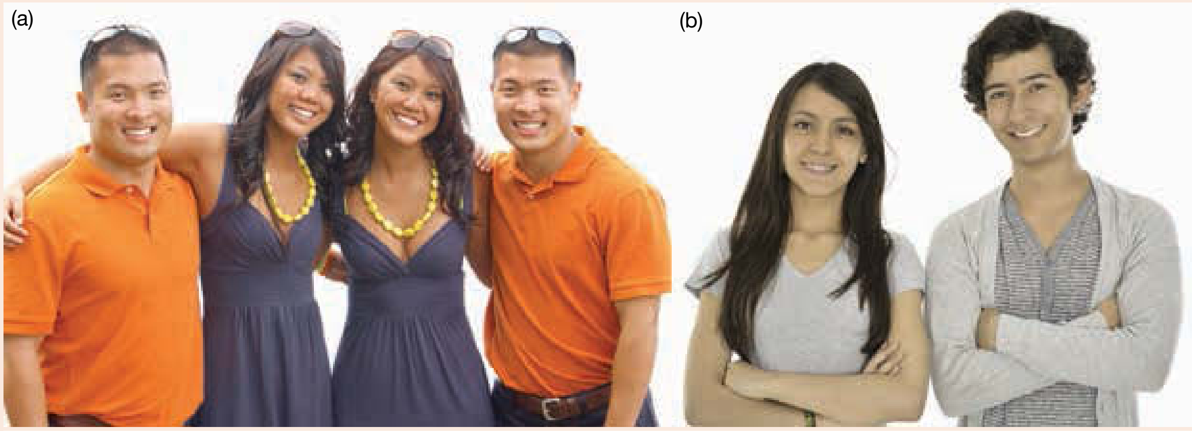
Twin studies involve research using identical and/or non-identical twins as participants. The two types of twins result from different biological processes.

Monozygotic (identical) twins are formed when a single ('mono') fertilised egg splits into two during the first 2 weeks after conception (when a zygote). These twins share 100% of their genes since they developed from the same sperm and egg combination. Studies of monozygotic (MZ) twins can provide valuable information to psychologists because any differences which later develop between them can be attributed to differences in their upbringing and experiences — that is, their environment.

Dizygotic (fraternal) twins develop when the female produces two separate ova (eggs) which are independently fertilised by two different sperm cells. They can be the same or opposite sex and are not genetically identical. Dizygotic (DZ) twins share 50% of their genes and their genetic similarities are comparable to other brothers and sisters.

If a characteristic is mainly influenced by heredity, monozygotic twins are likely to be similar in that characteristic. However, if a characteristic is influenced more by the environment, then monozygotic twins could show significant differences in that characteristic.

Twin studies have most commonly been used to research the development of personality and intelligence as these psychological characteristics can be easily measured using standardised personality or intelligence tests. For example, in five research studies across different countries, 24 000 pairs of identical twins were compared on two personality traits believed to be present to some extent in all people — extroversion (outgoingness) and neuroticism (emotional instability). The combined data showed that identical twins living in the same family environment were more alike in these characteristics than were fraternal twins living in the same family environment. This led researchers to conclude that heredity played a significant role in the development of these broad, psychological characteristics (Loehlin, 1992).



(a) Monozygotic (MZ) twins have an identical genetic make-up. (b) Dizygotic (DZ) twins are no more alike than siblings in genetic make-up and appearance.

Through studying twins, psychologists have been able to gain a better understanding of which psychological characteristics are more likely to be influenced by environmental factors.

Born in 1930, all four of these monozygotic female quadruplets (with the pseudonym Genain to protect their identity) developed schizophrenia by age 24. This suggests a 'schizophrenic gene' is the main contributory factor. However, despite their identical genetic inheritance, environmental factors cannot be ruled out. For instance, their schizophrenia differed in severity, their father was physically abusive and subjected them to harsh punitive treatment, and their mother had a history of mental health problems. In sum, this case study, in which the Genains continue to participate, suggests that schizophrenia has both genetic and environmental components (Mirsky et al., 2000).

In one American longitudinal ('long term') study of 400 pairs of twins (both monozygotic and dizygotic), researchers studied the intellectual development of twins from birth to the early school years, periodically taking measurements of intelligence (to obtain IQ scores). From the outset, the monozygotic twins were very similar to one another in intelligence and, by the time they began school, each of the monozygotic twins showed almost identical strengths and weaknesses in their mental abilities. Fraternal twins were also similar to one another, but significantly less than identical twins (McGue et al., 1993).

This study, and others with similar findings, suggest that intelligence is at least partly determined by heredity. It also seems that monozygotic twins who share similar environments, as well as their identical genetic structure, achieve similar scores on intelligence tests.

on Resources

Weblink Video on twin studies and adoption studies 9 m 51 s

While twin studies seem to provide a sound basis for judging the differences between the influences of heredity and environment on development, there are a number of issues to consider before accepting these findings without question.

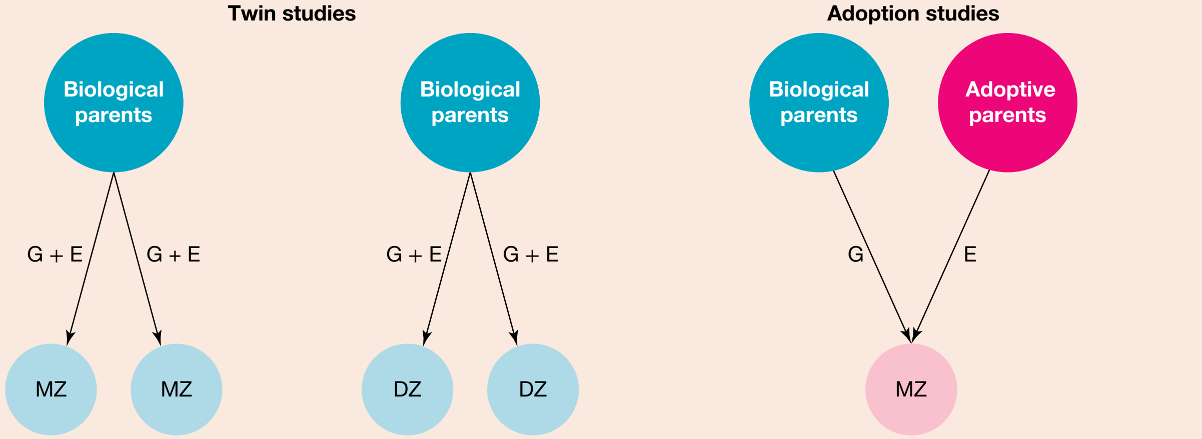
Identical twins are often viewed by parents, and sometimes by themselves, as being a ‘unit’ and they are often treated in a similar manner. Identical twins may also be more inclined to do things together than fraternal twins. Thus, to say that any differences between identical twins are definitely the result of hereditary factors is risky, as identical twins may often be exposed to the same environmental factors. Some of their similarities, therefore, could also be attributed to environmental factors.

Adoption studies

Psychologists also use information from research with children who have been adopted, and therefore have no genetic similarity to their adoptive parents, to learn about the influence of heredity and environment on psychological development. These are called **adoption studies**.

By examining the similarities and differences between adopted children and their adoptive and biological parents, psychologists can gain an insight into the relative influences of heredity and environment on a range of psychological characteristics. Similarities between children and their adoptive parents would suggest that environmental influence is greater, whereas similarities between adopted children and their biological parents would indicate that inherited influence is greater.

Studies of adopted children have provided considerable support for the view that inheritance plays a significant role in an individual’s intelligence. They show that the scores on intelligence tests achieved by adopted children are much more similar to the IQ scores of their biological parents than with those of their adoptive parents even though their adoptive parents had raised them since birth. Because the children did not spend time living with their biological parents, the most likely explanation for the similarity in IQ scores involves heredity (Bouchard & McGue, 1981; Plomin et al., 2012; Plomin & Spinath, 2004).



Monozygotic/identical twins (MZ) share 100% of their genes and dizygotic/fraternal (DZ) twins share 50% of their genes. Comparing similarities and differences between MZ and DZ twins will provide evidence for genetic and environmental influences on behaviour.

Adopted child shares genes (G) with its biological parents and environment (E) with its adoptive parents. If the adopted child behaves like the biological parents (e.g. similar IQ score), this suggests genetic influence on behaviour, and vice versa.

Comparing twin and adoption studies

on Resources

Teacher weblink Mini documentary on nature vs nurture 6 m 15 s

learnMORE | Role of maturation in development

Genes also play an important role in shaping the *course* of development through a process known as maturation. Maturation is a developmental process that is automatic and internally programmed. **Maturation** refers to the orderly and sequential developmental changes which occur in the nervous system and other bodily structures controlled by our genes.


"Stan, will you knock it off!
He will walk when he's ready to walk!"

This suggests that the development of all individuals follows the same process or pattern, unless there is significant interference from environmental factors. That is, we all go through predetermined, maturational-dependent phases. For example, in language development, the ability to 'talk' starts with sounds that are unrecognisable as meaningful words. We then develop the ability to say individual words, then the ability to string two or three words together into a phrase such as 'I want biscuit'. By about two years of age we are usually able to construct short sentences, and by three years of age we can construct and use some grammatically correct sentences.

In order to speak using sentences, the relevant areas of our brain must be sufficiently matured or developed to process sounds and enable us to understand words. In addition, the muscles in our mouth, particularly the tongue and lips, must also be sufficiently developed so that we can move and coordinate them in the manner required to form and speak words.

Many developmental changes are affected by maturation. For example, most children sit before they stand, draw shapes before recognisable objects and count before they can apply a mathematical formula. Similarly, puberty occurs for most people between 10–14 years of age and most people peak in their physical strength in late adolescence or early adulthood, then begin to decline in middle age.

Principle of readiness

An individual's physical development lays the foundation for the onset of many aspects of psychological development. This reflects the principle of readiness, that maturation creates the readiness which determines the onset of particular mental processes and behaviours.

The **principle of readiness** states that unless the necessary bodily structures and processes are sufficiently mature, — be they muscles, bones, the brain, nerves, neurons or neurotransmitters — then no amount of practice will produce the particular mental process or behaviour. It is only when an individual is sufficiently mature that the thought, feeling or action can occur.

The principle of readiness is used by Victorian educational authorities in determining the age at which it is appropriate for children to start formal schooling. In the past, parents could enrol their child at school after they had turned four years of age — the age at which they were believed to be sufficiently mature to learn in a classroom situation. However, based on psychological research evidence on the maturational readiness of children to learn in a school environment, children must now be five years of age or older by 30 April of the year they start school (or at least four years and nine months of age or older when they begin Prep).

In summary, while there are undoubtedly individual variations as to when a developmental 'milestone' occurs in any area of development, the *order* in which such milestones occur seems connected to the process of maturation.

Process of genetic inheritance

The inheritance of genetic information begins at conception. When conception takes place, the ovum (egg cell) from the mother and the sperm from the father unite to form a *zygote*. Each ovum and sperm cell contains structures called chromosomes (Figure A). The zygote receives chromosomes from both the mother and the father. Chromosomes come in 23 pairs (making a total of 46). One of each pair of chromosomes comes from the mother via the ovum and one of each pair comes from the father via the sperm cell.

A *chromosome* is a threadlike structure found in the nucleus of almost every cell in the body. Each chromosome consists of a string of smaller structures called genes. The *genes* contain the instructions for the development of characteristics.

Genes are the basic unit of heredity. Genes also normally come in pairs — one gene of each pair comes from the ovum chromosome and the other from the sperm chromosome. Thus, an individual receives only half of each parent's total genes and which genes an individual receives from each parent is a matter of chance.

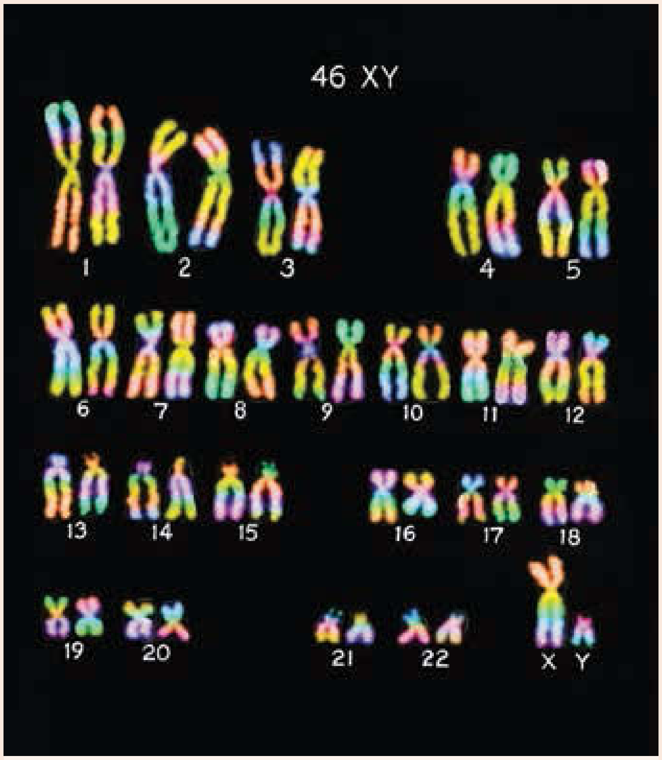


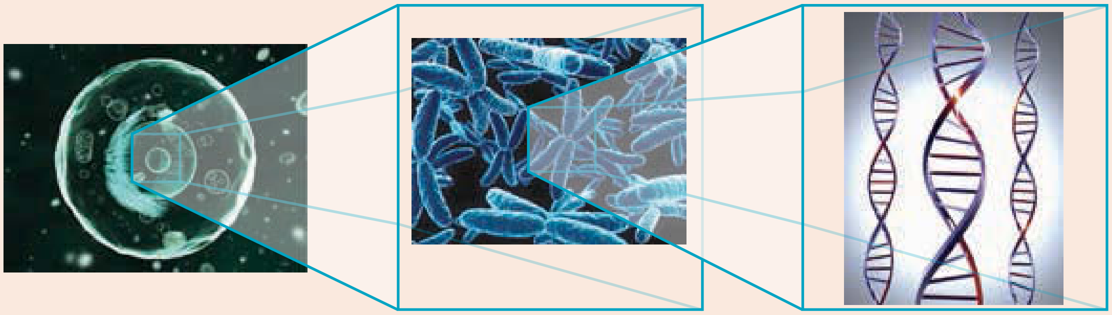
Figure A Humans have 23 pairs of chromosomes. Males and females differ only on the 23rd chromosome pair, with males having an X and Y chromosome (shown) and females having two matching X chromosomes.

Genes provide the 'blueprint' or 'plan' for our development. For some characteristics, only one pair of genes determines it, such as the ability to roll your tongue. However, for most characteristics, a number of pairs of genes work together. Psychological characteristics such as personality, musical ability and abilities associated with intelligence are believed to be influenced by the interaction of many gene pairs.

Nucleus
(the inner area of a cell where chromosomes and genes are located)

Chromosome
(threadlike structure made largely of DNA)

Gene
(segment of DNA; determines our individual biological development)



Cell
(the basic structural unit of a living thing)

DNA
(a spiralling, complex molecule containing genes)

Figure B The nucleus of each of the trillions of cells in your body contains 46 chromosomes. Each chromosome contains a coiled chain of the molecule called DNA. Genes are segments of DNA which contain a code that directs the production of proteins — the building blocks of development.

learnMORE | Attachment objects

For many children, their ‘blankie’, ‘bibba’, ‘num num’, or ‘teddy’ are as important in their daily lives as their main caregiver. In fact, many parents dread the thought of going anywhere with their child without the loved ‘security blanket’.

The term *security blanket* usually refers in a general way to inanimate (‘non-living’) objects like a blanket, a special bib, a dummy, a teddy bear or another soft toy for which the child has a special affection.

For most children, however, the security blanket does not usually replace the attachment to the main caregiver. It provides an additional attachment, which, unlike the caregiver, can be taken with the child wherever they go.

Most attachments to security blankets develop between about 10 and 12 months of age and they serve an important function of comforting a child when separated from the main caregiver; for example, when a child goes to bed or is left in the care of a person who is not the main caregiver. A security blanket is also often the first thing a child asks for when they are upset or afraid. It seems to provide reassurance and comfort in mildly stressful situations.

The security blanket, such as a ‘bibba’, provides an additional, ‘portable’ attachment.

learnMORE | Biopsychosocial model of attachment

Many factors govern the development and emergence of attachment. We consider three key influences from a biopsychosocial perspective: a genetic predisposition to form an attachment (biological), the infant's temperament (psychological) and the infant's experiences early in life (social).

An explanation of the development of attachment from the biopsychosocial approach.

Biological factor — genetics

The concept of attachment was first proposed by eminent British psychiatrist John Bowlby (1907–1990). Bowlby (1969) argued that all infants have an inborn, 'primary drive' to form an attachment with a caregiver. He considered the infant–caregiver bond to be important in two ways.

First, the bond forms the foundation for healthy emotional development later in life. Second, the bond has an 'evolutionary' function, which, according to Bowlby, improves the infant's chances of survival. A close emotional connection with a caregiver keeps the infant and caregiver physically close, thereby increasing the helpless and dependent infant's chances of survival. For example, when the infant is physically close, the caregiver can keep a watchful eye on their safety and intervene if danger threatens (Bowlby, 1988).

Bowlby suggested that infants use genetically inherited abilities such as crying, smiling, gazing, vocalising and clinging to get near to their main caregiver or to get their caregiver's attention. These behaviours bring about attachment responses from the main caregiver who has a biological need to be near to and to protect their infant. For example, the main caregiver responds to the infant's 'attachment signals' by caring for it with nurturing behaviours such as feeding, touching and cuddling.

Bowlby maintained that attachment develops in a fixed, age-related sequence and that the consistency with which infants progressed through the different phases provided evidence of the biological and evolutionary basis of attachment (see Table 'Bowlby's phases of attachment')

Bowlby also proposed that mothers are the best caregivers for infants. He believed 'nature' intended the mother to be the primary caregiver; that is, females are genetically programmed to be the best and therefore the main caregiver.

Many psychologists also believe that infants may have a preference to form an attachment to the mother, but this is not necessarily a natural, biologically programmed tendency. Infants tend to develop an attachment to the mother because the mother is usually the person who takes on the role of main caregiver. However, research findings indicate that even when the mother is the person who performs the routine tasks of looking after the infant and spends more time with it than anyone else, she will not automatically be the infant's attachment target.

British psychiatrist John Bowlby (1969) proposed that all infants have an inborn, 'primary drive' to form an attachment with a caregiver and that mothers are the best caregivers.

Bowlby's phases of attachment

Phase	Approximate age of onset and duration	Infant characteristics
1. Pre-attachment	0–2 months	Little differentiation in social responses (e.g. smiling, crying, vocalisations) to familiar and unfamiliar people. Accept comfort from anyone who provides it to their satisfaction
2. Laying foundations of attachment	2–7 months	Starting to recognise caregivers but does not usually show attachment responses upon separation
3. Clear-cut attachment	8 months–2 years	Protest or anxiety at being separated from their caregivers and become wary of strangers. May cry or cling when caregiver moves away and react negatively to anyone else who tries to provide comfort
4. Goal-directed partnership	2+ years	Increased independence and recognition that their caregivers have goals and plans that sometimes make separation necessary

Neither is there widespread agreement among psychologists that humans have a biological, pre-programmed need to form an attachment or that the infant's genes influence the quality of the attachment. A more widely held view is that humans may inherit a capability to form an attachment, but the type and quality of the attachment is influenced by a complex interaction of many different factors; for example, the respective characteristics of the infant and caregiver and the quality of the interaction which takes place between them.

Psychological factor — temperament

An attachment relationship is two-way. Both individuals involved in the relationship play an active role in establishing the bond. The caregiver plays an important part in the emergence of attachment, but the type of attachment formed also depends to some extent on the infant's behavioural characteristics. There is considerable research evidence that infants differ at birth in their basic response tendencies. Some will cry a lot, others will be placid, some will be active, some less so, and so on. These types of behaviours have been associated with temperament.

Temperament has been defined and measured in various ways by different psychologists who have studied it. Most definitions refer to **temperament** as our characteristic way of reacting to people, objects and events. For example, temperament may be considered as the 'style' with which we behave and includes such characteristics as the speed and intensity of emotional reaction when frustrated or uncomfortable, whether we are easy-going, calm and readily adaptable, or very fussy, irritable and slow to adapt. Many psychologists believe our temperament provides the foundations of personality development or at least significantly influences its development (Thomas & Chess, 2009).

Temperament is also widely regarded as having some degree of genetic basis. Differences in temperament are found in infants across all cultures and tend to persist throughout childhood and into later years. For example, some newborns typically display positive moods, are non-irritable, relaxed and adapt easily to new routines, food, people and situations. Others are more intense, irritable, fussy and less adaptable.

Types of temperament

One of the early and best-known research studies on infant temperament classified infants as having one of three temperaments:

- *easy:* even-tempered, usually content or happy, and open and adaptable to new experiences such as the approach of a stranger or their first taste of a mashed vegetable. They have regular feeding and sleeping habits, and they usually tolerate frustration (e.g. being retrained) and discomfort (e.g. dirty nappy).
- *difficult:* these infants are active, irritable, and irregular in their daily feeding and sleeping habits. They often react negatively and quite extremely to changes in their routine and are slow to adapt to new people or situations. They cry often and loudly and are inclined to throw a tantrum when frustrated or uncomfortable.
- *slow-to-warm-up:* these infants tend to be more inactive than active, somewhat moody and only moderately regular in their daily habits. Like difficult infants, they are slow to adapt to new people and situations, but they tend to respond mildly, rather than in an intense, negative way. For example, they may resist a cuddle by looking away from the cuddler rather than by screaming. They eventually adjust, showing a quiet interest in new foods, people, or places. (Thomas, Chess & Birch, 1970).

Researchers have also found that an infant's type of temperament can influence a caregiver's responsiveness to the infant and the appropriateness of their response. In turn, these can impact the infant and influence the growth and quality of an affectionate bond. For example, the main caregiver of an 'easy' infant who is usually cheerful, relaxed, adaptable and has a regular pattern of 'eating, eliminating and sleeping' will more readily be able to identify the infant's needs and respond appropriately than would the caregiver for a 'difficult' infant who is moody, tense, fussy and has irregular habits (Bukato, 2008; Charlesworth, 2014; Sigelman & Rider, 2012).

It is also possible that a caregiver's attitude to an infant will be influenced by the infant's temperament. For example, a caregiver may develop and show less affection for an infant with a 'difficult' temperament than they would for an infant with an 'easy' temperament.

The infant's temperament can influence a caregiver's responsiveness and the appropriateness of their response.

Social factor — early life experiences

Attachments usually form within the first 6–7 months or so. Therefore, the infant's experiences in its environment during this period are important. A great deal of the infant's time throughout this vital period is spent with the main caregiver who is meeting its needs. The human newborn, however competent it may be, cannot survive unless responsive adults attend to their needs and protect them from environmental hazards.

Sensitivity and responsiveness of the caregiver

It is not until about 12 months of age that most infants start to use recognisable words. Up until that time, they rely on other ways to communicate their moods, feelings and needs. For example, they use body language such as smiling, gazing, reaching, squirming and clinging, and vocalisations such as crying and babbling. A secure attachment is most likely to be formed with the person(s) who is most sensitive to these signals and responds appropriately. Ainsworth (1983) referred to this factor as the *sensitive responsiveness* of the caregiver and believes that it is crucial in the type of attachment formed between an infant and caregiver.

A secure and healthy attachment is most likely when the caregiver is sensitive and appropriately responsive to the infant's signals.

In one study, Ainsworth (1983) compared how mothers with securely attached infants and mothers with insecurely attached infants responded to signals of discomfort from their infants. She found that mothers with securely attached infants were more sensitive to their infants and responded more appropriately throughout the first year of their infant's life. They were quickest to respond when their infants cried and were able to more accurately identify the cause of the crying and the remedy required.

Not only were they more responsive in detecting when the infants cried because of hunger, but they were also very responsive to the infants' signals in terms of when to stop feeding and how quickly or slowly the feeding should proceed. By contrast, mothers with insecurely attached infants tended to lack awareness of what their infants were feeling or needing. They had less physical contact with their infants and their caregiving activities appeared to revolve more around their own interests and moods than those of their infants. The mothers of insecurely attached infants also tended to be less interested in mothering in general. This likely influenced their responsiveness and their overall style of parenting.

The sensitivity and responsiveness of the caregiver are vital aspects of early life experience and play an important role in the type and strength of attachment that occurs with an infant. Attachment appears to thrive when the caregiver is sensitive to and appropriately interprets and responds to the infant's signals. However, not all main caregivers act in this way.

One factor which may account for inappropriate responsiveness by a caregiver is their general attitude towards parenting. This is influenced by a complex interaction of many other factors, some of which can be traced to the early experiences of the parents. Situational factors can also influence the infant–caregiver relationship; for example, the type of relationship between the parents, involvement of others in the parenting, the number of other children, being in paid employment, and adequacy of the family income and housing.

The caregiver's views of their own early life experiences with their parents has also been found to be influential. American psychologists Inge Bretherton and Everett Waters (1985) interviewed parents of insecurely attached infants and compared their recollections of childhood with those of parents of securely attached infants. They found that many of the parents of insecurely attached infants had failed to form a secure attachment during their own infancy or had experienced a traumatic loss of an early attachment figure. Many also reported being rejected or feeling unloved by their parent(s) and severe loneliness during childhood.

Although it is reasonable to expect that secure attachment is promoted by the mental health condition of parents, especially mothers, research studies have generally provided contradictory results. A majority of studies, however, have found that mothers diagnosed as having post-natal depression were more likely to develop insecure attachment relationships with their infants (Gervai, 2009; McMahon et al., 2006).

Demographic factors

Research studies over the last three decades have also identified other factors associated with the infant's early life experience that can affect the type and quality of attachment relationships. These are often described as *demographic factors* and include family income, family size, parental age and education and major stressful life events within the family, such as loss of a parent, birth of a sibling, severe illness, marital breakdown and ongoing presence of a new romantic partner of the main caregiver (Gervai, 2009).

The infant's and caregiver's cultural background also influences their relationship. For example, German parents tend to strongly encourage independence and discourage clingy behaviour, fearing that if they are too responsive to cries they will 'spoil' their infants. This has been suggested as a reason why many German infants tend to make few emotional demands on their parents and are often classified as having an avoidant attachment when assessed in the Strange Situation. By contrast, Japanese infants, who are rarely separated from their mothers early in life and are encouraged to be dependent on their mothers, tend to become highly distressed by separations such as those when they are exposed in the Strange Situation. As a result, they are more likely than non-Japanese infants to be classified as having a resistant attachment (Sigelman & Rider, 2012).

A range of demographic factors, including cultural background, can influence an attachment relationship.

on Resources

Teacher weblink Video of two pioneering researchers discussing temperament 8 m 25 s

learnMORE | An experiment by Piaget to study egocentrism

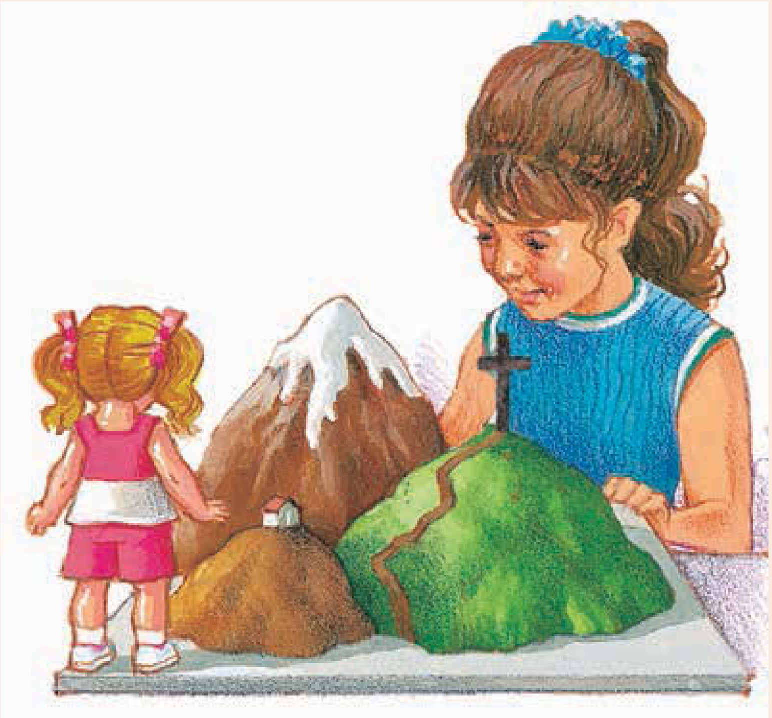
Piaget proposed that pre-operational children use egocentric thinking. They see things from only their own point of view and have difficulty doing so from another person's perspective.

In one experiment to study egocentrism, Piaget used a diorama apparatus. As shown in the figure below, this consisted of three model mountains made of papier-mâché. Each mountain was a different size, shape and colour and each had a different landmark on top. One mountain had a hut, one had a cross and one was covered in snow.

The child was first asked to walk around the diorama and become familiar with the landscape from all sides. Once the child had done this, they were required to sit facing the three mountains and a doll was placed behind the first mountain. The researcher then asked the child, 'What can the doll see?' The child was then shown several pictures of the mountains from different viewpoints. One picture was the view of the mountains from where the child was seated. The procedure was repeated with the doll in front of the second mountain and then the third mountain. Each time, the child was asked a question about the doll's viewpoint and was required to select one of the pictures.

Piaget found that four-year-old children always selected the picture which showed what *they* could see, while six-year-olds often showed awareness of different perspectives. Only seven- and eight-year-olds consistently chose the correct picture. They had developed the ability Piaget called decentred thinking, enabling them to consider situations from different perspectives, not just their own.

Researchers have since questioned the appropriateness of the three mountains task for young children; for example, that it may not be a suitable, interesting or motivating problem. Using other test materials, such as familiar cartoon characters from popular television programs or movies, they have found the potential for understanding another's point of view is present in children as young as three and four years of age.



Piaget's three-mountain task

learnMORE | An experiment by Piaget to assess formal operational thinking

One experiment used by Piaget to assess formal operational thinking involved the 'pendulum problem'.

Participants were shown several different weights which could be hooked on the end of a piece of string to make a pendulum. They were then asked to choose the length of the string, the weight to be attached and the height at which the weight should be released.

The problem involved working out which of the three factors (length, weight or height), or combination of factors, determines the speed at which the pendulum will swing. The solution involves changing one of the three factors while keeping the other two constant and seeing if it has any effect on speed.

Piaget found that children in the pre-operational or concrete operational stages randomly change one or more of the factors (length, weight or height), rather than changing them or testing their respective effects in a systematic and logical way. Consequently, children in these stages tend to find it difficult to solve the pendulum problem.

However, someone in the formal operational stage approaches the problem-solving task in a more systematic way and discovers more quickly that the length of the string is the factor that determines the speed of the pendulum (that is, the shorter the string, the faster a pendulum swings).

Does length, weight or height determine the speed at which a pendulum will swing?

learnMORE | Case studies of Genie and Isabelle provide insights into a sensitive period for learning language

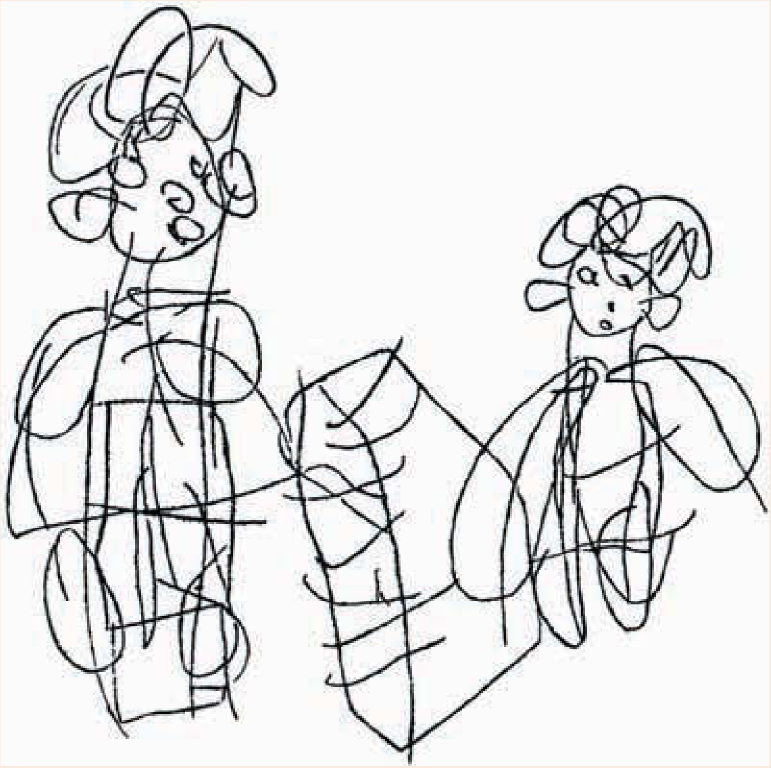
For many years, psychologists debated the existence of a sensitive period for learning language — whether our brain is especially sensitive to learning to speak our native language during a specific period in time. Generally, psychologists who believe that a sensitive period for oral language exists, propose that the sensitive period is between infancy and puberty. They argue that if the language speaking skills and knowledge are not acquired during this sensitive period, the individual will be unable to catch up completely at a later stage, no matter how much help they get.

How can psychologists test whether a sensitive period exists? One way would be to place infants in solitary confinement until adolescence and then expose them to language for the first time. Of course, it would be unethical (and illegal) to do this. A way around this is to study the cases of infants and young children who have been abandoned or isolated by their parents and have therefore been deprived of opportunities to learn to speak their native language until they were rescued, sometimes after many years of solitude. One of the best-known case studies involved a child known as 'Genie'.

In 1970, authorities discovered 13-year-old Genie whose parents had locked her in a tiny room from the age of 20 months. During each day she was usually tied to a chair. At night she was confined to a sleeping bag that was like a straitjacket. Her abusive father rarely spoke to her except to occasionally scream or 'bark' at her because he considered her to be 'no more than a dog'. Her mother, a physically abused wife who lived in terror of her husband, barely cared for Genie. She had as little interaction with her as possible, sometimes uttering only a word or two. There was no television or radio in the home. If Genie made the slightest sound, her father hit her with a large piece of wood.

Psychologists reported that Genie hardly seemed human when she was found. She did not know how to chew or stand up straight and she was not toilet trained. She drooled uncontrollably and often spat on anything that was nearby, including herself and other people. When she was first tested by psychologists, the only sounds she could make were high-pitched whimpers. She understood only a few words, probably learned shortly after she was discovered.

Genie was initially placed in a hospital rehabilitation clinic and then a foster home. Throughout this period, psychologists worked intensively with Genie and she made rapid progress. Genie developed physically and learned some basic rules of social behaviour. Gradually, she began to understand words and use short sentences such as 'Genie go', 'No more eat soup' and 'Another house have dog'. However, Genie's use of language continues to remain abnormal after many years. She can say many words and put them together into sentences, but she still has problems with pronunciation and can't form sophisticated sentences as most adults her age can (Curtiss, 1977; Wade & Tavris, 1990).



This picture was drawn by Genie, who lived in isolation and was mistreated for many years. It shows one of Genie's favourite pastimes — listening to psychologist Susan Curtiss play classical music on the piano. Genie's drawings were used with other case study information to describe and explain her psychological and social development.

Evidence from case studies of children such as Genie indicates that there may be a sensitive period in oral language learning. If the child misses the opportunity to learn language during that time, it seems that learning to speak one's native language is much more difficult.

Comparison with a case study of another isolated child provides additional evidence to this theory. 'Isabelle' was hidden away by her mother and given only enough care to stay alive. Her mother, who was deaf, is believed to have never spoken to her. At the age of six, Isabelle was discovered by other adults and brought into a 'normal' environment. When Isabelle was found, she could not utter any words. Assessments by a psychologist indicated that her cognitive development was below that of a normal two-year-old.

But within a year Isabelle had learned to speak many words, her tested intelligence was normal for her age and she started attending a normal school. Thus, Isabelle at seven years, with one year of intensive language practice, spoke about as well as other children in her grade at school, all of whom had about seven years of practice (Gleitman, Fridlund & Reisberg, 2004). Compared with Genie, Isabelle had been given the opportunity to learn to speak her native language during the sensitive period.

Psychologists believe that after age 12, developing fluency in speaking one's native language is difficult to achieve. Acquisition of oral language skills and knowledge usually takes more time, is more difficult and the language learning is often not as successful.

on **Resources**

Weblink Mini-documentary on Genie 12 m 26 s

3 Defining and supporting psychological development

TOPIC CONTENT

3.1 Overview

KEY KNOWLEDGE

- the usefulness, and limitations, of psychological criteria to categorise behaviour as typical or atypical, including cultural perspectives, social norms, statistical rarity, personal distress and maladaptive behaviour
- the concepts of normality and neurotypicality, including consideration of emotions, behaviours and cognitions that may be viewed as adaptive or maladaptive for an individual
- normal variations of brain development within society, as illustrated by neurodiversity
- the role of mental health workers, psychologists, psychiatrists and organisations in supporting psychological development and mental wellbeing as well as the diagnosis and management of atypical behaviour, including culturally responsive practices

Source: © VCAA, *VCE Psychology Study Design: 2023*–2027. p.24.

Sometimes psychological development does not occur as it should. An individual may persistently think, feeling or behave in a way that is a markedly different from how they usually do, or their development may not be at the same rate as others of about the same age. How they go about their daily life may also differ from what is considered to be 'typical' when compared to others of the same age, sex and cultural group. In such cases, development may be described as 'atypical'.

Atypical development is development that is not typical — it noticeably differs in a significant way from what is usual or appropriate. It may involve the developmental process or its outcomes. Small delays, bursts of rapid progress and other individual differences that occur naturally are to be expected. These are not considered atypical unless they are so unusual that they 'stand out' to the extent that they can't be overlooked.

The terms 'normal' and 'typical' are often used interchangeably. Knowing what is normal (or typical) is important because it assists understanding of what is 'abnormal' (or 'atypical'). But there is not always a clear line between psychological development or functioning that can be considered normal or abnormal.

In this topic, we explore the concept of normality and consider how typical or atypical psychological development, behaviour and mental processes in individuals may be culturally defined, classified and categorised. In doing so, we also consider concepts such as 'adaptive', 'maladaptive', 'neurotypicality' and 'neurodiversity' which are also used in relation to development, behaviour and mental processes.

The concepts of neurotypicality and neurodiversity in particular are explained through the consideration of developmental disorders such as attention deficit hyperactivity disorder (ADHD) and autism. In the past decade or so, the terms neurotypicality and neurodiversity have increasingly become a part of the psychological language that is used when discussing these disorders.

Finally, we also examine the role of mental health workers, psychologists, psychiatrists and organisations in supporting psychological development and mental wellbeing.

3.1 LEARNING ACTIVITY

Multiple-choice questions

1. Atypical psychological development means development that is
   A. normal.
   B. like everyone else's.
   C. the same as the norm in being usual, representative and characteristic.
   D. different from the norm in being unusual, unrepresentative or uncharacteristic.

2. Typical development means development that is
   A. unusual.
   B. abnormal.
   C. the same as the norm in being usual, representative and characteristic.
   D. differing from the norm in being unusual, unrepresentative or uncharacteristic.
3. The term normal may be used interchangeably with the term
   A. typical.
   B. abnormal.
   C. atypical.
   D. development.
4. The term abnormal may be used interchangeably with the term
   A. typical.
   B. diverse.
   C. atypical.
   D. development.
5. Typical and atypical psychological development involve changes in
   A. growth, movement and physical appearance.
   B. cognition, emotion and social skills.
   C. behaviour that is directly observable.
   D. the body and its various systems.

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3.2 Categorising behaviour as typical or atypical

The terms typical and atypical are not only used in relation to development. They may also be used to describe behaviour and mental processes, either generally or a specific characteristic. Moreover, they may be used in relation to an individual, a group, a crowd or any other collection of people.

Generally, **typical behaviour** is behaviour that would usually ('typically') occur and is appropriate and expected in a given situation. It is what most people would ordinarily do in that situation at that time.

In relation to a particular individual's behaviour, typical means that, at most times, the person acts as they usually do in a given situation. Their behaviour occurs in the characteristic way expected of them. There may be some occasions when their behaviour is quite different or inconsistent with how it usually occurs, but such variations are temporary.

In contrast, **atypical behaviour** is behaviour that is *not* typical — it differs markedly in some way from what is expected in a given situation. It is uncommon and not what most people would ordinarily do in that situation at that time.

In relation to a particular individual's behaviour, atypical means that the person acts in ways that are unusual ('atypical') for them in a given situation. Essentially, they are behaving in an uncharacteristic way or 'out of character'. For example, if a usually friendly, outgoing person becomes withdrawn, does not talk or interact with others and stays in their bedroom alone for extended periods of time, they would be considered to be behaving in a way that is atypical for them.

Figure 3.1 Whether we judge someone's behaviour as typical or atypical is influenced by the context.

3.2 LEARNING ACTIVITY 1

Review

Complete the table by indicating whether each behaviour may be described as typical or atypical. In the column on the right, outline the main reason for your choice. If you could not decide, outline your reason why.

Behaviour	Typical	Atypical	Unsure	Comment
a. Being scared of snakes				
b. Constantly worrying about VCE grades				
c. Wearing black makeup and clothing everywhere each day				
d. Saying ‘hello’ to every person you see				
e. Changing your plans because of a horoscope prediction				
f. Feeling shy and awkward at parties				
g. Walking arm in arm down the street with a friend of the same sex				
h. Fainting at a rock concert when the lead performer appears on stage				
i. Achieving an extremely high IQ score on an intelligence test				
j. Preferring to live alone and isolated from others				
k. Being able to provide help to someone in need of it, but choosing not to do so				
l. Doing or saying whatever you want without caring what others think				

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

Perspectives on typical and atypical behaviour

Whether a person's behaviour is categorised as typical or atypical depends on the individual, the specific circumstances and the perspective from which it is considered.

For example, the judgment may take account of whether the behaviour is maladaptive, causes personal distress and whether being distressed is appropriate for that behaviour. We also make comparisons in order to help our understanding. For example, what is typical or atypical behaviour is often dependent on how it compares to the behaviour of most others of the same age and sex in a similar situation. In addition, it can depend on such factors as society's expectations and the cultural context in which the behaviour occurs.

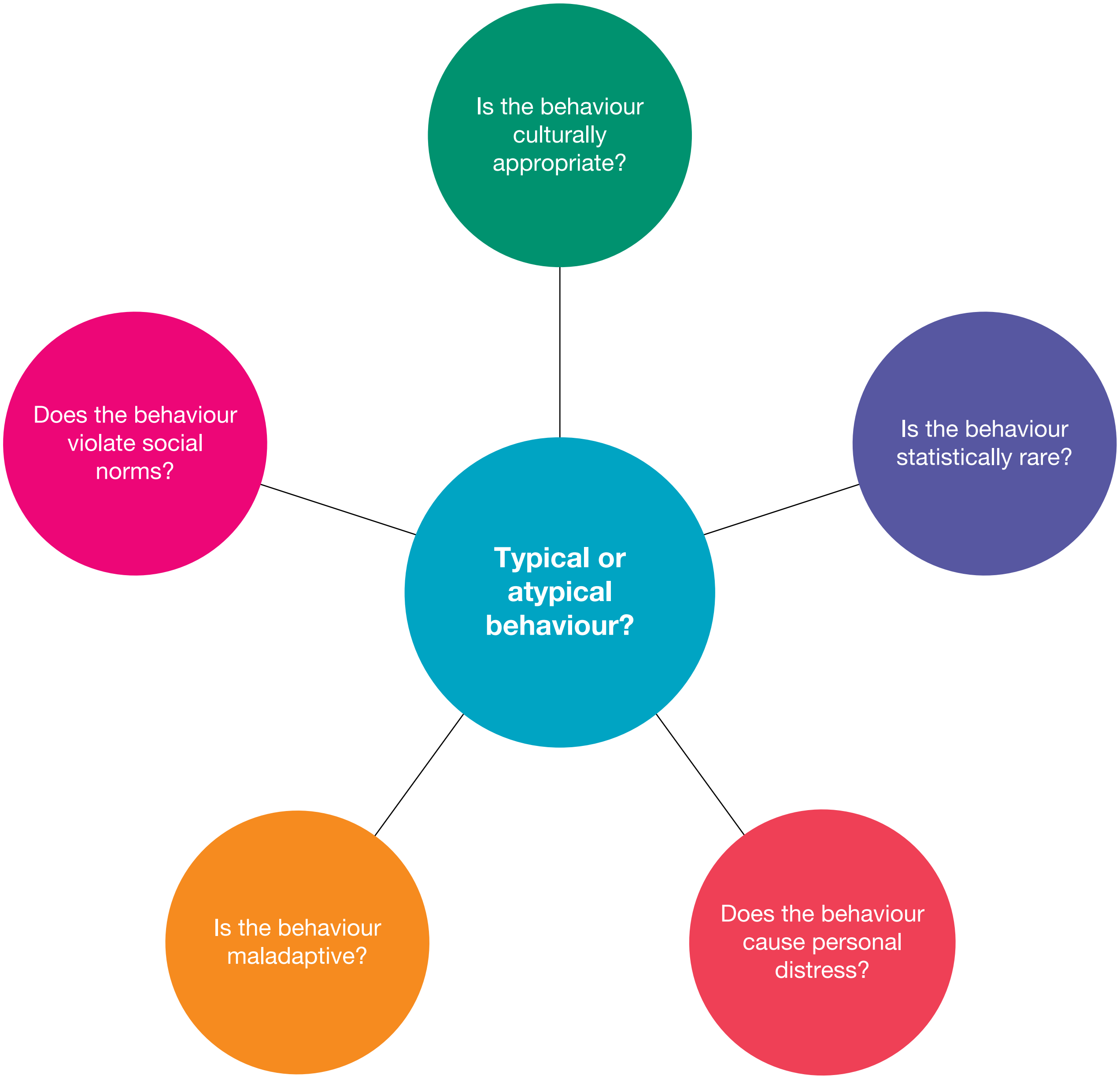

Figure 3.2 Categorising behaviour as typical or atypical from different perspectives.

Social norms

Behaviour is viewed as atypical when it violates a society's ideas about what is acceptable in a given situation. In each society, there are social norms.

Social norms are widely held standards that govern what people should and should not do in different situations, especially in relation to others. Although social norms are often not written down or explicitly stated, they are generally known ways of behaving in particular social groups or society in general.

We use social norms consciously or unconsciously when considering whether a specific behaviour is acceptable or appropriate, and therefore judging whether it is typical or atypical. For example, you would probably agree that thanking a friend for a birthday present, smiling when happy and feeling saddened by the loss of loved one are typical behaviours in Australian society. Similarly, from a social norm perspective, people who bathe infrequently, stand too close in a conversation with a stranger or wear pyjamas to a funeral would violate social norms and therefore be demonstrating atypical behaviour.

There are also age-specific and gender-specific norms which influence our behaviour and judgments of that of others. For example, the very short attention span considered typical behaviour for a 2-year-old would be categorised as atypical in an adult.

The social norm perspective is useful because norms are widely known and we can often use them intuitively to distinguish between typical and atypical behaviour. Most do not have to be taught explicitly. They are absorbed in childhood through the process of socialisation and we take them for granted as our social world expands.

A limitation of the social norm perspective is that judgments of atypical behaviour vary from society to society and are not always clear cut. Nor is there universal agreement on all social norms. What might be atypical in one part of the world may be typical and perfectly acceptable in another. In some places, a norm violation may be better described as illegal rather than atypical.

A society's social norms may also change over time, causing its views of typical and atypical behaviour to change as well. For example, it is now generally acceptable to fall in love with someone who you only meet and interact with on the internet, whereas before dating apps were widely used such behaviour would have been considered atypical from a social norm perspective.

Consider also cigarette smoking which was once acceptable in virtually any situation. It was typical rather than atypical behaviour in Australian society. People could smoke as much as they wanted to, almost anywhere. Teachers smoked in classrooms, nurses in hospital wards and passengers on buses, trains and planes. Over a relatively short period of time, smoking became increasingly unacceptable, atypical and is now illegal in most public settings throughout Australia.

Finally, social norms also vary a great deal across cultures and between cultural or ethnic groups within cultures. As societies become increasingly multi-cultural, social norms become increasingly variable within those societies. They also tend to become increasingly vague, unknown or even unacceptable in the different cultural and ethnic groups.

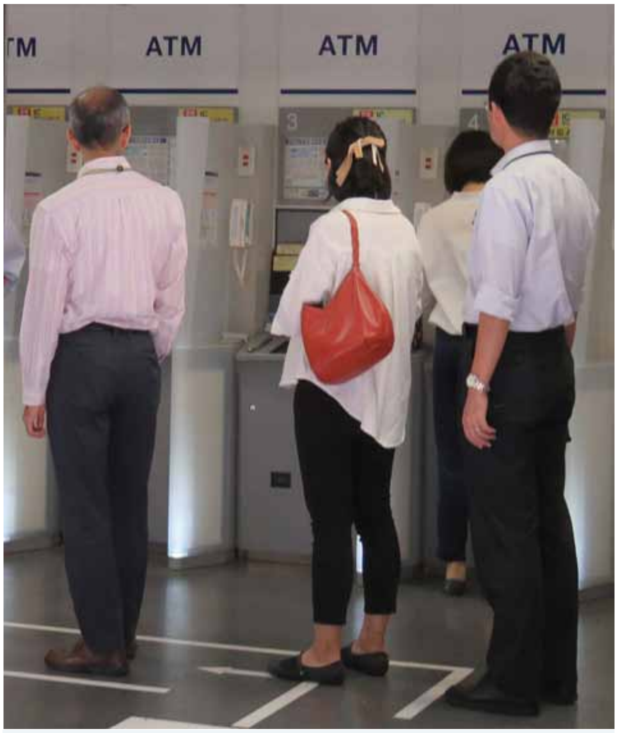

Figure 3.3 There is no rule or law stipulating that we must queue in an orderly way at an ATM. Instead, the expected behaviour is governed by social norms which have been adopted by different societies throughout the world.

Cultural perspective

Generally, each culture and ethnic group within that culture has its own set of norms about what is considered acceptable behaviour. This means that behaviour that clearly violates a social norm in one culture or ethnic group may not do so in another. For example, in some cultures, to claim you have been communicating with dead ancestors would be atypical behaviour and also likely to be taken as a sign of possible mental illness. However, in some other cultures, this behaviour would not be considered unusual or atypical. In these cultures, individuals who experience this state may even be viewed as having a special and precious gift.

A behaviour does not have to be so extraordinary in order to be categorised as typical or atypical within one cultural or ethnic group. For example, showing fear at the sudden presence of a hairy spider is typical behaviour among most cultural groups in our society but is likely to be atypical in communities living in remote jungles where hairy spiders are common.

Our everyday use of body language can also have different meanings across cultures and therefore be interpreted as typical behaviour in one culture and atypical in another. For example, a raised thumb may be typical behaviour when greeting someone in one culture but atypical behaviour for a greeting in another culture as it would be interpreted as an insult.

There may also be different gender-specific norms in different cultures or ethnic groups. For example, in some cultures, loud crying and wailing at the funeral of a stranger is expected and considered typical, especially if by a female. However, in other cultures it would be considered atypical for either males or females as it is inappropriate in that culture to wail at the funeral of a stranger.

The cultural perspective raises important considerations which cannot be ignored when distinguishing between typical and atypical behaviour. But the cultural perspective is not entirely satisfactory on its own. Cultures vary globally and within multicultural societies. The values, beliefs and expectancies of a given culture can also change over time. So there is no universal cross-cultural standard for categorising typical and atypical behaviour.

Figure 3.4 Women trying to comfort a distraught mourner at a funeral

Statistical rarity

From a statistical perspective, it is assumed that any behaviour in a large group of individuals which is measured and plotted on a graph will tend to fall in the bell-shaped pattern of the normal distribution curve shown in Figure 3.5 on the next page. Therefore, typical and atypical behaviour can be determined by how often or how rarely they occur.

Generally, if the large majority of people, called the 'statistical average', behave in a certain way, it is considered to be typical behaviour. For example, laughing at a very funny joke is typical behaviour because that is what most people do. It occurs most frequently in the population.

Similarly, atypical behaviour is any behaviour that occurs least frequently in the population. For example, if the behaviour is common among a small minority of people, called the 'statistical extremity', then it is considered atypical. So, to laugh when learning that a loved one has died would be atypical because very few people do this. It is statistically rare and therefore uncommon and unusual in the population.

The statistical perspective provides a useful approach to categorising and distinguishing between typical and atypical behaviours when the cut-off points are known. For example, intelligence is commonly defined as IQ — the score on a standardised intelligence test. Scores in the general population have a normal distribution, as shown in Figure 3.5 on the next page. The mean IQ is set at 100 so that

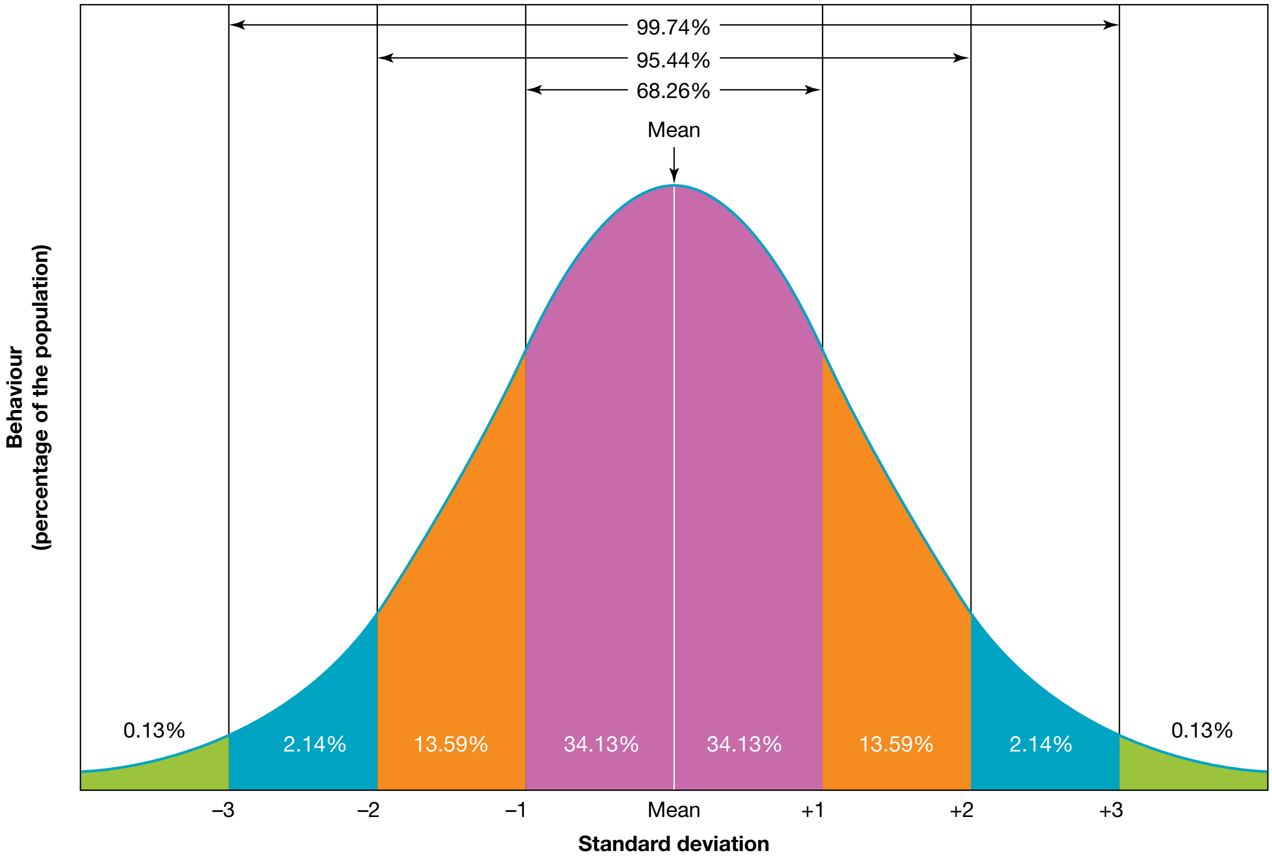

Figure 3.5 The bell-shaped normal distribution curve. It is assumed that any behaviour will show this kind of shape and spread when measured in a large enough sample and graphed. Atypical behaviour is statistically rare so it would be located at the far left and far right of the distribution.

comparisons can be made. Individuals with an IQ that falls within a standard deviation of 1 either side of the mean (i.e. –1 to +1) are described as having 'average intelligence'. This would be categorised as a typical score since almost 70% of all IQ scores fall within this range.

Similarly, individuals with a score which is more than two standard deviations from the mean are described as having either 'very superior' or 'extremely low' intelligence. These scores are achieved by less than 5% of the population and are at the extremes of the distribution. They would therefore be categorised as atypical scores and likewise the associated 'intelligent behaviour' as atypical.

But what if the cut-off point dividing typical and atypical behaviour is unknown or cannot be determined? This is the case for many of our behaviours. Furthermore, such 'dividing lines' between behaviour categories are arbitrary. They are not always so clear cut and may therefore be disputable. For example, the average IQ and therefore typical score lies somewhere between 85 and 115. This means a score of 84 would be 'below average' and 116 would be 'above average'. Is it reasonable to draw such distinctions on the basis of 1 point? Furthermore, how is intelligence described for those whose IQ scores fall in between the average and the extremities; for example, between 115 and 130? Is it typical or atypical?

From a statistical perspective, the intellectually disabled and geniuses, the obese and extremely thin, alcoholics and non-drinkers and the extremely sad and extremely happy are considered atypical. The perspective provides a simple way of categorising atypical behaviour when rarity is known.

However, care must be taken to not always equate atypical behaviour determined through its statistical rarity with undesirable or maladaptive behaviour. For example, not using illegal drugs is rare and atypical but highly desirable and strongly correlated with adaptive behaviour. Similarly, behaviour associated with voodoo beliefs may be statistically rare and therefore atypical in one culture but very common and therefore typical in another culture.

In addition, a limitation of this perspective is that some behaviours may be categorised as atypical despite not being statistically rare. For example, it is estimated that as many as one in seven Australians will experience depression in their lifetime, yet this mental health disorder is commonly associated with atypical behaviour (Beyond Blue, 2021).

Personal distress

When a person is distressed, they are extremely upset and suffering emotionally. People experience distress for many different reasons in everyday life. It is a strong but natural psychological reaction to certain events; for example, when experiencing the loss of a loved one, a traumatic event, a life-threatening disease, financial difficulties, or perhaps disappointment at missing out on a very important opportunity.

Generally, if the personal distress is a reasonable response to such events and is appropriate in their culture, then it is likely to be considered typical rather than atypical behaviour. If the distress is so intense, disruptive and persistent that it interferes with the person's capacity to function adequately for a prolonged period, it is likely to be considered atypical as it has become a cause for concern and possibly maladaptive.

Although the personal distress perspective is useful, there are limitations. The experience of distress is highly variable among individuals. Identical behaviour patterns can make one person miserable and another only a little or not at all. Unlike statistical judgments, there is often not a clear cut dividing line that can be used as a reference point. In addition the judgment of whether someone is distressed tends to be highly subjective rather than objective.

Personal distress alone cannot always be used to categorise atypical behaviour. It does not take account of the fact that some people engage in atypical behaviour without distress. For example, little or no personal distress is experienced by many perpetrators of serious crimes. An arsonist may start a bushfire and experience exhilaration rather than distress. Similarly, someone diagnosed with antisocial personality disorder will manipulate and deceive others cold heartedly, and repeatedly break the law without experiencing any guilt, remorse or anxiety, let alone personal distress.

Figure 3.6 Personal distress alone cannot always be used to categorise atypical behaviour. For example, American serial killer John Wayne Gacy shows no personal distress in these arrest photos despite having just been charged with murdering at least 33 young men.

Maladaptive behaviour

Adaptive behaviour is any behaviour that enables the individual to adjust to the environment appropriately and effectively. It involves actions that enable a person to satisfactorily carry out their everyday life tasks and meet their personal and social responsibilities, such as being productive at school or work and participating in their relationships with others. Basically, the individual is able to 'adapt' to the demands of daily living in age-appropriate ways and do so relatively independently in a variety of settings.

Generally, examples of adaptive behaviour you may carry out on a daily basis include eating dinner, brushing your teeth before bed, having a 'good night's sleep', setting an alarm if a late awakening is undesirable, waking up in time to get to the first scheduled activity at school, dressing yourself in an appropriate way for school, performing all the actions that usually enable you to get to school on time, greeting friends, controlling your impulses if a teacher treats you unfairly, and so on.

Adaptive behaviour is generally considered to be positive, constructive and age-appropriate within the individual's socio-cultural environment.

In contrast, **maladaptive behaviour** is any behaviour that is detrimental, counterproductive or otherwise interferes with the individual's ability to successfully adjust ('adapt') to the environment and fulfil their typical roles in society. As you would expect, it involves actions that impair a person's ability to satisfactorily carry out their usual everyday tasks and to cope with or adjust to the challenges and stresses of daily life. For example, there is a reduced ability to do the things one normally does each day, such as attending to personal hygiene, sleeping well, eating and preparing food, speaking, decision-making, learning, remembering things, going to school or work, and maintaining relationships with others.

Most people have engaged in maladaptive behaviour at some time in their life. An occasional incident is not uncommon.

Figure 3.7 (a) Tantrum behaviour such as crying or screaming when a play session is abruptly ended by a parent may be considered maladaptive. Although viewed by many people as age-appropriate in toddlers, the tantrum is often an attempt to decrease maintain or gain control. Its maladaptive nature can prevent effective adjustment to and participation in family activities and other aspects of everyday life. (b) Hand washing would only be considered maladaptive if it is done so many times each day that it interferes with the person's ability to effectively carry out their usual daily activities.

Maladaptive behaviour tends to violate social and cultural norms because it is does not meet expectations of how a person should usually behave. It is also statistically less common when compared to the distribution of adaptive behaviour in the general population and often causes personal distress because of its disruptive effects. It is therefore considered to be atypical behaviour and the terms atypical behaviour, maladaptive behaviour and dysfunctional behaviour are sometimes used interchangeably.

Considering maladaptive behaviour is useful in assisting psychologists and other mental health professionals to identify individuals who are not functioning effectively and may require support.

For example, behaviour associated with phobias and obsessive-compulsive disorder can hinder a person in carrying out what are ordinarily regarded as basic, everyday tasks. A fear of driving, flying, open or enclosed spaces may stop someone from going to school or work, putting out the bins, hanging up washing in the backyard, shopping at the local supermarket, and so on.

Similarly, someone with a fear of contamination may repeatedly wash their hands. Washing hands is in itself not a maladaptive behaviour. However, it would be considered maladaptive when it requires so much time and effort each day that it interferes with the ability to get on with everyday living.

Mental health professionals have expertise in assessing whether behaviour is maladaptive but the general public do not have this expertise and can have differing views on what they consider to be effective and ineffective functioning in everyday life. As with other perspectives, these views about maladaptive behaviour may also vary in relation to different social norms across cultures and groups within cultures.

In addition, some maladaptive behaviours may be categorised as typical when viewed exclusively from a statistical perspective. For example, talking on a hand-held mobile phone while driving puts an individual at risk for self-harm and is therefore maladaptive. However, it is commonly recognised as typical behaviour throughout Australia, despite being illegal. Talking on a hand-held phone while driving any type of vehicle is also very common throughout the world, so it is not statistically rare behaviour.

Finally, some maladaptive behaviours may actually alleviate distress despite being atypical. For example, the ritualistic, repetitive hand washing behaviour performed by some people with obsessive compulsive disorder may be calming and reassuring. Or, a person with schizophrenia who spends a great deal of time responding to messages from aliens may actually enjoy listening to the voices, feel honoured to be chosen to save the world and feel less stressed by knowing that the world will not end because of their intervention.

None of the perspectives is entirely satisfactory for fully distinguishing between typical and atypical behaviour. Not one of them encompasses all behaviour that might be universally categorised as typical or atypical in any situation, in any place at any time. The judgments of typical and atypical behaviour should be based on a combination of standards from different perspectives.

3.2 LEARNING ACTIVITY 2

Review

1. Distinguish between each of the following:
   a. typical and atypical behaviour
   b. atypical behaviour and maladaptive behaviour
   c. social norms and cultural norms
2. a. Explain the meaning of ‘normality’ with reference to an example.
   b. Give an example of a behaviour that may be considered normal in a cultural group within Australian society but abnormal by another cultural group in Australia.

3. **a.** Define the meaning of 'abnormality'.
   b. Give an example of a psychological or behavioural characteristic that would be considered abnormal.
   c. Give an example of a test result or distribution of scores that would be considered abnormal.
4. When would atypical psychological development be of concern to a mental health professional?
5. **a.** Explain the meaning of 'target for intervention' in relation to maladaptive behaviour.
   b. Does all maladaptive behaviour require intervention? Give an example to support your view.
   c. Under what circumstances would maladaptive behaviour most likely require intervention?
6. Assume Alessio who is described below engages in atypical behaviour. What features of Alessio's behaviour justify this judgment? Write five answers, with each answer taking the perspective of a different approach to identifying atypical behaviour.

   Before leaving his house, Alessio always checks that all the electrical appliances are unplugged (because he thinks they might start a fire while he's out), all the taps are completely turned off (because they might flood his house while he's out) and that all the doors and windows are properly secured (because he thinks someone might break in while he's out). On a couple of occasions, Alessio has made several journeys back and forth to his home to check that things are as they should be, because he had a 'niggling doubt' that his first check was not done properly. Alessio's checking behaviour consumes several hours of his day and it has got to the point where he has been late for work so often that he's just been dismissed. The situation between Alessio and his girlfriend is also strained. Alessio's girlfriend reports that 'he has no time for me anymore'. Alessio wants to stop having to 'check' things all the time, but if he doesn't do it he experiences so much stress or anxiety that he is nearly physically sick.

7. Complete the following table to indicate whether each of the following examples describes typical or atypical behaviour and adaptive or maladaptive behaviour.

Example	Typical behaviour	Atypical behaviour	Adaptive behaviour	Maladaptive behaviour
a. Trinh usually copes well with stress but today he is feeling very anxious before an important job interview. Last night he didn't sleep as well as usual and this morning he hardly had anything for breakfast. He is looking forward to catching up with his friends this evening, unwinding and getting on with what he normally does.				
b. Hamish enjoys going to school but in the 48 hours following his grandfather's death, he has stayed in bed for hours during the day, not eaten much, not showered and experienced a constant headache and bouts of uncontrolled crying.				
c. Sienna always worries about how she looks before going to a party, but goes and has a good time.				
d. Kania always worries about how he looks so he doesn't go to parties when invited.				

Example	Typical behaviour	Atypical behaviour	Adaptive behaviour	Maladaptive behaviour
e. Jack gets angry very easily, especially when his brother uses all the hot water in the shower and therefore makes him wait for up to an hour for his own shower.				
f. Olivia is so angry with her brother for using all the hot water in the shower one day that she does not talk to him for 3 months. She rarely gets angry but on that occasion she missed an interview for casual work she was desperate to get.				

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3.2 LEARNING ACTIVITY 3

Multiple-choice questions

1. Adaptive behaviour primarily involves _____ in everyday life.
   - **A.** excellence
   - **B.** obedience
   - **C.** independence
   - **D.** adjustment
2. Maladaptive behaviour primarily involves _____ in everyday life.
   - **A.** dysfunction
   - **B.** disobedience
   - **C.** achievement
   - **D.** change
3. Atypical behaviour is best described as _____ for an individual.
   - **A.** common
   - **B.** unusual
   - **C.** characteristic
   - **D.** distinctive
4. Social norms are
   - **A.** rules and regulations that are documented to ensure people in society behave in socially appropriate ways.
   - **B.** widely held standards that influence how people should behave in different social contexts.
   - **C.** followed by all people in all societies regardless of their cultural background.
   - **D.** guidelines that enable individuals to adjust to the environment appropriately and effectively.
5. People who judge an individual's behaviour as atypical on the basis that it is extremely uncommon compared to what most people do are adopting the _____ perspective.
   - **A.** non-conformity
   - **B.** social norm
   - **C.** statistical rarity
   - **D.** cultural

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3.3 Concepts of normality and neurotypicality

There is no universally accepted single definition of normality in psychology. Its definition and meaning can vary considerably depending on the perspective that is adopted. Consequently, psychologists tend to avoid defining it.

Instead, psychologists focus on the concept, or 'idea', of normality, how it can be recognised, and key characteristics for doing so. It is a broad concept, most commonly used in relation to mental health and wellbeing. It may be considered as roughly the equivalent of good mental health (APA, 2022).

A number of psychological and behavioural characteristics have been suggested to help recognise normality or the state of 'being normal'. These mainly refer to ways of thinking, feeling and behaving that indicate a person is able to perform everyday tasks at the level required to fulfil their roles in society. The characteristics, or 'criteria', include:

- freedom from disabling thoughts
- the capacity to think and act in an organised and reasonably effective manner
- freedom from disabling feelings, such as hopelessness and despair
- freedom from extreme emotional distress, such as excessive anxiety and persistent upset
- the ability to cope with the ordinary demands and problems of life; and
- the absence of clear-cut symptoms of a mental health disorder, such as obsessions and phobias.

These characteristics are not suggested as rigid benchmarks for identifying or assessing normality. Nor are they presented in order of importance or form a complete list. Instead, they are flexible and it is recognised that the concept of normality and criteria used to determine normality are likely to vary from culture to culture (APA, 2022).

The conceptual approach to describing normality provides a basis for identifying thoughts, feelings and behaviour that may be considered adaptive or maladaptive. It also provides a basis for describing **abnormality** — any deviation from what is considered normal, typical, usual or healthy.

In psychology, this is particularly useful for the diagnosis and treatment of developmental and mental health disorders. However, care is taken when using the term abnormality (and abnormal). For example, it is appropriate when used in a medical or scientific context such as 'an abnormality of the brain', an 'abnormal test result' or 'an abnormal distribution of scores'. But when used to describe a person, the terms abnormal and abnormality are widely viewed as derogatory and therefore inappropriate.

Whether use of the term abnormality is viewed as 'negative' depends on what is being considered and the perspective that is adopted. For example, in relation to mental health, abnormality usually refers to thoughts, feelings and behaviour that may be maladaptive and therefore of some concern. In contrast, from a statistical perspective, dedicating one's life to living among impoverished people in an isolated and hostile environment in order to help them would be abnormal

Figure 3.8 There is no universally accepted single definition of normality in psychology. It is a broad concept, most commonly used in relation to mental health and wellbeing.

because relatively few people do so compared to the general population. However, such behaviour would be praised and not be a cause for concern.

The concept of neurotypicality is based on the terms ‘neuro’ and ‘typical’. Neurotypicality therefore means being neurologically typical. Generally, **neurotypicality** is used to describe people whose neurological development and cognitive functioning are typical, conforming to what most people would consider to be normal in the general population.

If you are neurotypical, then your brain and its functioning are as would occur in a typical, ‘average’ person. For example, your skills associated with perception, learning, memory, understanding, awareness, reasoning, judgment, intuition and language fall within the range of normal experience in Australian society for people of your age, sex and cultural background. Your cognitive skills may vary and there will be differences when compared with others, but the variations are typical and therefore like those experienced by most others in the general population.

In addition, given the relationship between cognitive, emotional and social development, your skills and behaviours associated with these areas will also be consistent with what is commonly expected, including variations when compared with others. For example, you will be able to perceive and express emotions like most others and your social skills will enable you to effectively interact with people of different ages and backgrounds, form close interpersonal relationships, participate in community activities, and so on. If you are neurotypical, then most of your behaviours are likely to be adaptive rather than maladaptive because this is the kind of spread observed in the general population.

Figure 3.9 Neurotypicality means your brain functions like that of the typical, ‘average’ person in the general population.

3.3 LEARNING ACTIVITY

Multiple-choice questions

1. The term _____ is used to describe thoughts, feelings or behaviours that differ from what is considered normal, typical, usual or healthy.
   A. neurotypical
   B. neurotypicality
   C. normality
   D. normality
2. The term neurotypicality is used to describe _____ behaviour and cognitive functioning.
   A. typical
   B. adaptive
   C. atypical
   D. maladaptive
3. Normality in relation to behaviour and mental processes may be considered as roughly the equivalent of
   A. statistical rarity.
   B. neurotypicality.
   C. good mental health.
   D. maladaptive behaviour and cognition.
4. A significant limitation of the use of the term normality is that
   A. no person can truly be considered to be normal from any perspective.
   B. there is no universally accepted single definition of normality in psychology.
   C. its definition and meaning does not vary enough in different societies or cultures.
   D. it is too narrow a concept to be used in relation to mental health and wellbeing.
5. Neurotypicality means
   A. absence of clear-cut symptoms of a mental health disorder.
   B. deviation in neurological functioning from what is considered normal, typical, usual or healthy.
   C. neurological development and cognitive functioning are consistent with what most people consider to be typical in the general population.
   D. neurological development and cognitive functioning are consistent with what most people consider to be atypical in the general population.

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3.4 Neurodiversity — normal variations of brain development within society

The concept of **neurodiversity** is used to describe people whose neurological development and cognitive functioning are atypical and therefore deviate from what is considered typical or normal in the general population.

The range of differences among individuals who are neurodivergent is regarded as part of the normal variation of brain development found within any group or society in general. For example, there is neurodiversity in a group when one or more members of the group differ substantially from others in terms of their neurological development and cognitive functioning.

This means that a family, friendship group, psychology class, a school, a suburb, a country or the cast of characters in TV soapie would be neurodiverse if some members varied in their cognitive abilities and functioning (Walker, 2014).

Individuals diagnosed with an intellectual disability may be described as neurodivergent or having a form of neurodivergence. *Intellectual disability* is a neurodevelopmental disorder characterised by mild to profound limitations in cognitive abilities and in skills required to function independently in everyday life, such as the adaptive behaviours described previously.

As with any other form of neurodivergence, intellectual disability may vary in severity within and between individuals. Every individual has their own unique characteristics as well as strengths that can be acknowledged. For example, a person with an intellectual disability may experience substantial impairment in one specific adaptive behaviour, but excel in another behaviour. Similarly, they may be able to perform a particular task perfectly one day, only to find that they are incapable of doing so on the next day.

The term neurodiversity emerged in the autistic community alongside neurotypicality in the late 1990s. Since then, both have gradually been applied to other neurological conditions. Generally, they are a means of recognising the similarities and differences in the abilities of individuals with a neurological disorder.

In particular, the term neurodivergence recognises that many neurological disorders are disabilities, but they also represent normal human variation in the cognitive functioning of individuals within our society. As such, all forms of neurological diversity should be respected as differences in how people think, see the world around them and process information. Therefore, neurodiversity is viewed as a natural and valuable form of human diversity and that neurological differences in people should be recognised in much the same way as we view differences in biological sex, ethnicity, eye colour, hair colour and so on (Walker, 2012; Walker, 2014; Baron-Cohen, 2019; den Houting, 2019; Singer, 2021).

As with use of the terms normality and abnormality, there is also appropriate and inappropriate use of terms associated with neurotypicality and neurodiversity. For example, neurotypical can be used as either an adjective to describe someone (e.g. 'He's neurotypical') or a noun (e.g. 'She's a neurotypical'). However, there is no such person as a 'neurodiverse individual'. The correct term is 'neurodivergent individual'. An individual can diverge or deviate from what is considered normal or typical, but an individual cannot be diverse.

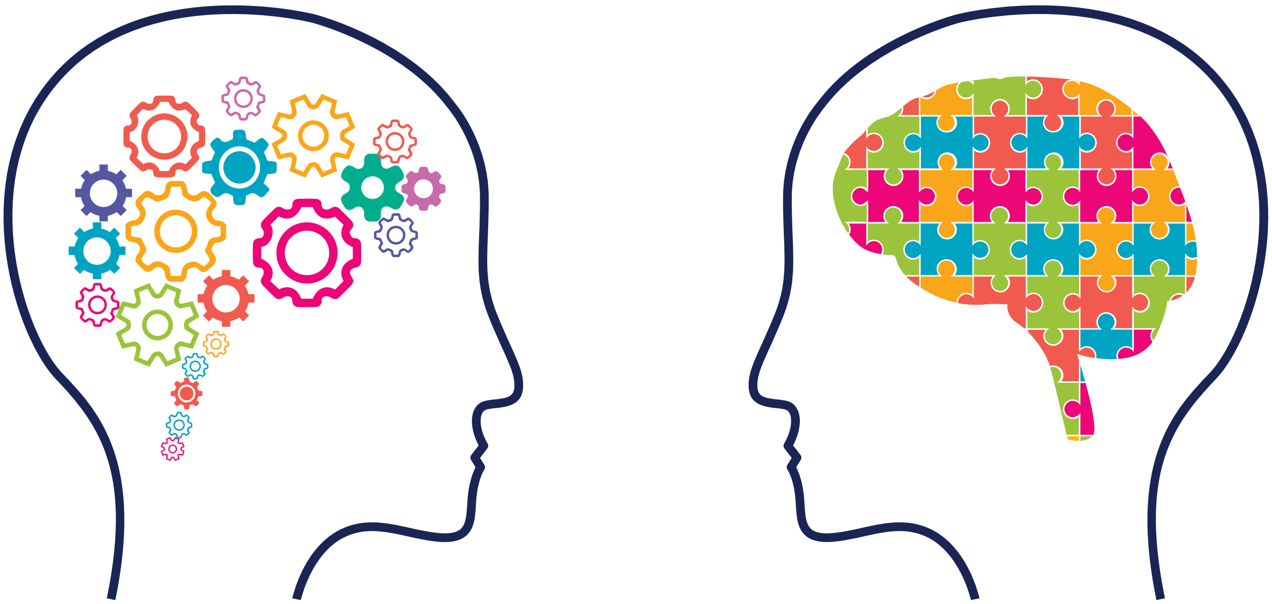

Figure 3.10 Neurodiversity is used to describe people whose neurological development and cognitive functioning are different to what is considered typical or normal in the general population.

In addition, neurodiverse cannot be used to mean 'non-neurotypical', because neurotypical people, like all other human beings, are part of the spectrum (or range) of human neurodiversity. It should also be kept in mind that neurotypical and neurodiverse do not describe an ability, set of abilities, personality or a personality trait. Finally, unlike abnormal or abnormality, neither neurotypical or neurodiversity are considered derogatory when used to describe a person (Walker, 2014).

Neurodivergence is an umbrella term that covers all psychological disorders involving some kind of neurological disturbance due to either hereditary influences, environmental influences or a combination of both. For example, neurodivergence can be largely or entirely inherited, or it can be largely or entirely produced through experience that changes brain functioning, such as a brain injury acquired in an accident or by misuse of an illegal drug, or it can be produced by a combination of genetic and lifestyle factors (Walker, 2014).

Autism, attention deficit hyperactivity disorder (ADHD) and dyslexia are three of many forms of neurodivergence. We examine these and other conditions in the next section. From the neurodiversity perspective, each condition should be considered as a neurological disorder involving normal variations in brain development. Furthermore, individuals diagnosed with one of these conditions are not 'all the same' and don't necessarily 'all need fixing'. They all have brains that are 'wired differently', just like neurotypicals. But their brain functioning alters how they think, feel and behave, and does so in ways that are unique to each individual.

People diagnosed with one of these disorders will experience many of the same symptoms, but they retain their individuality and will have many positive attributes as well as several disabilities and impairments that impact on their everyday functioning to some degree.

Of course, individuals with one of these disorders may also have attributes that are strengths which neurotypicals lack. For example, a person diagnosed with autism who has an exceptional ability such as a prodigious memory for facts may prefer respect for the ability rather than treatment for their autism.

Figure 3.11 Neurodivergence is an umbrella term that covers all psychological disorders involving some kind of neurological disturbance.

3.4 LEARNING ACTIVITY 1

True/False questions

Indicate whether each statement is true or false by entering T or F in the space provided.

1. _____ Neurotypicality and neurodiversity illustrate normal variations of brain development.
2. _____ Neurodiversity is a characteristic that any individual possesses.
3. _____ Neurotypicality specifically refers to someone without a mental health disorder.
4. _____ Neurodiversity may be described as an abnormality.
5. _____ Neurotypicality may be represented on a continuum or scale ranging from low to high.
6. _____ Neurodiversity may be represented on a continuum or scale ranging from low to high.
7. _____ Neurotypicality and neurodiversity are produced by the interaction of nature and nurture.
8. _____ A neurodivergent person is typical rather than atypical.
9. _____ Neurodivergent individuals are non-neurotypical.
10. _____ Neurodivergent individuals are outnumbered by neurotypicals in the general population.

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3.4.1 Autism

By the time Kim was 18 months of age his parents were aware that he was 'different' from other children of the same age. He made few sounds and seldom communicated using his voice. His mother commented that 'he doesn't seem to know us'. Kim didn't interact with her in the same way her first child did and he seemed to have no connection with his older brother Sam. He seldom responded when Sam tried to play with him or make him giggle.

Kim didn't imitate the behaviour of others as children of his age usually do when they wave goodbye, 'clap hands' or 'blow kisses'. He would often sit in the corner of a room and stare for long periods of time at the lights or the corner of the ceiling, or fiddle endlessly with a piece of cloth or scrunched up paper. He seemed to be in a world of his own.

Kim's parents initially thought he might be deaf because he didn't seem to respond to his name. However, over time, they realised that Kim's lack of response to noise was 'selective' because loud noises seemed to distress him.

As Kim got older, he spent long periods of time playing alone with a few favourite objects, such as his Marvel figurines. He would arrange them in neat lines, always in the same order. If anyone else attempted to rearrange them or direct his attention to something else, Kim would have a tantrum.

He also became distressed whenever his mother was out of sight. Although her return would stop his tears, he made no attempts to gain her attention and would return to what he was doing previously. Kim had little interest in food and when he did eat, it was always the same foods. He had very poor sleep habits. He rarely slept during the day and was difficult to settle at night. Kim was eventually diagnosed with autism spectrum disorder, commonly referred to as autism.

Autism is a neurodevelopmental disorder that affects the way people communicate and interact with others and the world. It is diagnosed when a person displays a pattern of behaviour involving persistent difficulties interacting and communicating with others and more highly restricted or repetitive behaviours, interests and activities than are typically expected. These characteristics may also be accompanied by atypical reactions to sensory stimuli, such as over- or under-sensitivity to specific lighting, sounds, tastes, smells or touch.

Figure 3.12 Autism is a neurodevelopmental disorder that affects the way people communicate and interact with others and the world.

Classification as a *neurodevelopmental disorder* means that autism has a neurological basis (i.e. involving the brain and nervous system) and its onset occurs at some stage during development. This means that autism may develop before birth, however, difficulties become apparent in early childhood. Autism can be reliably diagnosed by the age of about 18 months–2 years, but symptoms may be seen in the first 12 months.

Autism, however, is not just a childhood condition. It is a lifelong condition, so it will almost always be present in some form throughout the entire life span. Although autism is predominantly diagnosed in childhood, some people reach adulthood without a diagnosis.

There is no specific medical procedure, such as a brain scan or blood test, for diagnosing autism. Instead, various behaviours and abilities across a broad range of areas are considered.

Generally, mental health professionals use detailed parent interviews, behavioural observations and developmental assessments to establish an understanding of the child's behaviour patterns. The profile is then compared with evidence-based criteria, formally recognised by mental health professionals for a diagnosis of autism. A medical evaluation may also be included as part of the assessment to rule out medical causes for behaviours or other characteristics of concern.

on Resources

Weblink Autism Awareness Australia resources for teachers and students

Characteristics of autism

The characteristics used to diagnose autism fall into three broad categories — social interaction, social communication and restricted or repetitive patterns of behaviour, interests or activities.

Social interaction

Autistic individuals have difficulties with social interaction. There is likely to be little or no response to social interaction from others and little or no initiation of social interaction or sharing of emotions. The individual is likely to find it hard to form 'normal' social relationships and have difficulty adjusting their behaviour to suit different social contexts.

Many autistic infants do not demonstrate typical behaviours associated with a secure attachment. They tend to make very little eye contact with people and they generally do not respond by snuggling when held. In addition, infants with autism seldom seek comfort from a caregiver when distressed. Many have difficulty showing affection but this doesn't necessarily mean a lack of interest in being affectionate. Some may be oversensitive to touch or hugs, or not understand the purposes of hugging.

As children, they are likely to have difficulty making friends. They can often be seen alone in the school playground at recess and lunchtime. They tend to show little or no interest in others and often do not respond when someone calls their name. If they do respond in a social situation, their response is often inappropriate for the situation.

Children with autism are unlikely to engage in pretend or interactive play and have a preference for a small range of toys or objects which they tend to use in the same way. They are also unlikely to share enjoyment of objects or activities by pointing or showing things to another person.

Social communication

Social communication problems are also evident in many autistic individuals. These are usually compounded by delayed speech development, limited language skills and a limited range of facial expressions. In addition, facial expressions, gestures and body movements are often not integrated or do not match what is being said in a conversation.

Difficulties with everyday back-and-forth conversation are common. Those individuals who do speak may seem to have no understanding of the 'social rules' of listening and then talking. They may fail to, or be slow to, respond to someone calling their name or to other verbal attempts to gain their attention. They are also likely to have difficulty understanding another person's point of view or with predicting or understanding another person's actions.

When speech is used, the tone may be unusual. For example, speech is often mechanical and monotone with little variation, therefore sounding flat or robot-like. Language may also be unusual, for example, repeating or echoing words or phrases someone else says rather than using their own language to express needs or wants.

Figure 3.13 Children with autism have difficulties with social interaction

Table 3.1 Parental reports of the social behaviour of their autistic children before the age of 6 years (N = 50)

Behaviour		Percentage of responses				
		Never	Rarely	Often	Very often	Almost always
1.	Ignored people	0	4	22	29	45
2.	Emotionally distant	0	8	23	19	50
3.	Avoided eye contact	2	4	20	16	58
4.	No affection or interest when held	11	11	35	26	17
5.	Going limp when held	30	33	17	17	2
6.	Stiff/rigid when held	33	24	7	18	18
7.	Ignored affection	6	30	34	11	19
8.	Withdrew from affection	12	33	29	10	15
9.	Cuddling when held	26	24	29	10	15
10.	Accept/return affection	30	34	26	4	6
11.	Looked through people	4	10	22	22	41
12.	Seemed not to need mother	12	20	32	8	28
13.	Responsive smile to mother	14	30	30	14	12
14.	Unaware of mother's absence	17	25	25	14	19

Source: Adapted from Volkmar, F. R., Cohen, D. J. & Paul, R. (1986). An evaluation of DSM-III criteria for infantile autism. *Journal of the American Academy of Child Psychiatry, 25*, p.193. Copyright 1986 by the American Academy of Child Psychiatry. Adapted by permission.

Restricted or repetitive behaviour, interests and activities

Autistic children will also have patterns of restricted, repetitive behaviour, interests and activities. This includes behaviour with limitations, such as a fixation on certain activities, insistence on sameness and adherence to rigid routines, as well as hypersensitivity to sensory input.

For example, they may spend long periods of time repeating simple movements such as hand flapping or rocking back and forth in the same spot. They can also spend a lot of time repeating use of objects, such as spinning a coin or arranging object so they are in a straight line or some other order.

Autistic individuals excessively like routine and seem to have a strong need for sameness to the extent of resisting even minor change. For example, they may watch the same video multiple times, insist that a favourite food is always packaged in one way only, demand that furniture is arranged in a certain way or have a need to take the same route to school each day. They can get upset or even distressed by slight changes in a routine.

Autistic individuals can become strongly attached to particular objects and some develop a preoccupation with moving objects or parts, such as their hands or fingers. Some individuals spend long periods of time intently watching their own hands and fingers as if mesmerised by their movements. Some have an ongoing, intense interest in certain topics, such as numbers, details, or facts.

Figure 3.14 Some autistic children can spend long periods of time arranging and rearranging objects so they are in a particular order.

It is also evident that many autistic individuals are more or less sensitive than other people to sensory input or having atypical interest in sensory aspects of the environment. For example, certain sounds may cause distress, there may be indifference to hot or cold air temperature, excessive smelling or touching of objects, or visual fascination with lights or movement. It is common to have a high pain threshold.

Many behaviours associated with autism are predominantly maladaptive so they are often severe enough to cause impairment in everyday life. Some autistic individuals need a lot of help in their daily lives, whereas other do not.

Autism is frequently associated with learning disabilities. One reason is that impaired social and communication skills may hamper learning and negatively impact on academic achievement. Only a minority of autistic people live and work independently in adulthood. Those who do, tend to have very well-developed intellectual and language abilities (APA, 2013).

Autistic children usually need a structured environment both at home and at school. For example, they need a predictable routine at home in relation to getting up in the morning, meal times and going to bed at night. Individuals who have severe communication and/or intellectual disabilities may attend a school specifically for autistic children that provides specialised programs designed to meet their particular learning and behavioural needs. Children whose language problems and intellectual disabilities are less severe are likely to attend a regular school where they may receive additional assistance through an integration program.

No two individuals diagnosed with autism are alike, which means that each person has unique strengths and challenges. The severity of the behaviours that characterise autism vary considerably within and between individuals. Social interaction and communication difficulties, for example, can range from having complete lack of speech to fluent language. The frequency and intensity of autism behaviours — such as repetitive play with objects and repeated body movements like rocking and hand flapping — vary between mild and severe. And intellectual abilities can range from significant disability with a very low level of intellectual functioning to a very high IQ.

Some individuals also have in exceptional ability in a very specific area; for example, in being able to tell you, within seconds, the day of the week of any date in any year, or memorising the name of every train station in Australia or the post code of every town and city in Australia. However, this is not common (Treffert, 2009; Whitehouse, 2019; Alvares et al., 2020).

Figure 3.15 Every person on the autism spectrum experiences unique strengths and challenges. Some have exceptional ability in a very specific area, such as being able to give the latitude and longitude of every capital city in the world.

Autism spectrum disorder

This wide variation in the type and severity of characteristics is why autism is described as a ‘spectrum’ disorder, more formally as *Autism spectrum disorder*. A spectrum is used to represent the position of something on a scale between two extreme points. The term *autism* includes two other neurodevelopmental conditions previously called Asperger syndrome and Pervasive developmental disorder, but these are no longer described as distinct disorders.

Most estimates suggest that autism affects about 1 in 100 Australians. It affects people in all racial, ethnic and socioeconomic groups, but it is about four times more common in males than females (Jones, 2019).

Individuals who have a personal connection with autism may have preferences about how autism is described or talked about. This is mainly because the language used can affect attitudes towards autism and people diagnosed with the condition.

Although there is no single term that everyone prefers, most tend to prefer 'autistic person'. This is identity-first language that conveys the message that autism is an inherent part of the individual's identity. For example, to state that 'I am autistic' has the same value and meaning as stating 'I am Australian' and 'I have brown eyes'. There are, however, members of the autistic community who prefer the expression 'person with autism'. Regardless of specific language preferences, the right of all individuals who experience or live with autism should be respected (Amaze, 2018; DeRango et al., 2020).

Risks and contributing factors

There is no known single cause of autism. Research evidence suggests that autism results from changes to the development of the brain. However, what causes the brain to develop so differently and result in autistic behaviours in some people but not others remains unknown. It is likely that there are multiple causes for variations of autism that have different degrees of severity and may contribute in different ways among individuals. Much research remains to be done.

Biological factors that have been proposed as risk factors for autism include physical or chemical changes in the developing brain, either before birth or in early infancy; interaction of several genes involved in brain development; having certain genetic or chromosomal conditions (e.g. fragile X syndrome); genetic mutations; advanced parental age (e.g. over 45 years) and a very low birth weight.

The contribution of genetic inheritance in the development of autism is evident in the results of correlational research. These types of investigations show that families with one autistic child have an increased risk of as much as 20% (1 in 5) of having another autistic child when compared with others in the general population. In addition, the results of twin studies show that when one identical twin is affected by autism, there's a 50 to 80% chance the other twin will be autistic too. With fraternal twins, who have a different genetic makeup to each other, the risk is much less (5–20%) (Sandin et al., 2014; Whitehouse, 2016; Autism Awareness Australia, 2021).

Psychological and social factors that may influence the onset or experience of autism (but not *cause* autism) include individual differences (e.g. types and severity of autistic characteristics); having autism plus another neurodevelopmental disorder such as an intellectual disability (e.g. a dual diagnosis); presence or absence of a mental health disorder (e.g. anxiety or depression); the timing of intervention and treatment (e.g. early vs late diagnosis); the quality of treatment; schooling (e.g. specialised vs mainstream); home environment (e.g. parenting, having other siblings); socioeconomic circumstances; access to social support (e.g. support from family, friends, the community); and access to financial support through the National Disability Insurance Scheme (NDIS).

There is no scientific research evidence supporting views expressed by some people in the wider community that autism is caused or influenced by such factors as bad parenting, vaccination, or energy emitted from mobile phone towers and high voltage power lines.

Figure 3.16 Autism cannot develop through exposure to energy emitted from a mobile phone tower.

3.4 LEARNING ACTIVITY 2

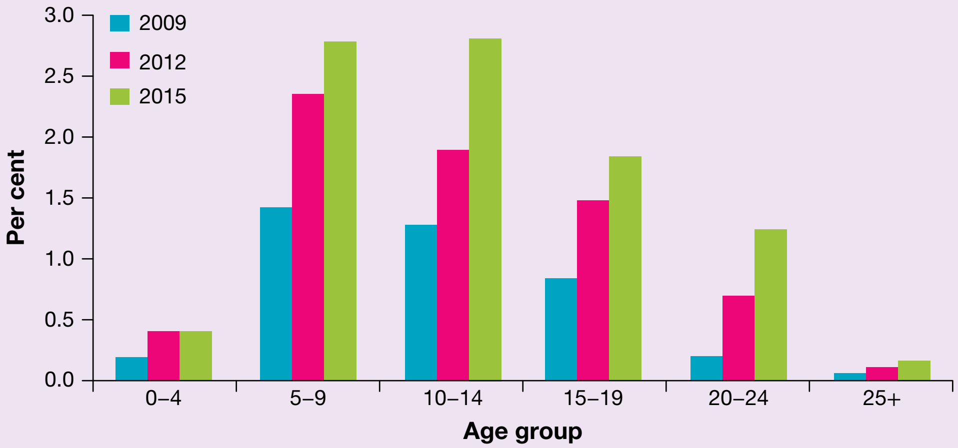
Review

1. a. What is autism?
   b. Consider common characteristics of autism. Complete the table below by including three examples in each column.

Social communication	Social interaction	Restricted/Repetitive behaviours, interests, activities

   c. Why do mental health professionals prefer to use the term autism spectrum disorder?
   d. Define the meaning of 'neurodevelopmental disorder'.
2. Suggest why autism may be difficult to diagnose in infancy.
3. Some people reach adulthood without a diagnosis of autism. Suggest why this may occur.
4. Consider the graph below and answer the questions about the data.

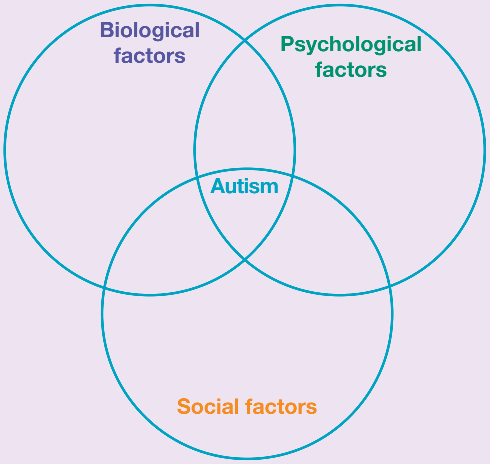
Prevalence of autism, by age group, 2009, 2012 and 2015



Source: Australian Institute of Health and Welfare (2017). *Autism in Australia.* Retrieved May 19, 2022, from https://www.aihw.gov.au/reports/disability/autism-in-australia/contents/autism

   a. Among which age groups is autism most common?
   b. Which age group shows the greatest increase in autism over time?
   c. Describe the pattern or trend evident in the data.
   d. Suggest an explanation of the pattern or trend.
5. What causes autism?
6. Suggest an example of how a maladaptive behaviour associated with autism may be treated to help an autistic child function more effectively in everyday life.

7. Complete a Venn diagram to the right by inserting biological, psychological and social factors that may influence the development, progression or experience of autism.



8. Indicate whether each statement is true or false by writing T or F in the space provided.
   a. _____ Autism can be caused by bad parenting.
   b. _____ Children can grow out of autism.
   c. _____ Autism can be caused by eating certain foods.
   d. _____ Autism can be caused by vaccination.
   e. _____ Autism is a neurological disorder.
   f. _____ Autism is a developmental disorder.
   g. _____ There is no cure for autism so it is a lifelong condition.
   h. _____ An autistic person is a failed neurotypical person.
   i. _____ An autistic person has neurodiversity.
   j. _____ There is neurodiversity among autistic people.
   k. _____ Autistic people are highly likely to have an extraordinary ability such as an encyclopaedic memory for certain facts.
   l. _____ Autistic people cannot learn.
   m. _____ Autistic people do not have emotions.
   n. _____ Autistic people do not speak.
   o. _____ Living near a mobile phone tower or under high voltage power lines may contribute to the development or progression of autism.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

3.4 LEARNING ACTIVITY 3

Analysis of data — Parental reports of social behaviour

Consider the data in Table 3.1 and answer the following questions.

a. Identify the sample and the population used for data collection.
b. Are the data best described as:
   i. primary or secondary?
   ii. quantitative or qualitative?
   iii. objective or subjective?
c. Which three behaviours were most frequently observed in autistic children?
d. Which three behaviours were least frequently observed in autistic children?
e. Explain how reliable the data are likely to be.
f. If the data were to be graphed, which type of graph would be most appropriate? Give a reason for your answer.
g. i. Give two examples of behaviours for which parents may have experienced difficulties in making distinctions.
   ii. What does your answer to (a) above suggest about a possible limitation of the data?
   iii. Suggest another possible limitation of the data.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

3.4.2 Attention deficit hyperactivity disorder (ADHD)

Alex's mother cannot remember a time when her son was not doing something 'naughty'. As a young child, he was always 'on the go'. He was so active that one night when he was rocking in his cot he almost rocked his cot apart. Alex was often doing things he wasn't allowed to do, such as pulling bottles out of the medicine cupboard, playing with the detergents under the kitchen sink, or poking things into a power point. Alex's mother said he was 'clumsy' and 'accident-prone' as a child. He had more visits to the emergency department of the local hospital than his older brother and younger sister. Alex's mother recalls that he progressed from crawling to running and seldom walked anywhere. He found it difficult to sit still to listen to a story and seldom watched a television program without losing interest part way through.

Alex had difficulty managing his behaviour when he started school. It seemed he was always in trouble for doing something he shouldn't have been doing. He could not pay attention for longer than a few minutes and had difficulty following instructions. He was unable to stay sitting at his table working on a task for any length of time. When he did sit down he constantly jiggled his leg, tapped his pencil on the table, fidgeted with something, tickled the person next to him or just 'mucked around'. Way too much of his class time was spent wandering around the room. He refused to follow directions from teachers and his constant back-chatting resulted in him being sent out of the classroom regularly. Despite all his disruptive behaviour, Alex's year 1 teacher reported at the end of the first semester that 'Alex is underachieving academically in relation to his ability.'

Alex also had difficulty making and keeping friends. He annoyed and frustrated his peers because he never followed the rules in games and often walked away halfway through. On one occasion, when he was playing in a soccer match at school, he tried to play virtually all the positions on the field himself. He was short-tempered and he sulked when they didn't pass the ball to him or when free kicks were given against him. He would react in a similar way in the classroom when reprimanded by his teacher for misbehaving. Over time, his attitude to school became increasingly negative and his mother often had difficulty getting him to go to school.

Alex's behaviour at home was no different. His room was a mess. He did everything quickly and most tasks were only half done. He was often in trouble with his parents for not doing what had been asked of him. His father commented that while Alex often did the 'wrong' thing, it seemed that he forgot what he was meant to be doing rather than deliberately trying to be naughty. After a referral from the school counsellor to a psychologist, Alex was diagnosed with Attention deficit hyperactivity disorder.

Attention deficit hyperactivity disorder (ADHD) is a disorder involving a persistent pattern of inattention, and/or hyperactive-impulsive behaviour that adversely affects development or everyday functioning. Like autism, ADHD is classified as a neurodevelopmental disorder.

Patterns of behaviour associated with ADHD may be seen in children under the age of 4, sometimes when toddlers. For example, some parents are aware by the time their child is 4 or 5 years old that there is something 'different' about their behaviour. However, many ADHD symptoms are difficult to distinguish from the typical behaviour of children of that age. In most cases, ADHD is identified after the child starts primary school when inattention becomes more prominent and impairing in the structured setting of a classroom.

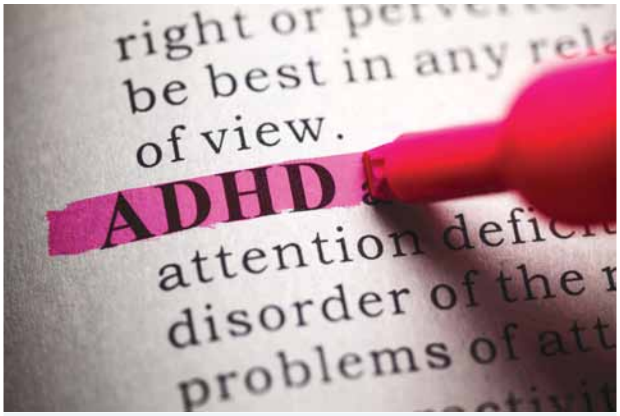


Figure 3.17 ADHD is a neurodevelopmental disorder characterised by a persistent pattern of inattention, and/or hyperactive-impulsive behaviour.

ADHD is one of the most common neurodevelopmental disorders of childhood, however, as with autism, it is not just a childhood disorder. Despite the view of some people that children with ADHD 'will grow out of it', 75% of children with ADHD continue to experience these difficulties into adolescence and often adulthood.

ADHD is considered a lifelong condition, so it is likely to be present in some form and to some degree in adulthood. The disorder tends to stabilise from early adolescence, though for some individuals the condition worsens and they may develop antisocial behaviours. As the person gets older, the symptoms of hyperactivity become less common but impulsivity can remain problematic.

As with autism, some adults have ADHD but have never been diagnosed. The symptoms can cause difficulties at work, at home, or with relationships. Symptoms may also seem to be different at an older age. For example, hyperactivity may become less common but appear as extreme restlessness. Generally, to be diagnosed with ADHD after the age of 17 years through to any older age, it must be evident that a number of behaviours associated with inattention in particular were present in childhood, before the age of 12 years.

The diagnostic procedure for ADHD is like that for autism. As with autism, there is no single test to diagnose ADHD. Instead, mental health professionals primarily use behavioural observations, parental interviews and developmental history. They may also recommend a medical evaluation or hearing and vision tests to investigate other problems that may underlie some of the symptoms and possibly require treatment.

Characteristics of ADHD

The three behaviour 'categories' used to diagnose ADHD are inattention, hyperactivity and impulsivity.

Inattention

Inattention associated with ADHD means that the individual has significant difficulty maintaining their attention on tasks that do not provide a high level of stimulation or are frequently rewarding in some way. For example, they are likely to have trouble holding their attention when performing daily tasks such as basic chores, schoolwork and even when watching TV, using social media or playing a game.

In particular, they often fail to pay close attention to details or make careless mistakes in schoolwork, at work, or with other activities. Regardless of age, they often do not seem to listen when spoken to directly.

In addition, inattention means that the individual is easily distracted and has difficulty sticking to the same task for very long, especially if it requires mental effort. For example, during 'story time' on the mat in prep grade, a child with ADHD is likely to listen for the first minute or so. They may then start wriggling and turning around to see what the person behind is doing and start talking to them. They may then get up from the mat to play with the blocks for a few minutes, then move on to another activity.

Similarly, an older person will easily lose focus and get side-tracked if a task requires too much mental effort. They often do not follow through on instructions and fail to finish schoolwork, chores, or workplace duties within set deadlines.

Figure 3.18 Children with ADHD are often inattentive and easily distracted.

on Resources

Weblink Video presentation outlining ADHD 4m 28s

Finally, *inattention* associated with ADHD also means that the individual will usually have problems organising tasks and activities. For example, they are often forgetful in daily activities such as running errands, keeping appointments, returning calls and paying bills. They also tend to lose or 'can't find' things such as their keys, glasses, mobile phone, wallet, a school assignment due for submission or a bill that needs to be paid. Similarly, they often lose things necessary for completing various tasks, such as pencils, rulers, books and tools.

Hyperactivity

Hyperactivity refers to excessive motor activity and difficulties with remaining still, most evident in structured situations that require behavioural self-control.

Hyperactive people are very restless. They appear to have excessive energy and are always 'doing' something. They have difficulty keeping still for an extended period of time. If required to remain in one spot for a period of time, they seem to need to find a way to release some of their energy. For example, if sitting at a table at school, they will often fidget, tap their fingers or pencils, or be touching something. Hyperactive children are often considered 'chatterboxes' at school. This may be another way of releasing their excess energy.

At school or in the workplace, an adolescent or adult diagnosed with ADHD will often be 'on the go', unable to be still for an extended period of time. They are more restless than is typical for others and often need to get up mid-activity and walk around or do something else for a while. Standing relatively still in a queue when waiting for their turn to be served usually takes place with great difficulty.

Impulsivity

Impulsivity is a tendency to act on the spur of the moment in response to immediate stimuli, without a plan or consideration of the outcomes. Impulsive people act before they think. They do not consider consequences of their actions before doing them. Nor are they likely to weigh up the risks, which is potentially self-harming.

Individuals with ADHD are often unable to control the urge to blurt things out or wait their turn in a conversation, activity or game. They often interrupt a conversation, blurt out the answer to a question before it is finished or take over an activity to finish it more quickly.

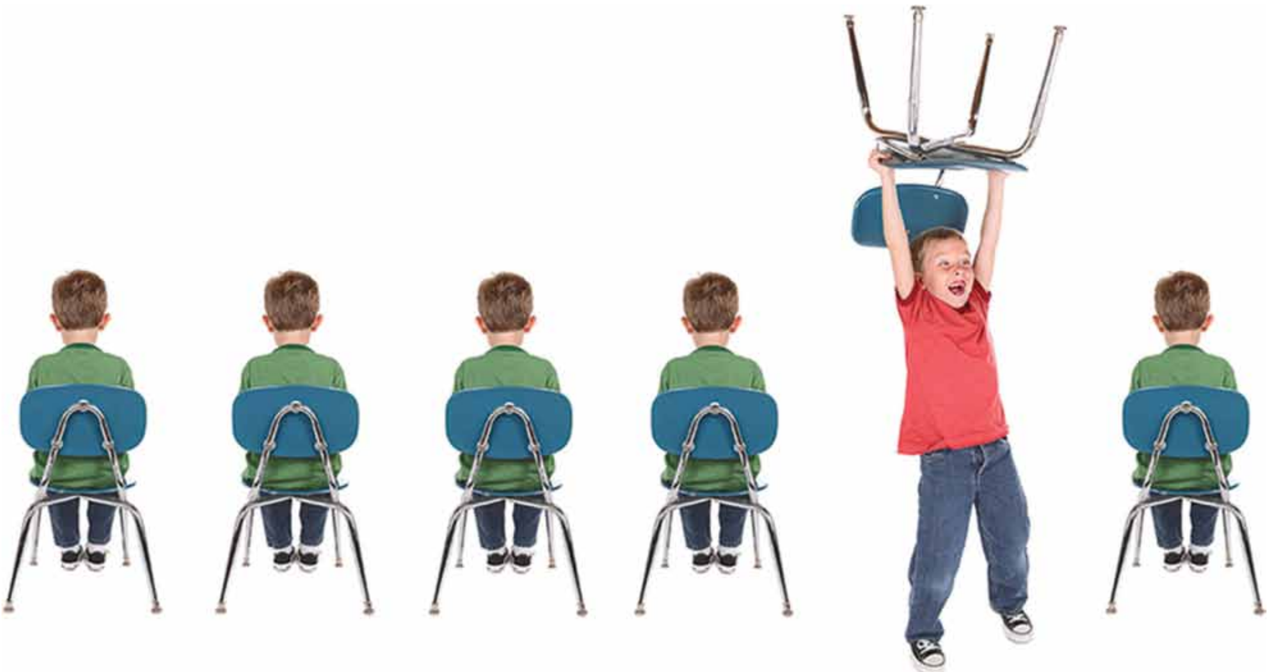


Figure 3.19 Children (and adults) with ADHD tend to find it difficult to keep still for a long time.

Other people often interpret the behaviour of children diagnosed with ADHD as naughty. However, much of the behaviour of these children is outside their control rather than a deliberate choice to be naughty. Similarly, the impulsive behaviour of an adolescent or adult diagnosed with ADHD may be interpreted as rude or arrogant. However, they may also simply be unable to control their impulsive behaviour.

The pattern of inattentiveness, hyperactivity and impulsivity must be present for at least six months and have caused impairment in everyday social and school or work settings before a diagnosis of ADHD is given. In addition, the degree of inattention and hyperactivity and/or impulsivity must be outside the limits of normal variation expected of someone of the same age.

Thus, a child who is very excited about their upcoming birthday party and who has difficulty concentrating, is loud and runs around the house knocking things over would not be considered to have ADHD simply on the basis of this one experience of 'uncontrolled' behaviour.

Types of ADHD

There are three different types of ADHD that may be formally diagnosed. The diagnosis depends on the kind of symptoms that are the most predominant in the individual. The three types are: *Predominantly inattentive presentation* (mainly problems associated with attention); *Predominantly hyperactive-impulsive presentation* (mainly problems associated with hyperactivity and impulsivity) and *Combined presentation* (mainly problems associated with attention, hyperactivity and impulsivity). Because symptoms can change over time, the type of ADHD with which an individual is diagnosed may also change over time.

As with autism, all ADHD-related behaviours, should be viewed as occurring on a spectrum with little or no hyperactivity and inattention on one end and severe ADHD on the other (McLennan, 2016; Kazda, 2021).

It is estimated that ADHD affects about 6–10% of children and adolescents and 2.5% of adults. Like autism, it affects people in all racial, ethnic and socioeconomic groups, but it is diagnosed 3 times more often in boys than it is in girls, whereas in adults it affects men and women equally (Faraone et al., 2015; Coghill et al., 2021; May & Bellgrove, 2022).

There is considerable debate about the number of people who are actually affected by ADHD. Some psychologists argue that it is under-diagnosed and others that it is over-diagnosed, especially in childhood and adolescence. It is possible that there are some people with ADHD who have not been diagnosed and some diagnosed with ADHD who should not have been (ADHD Australia, 2019; Kazda, 2021; May & Bellgrove, 2022).

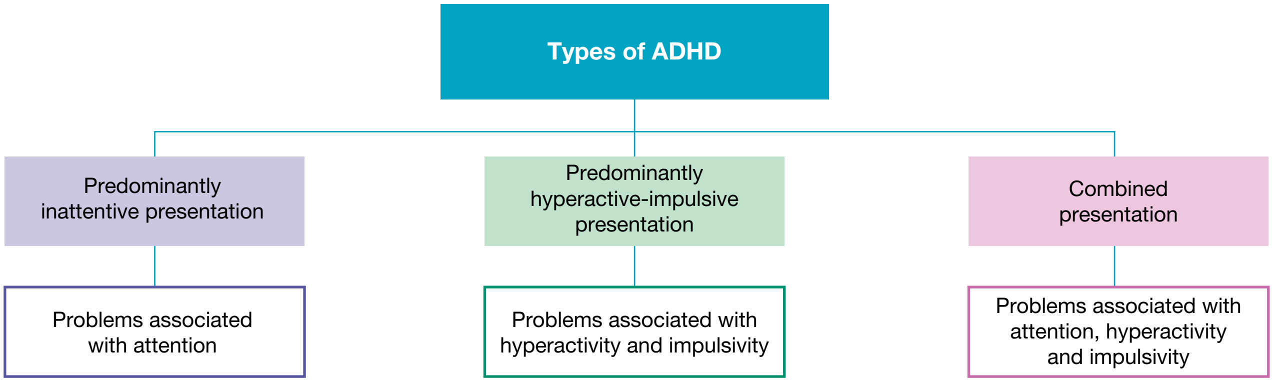


Figure 3.20 The three types of ADHD that may be formally diagnosed

Risks and contributing factors

ADHD is a complex disorder. Generally, it develops through the combined interaction of hereditary and environmental risk factors that each have a small individual effect and act together to increase susceptibility. Specific factors will most likely vary between individuals.

There is, however, considerable research evidence which shows that inherited, genetically determined differences in the way the brain develops play a significant role. ADHD has a neurological basis and there is some kind of difference or change in the brains of people with ADHD. But what actually causes the brain to develop differently and result in ADHD behaviours in some people but not others remains unknown (Faraone et al., 2015; Coghill, 2021).

The results of correlational research, including family, twin and adoption studies, show that ADHD is a highly heritable disorder. For example, a child is more likely to have ADHD if their parents or siblings have ADHD. Furthermore, the closer the genetic relatedness of family members with ADHD, the greater the likelihood of having ADHD.

Research evidence also suggests that genetics account for about 70–80% of the risk for developing ADHD. No single ADHD gene appears responsible for causing ADHD. Instead, research shows that it is likely to result from a number of interacting genes.

Expression of these genes is thought to result in alterations in brain structure, brain chemicals and brain function. For example, brain scans show that certain areas of the brain may be smaller in people with ADHD, whereas other areas may be larger.

People with ADHD may also have an imbalance in the level of neurotransmitters in the brain and these chemicals may not work properly. When people diagnosed with ADHD process sensory information from the environment, their brain may respond to it in a different way than that of people who do not have ADHD. However, the exact significance of possible differences in the brains of people with ADHD from those without the condition is not clear (Faraone et al., 2015; Hoogman et al., 2017; Sciberras et al., 2017; ADHD Australia, 2019).

Other biological factors that have been proposed as risk factors in varying degrees for ADHD include significantly low birth weight, premature birth and exposure to maternal tobacco smoking, alcohol use or environmental toxins during prenatal development (Sciberras et al., 2017; ADHD Foundation, 2021).

Psychological and social factors may influence any psychological disorder. As with autism, potential influences on the onset or experience of ADHD include individual differences, whether the individual has another disorder, the timing of intervention and treatment, the quality of treatment, type of schooling, home environment, and access to support.

Scientific research does not support views expressed by some people in the wider community that ADHD arises from excessive sugar intake, food additives, excessive viewing of television or use of social media, poor child management by parents or family chaos (ADHD Foundation, 2021).

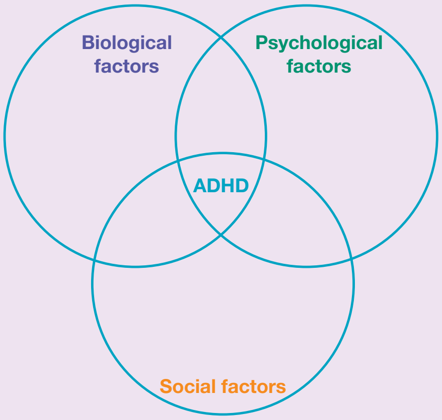
Figure 3.21 Premature birth has been proposed as one of the possible biological risk factors for ADHD.

Figure 3.22 Research evidence shows that ADHD is a highly heritable disorder.

3.4 LEARNING ACTIVITY 4

Review

1. What is attention deficit hyperactivity disorder (ADHD)?
2. Explain what is meant by the phrase ‘ADHD has a neurological basis’.
3. Describe the three prominent behaviours of ADHD with reference to an example of each type.
4. Which ADHD type involves a significant number of difficulties with each of the three prominent behaviours?
5. List three criteria other than the three prominent behaviours that are considered when diagnosing ADHD.
6. Explain whether ADHD can be described as a spectrum disorder.
7. Suggest two reasons to explain why ADHD is often not diagnosed until a child starts formal schooling.
8. Complete a Venn diagram like the one below by inserting biological, psychological and social factors that may influence the development, progression or experience of ADHD.



9. Indicate whether each statement is true or false by entering T or F in the space provided.
   a. _____ Anyone with ADHD is hyperactive.
   b. _____ Anyone with ADHD can overcome it by trying harder.
   c. _____ Children with ADHD will outgrow it.
   d. _____ ADHD is strictly a childhood disorder.
   e. _____ ADHD has a neurological basis.
   f. _____ ADHD is actually an invented condition used to label normal children who behave in atypical ways.
   g. _____ ADHD is caused by watching too much TV.
   h. _____ ADHD is caused by lack of parental affection.
   i. _____ ADHD is caused by too much exposure to the Internet.
   j. _____ ADHD is caused by the interactive influence of nature and nurture.
   k. _____ ADHD is diagnosed by its symptoms.
   l. _____ ADHD is comprised of many symptoms.
   m. _____ ADHD may be diagnosed in a very old person.
   n. _____ ADHD is caused by too much sugar or food additives in the diet.
   o. _____ ADHD is not curable.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

3.4.3 Learning disabilities

Disability is any impairment that makes it significantly more difficult for a person to undertake everyday activities. The impairment may be associated with mental or physical health, or a combination of both. It may be temporary, episodic or continuing. The term disability is most commonly used in relation to impairment that is permanent, or likely to be permanent.

There will also be individual differences in the severity of any specific disability, the degree to which each person experiences impairment, and the extent to which participation in their everyday activities is restricted.

Disability can be acquired at birth or at any other time in life. It can be related to a genetic disorder, ageing, an illness, injury, accident or a combination of these factors. It may be obvious or hidden.

Some people with disability have multiple impairments. Importantly, how people experience disability is affected by environmental factors — including the opportunities, services and assistance they can access — as well as by personal factors and community attitudes (WHO, 2012 [2018 update]; AIHW, 2020).

The term learning disabilities is used in relation to disorders and associated impairments that adversely affect learning — the acquisition of knowledge and/or skills needed for independent living, social functioning or some aspect of everyday life in general.

A **learning disability** is any disorder that impairs learning and results in the person learning with greater difficulty than a person without the disorder. In addition, the disorder typically has a neurological basis, is permanent and also makes it significantly more difficult for a person to undertake certain everyday activities.

As with any type of disability, impairment may be mental or physical. For example, a learning disability may predominantly involve cognitive skills such as learning to read, spell, calculate with numbers or acquire new knowledge, or it may predominantly involve behaviour, particularly motor skills such

Figure 3.23 Learning disabilities may involve mental processes or behaviour. They typically have a neurological basis and are lifelong. The most common learning disabilities affect the ability to understand or use spoken or written language, do mathematical calculations, coordinate movements, or direct attention.

as running, jumping, catching a ball, dressing and keyboarding.

The most common learning disabilities affect the ability to understand or use spoken or written language, do mathematical calculations, coordinate movements, or direct attention. For example, ADHD is often described as a specific learning disability because of the attentional difficulties that are predominant in the disorder. Although learning disabilities occur in very young children, the impairments are usually not recognised until the child reaches school age.

Sometimes learning disabilities are referred to as learning disorders. The term *learning disorder* tends to be preferred over learning disability for diagnostic purposes. For example, diagnostic manuals used by mental health professionals which are described in the next section use the term learning disorder and describe criteria for diagnosing a range of specific learning disorders such as *Language disorder, Speech sound disorder, Disorder of written expression* and *Developmental arithmetical disorder*. In addition, the term learning disorder is often restricted to academic abilities, whereas psychologists recognise that learning disorders (or disabilities) may occur with any type of behaviour or mental process.

Learning disability vs learning difficulty

Some people use the terms learning disability and learning difficulty interchangeably. Psychologists, however, tend to distinguish them. Both affect the acquisition of knowledge or skills, but a learning disability is long-term and lasting, whereas a *learning difficulty* is relatively short-term in nature and may change when the individual's circumstances change.

For example, a learning difficulty may arise due to a physical health problem such as a recurring ear infection that results in a person being unable to distinguish a range of spoken sounds. Or, an eye defect may impair vision and make it difficult for a person to catch a ball or to see and process written information.

Similarly, an individual can have difficulties learning academic or motor skills for a reason relating to maturation of their brain and nervous system, social and cultural factors (e.g. a student whose English is a second language), emotional or behavioural problems (e.g. a student misses many days of schooling), trauma or ineffective teaching.

These can all impact on someone's ability to learn but the impairment may be resolved when the individual's circumstances change. Sometimes, change occurs over time with little or no intervention. For example, maturation of the nervous system and some practice may enable a person to catch a ball or write more legibly. Alternatively, some learning difficulties may be overcome following intervention. For example, treatment from an optometrist may rectify a learning difficulty due to impaired vision. Or, if there is no underlying physical problem, a learning difficulty with literacy or numeracy may be overcome with appropriate teaching or support.

Generally, people with a learning difficulty have the potential to achieve at age-appropriate levels or reach their full potential once provided with programs that incorporate appropriate support and evidence-based instruction.

In contrast, a learning disability will persist despite support or intervention. It can be a lifelong condition. Similarly, it may persist despite an individual's above-average intelligence, excellence in other areas, a positive learning attitude and lots of hard work. There is usually an underlying neurological disorder involving the brain and/or nervous system. The disorder may be developmental or acquired through injury after birth. In either case, the effect is that the individual does not perceive or process information as efficiently or accurately as people without a learning disability.

One of the defining features of a specific learning disability is that the difficulties continue to exist, despite appropriate instruction and intervention. This does not mean, however, that a learning disability cannot be reduced to some extent through effective intervention despite involving an enduring impairment.

Finally, a learning disability does impair everyday functioning to some extent, whereas a person may have a single, isolated learning difficulty that has little impact on their life (AUSPELD, 2018; SPELD Victoria, 2021).

Types of learning disabilities

It is estimated that about 5–10% of Australians have a learning disability. Among the most common are dyslexia (difficulties with reading, writing and spelling), dyscalculia (difficulties with Maths) and dyspraxia (difficulties coordinating movements and possibly speech muscles).

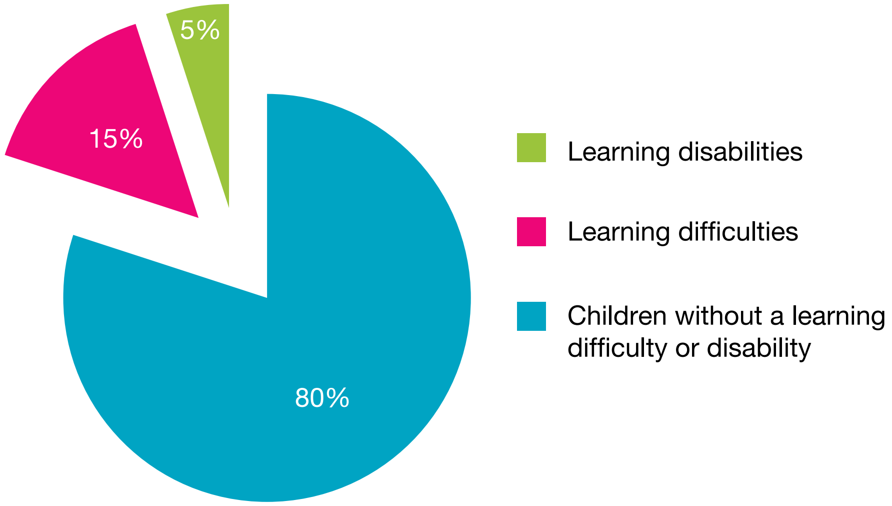


Figure 3.24 Percentage of Australian children with a learning disability or difficulty

Source: AUSPELD (2018). *Understanding learning difficulties: A guide for parents (Revised ed.).* Retrieved March 18, 2022, from https://uldforparents.com/contents/the-difference-between-a-learning-difficulty-and-a-learning-disability/

Dyslexia

Most children who are exposed to language throughout infancy master the incredible complexity of speech production and comprehension with seemingly little effort. As they grow older, they become increasingly able to read independently, especially when they start school and are given a variety of language-learning opportunities. But some lag behind their peers in reading skills and it becomes apparent that they have significant reading difficulties however hard they try and however accomplished they are with other skills.

For some children, reading will continue to be a life-long challenge. Their reading ability is compromised by problems identifying the separate speech sounds within a word and learning how letters represent those sounds. For example, take a few seconds to read the following paragraph.

> Dyslexia wis originilly defnied is i formm fo word blnidness ni cise studees publishd over 120 yeirs igo. Thsi has snice been fownd ot be incorrect. Dyslexia is not ciused by i problem wtih eyys or visin. nisteid, there ire underlynig briin-relited problems wtih processnig wrtiten words ind tteelers.

What does the paragraph describe? How quickly could you read? What was the experience like? Frustrating? Confusing? Hard work? Did you sometimes focus on a single letter within a word rather than the word itself? Did some of the misspelt words have letters that did not seem to fit the sound of the word?

Your simulated reading experience was intended to be somewhat like that of someone with severe dyslexia. Although people with dyslexia tend to read at lower-than-average levels for their age (and neurotypicals in general), specific difficulties vary from one person to another. You can check the correct spelling of the words below.

> Dyslexia was originally defined as a form of word blindness in case studies published over 120 years ago. This has since been found to be incorrect. Dyslexia is not caused by a problem with eyes or vision. instead, there are underlying brain-related problems with processing written words and letters.

Dyslexia is a learning disability characterised by significant difficulties with accurate and fluent word reading, spelling and writing words. It is neurologically based and involves impaired ability to process sounds, to make connections between written letters and their sounds.

When reading fluently, we 'decode' words by converting the letters in words to their correct sounds and linking these sounds to their correct letters. We also integrate separate letters into words. These are generally simple tasks which we perform automatically and effortlessly.

Figure 3.25 Dyslexia typically involves reading, writing and spelling difficulties. The learning difficulty did not stop Sir Richard Branson from building the billion-dollar Virgin empire. Most people with dyslexia have difficulties with phonological awareness — the ability to recognise that words are made up of smaller units of sound (phonemes) and that changing and manipulating phonemes can create new words and meanings. A child with poor phonological awareness may not be able to correctly answer these questions:

- What sounds do you think make up the word 'hot', and are these different from the sounds that make up the word 'hat'?
- What word would you have if you changed the 'p' sound in 'pot' to an 'h' sound?
- How many words can you think of that rhyme with the word 'cat'?

Source: NHS (UK). *Dyslexia (Symptoms)*. Retrieved March 14, 2022, from https://www.nhs.uk/conditions/dyslexia/symptoms/

on Resources

Weblink Video presentation by an Australian psychologist giving an overview of dyslexia 7 m 13 s

People with dyslexia often struggle to process the separate sounds of letters that form words and connect the sounds to the relevant letters. This results in specific problems such as:

- difficulty distinguishing the sound of one word from another
- difficulty learning the letter names and sounds for reading and spelling
- difficulty in reading single words, e.g. words on flash cards or in a list
- difficulty recognising 'sight words' like *it*, *the*, or *and*
- lack of accuracy and fluency when attempting to read, e.g. reading slowly with many mistakes
- reading or writing letters the wrong way around, e.g. reversing two letters in a word without realising it, such *b* instead of *d, p* for *q* and *u* for *n*
- poor or inconsistent spelling.

In addition, there may be challenges with pronunciation, especially of longer words, difficulties understanding what is read or written down (but understanding information when told verbally), and with writing sentences or paragraphs (Australian Dyslexia Association [ADA], 2018).

Although dyslexia is classified as a learning disability, this does not mean that individuals with dyslexia do not have the ability to learn. Their disability specifically involves difficulties with words.

Nor is dyslexia correlated with poor vision, poor speech, a hearing impairment or low intelligence. For example, some people with dyslexia have eye and speech problems but no more or less than people without dyslexia.

Similarly, as would be expected for the distribution of intelligence among neurotypicals in the general population, most people with dyslexia have average intelligence, some have high intelligence and some have low intelligence. There is also the same distribution of all other strengths, talents and abilities among people diagnosed with dyslexia as there are among those without dyslexia.

Dyslexia is one of the most common learning disabilities in Australia and worldwide. Estimates vary considerably because there is no universally agreed set of criteria for its diagnosis.

Types of dyslexia

Various types and sub-types of dyslexia have been identified, so not everyone diagnosed with the disorder has the same difficulties. For example, some individuals experience difficulties with both reading and writing, some have severe difficulties with reading but not writing and some can write quite well but struggle to read what they have written.

As with other disabilities and neurological disorders, the experience of dyslexia, whatever the type, varies in severity for different individuals and may therefore be considered as a spectrum disorder (APA, 2013; ADA, 2018).

Dyslexia most often occurs as a developmental disorder and is therefore present from birth and lifelong. This form is called *developmental dyslexia*. Dyslexia can also be acquired as a result of a brain injury, stroke, dementia or another cause of neurological damage. *Acquired dyslexia* is often called *alexia*. Individuals with 'pure alexia' lose the ability to read fluently following injury to areas in the rear part of the left hemisphere of their brain. They can still walk, talk, think, and even write like they did before their injury. They just can't read. Not even what they have written themselves. Some lose the ability to recognise letters and words completely (APA, 2013; Starrfelt, 2015).

Cause of dyslexia

Unlike acquired dyslexia, there is no known single cause of developmental dyslexia. Research evidence shows that it has a strong genetic component as it often runs in families. For example, parents with dyslexia have about a 40–60% chance of having a child with the same condition. It is thought that certain genes inherited from the parents interact in a way that affects how some areas of the brain develop during early life. Of course, having a parent with dyslexia does not automatically mean that a child will be born with the condition (Gialluisi et al., 2021)

In addition, research studies using brain imaging have shown differences in the structure and functioning of brains of people with dyslexia when compared with the brains of people who do not have dyslexia. Evidence also shows that its incidence is generally evenly distributed between males and females (NHS, 2018; International Dyslexia Association [IDA], 2020)

Dyslexia is not due to either lack of motivation, sensory impairment, inadequate learning, teaching or environmental opportunities, emotional disturbances, or other such factors. Nor is there any medication or cure. However, with appropriate teaching methods, family support and other targeted evidence-based interventions, individuals with dyslexia can learn to read, process, and express information more efficiently.

Over time, effective compensatory strategies are often developed and, as a result, the visible signs of the learning disability can become less obvious. Children with dyslexia also benefit from the same kinds of teaching strategies used to help neurotypical children learn to read and write; they may just need more reading and writing practice or need to move at a slower pace than their classmates (IDA, 2020; AUSPELD, 2021a).

Dyscalculia

Dyscalculia is a condition that affects the ability to acquire mathematical concepts and skills. It is a specific learning disability that impairs learning and understanding of number concepts and calculations, as compared with others of the same age who have similar learning opportunities.

Many people have difficulty with numbers or do poorly at Maths subjects. However, it is the degree of difficultiy and the resistance to remedial intervention because of underlying neurological problems that sets individuals with dyscalculia apart from neurotypicals and others with learning difficulties (AUSPELD, 2021b).

Characteristics of dyscalculia may include difficulties with:

- counting
- understanding simple number concepts
- learning how to manipulate numbers
- learning basic Maths facts
- learning how to measure quantities
- learning how to solve numerical problems.

Estimations of the incidence of dyscalculia vary between 6–7% of the general population and range from 5–15% of school-aged children and young adults. The estimates vary because researchers use different criteria to define and classify mathematical disabilities, sometimes including learning difficulties such as *Maths anxiety*.

In addition, dyscalculia may also be referred to as *developmental dyscalculia* or *acalculia* (if acquired through brain injury or disease). About one-quarter of students with dyscalculia are also diagnosed as having ADHD (O'Neill et al., 2015; Forbes, 2017).

The first signs of developmental dyscalculia in young children are problems with counting, or being able to tell how many objects are in a group, even when there are just a few objects.

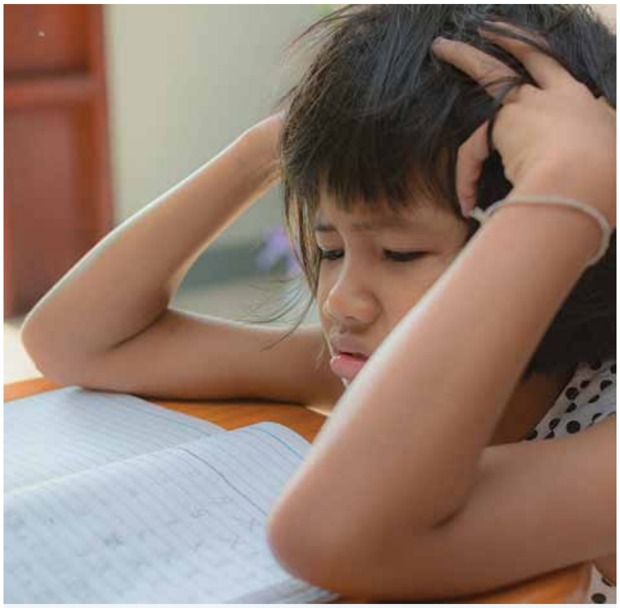


Figure 3.26 Dyscalculia involves significant difficulties acquiring mathematical concepts and skills.

on Resources

Weblink Video presentation by an Australian psychologist outlining dyscalculia 4 m 51 s

Other signs include difficulty telling time or understanding time-related concepts, inability to work out which of two numbers is the larger, difficulty with memorising basic Maths facts (like multiplication tables) and doing mental arithmetic, and difficulty with understanding mathematical formulae and concepts. Additional problems may include telling left from right, reading music and map reading (O'Neill et al., 2015).

As with other learning disabilities, the severity of mathematical impairment differs depending on the individual. Furthermore, to be diagnosed with dyscalculia, the degree of difficulty must be below expectations for the individual's age, the mathematical difficulties cannot be due to lack of educational opportunities or some other problem or disorder, and the mathematical impairment must have persisted for at least 6 months and cause significant difficulties at school, work or everyday life in general (APA, 2013).

There is no single cause of developmental dyscalculia, nor a cure. However, as with dyslexia, targeted evidence-based interventions can assist individuals to allay their 'Maths anxiety' and improve their numeracy skills to some extent.

Dyspraxia

Dyspraxia is a condition that affects coordination of physical movements, which may include muscles for speaking. It is a specific learning disability that impairs acquisition and/or execution of skills required for motor coordinationand possibly speech. The term is generally used in relation to motor coordination difficulties.

Coordination of motor skills is substantially below that expected for the individual's age and opportunities for skill learning and use. For example, coordination of arms, legs, fingers, mouth or eyes is less smooth, fluent or precise than seen in others of the same age with the same types of experiences. Motor coordination problems may also appear as awkward or clumsy movement and poor balance.

One form of dyspraxia impairs speech. *Verbal dyspraxia* involves difficulties coordinating the movements necessary for speaking. Speech coordination problems can include forming sounds,

Figure 3.27 The most common form of dyspraxia impairs acquisition and execution of skills required for motor coordination. Playing catch would be very difficult and may not improve with practice.

slower speech, limited vocabulary and perseveration (getting stuck on a word and repeating it). Generally, the person has trouble saying correctly, efficiently and consistently what they want to say (APA, 2013; O'Neill et al., 2015).

The most common form of dyspraxia is called *Developmental coordination disorder*. This is characterised by persistent difficulty performing movement skills at an age appropriate level.

Like other brain-based disorders, dyspraxia can also be acquired. *Acquired dyspraxia* results from brain damage, as might be caused by a head injury or stroke. It may also gradually develop as part of a neurological damage associated with dementia later in life.

Developmental coordination disorder may cause difficulties with gross or fine motor coordination skills, and these will vary with age. Dyspraxia can affect everyday activities such as:

- *dressing* — e.g. buttoning clothing, tying shoelaces, doing up buckles, using zippers, putting on a jacket
- *self-care skills* — e.g. using age-appropriate cutlery to eat meals without mess, brushing teeth, washing properly, shaving, getting items out of a bag
- *domestic skills* — e.g. opening a tin of food, operating appliances, house cleaning, gardening
- *school skills* — e.g. handwriting, drawing, keyboarding, using a scissors or ruler
- *recreation and sports participation* — e.g. throwing, catching, climbing, hopping, skipping, balancing, riding a bicycle, learning new physical skills, playing board games
- *general skills* — e.g. planning of gross and fine movements, difficulty picking up new motor skills, difficulty using learned motor skills in different ways, difficulty moving around without bumping into other people or objects, difficulty with everyday motor skills at school or work that require speed and accuracy.

Dyspraxia is estimated to affect around 5–6% of school-aged children and about 2% of the general population. Males are about four times more likely than females to be diagnosed with the disorder (Gibbs et al., 2007; Zwicker et al., 2012).

Early signs of dyspraxia in young children, particularly developmental coordination disorder, include delay in achieving typical motor milestones such as sitting, crawling and walking. They also may be delayed in developing skills such as negotiating stairs, pedalling, buttoning clothing and completing puzzles. Even when the skill is achieved, execution of the movements tends to be slow, awkward or less precise when compared to other children of the same age.

Older children and adults may display slow speed or inaccuracy with motor skills involved in activities such as assembling jig saw puzzles, model building, playing ball games, hand writing, texting, driving and carrying out various independent living skills (APA, 2013).

Figure 3.28 Developmental coordination disorder can affect everyday activities such as buttoning clothing.

No single cause of dyspraxia has been identified for the majority of people with the condition, nor is there a cure. There is, however, a range of evidence-based treatment options that can assist individuals to improve coordination of gross and fine motor skills, or speech skills (for verbal dyspraxia).

Children can and do learn to perform certain motor tasks well, however, they have difficulty when faced with new, age-appropriate ones. Although there may be improvements, many of the difficulties associated with dyspraxia continue through adolescence in an estimated 50–70% of children, and then often continue on into adulthood.

on Resources

Weblink Video presentation by an Australian researcher on developmental coordination disorder 2m 32s

As with other learning disabilities, dyspraxia takes different forms in different people. There is also considerable variability in the type of skills affected and the severity of motor or speech skill impairments. These may change over time depending on life experiences. A considerable number of people with dyspraxia are able to learn skills that help them to get around their difficulties and lead normal productive lives. The extent to which this occurs depends on the individual and their impairments (APA, 2013; Brain Foundation, 2021).

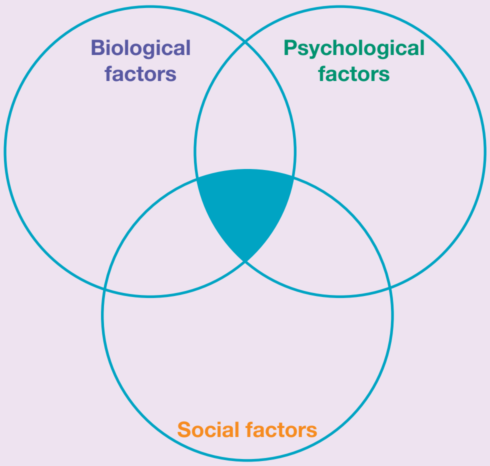
3.4 LEARNING ACTIVITY 5

Review

1. List four key characteristics of a learning disability.
2. Explain the difference between a learning disability and learning difficulty.
3. Define ‘learning disability’ from the perspective of neurodiversity.
4. Complete the following table to summarise three different learning disabilities.

Learning disability (LD)	Difficulties with...
dyslexia	
dyscalculia	
dyspraxia	

5. Complete a Venn diagram like the one below by inserting biological, psychological and social factors that may influence the development, progression or experience of a learning disability of most interest to you. Ensure you include the name of the disability in the shaded area.



To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

3.5 Supporting psychological development and mental wellbeing

There is a range of mental health professionals and organisations who provide support services for the diagnosis and management of atypical behaviour or for mental wellbeing in general. They include psychologists, psychiatrists and various organisations that employ mental health professionals and other mental health workers.

Psychologists and psychiatrists are the best-known and most qualified mental health professionals. Although there are many similarities in their work and roles may overlap, they do not all have the same qualifications, specialties, knowledge or skills.

Some psychologists and psychiatrists deal with all types of psychological and behavioural problems, like medical doctors who work as a GP and treat people with all types of physical health problems on a daily basis. Others specialise in diagnosing and treating specific problems and/or in working with people of certain ages, such as children with developmental disorders or older people with Alzheimer's disease. Some work relatively independently in a private practice. Others work as part of a multi-disciplinary team for a private or government organisation. Many take on different roles at the same time and apply their skills and expertise in a combination of work settings. For example, they might spend part of their time at a hospital or community health centre and the rest seeing clients in their own practice.

3.5.1 Psychologists and psychiatrists

A **psychologist** is a professional trained in the science of how people think, feel and behave. In Australia, a person can work as a psychologist and use the title psychologist only if they are registered as a psychologist by the Psychology Board of Australia (PBA) and the Australian Health Practitioner Regulation Agency. Registration and regulation of psychologists helps ensure that people have the required qualifications and skills to provide psychological services ethically and safely (APS, 2022).

Registered psychologists are required to have completed a minimum of six years of university training and supervised practical experience in psychology and to engage in ongoing education to keep their skills and knowledge up to date.

Figure 3.29 shows the training pathways to general registration for people with psychological qualifications completed in Australia. Many complete an additional two years of training to become specialists. Table 3.2 shows the specialist areas of practice endorsed by the PBA. Some of these specialties often do not require diagnosis or treatment of psychological or behavioural problems.

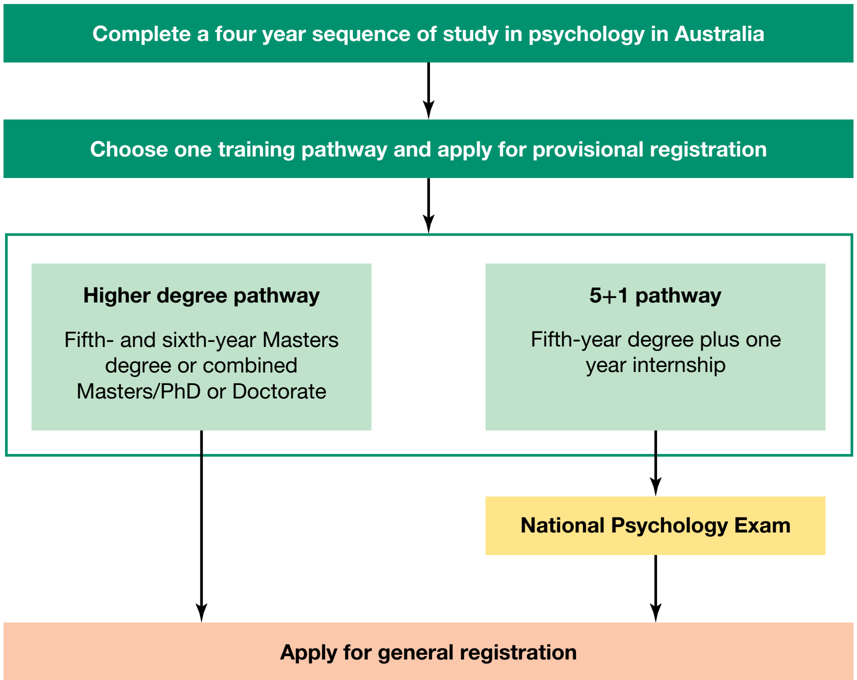


Figure 3.29 Training pathways to general registration by the Psychology Board of Australia for people with psychological qualifications completed in Australia. All psychologists with general registration meet a minimum standard of education and training and have been assessed as a suitable person to hold general registration in the profession.

Source: Based on Psychology Board of Australia (2020). *General registration requirements*. Retrieved January 21, 2022, from http://www.psychologyboard.gov.au/Registration/General.aspx

Table 3.2 Specialist areas of practice in psychology

Clinical neuropsychology	Assessment, diagnosis and treatment of cognitive, emotional and behavioural disorders due to brain damage or irregularities in brain function
Clinical psychology	Assessment, diagnosis, and treatment of mental health problems and disorders across the lifespan
Community psychology	Assisting communities in addressing community-focused needs that improve the wellbeing of all their members, e.g. supporting at-risk groups, disaster recovery
Counselling psychology	Assisting people of all ages to deal effectively with personal, relationship and lifestyle problems that impact on their mental health and wellbeing
Educational and developmental psychology	Assessment, diagnosis and treatment for learning and development problems arising at any time in the lifespan
Forensic psychology	Applying psychological expertise in legal and justice settings for litigants, perpetrators, victims, and government and community organisations
Health psychology	Assisting individuals, groups and communities to promote positive mental health behaviours and minimise harmful ones
Organisational psychology	Assisting organisations such as private companies and government departments to become more effective and productive in one or more areas while promoting employee wellbeing
Sport and exercise psychology	Assisting elite-level, professional and recreational athletes to enhance performance, personal development and wellbeing from participation in sport and exercise

A **psychiatrist** is a qualified medical doctor who has obtained additional qualifications to become a specialist in the diagnosis and treatment of mental illnesses. In all, this involves at least 11 years of study, usually more. Just as cardiologists are doctors who specialise in diseases of the heart, and oncologists are doctors who specialise in treating cancer, psychiatrists are doctors who specialise in mental health (Royal Australian & New Zealand College of Psychiatrists [RANZCP], 2022).

Psychiatrists tend to treat people with complex mental health disorders such as severe depression, schizophrenia and bipolar disorder. Some have completed additional training to assess neurodevelopmental disorders and learning disabilities. They can provide a wide range of treatments, according to the particular problem and what will work best. These include medication, general medical care, brain stimulation therapies such as electroconvulsive therapy (ECT) and psychological treatments such as psychotherapy, or 'talking therapy'. As with other specialists, a doctor's referral is required to see a psychiatrist.

Psychologists are more likely to see people with conditions that can be helped effectively with psychological treatments. These are often complex and might include anxiety disorders, eating disorders, depression, developmental disorders, learning disabilities and behavioural problems. Psychologists can assess and diagnose mental health disorders but are not medical doctors and therefore cannot prescribe medication. Nor is a referral required to see a psychologist.

Psychologists and psychiatrists often work together. For example, a psychologist might make an initial assessment and diagnosis and refer a client to a psychiatrist for a medical intervention to complement psychological treatment. Alternatively, a psychiatrist might make the initial assessment and diagnosis, then refer the client to a psychologist for ongoing psychological treatment. Psychologists and psychiatrists and or other organisations may also work together in a clinic, community centre or hospital as part of a mental health or multidisciplinary team.

on Resources

Weblink Psychology Board Australia — Information about qualifications and requirements to be registered as a psychologist in Australia

3.5.2 Other mental health workers

Other mental health workers tend to have qualifications in social work, mental health nursing, counselling or mental health support work. There are also positions that primarily involve administrative work, or policy and planning roles. Other mental health workers may work with psychologists and other professionals and team members in providing treatment, information, support and care. Psychologists or psychiatrists usually lead the teams providing support.

Generally, mental health social workers and mental health nurses have higher education qualifications and additional training and supervised experience in mental health settings. Counsellors have different levels of training, skills and experience, and mental health support workers have a TAFE qualification such as a Certificate IV in Mental Health. Mental health support workers may include peer workers who have their own lived experience of mental health problems and recovery. Administrative staff do not necessarily have specific mental health qualifications.

The family doctor is often the first health professional who is spoken to about psychological or behavioural problems of concern. For example, a parent worried that their child is struggling in one or more areas of learning compared to others of the same age may visit their GP for advice. If the GP suspects an underlying neurodevelopmental problem, they may refer the child to someone with relevant expertise; for example, a clinical neuropsychologist, an educational and developmental psychologist, a neurologist or a paediatrician. The specialist areas of practice for registered psychologists in Australia are summarised in Table 3.2 on the previous page.

Some GPs have extra training in mental health and can also offer psychological treatments. In most cases when patients present with a mental health concern, the GP will provide a referral to a psychologist or psychiatrist and then work as part of the support team if a treatment plan is put in place; for example, by keeping track of the patient's physical health and any side effects of medication, and following up after they've finished seeing the psychologist or psychiatrist.

3.5.3 Organisations

There are many organisations throughout Victoria that offer mental health support services. These include private organisations that provide services for a fee and not-for-profit organisations that provide all their services without charge. Well-known, long-standing not-for-profit organisations include:

- headspace
- Kids Helpline
- Beyond Blue
- Youth BeyondBlue
- SANE
- Black Dog Institute.

Generally, these organisations offer a range of services that are available 24 hours a day, 7 days a week, online or over the phone. Some offer services for all types of mental health issues for people of all ages and backgrounds, whereas others may focus on a particular group of people or disorder(s). Their services are usually aimed at providing people with information, access to treatment and advice on how to deal with a range of mental health issues.

Figure 3.30 Some of the organisations that offer mental health support services.

For example, headspace targets ‘young people between the ages of 12 and 25’ and offers a comprehensive range of services online, over the phone, through school visits and from ‘headspace centres’ that ‘act as a one-stop-shop for young people who need help with mental health, physical health (including sexual health), alcohol and other drugs or work and study support’.

headspace also has staff with expertise in supporting people of different cultural backgrounds. For example, there are Aboriginal and Torres Strait Islander support staff with expertise in Aboriginal and Torres Strait Islander cultural and lived experience considerations.

There are also organisations that focus on providing early intervention services to people with severe and/or complex mental health issues, possibly in certain geographical areas only. For example, Orygen Specialist Program (formerly Orygen Youth Health) provides ‘specialist mental health services for young people aged 15 to 25 who reside in the western and north-western regions of metropolitan Melbourne’.

Similarly, various general hospitals can provide inpatient support services for people with severe mental health issues who cannot be assessed or treated safely and effectively in the community. These services typically involve ‘therapeutic interventions and programs to patients and their families to learn more about the impact of the illness, explore ways to better manage the illness, improve coping strategies and move towards recovery’. Admission to an acute inpatient unit depends on the severity of the symptoms, the distress involved to the person and the risk of harm to self or others (Department of Health, Victoria, 2022).

All support services provided by organisations such as those above are confidential and non-judgmental, regardless of the need, urgency or background of the person who makes contact. They are staffed by supportive people, who may provide immediate support, counselling and information. If they can’t, they will direct the person to where their needs can be met.

3.5.4 Assessment of psychological development and atypical behaviour

Assessment in the context of mental health involves collecting and interpreting information about how a person, thinks, feels and behaves in order to make a diagnosis so that appropriate treatment can be provided. This may include information about the individual’s psychological development and whatever else may be of relevance to the issues and concerns that are presented. Overall, biological, psychological and social factors will be considered. The process is more formally referred to as a *clinical assessment* to distinguish it from other types of assessments which people experience in other settings.

The assessment is typically undertaken at an appointment with the mental health professional. As shown in Figure 3.31, information may be collected through a systematic procedure involving interviews, behavioural observations and psychological testing.

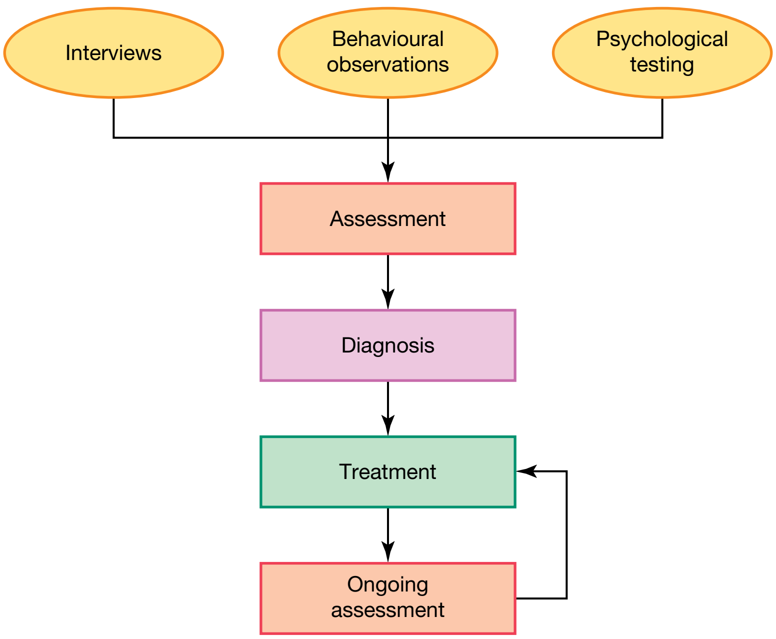


Figure 3.31 Assessment involves the systematic collection of relevant information about a person’s mental functions and behaviour to make a diagnosis and make treatment decisions. Biological, psychological and social factors are considered. The effectiveness of the treatment will be monitored for a while to determine if the treatment needs to be changed.

The first step in an assessment is often to conduct a face-to-face interview with the person to explore and understand the presenting problem. This is often referred to as a *clinical interview*. The mental health professional will ask both free- and fixed-response questions about the person's concerns and symptoms, their current and past thoughts, feelings and behaviour, their family history, school or work experiences, and other relevant life experiences. Of course, if a child or someone with a disabling neurological condition is being assessed, then the parent (or guardian) will be present and answer many of the questions.

There are usually lots of questions and possibly additional appointments. The mental health professional might also want to speak with others to develop a holistic understanding of the individual and their condition. This could include discussions with one or more family members, teachers or other health professionals or workers.

Behavioural observations are usually made in conjunction with an interview. The mental health professional will watch for cues and expressive behaviours that may have diagnostic significance. For example, the manner in which questions are answered can provide useful information. Fast, disjointed speech that makes little sense and refers to unrealistic experiences suggests the person may have a distorted sense of reality.

Furthermore, eye contact, facial expressions and posture can reveal relevant characteristics or provide important clues of relevance the diagnosis. A person whose eyes dart around nervously and hesitates when answering certain questions may feel extremely anxious or even paranoid. A person who avoids eye contact and can't sit still may have ADHD. A person who sits slumped in their chair with downcast eyes and arms folded and motionless in their lap may be experiencing depression. The person's general appearance, cleanliness and mode of dress may also be considered to note attention to self-care.

Sometimes it is appropriate to also conduct behavioural observations outside the mental health professional's office, within an environment more relevant to the condition being assessed. This is often useful with children. For example, observing a child's behaviour and interactions with other children in or outside the classroom at school may tell the mental health professional more than the child can tell themself.

In some cases, a teacher, parent or someone else may be asked to observe and record information about the person's behaviour in another setting. This may be done relatively objectively using a simple rating scale format with certain pre-determined target behaviours for which they typically record frequency and/or severity over a specified period of time.

Rating scales are also useful when a number of different people are asked to observe and record behaviour. For example, a child's classroom teachers may be asked to complete behavioural observations using a rating scale such as that shown in Figure 3.32. This would enable data to be easily collated and comparisons to be made.

Psychological tests are another source of information for an assessment. A wide variety of valid and reliable, 'standardised' tests devised for people of all ages and abilities are available. These include personality tests, intelligence tests, tests for specific mental health disorders, language abilities, decision-making, problem-solving, cognitive impairments, self-care skills, and so on. Other tests are designed to assess for neurodevelopmental disorders such as autism, ADHD and specific learning disabilities.

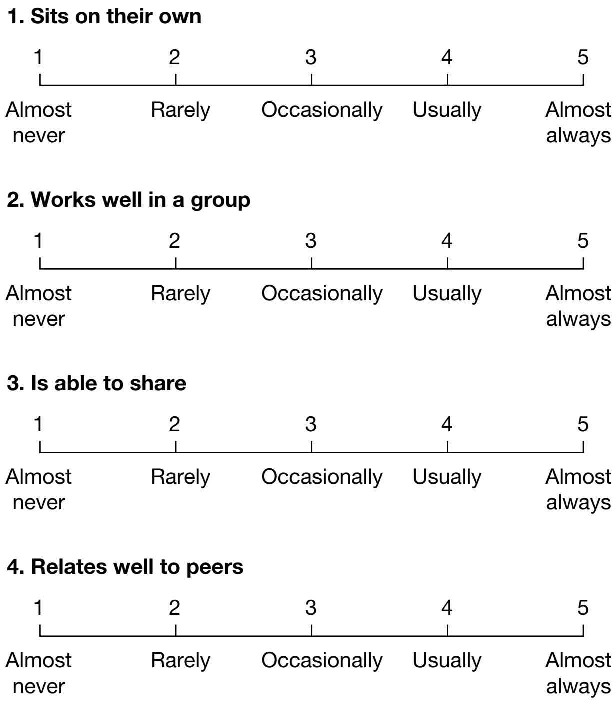


Figure 3.32 An example of a rating scale that may be used for behavioural observations

A psychological test may be paper-and-pencil, require verbal answers and/or require the person to perform manual tasks such as copying a picture or completing puzzle-like activities. They may be self-reports with questions or rating scales or entirely directed by the assessor.

By discovering strengths and weaknesses with certain abilities, as compared with others of the same age, the assessment provides valuable information to assist the diagnostic process.

Once assessment reveals that someone is experiencing significant and persistent difficulties, the next step is to make a diagnosis.

Figure 3.33 Assessments usually start with an interview and involve collection of a range of data so that an accurate diagnosis can be made.

on Resources

Weblink Resource sheet summarising helplines, telephone and online counselling services for children, young people and adults in Victoria

3.5 LEARNING ACTIVITY 1

Review

1. What are the main differences between psychologists and psychiatrists in relation to:
   a. qualifications and training?
   b. treatments that may be used in providing support?
2. About 40% of psychologists have gained additional qualifications for an area of practice endorsement. In which three specialist areas would you be more likely to find a psychologist who directly supports an autistic person or an individual with ADHD or a learning disability?
3. Name a type of mental health worker other than one referred to in the text.
4. Explain the meaning of the term clinical assessment.
5. What is the relationship between a clinical assessment and a clinical interview?

6. a. Explain whether a clinical interview is likely to be a structured or semi-structured interview.
   b. Suggest why a series of interviews over a period of time is often required for a clinical assessment.
7. a. Describe what a behavioural observation involves in relation to a clinical assessment.
   b. What is an advantage and a limitation of using someone who knows the person well to conduct behavioural observations?
8. a. What is the meaning of the term psychological test in relation to psychological development and mental wellbeing?
   b. Use the internet to obtain the name of a psychological test that has been devised for one of the following disorders:
      i. autism
      ii. ADHD
      iii. dyslexia.
   c. What are the two essential characteristics of any test that would be used by a psychologist for assessment purposes?
9. Identify which element of a clinical assessment is relevant in each of the following situations.
   a. The psychologist viewed Goran's laughter after discussing his near-fatal incident as inappropriate and also noted that he appeared to be happy and excited.
   b. Mark's vocabulary and reasoning ability scores were above average, leading the psychologist to estimate that Mark was of average intelligence.
   c. After Charlie was brought to the psychologist's clinic, she was asked if she knew the date and time, her identity, and where she was.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

3.5 LEARNING ACTIVITY 2

Multiple-choice questions

1. A significant difference between the mental health work of psychologists compared with psychiatrists is that
   A. psychologists use psychological tests, whereas psychiatrists do not.
   B. psychiatrists do not use psychological therapies, whereas psychologists do.
   C. psychologists are not permitted to prescribe medications, whereas psychiatrists are.
   D. psychologists undergo specialist training in treating mental health disorders, whereas psychiatrists do not.
2. All psychologists
   A. have a medical qualification.
   B. are mentally healthy.
   C. are registered by the relevant authority.
   D. are endorsed to practice in a specialist area.
3. It is not possible get a mental health assessment from a psychiatrist unless the person has a
   A. mental health problem.
   B. referral from a medical doctor.
   C. referral from a psychologist.
   D. mental disorder requiring use of a prescribed medication.
4. It is essential that any psychological test used for assessment purposes
   A. is valid and reliable.
   B. can be administered online.
   C. can be administered verbally.
   D. can be administered in the manner preferred by the client.
5. The first step when assessing psychological development and atypical behaviour most likely involves a/an
   A. diagnosis.
   B. Interview.
   C. treatment plan.
   D. psychological test.

To answer these and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

3.5.5 Classifying and categorising behaviour for diagnosis

All sciences classify. For example, botanists classify plants into categories and subcategories according to species. Astronomers classify the stars, planets and other astronomical bodies according to features such as colour, size temperature and distance from the sun. The medical profession classifies diseases according to symptoms and the organ or system affected.

Likewise, psychologists, psychiatrists and other mental health professionals classify psychological and behavioural disorders in different categories according to characteristic patterns of thoughts, feelings and behaviour.

When certain symptoms regularly occur together and develop or progress in a particular way, they are considered to be typical of a specific disorder. When someone displays this particular pattern of symptoms they are said to fit the category and therefore have the disorder to which those symptoms belong. When this occurs, a diagnosis has been made.

Diagnosis is the process of identifying the type of disorder affecting an individual on the basis of its signs and symptoms, through the use of assessment techniques and other available evidence. The process also involves the classification of the individual on the basis of a specific disorder or set of characteristics. The term diagnosis also refers to the decision resulting from the identification or classification process (APA, 2013).

The DSM

The most widely adopted system with categories of disorders that is used for diagnostic purposes in Australia is called the *Diagnostic and Statistical Manual of Mental Disorders*, or DSM for short. It was first developed by the American Psychiatric Association in 1952 and is now in its fifth edition, called DSM-5-TR.

As indicated in its title, the DSM uses the term 'mental disorder' rather than 'mental illness' or 'psychological disorder' as an umbrella term for all types of psychological and behavioural disorders, including neurodevelopmental disorders such as autism and ADHD, and even disorders with the daily sleep-wake cycle, such as insomnia and sleep walking. Consequently, being diagnosed with a mental disorder does not necessarily mean having a mental illness involving a significant psychological disturbance.

The **DSM** provides a system for classifying and diagnosing mental disorders based on recognisable signs and symptoms. For each disorder, there is a description of:

- essential features and associated features
- its typical course, i.e. how the disorder is likely to progress
- age of onset, i.e. age at which people are more likely to develop the disorder
- the degree of impairment
- the prevalence of the disorder ie. how commonly it occurs
- familial pattern, i.e. whether the disorder runs in families
- the relationship of the disorder to gender, age and culture
- differential diagnosis, i.e. how to distinguish the disorder from others with common symptoms.

In addition to being used for diagnostic purposes, the above information about the disorders is considered useful to learn about them and for research purposes.

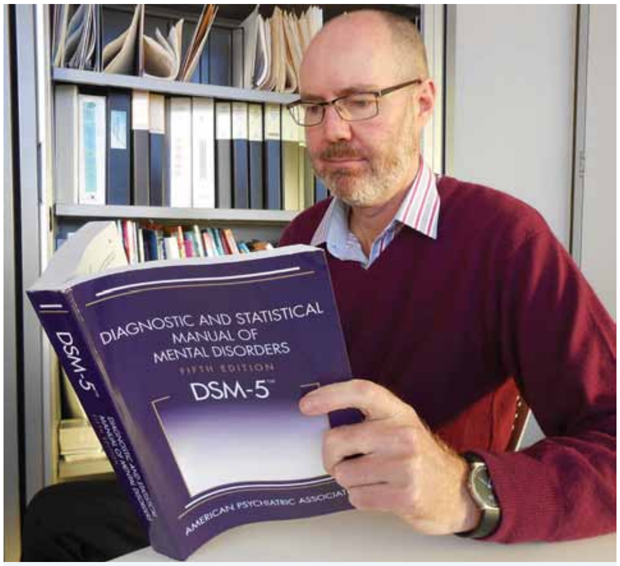


Figure 3.34 The DSM is useful for the assessment and classification of mental disorders.

The DSM does not suggest specific causes of any disorder unless a cause can be definitely established. It simply names the disorders and describes each in detail. There are over 20 major categories of mental disorders in the current DSM and numerous subcategories. Some of the major categories are outlined in Table 3.3.

Table 3.3 Examples of DSM-5 categories of mental disorders

Category	Description
Neurodevelopmental disorders	These disorders often emerge before starting school. They include *Autism Spectrum Disorder, Attention-Deficit/Hyperactivity Disorder (ADHD), Intellectual disabilities* (with onset early in development) and various types of specific learning disabilities (e.g. *Dyslexia, Dyscalculia*) and motor disorders (e.g *Dyspraxi*a) which first present early in the lifespan.
Neurocognitive disorders	Include disorders involving major or minor impairment to cognitive functioning, such as those due to *Alzheimer's disease, Parkinson's disease* and *Traumatic brain injury*
Substance-related and addictive disorders	Include *alcohol-related disorders, cannabis-related disorders, hallucinogen-related disorders, stimulant-related disorders* and *gambling disorder*.
Schizophrenia spectrum and other psychotic disorders	Common symptoms include delusions, hallucinations and disorganised thinking.
Depressive disorders	Characterised by severe lowering of mood for an extended period of time. Include *major depressive disorder* and *premenstrual dysphoric disorder*.
Bipolar and related disorders	Characterised by severe disturbances of mood involving alternating episodes of mania (e.g. elation, high energy and activity) and depression (e.g. sadness, low energy and activity).
Anxiety disorders	Include *phobias, panic attack, panic disorder, separation anxiety disorder* and *substance/ medication-induced anxiety disorder*. Characterised by recurring thoughts and/or impulses that are difficult to control. Include *obsessive–compulsive disorder, hoarding disorder, trichotillomania (hair-pulling disorder)* and *excoriation (skin-picking) disorder*.
Obsessive–compulsive and related disorders	Obsessions are thoughts, images or impulses (e.g. contamination, doubts about performance, need for orderliness, aggressive impulses) that recur or persist despite efforts to suppress them. Compulsions are behaviours or mental actions that are repeated over and over according to certain rules or in a ritualised manner.
Feeding and eating disorders	Include avoidant and restrictive food intake of infancy and early childhood, and serious eating disorders more common in adolescence such as *anorexia nervosa, bulimia nervosa* and *binge-eating disorder*.
Sleep wake disorders	Characterised by persistent sleep problems. Include *insomnia, narcolepsy, substance/ medication-induced sleep disorder* and breathing-related sleep disorders such as *sleep apnea*.
Disruptive, impulse-control and conduct disorders	Characterised by problems in behavioural and emotional self-control. Include *kleptomania, pyromania* and *intermittent explosive disorder* (i.e. aggressive outbursts).
Personality disorders	Include *general personality disorder, narcissistic personality disorder, antisocial personality disorder* and *dependent personality disorder*.

Source: American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, Virginia: Author.

Diagnostic criteria

Each disorder in the DSM has a set of diagnostic criteria and descriptors to be used as guidelines for making a diagnosis.

Diagnostic criteria are the signs and symptoms used for the diagnosis of a specific type of disorder. Some disorders have a few criteria, whereas others such as autism and ADHD have an extensive list. For example, the diagnostic criteria for Autistic Spectrum Disorder are:

A. Persistent deficits in social communication and social interaction across multiple contexts, as manifested by the following, currently or by history (examples are illustrative, not exhaustive):
   1. Deficits in social-emotional reciprocity, ranging, for example, from abnormal social approach and failure of normal back-and-forth conversation; to reduced sharing of interests, emotions, or affect; to failure to initiate or respond to social interactions.
   2. Deficits in non-verbal communicative behaviors used for social interaction, ranging, for example, from poorly integrated verbal and non-verbal communication; to abnormalities in eye contact and body language or deficits in understanding and use of gestures; to a total lack of facial expressions and non-verbal communication.
   3. Deficits in developing, maintaining, and understanding relationships, ranging, for example, from difficulties adjusting behavior to suit various social contexts; to difficulties in sharing imaginative play or in making friends; to absence of interest in peers.

B. Restricted, repetitive patterns of behavior, interests, or activities as manifested by at least two of the following, currently or by history (examples are illustrative, not exhaustive):
   1. Stereotyped, or repetitive motor movements, use of objects, or speech (e.g. simple motor stereotypes, lining up toys or flipping objects, echolalia, idiosyncratic phrases).
   2. Insistence on sameness, inflexible adherence to routines, or ritualized patterns of verbal or nonverbal behavior (e.g. extreme distress at small changes, difficulties with transitions, rigid thinking patterns, greeting rituals, need to take same route or eat same food every day).
   3. Highly restricted, fixated interests that are abnormal in intensity or focus (e.g. strong attachment to or preoccupation with unusual objects, excessively circumscribed or perseverative interests).
   4. Hyper- or hyporeactivity to sensory input or unusual interest in sensory aspects of the environment (e.g. apparent indifference to pain/temperature, adverse response to specific sounds or textures, excessive smelling or touching of objects, visual fascination with lights or movement).

C. Symptoms must be present in the early developmental period (but may not become fully manifest until social demands exceed limited capabilities, or may be masked by learned strategies in later life).

D. Symptoms cause clinically significant impairment in social, occupational, or other important areas of current functioning.

E. These disturbances are not better explained by intellectual disability (intellectual developmental disorder) or global developmental delay. Intellectual disability and autism spectrum disorder frequently co-occur; to make comorbid diagnoses of autism spectrum disorder and intellectual disability, social communication should be below that expected for general developmental level.

Common characteristics of disorders

According to the DSM, all disorders have a number of common characteristics. These are:

- the disorder occurs within the individual and results from dysfunction within the individual
- there is clinically diagnosable dysfunction in thoughts, feelings and/or behaviour, for example, low levels of functioning, social and emotional wellbeing
- the disorder causes significant personal distress or disability in functioning in everyday life
- actions and reactions are atypical of the person and inappropriate within their culture
- the disorder is not a result of a personal conflict with society (APA, 2013).

Each of these characteristics captures a part of what a mental disorder is. All must be evident for a particular disorder to be diagnosed, but the diagnosis of a disorder does not necessarily mean that there is a need for treatment.

A diagnosis of a mental disorder should always be made by a qualified mental health professional. This occurs following an assessment to identify and classify symptoms The mental health professional then considers the symptoms with reference to DSM guidelines for diagnosing a disorder.

The DSM criteria are designed so they can be used with people of all ages — children, adolescents and adults. They apply equally to males and females. Furthermore, mental health professionals must take into account potential cultural influences on an individual's behaviour and rule them out as an explanation of atypical behaviour.

The usefulness of the DSM for assessment and classification of mental disorders substantially depends on its validity and reliability. The DSM-5-TR is generally considered to have greater validity and reliability than previous versions and continues to be regarded as very useful by most mental health professionals.

The *International Classification of Diseases, 11th Edition (ICD-11)* published by the World Health Organization is another widely used system with categories of disorders. The ICD includes physical disorders as well as mental disorders but there is a great deal of overlap and consistency with the DSM regarding the types of mental disorders, their symptoms and diagnostic criteria. Mental health professionals often cross-reference between the two systems when making a diagnosis.

Figure 3.35 A diagnosis of a mental disorder should always be made by a qualified mental health professional.

Figure 3.36 Like the DSM, the ICD is useful for the assessment and classification of mental disorders.

Categorical vs dimensional classification

The DSM (and ICD) is based on a *categorical approach* to the classification of disorders. When diagnosing a disorder, a person's symptoms are classified in terms of which specific category of disorder they best fit or 'belong to'.

The emphasis is on determining whether the person has or does not have a specific type of disorder. This is based on whether or not they have a sufficient number of symptoms that are either present or not present.

Essentially, the mental health professional is required to make a number of 'Yes–No' judgments. This has led to criticisms of the DSM approach; for example, that many individuals do not fit neatly into one of the precise categories defined by the DSM and that the DSM does not require knowledge of the severity of the symptoms as well as whether they are present.

The dimensional approach is an alternative to categorisation by type. The *dimensional approach* considers disorders and their symptoms along a continuum on which people vary in degree rather than in type. For example, each symptom experienced by any individual will vary in severity as will the degree of overall impairment. Symptoms can therefore be represented or rated on dimensions, such as the anxiety continuum shown in Figure 3.37. This recognises that we all experience anxiety in varying amounts that may range from slightly anxious to extremely anxious.

Unlike the categorical approach, there is no threshold or 'cut-off point' in order to meet formal criteria for the experience of anxiety. Instead, it is assumed that many disorders are extreme versions of what we often experience and that lower ratings or scores on a dimension such as anxiety are usually associated with lower impairment and vice versa.

Both approaches have advantages and limitations. Many mental health professionals find it useful to determine whether or not an individual has a specific type of disorder and to give that feedback to their clients. They also find it useful to adopt a dimensional approach to develop an understanding of the severity of the different symptoms, the amount of impairment and how these combine to affect the individual in everyday life. Consequently, many mental health professionals view the classification of disorders from the perspectives of *both* the categorical and dimensional approaches, rather than one or the other.

Treatment

Once a diagnosis is made, the mental health professional develops a treatment or management plan for the specific disorder that has been diagnosed. Sometimes, a person may be diagnosed as having more than one disorder. The term *comorbidity* is used to describe the experience of more than one disorder at the same time.

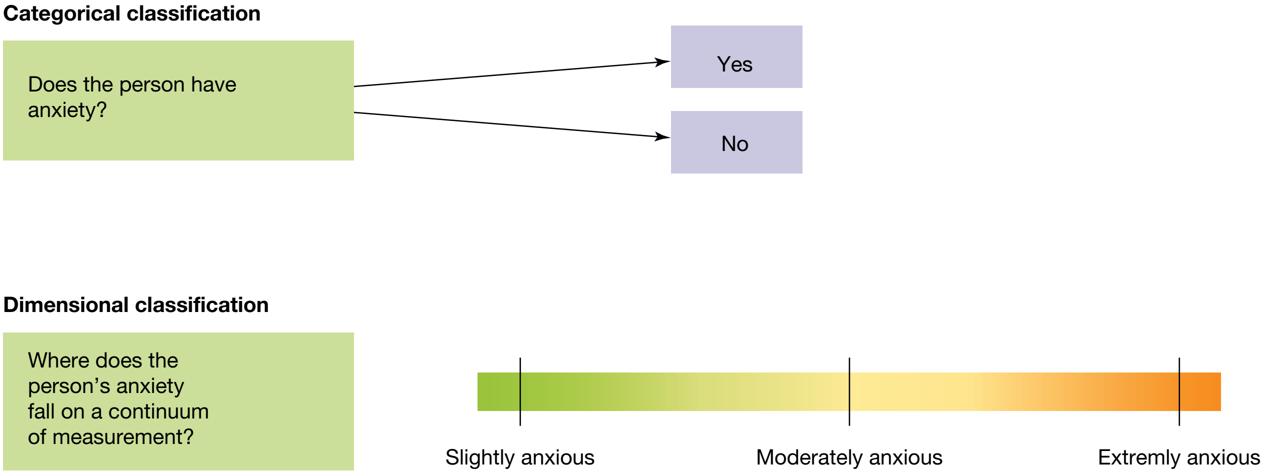


Figure 3.37 Categorial versus dimensional systems of classification

As with physical illnesses, all mental disorders differ in severity and involve variable amounts of impairment and distress to the individual. All are considered as being on a psychological or mental health spectrum or 'continuum' such as the example in Figure 3.38. As with physical illnesses, it is also possible for a person to feel 'mentally ill' even though a doctor or mental health professional cannot find evidence of any known disorder.

The symptoms of most mental disorders can be alleviated or successfully treated, especially if they involve what is commonly referred to as 'mental illness'. It is rarely possible for any mental disorder to 'go away' without treatment from a qualified professional. Professional help may include psychotherapy and/or medication. Depending on the disorder, this may be complemented with other types of therapy or a community program such as participation in a social support group.

There are, however, no known cures for disorders such as the neurodevelopmental types examined in this topic. Nonetheless, therapies and other evidence-based interventions can alleviate the affects of many symptoms and help with daily living by making the condition much less of a problem in everyday life.

Figure 3.38 Although severity is shown to increase from left to right (or right to left), there are no clear-cut dividing lines on a mental health continuum. Similarly, mentally healthy and mental disorder are represented at different ends, but this does not mean that they are entirely separate, can be compartmentalised, are polar opposites, or that a continuum cannot extend beyond the end points shown.

3.5.6 Labelling someone with a psychological or behavioural disorder

The term **labelling** is used in mental health to describe the process of classifying an individual according to a specific diagnostic category. The outcome is a 'label' or name for their disorder.

Labelling can be useful. For example, it can help psychologists and other mental health professionals or workers identify and specifically describe signs and symptoms associated with a particular disorder and assist them in working out an appropriate treatment or management plan. It is also helpful when health team members communicate with one another about a client's disorder. The names of the different categories and subcategories provide concise terms for describing and discussing disorders and help ensure a common understanding of what is being discussed. Similarly, labelling is useful when reporting research on disorders in journal articles.

However, labelling a person with a specific type of 'mental disorder', 'mental illness', 'psychological disorder', 'behavioural disorder' or 'developmental disorder' can also have a negative effect on the individual being labelled.

If a person is labelled as their disorder, rather than as someone living with or being treated for a disorder, it can give the impression that this defines their life. This use of labels is often upsetting as it classifies someone by their symptoms. A person may feel the label ties them to a negative stereotype that ignores their personal strengths.

Of major concern is that labelling exposes the person to stigma (SANE, 2022). **Stigma** is a sign of social disapproval or social deficiency, often involving shame or disgrace.

Social stigma refers to the negative attitudes and beliefs held in the wider community that lead people to fear, exclude, avoid or unfairly discriminate against people with a disorder. It can influence how people with a disorder think and feel about themselves and the way they believe they are viewed by others in the community. For example, individuals can develop self-stigma.

Self-stigma occurs when an individual accepts the negative views and reactions of others, internalises them, and applies them to themself, thereby affecting how they feel about themself and leading to low self-esteem and low self-confidence in their abilities (called low self-efficacy).

Importantly, self-stigma can inhibit people from seeing a mental health professional for assessment and diagnosis, or from seeking any type of help, thereby increasing the harmful impact of the disorder by increasing the duration of the untreated symptoms. Reducing self-stigma is considered vital for promoting recovery.

Once a label has been given to a person, it may be there for life and consequently can affect the way that individual is treated by others. For example, there can be fewer opportunities for employment and social interaction. Lack of understanding by friends and others can result in social isolation. Harassment and bullying are commonly experienced.

There is little doubt that labelling can have negative consequences. It is clear from research evidence that the many people in the wider community hold negative views and misunderstandings of psychological disorders in particular and that people with such disorders and their families often experience stigma.

Stigmatisation is one of the reasons mental health professionals take care with their use of language when referring to people with any type of disorder or disability.

'Person-first language' is often considered the most respectful way of talking about people with a disorder or disability; for example, by using the phrase 'a person with dyslexia' rather than the term 'a dyslexic'.

Person-first language places the focus on the individual rather than their disorder or disability. It conveys understanding that someone is living with a disorder or disability — not that their disorder or disability is their whole life. As described previously, many members of the autistic community prefer 'identity-first language'; for example, 'an autistic person' rather than 'person with autism'. But not all do. Many also prefer person-first language. This highlights the fact that individuals may have their own preference regardless of what the larger group may prefer.

Figure 3.39 Labelling someone with a psychological or behavioural disorder or disability is associated with stigma — negative attitudes and reactions that often result in embarrassment or shame for the individual involved and unfair discrimination against them and exclusion.

learnON

learnMORE | The Rosenhan (1973) experiment

Access learnON to read about a classic experiment in which hospital staff misdiagnosed and labelled pseudopatients who were confederates of the researcher.

learnON

learnMORE | The Medical student syndrome

Access learnON to read about the need to avoid self-diagnosis after reading about disorders.

3.5 LEARNING ACTIVITY 3

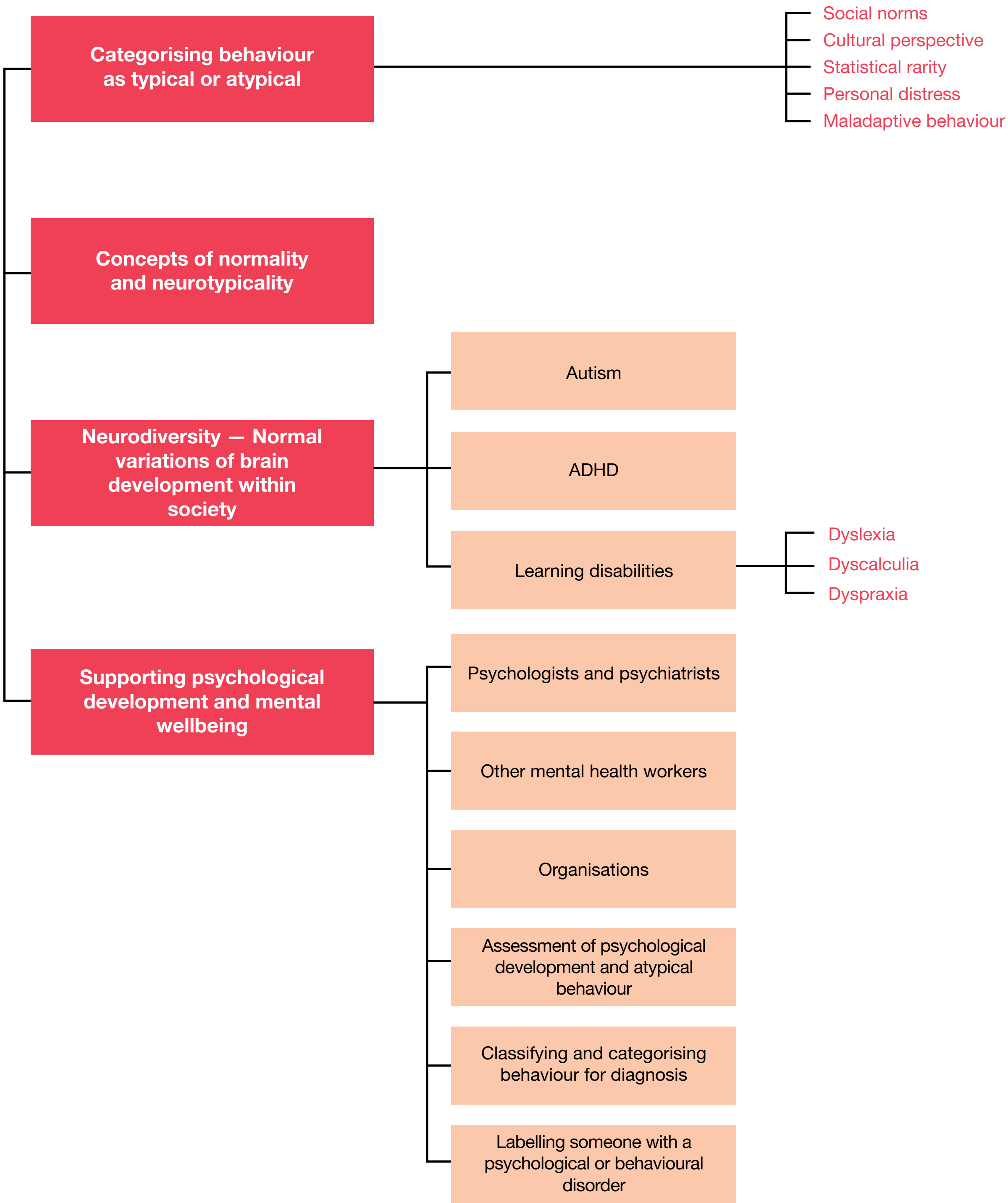
Review

1. a. Explain the meaning of diagnosis as a process with reference to classification.
   b. What are diagnostic criteria?
   c. What is the result of a diagnosis?
2. a. What does the abbreviation DSM stand for?
   b. What is the DSM used for?
   c. Who is the DSM published for?
   d. On what basis or criteria are mental disorders classified and categorised?
   e. Give three examples of the type of information in the DSM about each mental disorder.
   f. Explain why it is important that the DSM is a valid and reliable manual for diagnostic purposes.
   g. Suggest why it is important that only qualified mental health professionals use a DSM-type manual to diagnose someone's mental disorder.
   h. Suggest one or more ways in which this type of system could be misused by non-qualified individuals. Explain your answer.
3. Does atypical behaviour necessarily indicate the presence of a mental disorder? Explain your answer.
4. a. Define the meaning of labelling in relation to disorders.
   b. What are two potential benefits of labelling?
   c. Describe the relationship between labelling and stigma.
   d. Explain why mental health professionals view the removal of stigma as important.
5. a. Explain the meaning of the phrase 'categorical approach to the classification of mental disorders'.
   b. What is an underlying assumption of the categorical approach?
   c. In what main way does the dimensional approach differ from the categorical approach?

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

3.6 Review

Topic summary



Key terms

abnormality p. 242
adaptive behaviour p. 238
attention deficit hyperactivity disorder (ADHD) p. 252
atypical behaviour p. 231
atypical development p. 230
autism p. 247
cultural perspective p. 235
clinical assessment p. 271
diagnosis p. 275
diagnostic criteria p. 277
disability p. 260
DSM p. 275
dyscalculia p. 264
dyslexia p. 262
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ICD p. 278
labelling p. 280
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self-stigma p. 281
social norm p. 234
social stigma p. 279
statistical rarity p. 236
stigma p. 280
typical behaviour p. 231
typical development p. 230

Note: The **References** for the entire title can be accessed in learnON and are also available as a downloadable PDF.

on Resources

Digital documents
Key terms glossary — Topic 3 (doc-37355)
Topic summary — Topic 3 (doc-37356)
Key diagrams PowerPoint — Topic 3 (doc-37358)

3.6 Topic 3 test

Section A: 25 marks **Section B:** 20 marks **Total:** 45 marks

Access learnON to answer the following test questions online and receive **immediate feedback**.

Section A — Multiple-choice questions

Choose the response that is **correct** or **best answers** the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Question 1

In relation to mental health and wellbeing, atypical behaviour means that an individual

A. is distressed and extremely upset.
B. behaves in a way that is different from how they usually do.
C. is unable to do the kinds of things they normally do on a daily basis.
D. behaves in a way that is consistent with how they usually do.

Question 2

A mental disorder is best described as

A. maladaptive behaviour.
B. absence of mental health.
C. a mental health condition that will usually resolve itself without treatment.
D. a diagnosable psychological or behavioural condition that that impairs everyday functioning.

Question 3

The main goal of a clinical interview conducted for assessment and diagnostic purposes is to

A. clarify the mental health status of someone presenting with a problem.
B. follow closely the diagnostic guidelines in the DSM or ICD.
C. clarify whether the person has a categorical or dimensional disorder.
D. establish the validity and reliability of the assessment.

Question 4

ADHD

A. is untreatable.
B. has symptoms that are difficult to diagnose.
C. is a developmental disorder.
D. can usually be cured with medication.

Question 5

Dyscalculia primarily affects development of _____ ability.

A. mathematical
B. motor coordination
C. reading
D. writing

Question 6

Which of the following is best classified as a learning disability?

A. ADHD
B. dyslexia
C. maladaptive behaviour
D. atypical behaviour

Question 7

The term _____ is used to describe thoughts, feelings or behaviour that differ from what is considered normal, typical, usual or healthy.

A. abnormality
B. neurotypical
C. neurotypicality
D. statistical rarity

Question 8

Neurotypicality means

A. absence of clear-cut symptoms of a mental health disorder.
B. deviation in neurological functioning from what is considered normal, typical, usual or healthy.
C. neurological development and cognitive functioning are consistent with what most people consider to be typical in the general population.
D. neurological development and cognitive functioning are consistent with what most people consider to be atypical in the general population.

Question 9

Which of the following statements about the concept of neurotypicality is correct?

A. Neurotypicality specifically refers to someone without a mental health disorder.
B. Neurotypicality cannot be represented on a continuum or scale ranging from low to high.
C. Neurotypicality is a broad, umbrella term for people who have a neurodevelopmental disorder.
D. Neurotypicality means having the characteristics of someone who is neurologically typical.

Question 10

Which of the following statements about the concept of neurodiversity is correct?

A. Autistic spectrum disorder and ADHD and dyslexia are two examples of neurodiversity.
B. Neurodiversity is a characteristic that any individual possesses.
C. Neurodiversity may be represented on a scale or continuum ranging from low to high.
D. Neurodiversity is more common in the general population than is neurotypicality.

Question 11

The extent to which a psychological test provides the same results as other similar measures of the same thoughts, feelings or behaviour is referred to as

A. test validity.
B. test reliability.
C. test validity and reliability.
D. test standardisation.

Question 12

The DSM

A. classifies mental disorders according to their underlying causes.
B. presents a detailed list of symptoms of different mental disorders.
C. recommends appropriate courses of treatment for mental disorders.
D. All of the above are correct.

Question 13

A disadvantage of labelling a person with a specific psychological disorder is that

A. there are not enough labels to cover all the different disorders.
B. the label may be misunderstood by mental health workers if the individual needs to be hospitalised.
C. a label can influence the thoughts, feelings or behaviour of the person with the disorder in unwanted ways.
D. the process of labelling is often inaccurate and usually unreliable.

Question 14

Distinguishing between typical and atypical behaviour on the basis of what the great majority of people in a society or cultural group do or do not would be done by someone with a _____ perspective.

A. cultural
B. statistical rarity
C. social norms
D. personal distress

Question 15

The biopsychosocial model explains the occurrence of a occurrence and mental health disorders by emphasising

A. how biological factors influence psychological factors, which in turn influence social factors.
B. the relative contribution of biological, psychological and social factors.
C. the interaction of biological, psychological and social factors.
D. the impact of underlying biological factors on psychological and social factors.

Question 16

Which of the following statements about autism is correct?

A. Autism is a lifelong condition.
B. Autistic people cannot experience emotions.
C. Autistic people cannot speak.
D. Many children grow out of autism when there is an effective treatment plan in place.

Question 17

To say that a mental health disorder has a dysfunctional basis means that

A. an individual is experiencing difficulties in coping with living their everyday life independently.
B. there is no physiological basis to the disorder.
C. the disorder is caused by malfunctioning in some part of the body.
D. the disorder is experienced by a statistical majority of people.

Question 18

The validity of an assessment instrument refers to

A. whether the assessment instrument is useful.
B. how precisely a disorder's symptoms can be stated.
C. whether the person actually has the disorder a psychologist may assess them as having.
D. whether the instrument accurately assesses what it is designed to assess.

Question 19

Which term best describes adaptive behaviour?

A. obedience
B. adjustment
C. independence
D. excellence

Question 20

Which term best describes atypical behaviour?

A. assessable
B. characteristic
C. common
D. unusual

Question 21

Social norms are

A. guidelines that enable individuals to cope with living in their social environment appropriately and effectively.
B. followed by all people in all societies regardless of their cultural background.
C. rules and regulations that are documented to ensure people in society behave in socially appropriate ways.
D. widely held standards that influence how people should behave in different social contexts.

Question 22

All psychologists have

A. completed at least four years of approved study in psychology.
B. have passed the National Psychology Exam.
C. met general registration requirements.
D. All of the above are correct.

Question 23

Following the diagnosis of a disorder, the next step undertaken by a psychologist would most likely be to

A. refer the person to a medical doctor for further assessment.
B. devise a suitable treatment and management plan.
C. identify a suitable medication that target the disorder's symptoms.
D. conduct a psychological test for further assessment.

Question 24

Autism

A. is a neurodevelopmental disorder.
B. prevents the individual from learning.
C. can be caused by ineffective parenting.
D. will disappear over time if treated correctly.

Question 25

Which of the following is most likely to be associated with impaired motor coordination skills?

A. autism
B. ADHD
C. dyspraxia
D. dyscalculia

Section B — Short answer questions

Question 1 (2 marks)

a. What is the full name of the reference commonly called 'the DSM'? 1 mark
b. What are the initials of an alternative to the DSM that can be used for diagnostic purposes? 1 mark

Question 2 (1 mark)

The term ______ may be used as part of the name or description of a neurodevelopment disorder that causes a wide range of impairments.

Question 3 (6 marks)

Explain the difference between:

a. atypical and maladaptive behaviour 2 marks
b. mentally healthy and mental disorder 2 marks
c. hyperactivity and impulsivity 2 marks

Question 4 (5 marks)

a. List three key characteristics of a learning disability. 3 marks

b. How is a learning disability best distinguished from a learning difficulty? 2 marks

Question 5 (6 marks)

Briefly describe each of the following developmental disorders.

a. autism spectrum disorder 2 marks

b. ADHD 2 marks

c. learning disability 2 marks

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Go to learnON to access answers to the Topic 3 test. A customisable Word version of the test can also be downloaded from the **Digital documents** tab of the Resources panel.

learnMORE | The Rosenhan (1973) experiment

A research study by American psychologist David Rosenhan (1973) is commonly used to demonstrate some of the problems of labelling. Rosenhan and his colleagues set up a situation where eight people who had never experienced symptoms of any mental disorder presented themselves to various psychiatric hospitals and told the medical staff they had been hearing voices.

A dormitory room in a psychiatric hospital like that visited by Rosenhan (1973). There has been a shift away from this type of accommodation. If a person needs hospital care for a mental disorder, accommodation is often in a separate room as part of a psychiatric unit in a public or private hospital.

All of the pseudopatients were admitted to the hospitals and diagnosed as suffering from schizophrenia. From the moment they were admitted they behaved as they normally would and no longer faked the symptoms of schizophrenia. Their stay in the hospitals ranged from seven to 52 days. None of the medical staff identified them as fake patients, however, some of the actual patients recognised them as frauds. When the pseudopatients were finally discharged, it was on the grounds that they were 'in remission'. None of them was seen as being 'cured', suggesting that the symptoms could recur.

Rosenhan concluded that medical staff, including psychologists, could not recognise 'normal' behaviour and once a person was labelled as having a specific mental disorder, all of their subsequent behaviour was interpreted as part of their disorder. For example, while the pseudopatients were in hospital, they openly made notes relating to Rosenhan's research study. However, the staff interpreted this activity as part of their 'schizophrenic behaviour'. After Rosenhan's findings were published, the hospital staff said that, for this to be a fair assessment, they should have been warned of the experiment.

In a follow-up study, Rosenhan told staff at one hospital that in the next three months pseudopatients would present themselves to the hospital. The hospital staff were asked to identify which of their new patients were the pseudopatients. In reality, no pseudopatients were actually sent, yet one staff member was sure that 41 out of 193 patients were pseudopatients. Rosenhan concluded that a system of diagnosing and labelling mental disorders that allowed these kinds of errors to occur was not a very reliable one.

Not all psychologists agree with Rosenhan's conclusions. Many have also criticised his procedures. For example, prominent American psychiatrist Robert Spitzer, who led the development of the DSM, argued that being able to lie and get admitted to a hospital is no proof that the system used to diagnose a mental disorder does not work. He pointed out that hearing voices is a sign of serious psychological dysfunction and rightfully should not have been ignored just because the person then appeared 'normal'. He also stated that the diagnosis of 'in remission' is a rare one and shows that the staff did realise the pseudopatients were not behaving completely as expected of a person labelled 'schizophrenic'.

on Resources

Weblink Video of Rosenhan outlining his research 2 m 21 s

learnMORE | The Medical student syndrome

Have you ever read about a disease or disorder on the internet or heard about it on television and become convinced that you are suffering the same symptoms and therefore must have the disease or disorder? This is known as *medical student syndrome*, as it is most frequently observed in medical students.

It is thought that psychology students who study mental disorders may also suffer from the same syndrome. Although some students do suffer from a disorder, most are merely experiencing an exaggerated sense of their susceptibility to a disorder. It has been found that one in every five individuals responds 'yes' to the question 'Have you ever felt that you were going to have a nervous breakdown?' Of course, most of these people have never suffered an actual breakdown (Sue, Sue & Sue, 2006).

As you learn more about mental health and mental disorders you may recognise 'symptoms' in yourself — or in others — that are often not a sign of an actual disorder. If you have a concern, consult a mental health professional.

Research has shown that students who plan to complete a degree in psychology report more worry about their mental health than those planning to complete a degree in another discipline. However, the process of learning about mental disorders eventually decreases their anxiety about their own mental health (but increases it about the health of their family members).

It is also thought that anyone who reads a lot of medical information is susceptible to medical student syndrome. More recently, the term 'cyberchondria' has been coined to describe the condition suffered by people who use the wealth of medical information on the internet to diagnose themselves with a serious physical health disorder. What starts as a web search about headaches leads to the conclusion that they must have a brain tumour!

As you learn more about mental health and mental disorders you may recognise symptoms in yourself — or in others. These 'symptoms' are more likely to be a normal reaction to life circumstances and not a sign of an actual mental disorder. For example, feeling down, anxious or overwhelmed may be an understandable response to a stressful situation such as studying many different subjects at school, all of which 'must be passed at a high standard'. However, if you are concerned, talk about your concerns with a friend, family member or teacher. If you then feel you may have a problem, consider seeking support from your school's student welfare service or other mental health professional.

4 Role of the brain in mental processes and behaviour

TOPIC CONTENT

4.1 Overview

KEY KNOWLEDGE

- different approaches over time in understanding the role of the brain in behaviour and mental processes
- the roles of the hindbrain, midbrain and forebrain, including the cerebral cortex, in behaviour and mental processes

Source: © VCAA, *VCE Psychology Study Design: 2023–2027*. p.25.

Consider some of what your brain is doing as you read this passage of text. In order to read, symbols are seen on the page, organised into words, and the words are connected with meanings from memory. Then these meanings are combined to form thoughts. While you focus your attention on reading, you are less aware of any background sounds, perhaps the whispers of people around you, the footsteps of someone outside the room or the engines of an overhead plane. You are also less aware of other types of sensory information, such as the pressure of your bottom on the chair and where your arms and legs are. Once you pay attention to any of these, you will become fully aware of them and your brain will start processing that information.

In addition to processing the information you are reading, your brain is performing numerous other functions to keep you alive, such as ensuring that you breathe oxygen, your heart beats, your core body temperature remains within a suitable range and that your digestive system processes any food you have eaten. You are generally unaware of these activities. Even when you are asleep your brain is active.

Your brain sends and receives messages through its extensive nervous system via the spinal cord to control your breathing, maintaining just the right amount of oxygen in your bloodstream, as well as adjusting your blood pressure to keep fresh oxygenated blood flowing throughout your entire body.

Figure 4.1 The human brain is a complex structure that is involved in virtually everything we think, feel and do.

Furthermore, your brain continuously monitors and regulates these and almost all other internal conditions in your body. For example, it regulates the nutrient content in your bloodstream, which provides one of the signals to eat again. It also regulates the amount of water your body needs to stay in chemical balance and the activity of the endocrine system that secretes hormones into your bloodstream to help regulate the normal functioning of bodily processes.

Your human brain is one of the less obvious features that distinguish you from primates and all other living things. Everything that makes you who you are comes from the way your brain cells interact and connect. It is the source of your consciousness — your awareness of who you are, your state of being and your external environment. It stores all your knowledge and memories, enables you to experience emotions and gives you your personality. Ultimately, it shapes your hopes and dreams for the future. It is the ability of our brain to perform these types of functions that makes us human. But our brain may not look or feel as if it does all this.

4.1.1 Complexity of the brain

If you cupped a human brain in your hands, it would feel soft and squishy, like firm jelly. After a couple of minutes, if you turned the brain upside down, you would see a flattened bit left in the tissue from the weight of the brain resting in your hands. This would give you an idea of how delicate it is.

To protect and keep this fragile organ in place, the brain is covered by three transparent, 'skin-like' membranes (the **meninges**) and encased in a hard, bony skull. Also protecting the brain is a watery-like liquid (**cerebrospinal fluid**) that circulates between the membranes. This provides a cushion against knocks to the head, protecting the brain from injury unless the knock is quite hard. The many arteries you can see carry nutrients and oxygen-rich blood throughout the brain. Without this blood, brain tissue quickly dies. Another protective element is the **blood–brain barrier** formed between capillaries (very thin blood vessels) which limits the entry of potentially harmful substances that may be present in our blood.

If you peeled back the membranes you could touch the wrinkly looking surface and feel its many bulges and grooves. This outer layer of neural tissue (the *cerebral cortex*) covers the largest part of the brain (the *cerebrum*). Anatomically, however, most of what looks like a single layer of cortex is made up of layers of neurons.

If you actually touched the brain of a living person, they would not feel anything. Only if you stimulated some part beneath the surface with a low dose of electric current would the person react. The brain receives sensory messages from elsewhere in the body, but has no sensory receptors of its own. For example, there are no pain receptors in the brain tissue itself. That's why surgeons can perform brain operations on patients who are awake.

Figure 4.2 The human brain is often described as the most complex natural or artificial structure in the known universe.

If you sliced the brain in half, downward through the middle from side to side, you would see its inner features. Although not all features are distinctive to the untrained eye, you would notice that the inside does not all look the same. Both dark and light areas of tissue are visible and these represent different brain parts.

The darker areas, called **grey matter**, are largely composed of nerve cell bodies and their local connections to each other. The outer cerebral cortex part is entirely made up of grey matter, although it would look more pinkish than grey in a fresh or living brain because of the presence of blood capillaries. The lighter areas, called **white matter**, are mostly nerve fibres that connect distant brain areas to one another. They have a fatty coating that produces the whitish appearance. White matter is found in abundance beneath the cortex.

Two wing-shaped cavities (*ventricles*) are also easily seen. These are in the cerebrum. They are the largest of the brain's four ventricles which together form an inner communication network. All are filled with cerebrospinal fluid that flows between them.

Despite its fragile look and feel, the brain is the most complex organ in the body and perhaps the most complex natural or artificial structure in the known universe. Its remarkable complexity is largely invisible to the naked eye. You cannot see that it is densely packed with structures, systems, functions, connections and interconnections, many of which are still not fully understood.

Within the brain's tissue are roughly 86 billion individual nerve cells called neurons. Each neuron is connected to between 1000 and 15 000 or more other neurons, so there are trillions of connections.

These connections form numerous networks, or 'neural pathways', along which information is electro-chemically sent and exchanged. If there were no order to this complexity, it would be extremely difficult to understand brain function.

Advances in brain imaging and recording technologies during the past 30 years or so have dramatically increased understanding of brain function. However, psychologists and neuroscientists still know only a fraction of what there is to know about how the brain works.

In this topic we examine some of the approaches over time to understanding the brain and its role in mental processes and behaviour. We then examine the brain's basic structure and function at the cellular level followed by the roles of specific brain areas.

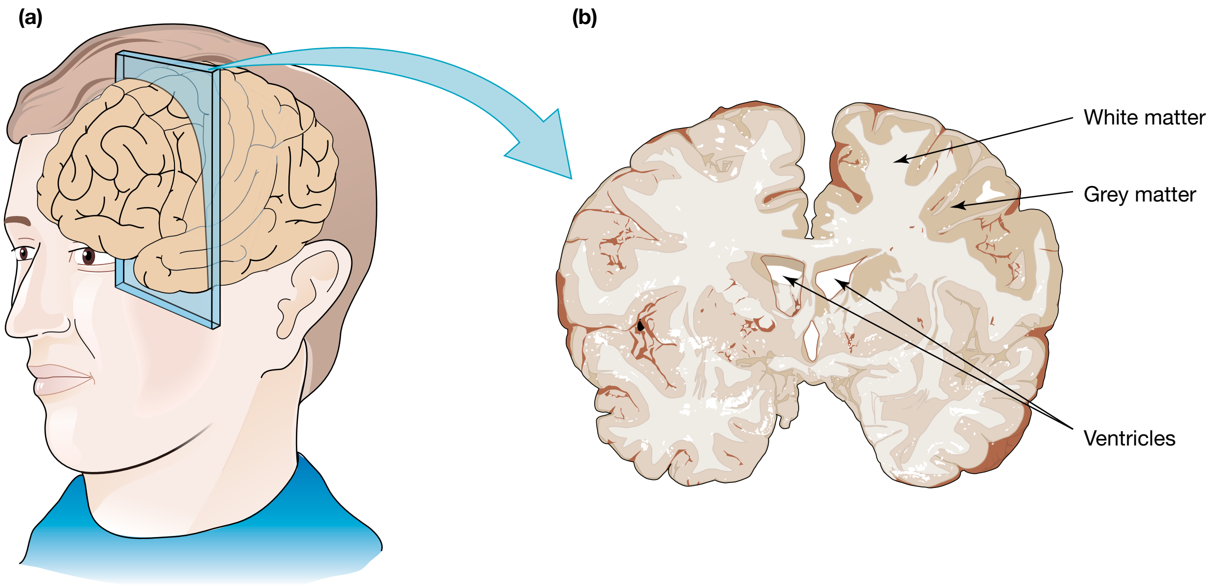


Figure 4.3 Slicing the brain as shown in (a) would reveal inner features such as those in (b).

Resources

Weblink Video about the world's largest brain bank 3 m 02 s

Teacher weblinks TED talk on 'What is so special about the human brain?' 13 m 31 s
Neuroanatomy video tour of the brain 8 m 08 s

4.1 LEARNING ACTIVITY

Multiple-choice questions

1. The human brain communicates with the rest of body through the
   - A. cerebral cortex.
   - B. blood–brain barrier.
   - C. nervous system.
   - D. white and grey matter.
2. The human brain has about ______ neurons within its tissue.
   - A. 1000
   - B. 15 000
   - C. 86 million
   - D. 86 billion
3. The human brain's grey matter is mostly composed of
   - A. neuronal bodies.
   - B. nerve fibres.
   - C. fatty coating.
   - D. blood capillaries.
4. Within the human brain, interconnected neurons form
   - A. nerve cells.
   - B. neural pathways.
   - C. ventricles.
   - D. the blood–brain barrier.
5. Which of the following anatomical features helps protect the human brain from external blows?
   - A. cerebrum
   - B. cerebral cortex
   - C. cerebrospinal fluid
   - D. blood–brain barrier

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

4.2 Approaches over time to understanding the role of the brain

The desire to understand ourselves and others has probably existed from the time our early ancestors developed the ability to reflect on their behaviour and that of others. It is possible that they were just as curious as we are today about why we think, feel and behave as we do. Our early ancestors, however, lacked the means to test their ideas and obtain the knowledge they sought.

There is evidence that philosophers in ancient Greece as far back as 2000 years ago spent considerable time contemplating the role of the brain in mental processes and behaviour. But these philosophers could advance understanding only to a certain point. Their ideas were mostly limited to personal observations, reflection, hunches and reasoning.

Although philosophers were good at reasoning, arguing and documenting their ideas, they rarely settled their differences of opinion. This is because their approach to understanding mental processes and behaviour, like our early ancestors, did not enable them to properly test their ideas by conducting scientific research to collect empirical evidence that could support their arguments.

By the nineteenth century, researchers were making progress in answering questions about the brain that philosophers could not. For example, researchers dissected the brains of dead animals or people whose bodies had been donated or sold to medical science. Autopsies were also conducted on people who had died from a brain injury.

Living people and animals were also studied. Valuable information was obtained from studying living people who had experienced a brain injury in an accident or as a result of disease. There were also animal experiments in which parts of the brain were intentionally injured or removed to study the effects on behaviour. Most of the researchers throughout the nineteenth century were physicians, physiologists or anatomists, so research predominantly reflected a biological perspective.

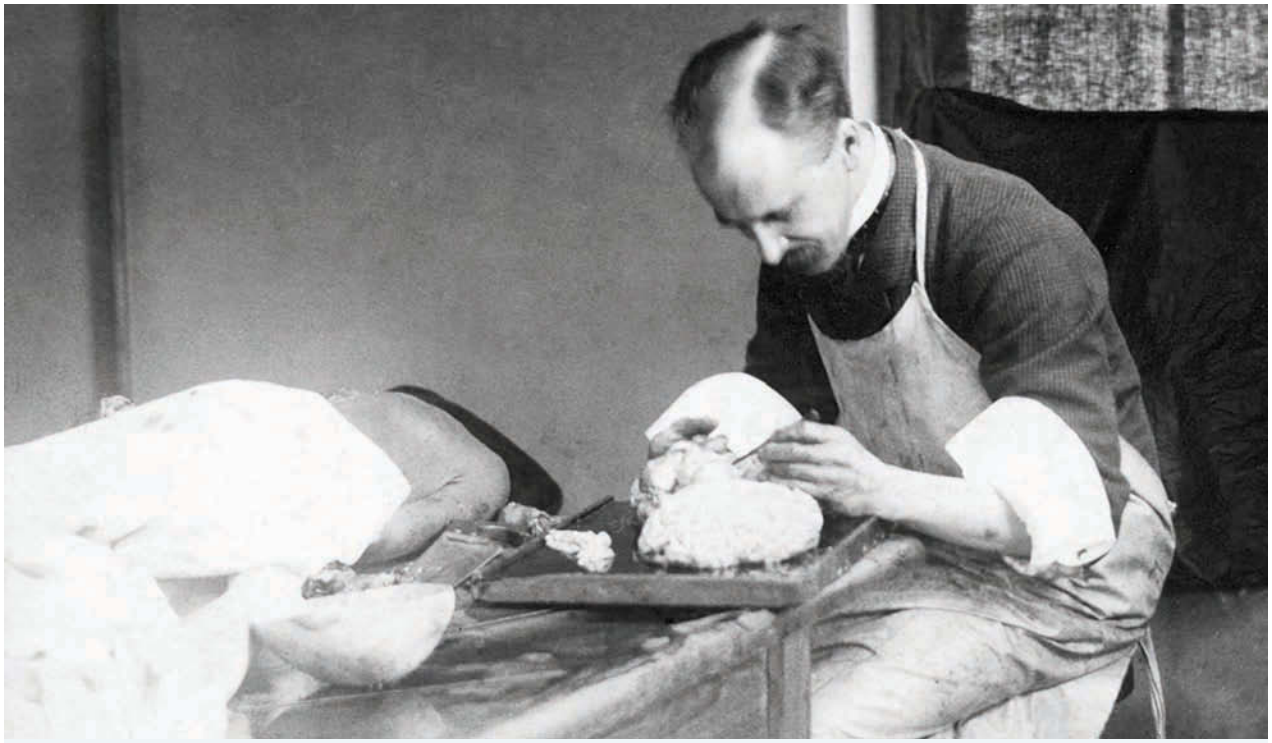


Figure 4.4 Early researchers obtained valuable information about the brain through autopsies on people who had died from a brain injury. However, this information was limited to the brain's structure and much remained unknown about the actual function of the brain.

Although early research provided useful information about the brain, this information was mainly limited to the *structure* of the brain, such as which part controlled a specific function. Relatively little was known about the actual *function* of the brain, such as *how* and *when* different brain structures and areas 'work', their relationships to other brain structures and areas, and nerve pathways linking them.

None of the early techniques for studying the brain enabled researchers to directly observe and study the brain functioning as it normally does in a healthy, living person. Consequently, researchers had to mainly rely on making assumptions about underlying brain function based on observations of participants' responses in experimental tasks. In some cases, invasive medical procedures that would not be permissible according to the ethical standards all researchers must now follow.

The development of new technologies during the twentieth century in particular helped advance understanding of the brain in significant ways. These technologies have become increasingly sophisticated over time.

Researchers can now observe and record images of the brain 'at work' in a healthy, living person in a non-invasive way. For example, researchers have access to very sensitive brain scanning and recording equipment that can reveal the brain areas that are active (and inactive) while a participant responds to some kind of experimental manipulation.

There have been both scientific and non-scientific approaches to understanding the role of the brain in mental processes and behaviour. First, we briefly consider ideas and approaches that relied more on opinion than science, focusing on differing views about the nature and location of the body part believed to be the source of our behaviour. We then examine some of the early brain experiments and the new technologies that promoted scientific investigations of the brain.

4.2.1 Brain versus heart debate

Is our brain or heart the source of our thoughts, feelings and behaviour? The ancient Egyptians didn't think the brain had any role at all. When the pharaoh Tutankhamen was mummified more than 3300 years ago, four vital organs were carefully preserved in jars in his tomb — the liver, lungs, stomach and intestines. There was no jar for his brain or his heart.

The Egyptians believed the heart held the mind and soul and was the source of all wisdom as well as memory, emotion, personality and all life forces. So, it was left in its place inside the body. Along with the organs in the jars, it was considered essential to fully take part in the afterlife. The brain, however, was removed with an iron hook through the nostrils and thrown out. It was not considered an asset.

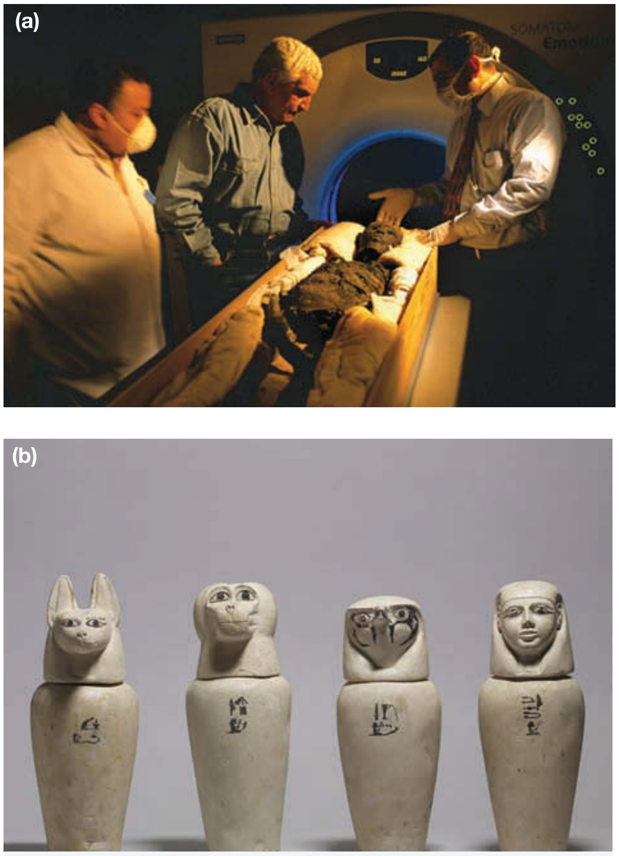


Figure 4.5 (a) Forensic medical experts conducting a CAT scan of the remains of Egyptian pharaoh Tutankhamen. (b) Jars in which the liver, lungs, stomach and intestines of mummified pharaohs were stored. The heart was left inside the body but the brain was considered useless in the afterlife so it was removed and thrown out.

The origin of the brain versus heart debate can be traced back to the writings of the ancient Greek philosophers. Amongst the earliest surviving documented records are those of Alcmaeon and Empedocles.

Alcmaeon located mental processes in the brain and therefore took the brain side of the debate. This view is often called the *brain hypothesis*. Empedocles located mental processes in the heart and therefore took the heart side of the debate. This view is called the *heart hypothesis*. The pros and cons of each side were debated for the next 2000 years or so.

Figure 4.6 The origin of the brain versus heart debate can be traced back more than 2500 years to the ancient Greek philosophers Alcmaeon (brain hypothesis) and Empedocles (heart hypothesis).

Alcmaeon (about 500 BCE) is widely regarded as the first person to identify the brain as the source of mental processes. He was interested in anatomy and sometimes dissected organs in dead animals. For example, he discovered the optic nerve connecting the eyes to the brain, probably by dissecting an eyeball. This led him to believe that all our senses are connected to the brain in some way. Therefore, the brain was the centre of understanding and played a vital role in perceptions, thoughts and other mental processes. It also followed that if the brain was injured then its functions could be disrupted or stopped (Debernardi et al., 2010; Celesia, 2012).

Empedocles (490–430 BCE) is best known for his proposal that every living and non-living thing in the world is made from four elements — earth, fire, air and water. He reasoned that the heart was the centre of the body's blood vessel system so the human soul is blood and our thoughts must therefore be located in the blood, particularly around the heart. He also argued that our perceptions were formed in the blood and since blood was the means by which we all think (and feel pleasure and pain), the degree of someone's intelligence depended on the composition of the blood (Gross, 1995; Kahn, 2013).

The heart is also where Aristotle (384–322 BCE) located all mental abilities (and the soul) at around 350 BCE. This famous ancient Greek philosopher, who dissected animals to learn about anatomy, gave no role to the brain in behaviour. Instead, he believed that the brain was a cooling mechanism to lower the hot temperature of the blood.

Some well-known physicians (doctors) in ancient Greece, such as Hippocrates (460–377 BCE), who is now regarded as the 'father of medicine', and Herophilus (325–255 BCE), who is called the 'father of anatomy', took the brain side of the debate. They advanced knowledge of the brain and nervous system by scientifically dissecting bodies of people and animals then recording their findings in highly detailed ways for other physicians. For example, Hippocrates wrote that all our emotions 'arise from the brain, and the brain alone' and that with the brain 'we think and understand, see and hear'. However, his views and those of Herophilus about the brain's role were in the minority (Wiltse & Pait, 1998; Yapijakis, 2009; Breedlove & Watson, 2020).

Figure 4.7 Greek physician Hippocrates (460–377 BCE), now regarded as the 'father of medicine', located mental processes in the brain. He wrote that the brain is where 'we think and understand, see and hear'.

It was not until the second century that widespread attention was drawn to the brain being very influential in behaviour. This is largely attributed to the work of the Greek physician Galen who argued strongly for the brain hypothesis.

Galen (c. 129–c. 216 CE) worked as a 'doctor to the gladiators' in first century (CE) Rome where he treated their head injuries and recorded his observations of how their behaviour changed in relation to different wounds. He observed that nerves from sense organs went to the brain and not to the heart, and that brain injury adversely affected behaviour.

Galen also reported on his experiences in attempting to treat wounds to the brain or heart. He noted that pressure on certain parts of the brain could affect behaviour such as movement, whereas similar manipulation of the heart did not directly affect behaviour. He also noted that gladiators who died from heart wounds 'keep their reasoning powers as long as they are alive, and this is clear proof that the rational soul does not live in the heart' (Scarborough, 2013; West, 2014).

These were accurate observations but Galen was mistaken with other observations. For example, he incorrectly argued that the important parts of the brain were in the fluid-filled cavities (ventricles) rather than its tissue and that all our physical functions and health depended on the distribution of these fluids along nerves to all body areas (Stirling, 2002; Kolb & Whishaw, 2003).

Galen was a prolific writer and his ideas remained largely unquestioned in medicine for nearly 1500 years until well into the nineteenth century. However, many of his specific ideas about the brain and its role in mental processes and behaviour were very inaccurate (Hankinson, 2008; West, 2014; Breedlove & Watson, 2020).

The brain hypothesis is now universally accepted. There is overwhelming scientific research evidence that the brain controls mental processes and behaviour. But it is also known that the function of our heart can affect our thoughts, feelings and behaviour. So, the heart-centred view argued by most of the early philosophers cannot be entirely dismissed.

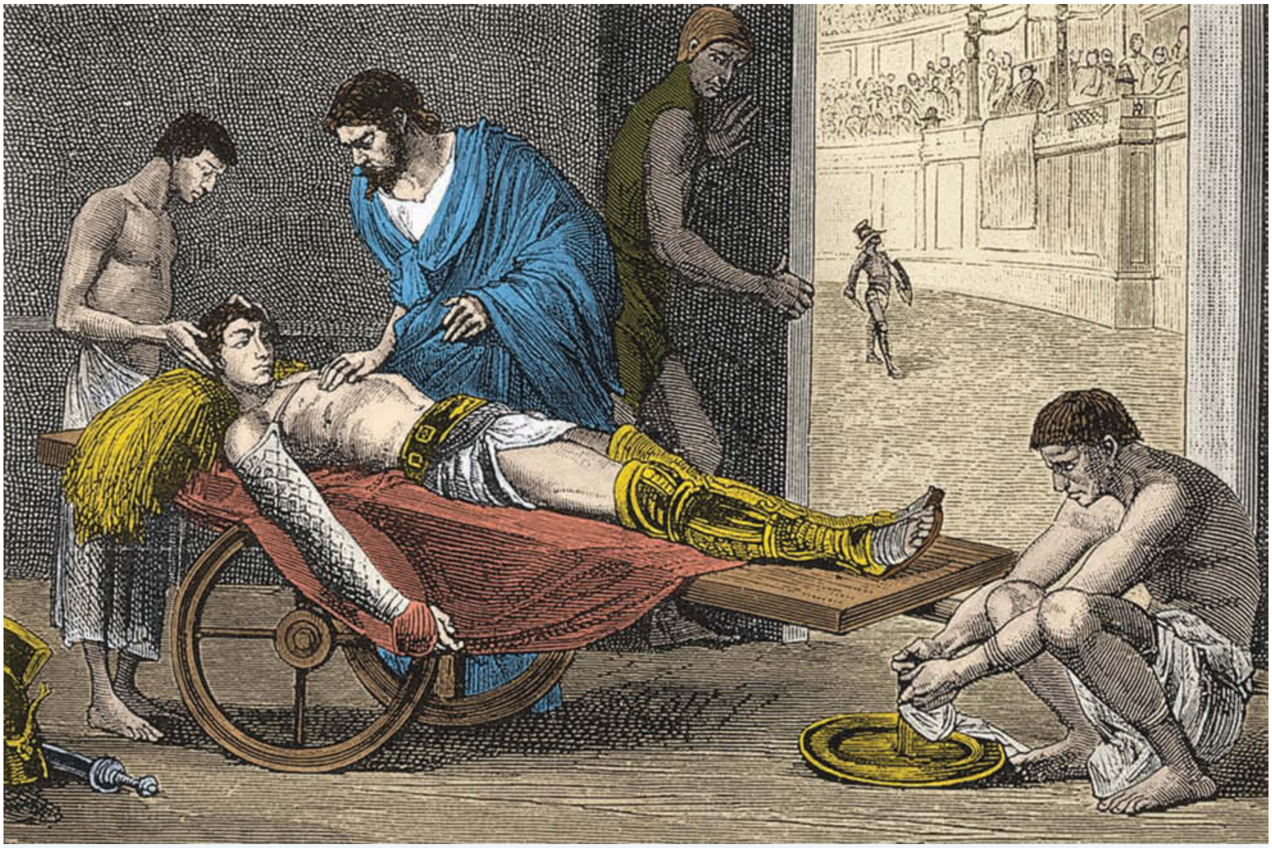


Figure 4.8 The Greek physician Galen argued strongly for the brain hypothesis on the basis of his work as a doctor to the gladiators in Rome during the first century (CE) where he treated their head injuries and recorded observations of the changes in their behaviour.

4.2.2 Mind–body problem

Another issue debated by the Greek philosophers is called the mind–body problem. This is about the relationship between the human mind and body. More specifically, the **mind–body problem** involves the question of whether our mind and body are distinct, separate entities or whether they are one and the same thing. For instance, is the mind part of the body, or the body part of the mind? If our mind and body are distinct and separate, do they interact? If they interact, how do they interact? And which of the two is in control?

Generally, most of the Greek philosophers believed that the mind and body were separate entities and that the mind could control the body, but the body could not influence the mind. This view was popular for almost 2000 years until it was challenged by French philosopher René Descartes in the seventeenth century.

In his version of a theory called *dualism*, Descartes agreed that the mind and body are two different things. He reasoned that the mind is a non-physical, spiritual entity (i.e. a soul), whereas the body is a physical, fleshy structure (i.e. matter). However, according to Descartes, the mind and body come into contact through the pineal gland, a tiny structure located deep in the brain. This enabled the mind and brain to interact to produce sensations, thoughts, emotions, self-awareness and other conscious experiences.

He identified the pineal gland because it is a single structure near the centre of the brain. The rest of the brain is split into right and left 'halves' enveloped by layers of cortex that are intricately folded within one another. Consequently, it seemed logical that the pineal gland, in being centrally located and isolated from the rest of the brain, could be the centre of consciousness and control behaviour.

Descartes also argued that the mind could affect the body and the body could affect the mind. For example, he believed that mental processes such as memory and imagination were the result of bodily functions, and that emotions such as love, hate and sadness arose from the body and influenced mental states, which could in turn influence the body.

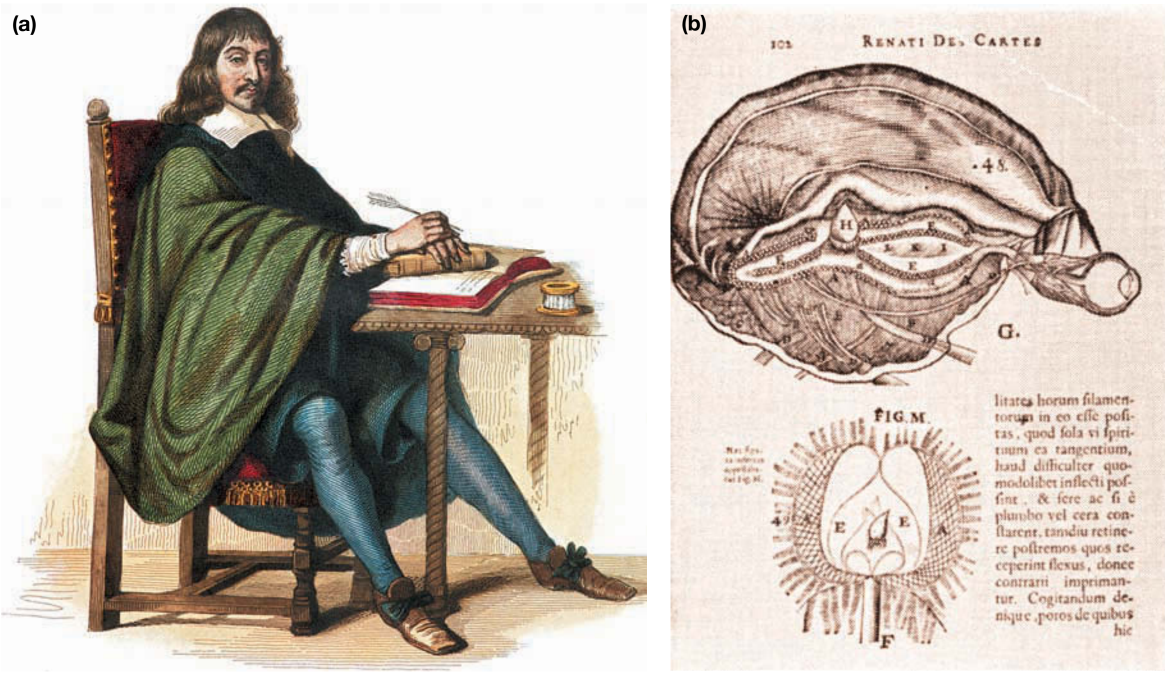


Figure 4.9 (a) French philosopher René Descartes (1596–1650) proposed that the human mind and body are separate but interconnected; (b) Descartes believed that the pineal gland connected the mind and body, enabling them to interact. This original drawing by Descartes shows the brain's pineal gland right in the middle of the brain (H), well located to serve as the centre of consciousness and control behaviour. Descartes is probably best known for his saying, 'I think, therefore I am'.

Descartes' understanding of the brain and the roles of its various structures was limited and, at times, wrong. It is now known that people who have a damaged pineal gland or have even had it surgically removed all display normal behaviour. Although located in the brain, the pineal gland is considered to be a part of the endocrine system. It secretes the hormone melatonin that contributes to the setting of the body's biological clock and promotes sleepiness. Although it plays a role in human behaviour, it does not govern it. Nonetheless, Descartes brought the mind, brain and body closer together in a way that others had not previously considered possible.

Mind–brain problem

The different views on the mind–body problem exchanged among philosophers throughout many centuries laid the groundwork for a contemporary version of the problem that has not yet been satisfactorily resolved by psychologists.

It is clear that the mind and body are intertwined and that mental processes may be triggered by events in the brain, or that mental processes may, in turn, trigger brain events and therefore influence our behaviour. However, the mind–body problem now tends to be more specifically described in psychology as the mind–brain problem.

The **mind–brain problem** essentially involves questions about the relationship between brain activity and conscious experience; that is, the relationship between what our brain does and our awareness of our own existence and our internal and external environments.

For instance, is our mind separate from our brain? Is our mind basically brain activity or is it our inner, personal experience of what our brain does? Is consciousness just one aspect of our mind? Does our mind become aware of what our brain does? If so, is our mind dependent on brain activity in order to become aware? Does our brain trigger conscious experience? Is conscious experience a by-product of brain activity? What comes first, brain activity or conscious experience?

Although there is no universally accepted solution to the mind–brain problem, it is likely that the rapidly advancing discipline of neuroscience will eventually lead psychologists to a better understanding of the relationship between conscious experience and brain activity.

learnon

learnMORE | What comes first — conscious experience or brain activity?

Access learnON to read a description of experimental research on the mind–brain problem.

4.2.3 Phrenology

Towards the end of the eighteenth century, German physician Franz Gall (1758–1828) proposed that different parts of the brain had different functions. This concept is now known as *localisation of brain function*. Gall took an extreme position that the brain was composed of distinctive, separate parts and that each part had a different function.

Gall argued that personality characteristics and mental abilities were controlled by different parts ('brain organs') which were located on its outer surface. The size of each of these parts indicated how fully developed it was and therefore the strength of its influence. The more it was used, the more it would develop, and vice versa. In addition, the development of a particular part would push out the surrounding skull to the extent that it would cause a bump on the head that could be observed or felt externally.

Gall's view on the relationship between brain and behaviour originated with his observations of classmates when he was at school. He noticed that those with the best memories who achieved better marks than he did had large, bulging eyes. This observation led him to propose that there was a well-developed memory located on the part of the brain directly behind the eyes and this is what caused the eyes to protrude. He had also observed that some of his friends who had similar personality types also had similar shaped heads, with bumps in similar places.

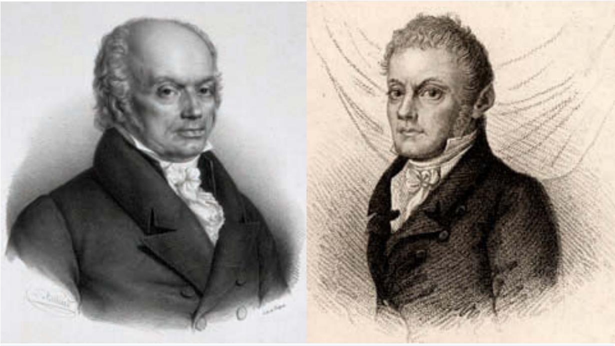


Figure 4.10 Franz Gall (1758–1828) and Johann Spurzheim (1776–1832)

Assisted by his colleague Johann Spurzheim (1776–1832), Gall studied a large number of skulls and skull casts of people with particular talents and unusual or extreme personalities. These included prominent writers, poets and philosophers, as well as criminals and mentally ill people. They also collected and compared many human and animal skulls to test their theory.

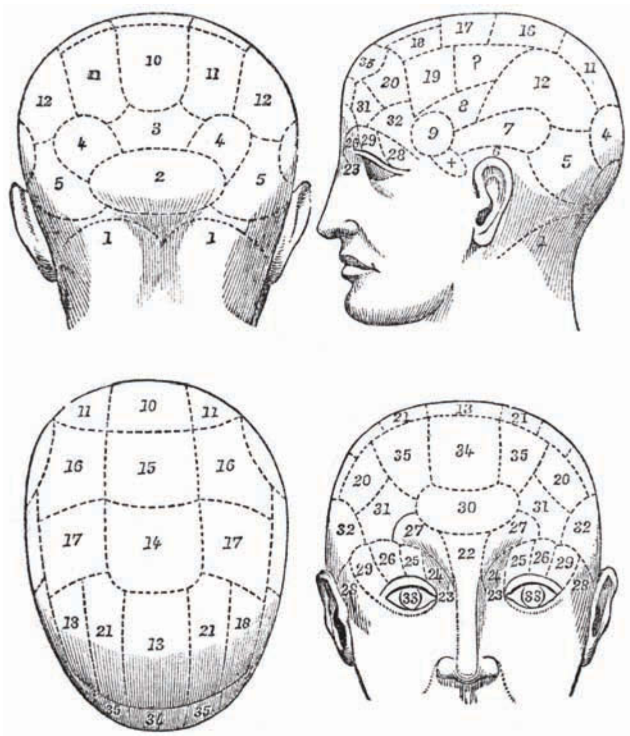
Their research led them to link various mental abilities, personality characteristics and behaviours, called faculties, to the skull and consequently underlying brain locations. Figure 4.11 shows a map of the skull with the locations of 35 different faculties. There were originally 27 faculties and the others were added later by Spurzheim.

The faculties were grouped in two major categories — *affective* (feelings) and *intellectual* faculties, each of which had sub-categories. The sub-category of *propensities* indicated 'internal impulses', whereas the *sentiments* 'designate other feelings, not limited to inclination alone' (Spurzheim, 1827).

Among the faculties was amativeness ('physical love') in the cerebellum at the lower back part of the brain (location 1 in Figure 4.11). A person with a bump there would be expected to have a strong sex drive, whereas a person low in this faculty would have a depression in the same area. Other faculties included:

4. adhesiveness — love of friends and the company of others (bump) vs neglect of friends and avoidance of others (depression)

6. destructiveness — violence and desire to destroy (bump) vs tameness and want of resolution (depression)



AFFECTIVE FACULTIES

I — *Propensities*

1. Amativeness
2. Philoprogenitiveness
3. Inhabitiveness
4. Adhesiveness
5. Combativeness
6. Destructiveness
7. Secretiveness
8. Acquisitiveness
9. Constructiveness

II — *Sentiments*

10. Self-esteem
11. Love of approbation
12. Cautiousness
13. Benevolence
14. Veneration
15. Firmness
16. Conscientiousness
17. Hope
18. Marvellousness
19. Ideality
20. Gaiety or Mirthfulness
21. Imitation

INTELLECTUAL FACULTIES

I — *Perceptive*

22. Individuality
23. Configuration
24. Size
25. Weight and Resistance
26. Colouring
27. Locality
28. Calculation
29. Order
30. Eventuality
31. Time
32. Melody
33. Language

II — *Reflective*

34. Comparison
35. Causality

Figure 4.11 A map used in phrenology to show the relation between the skull's surface features and a person's personality and behavioural characteristics. This map shows the location of 35 'faculties' according to Spurzheim's system published in 1815.

8. acquisitiveness — craving for possessions and extremely selfish (bump) vs lavish and wasteful (depression)

17. hope — view the future with much confidence of success (bump) vs gloom and sadness (depression)

24. size — excellent judge of dimensions and space (bump) vs poor judge (depression)

32. melody — musical appreciation (bump) vs no appreciation (depression).

Gall called his approach *organology*. Spurzheim later renamed it, using the term phrenology to describe the study of the relationship between the skull's surface features and a person's personality and behavioural characteristics (faculties). The map showing the location of brain functions on the skull's surface is called a *phrenological map*.

Spurzheim successfully promoted phrenology in the UK and the USA where it became very popular. Gall himself never approved of the term phrenology. He would later accuse Spurzheim of misrepresenting his ideas.

Phrenology was exploited by some people as a means of making personality and behavioural assessments. They used a method called *cranioscopy*, in which a device was placed around the skull to measure its bumps and depressions. The measurements were then analysed and linked to a phrenological map to determine the person's likely personality and behavioural characteristics.

Many who practised cranioscopy were 'quacks' and some created their own versions of a phrenological map. Vague or cleverly described interpretations were made to sound believable, as with other pseudosciences like astrology and palmistry. Cranioscopy was eventually ridiculed and, by association, so was phrenology. By the 1850s, phrenology had lost credibility, especially within the scientific community (Kolb & Whishaw, 2003).

There is no scientific research evidence supporting a relationship between bumps on the skull and the underlying brain tissue, nor a relationship between bumps and personality or any other human attribute.

Gall and Spurzheim's evidence was biased. It seems that they went looking for and found evidence to confirm their ideas. They also largely ignored other evidence that was available at the time, especially from patients with a brain injury that showed clear links between certain brain areas and functions. This meant that their phrenological map was largely inaccurate.

While Gall and Spurzheim's 'bump model' linking the brain and behaviour lacked scientific merit and was ridiculed by many physicians, Gall in particular had a lasting influence on thinking about the brain. For example, a key assumption of phrenology (or 'organology', as he called it) involves localisation of function. His ideas stimulated scientific interest in finding out more about which parts of the brain do what.

Localisation is now considered a basic principle of brain function, but not Gall's extreme view. There is now a more holistic view. Multiple parts of the brain are usually involved whenever we think, feel or voluntarily do something. No part operates in isolation to provide a specific function.

Figure 4.12 Although phrenology had lost credibility by the mid-eighteenth century, some people continued to exploit it. In the 1930s, this 'psychograph' device was promoted as a 'phrenology machine' that could 'examine the head' and use the 'measurements of the shape of the head' to report personality and behavioural characteristics. The device was used for 'readings' to paying audiences and was also commercially available. Some were installed in theatre lobbies and department stores for customers to use.

4.2 LEARNING ACTIVITY 1

Review

1. Suggest a reason to explain why it is generally believed that contemporary psychology has its roots, or origins, in philosophy.
2. a. Briefly describe the brain versus heart debate.
   b. Why would brain and/or heart dissection alone *not* provide substantial evidence of the role of either in mental processes and behaviour?
   c. Galen documented evidence supporting the brain hypothesis yet the brain versus heart debate persisted for many more years. Suggest a reason to explain this persistence.
3. a. Briefly describe the mind–body problem.
   b. What three key ideas proposed by Descartes influenced thinking about the relationship between the mind and body?
   c. What do you believe is the relationship between the mind and brain? Give an example that helps explain your belief.
4. a. What is phrenology?
   b. On what evidence was it based?
   c. Explain a limitation of this evidence.
   d. Explain why phrenology can be viewed as an early theory of brain localisation.
   e. Give two examples of 'faculties' that are easy to operationalise and two that may have been too vague to operationalise for research purposes.
   f. How could you scientifically test whether phrenology can be used to assess personality or behaviour?

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

4.2 LEARNING ACTIVITY 2

Multiple-choice questions

1. A limitation of the earliest research techniques used to study the human brain was inability to
   A. access a brain for study.
   B. observe a human brain.
   C. observe brain structure.
   D. observe brain function.
2. The brain versus heart debate was mainly about
   A. whether the brain or heart are one and the same thing.
   B. whether the brain and heart are interconnected and interrelated.
   C. whether the brain or heart is primarily responsible for mental processes.
   D. whether the brain and heart are distinct, separate entities.
3. The mind–brain problem was mainly about
   A. whether the brain is primarily responsible for mental processes.
   B. the relationship between human brain activity and conscious experience.
   C. whether the human mind and body are distinct, separate entities or one and the same thing.
   D. the relationship between human brain and heart activity.
4. The origin of the brain versus heart debate can be traced back to
   A. Gall.
   B. Descartes.
   C. the ancient Egyptians.
   D. the ancient Greek philosophers.
5. Phrenology is best described as
   A. pseudoscience.
   B. organology.
   C. cranioscopy.
   D. phrenological mapping.

To answer these and additional questions online and receive **immediate feedback**, access learNON at www.jacplus.com.au.

4.3 First brain experiments

The 'first' brain experiments were dominated by the use of ablation, lesioning or electrical stimulation of the brain to observe the effects on behaviour, cognitive functioning and other reactions. By the end of the nineteenth century, these techniques had enabled researchers to assign functions to large areas of the brain.

As examples of early brain experiments, we first examine pioneering research that used brain ablation and stimulation techniques. Then, we examine a series of Nobel Prize winning experiments conducted in the 1960s using brain lesioning that enhanced understanding of the specialised functions of the brain's left and right hemispheres. Finally, we examine various neuroimaging techniques used in contemporary brain research.

4.3.1 Brain ablation and lesioning experiments

In experimental research, **brain ablation** involves the destruction or removal of part of the brain. This may be an area of tissue as small as a few millimetres in diameter or a specific structure such as the amygdala or cerebellum. **Brain lesioning** involves disrupting or damaging the normal structure or function of part of the brain.

Both ablation and lesioning are done intentionally, often using a surgical procedure such as a scalpel cut, and are followed by an assessment of subsequent changes in behaviour (or mental functioning). The role of the brain area is inferred by observing the loss of function that is produced following its damage or removal.

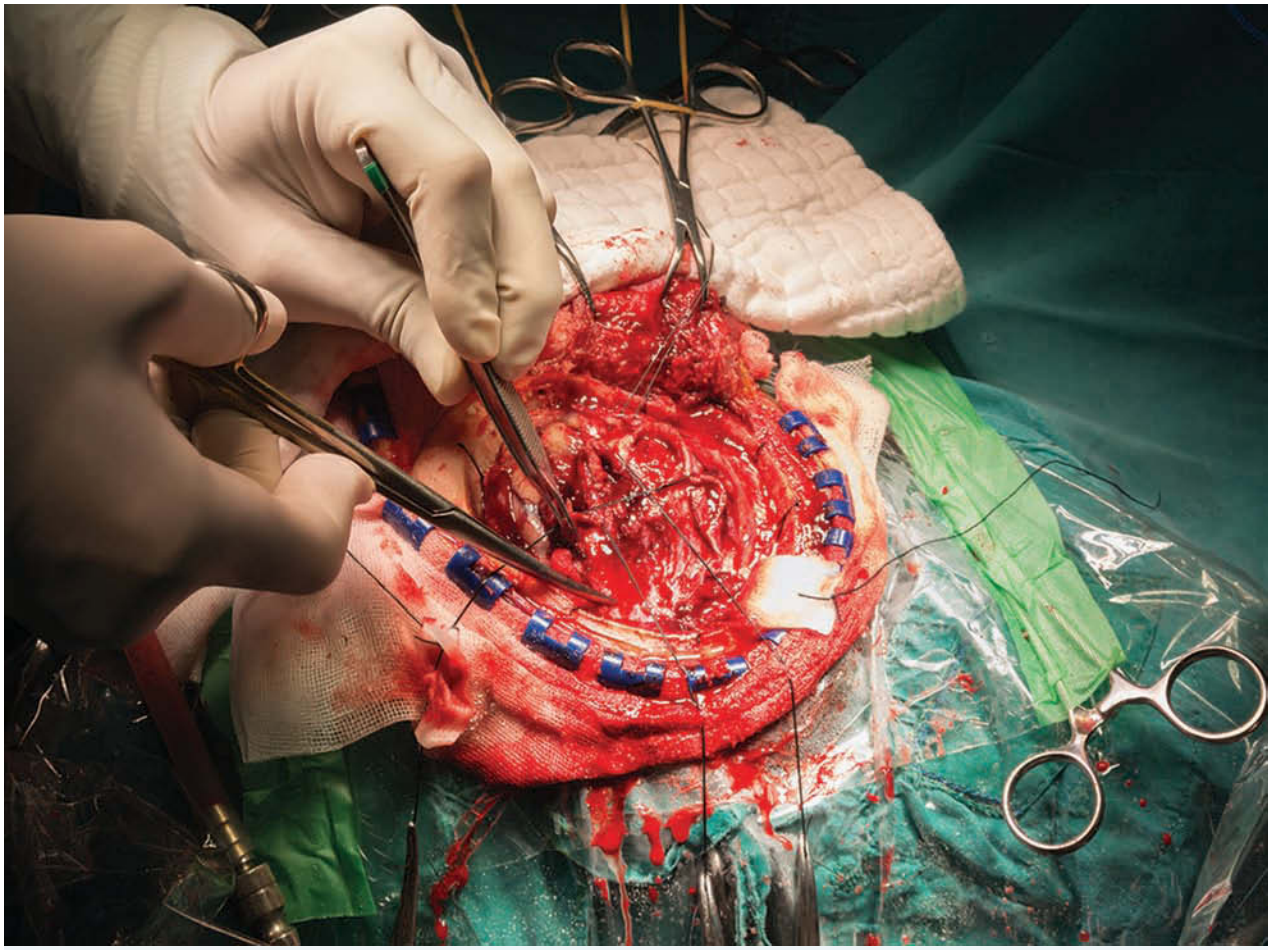


Figure 4.13 Ablation involving surgical removal of a harmful brain tumour is ethically acceptable, whereas removal for research purposes would not be permissible.

Ablation may involve cutting out and removing part of the brain, but lesioning does not. The term lesion is also used more generally to refer to any area of damage, so a lesion can be caused by ablation. Both terms tend to be used interchangeably, although some researchers strictly use the term ablation when brain tissue is actually removed.

Damage caused by ablation is irreversible, whereas some lesions may involve temporary disruption to brain function, typically produced when a non-surgical procedure is used; for example, by injection of a drug into the brain area or by electromagnetic stimulation of the area.

For obvious reasons, experimental research using brain ablation or permanent lesioning is considered unethical on humans. However, ablation may be used for brain tumour removal and lesioning may be an option to treat a debilitating brain-related disorder for people who don't respond to or can't have other treatments.

Pierre Flourens pioneers experimental ablation

French physiologist Pierre Flourens (1794–1867) is often credited as introducing brain ablation experiments. He did so in the 1820s in controlled laboratory experiments with animals. Working mainly with rabbits and pigeons, he developed techniques of damaging or removing small areas of brain tissue to observe the effects on behaviour. His research also provided the first scientific evidence that challenged the value of phrenology.

To search for different functions in the brain, Flourens varied the location where he lesioned or ablated brain tissue. He found, for example, that the brain stem, located deep within and at the base of the brain, had specialised functions. Injury (intentional damage) to one part caused animals to stop breathing so he assumed the brain stem was responsible for respiration. Furthermore, the cerebellum, which is connected to the brain stem, appeared to coordinate movement (and had nothing to do with phrenology's 'amativeness'). Many attribute the discovery of both of these localised brain functions to Flourens (Yildrim & Sarikcioglu, 2007).

Flourens also found that damage or removal of small bits of tissue in a specific area of the cerebral cortex would result in loss of movement. However, animals could eventually recover this function, possibly the first evidence of the brain's plasticity.

Flourens used this finding to argue a 'holistic' view of brain function — that the cortex worked as a whole. He believed that recovery from damage to cortical brain tissue was possible because the remaining cortex could do the same things that the missing cortex had done, so it could take over. The holistic view of the brain remained prominent for the next 40 years until localisation theory once again became prominent (Kolb & Whishaw, 2003).

Despite his significant findings, Flourens's research was criticised. For example, his surgical procedures were believed to be imprecise, which left open the possibility that behavioural changes he observed were caused by damage to brain parts beyond the cortex. Flourens was also criticised because he did not write detailed reports on his research, so his findings were difficult to test (Stirling, 2002).

Figure 4.14 French physiologist Pierre Flourens (1794–1867)

Karl Lashley's search for the location of learning and memory

The value of the lesioning and ablation techniques were recognised and used by other brain researchers. Some used them extensively. For example, beginning in the 1920s, eminent American psychologist Karl Lashley (1890–1958) used brain lesioning and ablation throughout the next 30 years in experiments to search for the location of learning and memory in the brain.

Lashley and his research assistants taught rats, monkeys and chimpanzees to perform various tasks and then damaged or removed bits of their cortical tissue with the goal of producing amnesia for memory of the learnt tasks. Lashley failed to produce amnesia and concluded that learning and memory were located throughout the brain rather than in a single place.

Lashley's experiments led him to develop two principles of brain function that became very influential for many years — mass action and equipotentiality.

Mass action is the idea that the large areas of the brain function as a whole in complex functions and that if a part is destroyed then loss of function will depend on the amount of cortex that is destroyed. *Equipotentiality* is the idea that any healthy part of the cortex can take over the function of an injured part (Lashley, 1963). Both of these principles reflect the holistic view and can be traced back to the ideas of Flourens.

Historically, the brain lesioning procedure in particular has been one of the most popular procedures used for the study of brain–behaviour relationships. However, an association between a specific brain area and behaviour (or some other function) does not prove that the brain area is the originating or single source for brain activity associated with that behaviour.

It is possible, for example, that ablation or lesioning may have cut off communication between the damaged area and another brain area that is also involved in the behaviour. An observed change in behaviour could be primarily due to this loss of connectivity rather than loss of brain tissue in the ablated or lesioned area.

Nonetheless, advances in technology since the pioneering experiments have allowed for more precise procedures, including non-surgical lesioning techniques such as use of chemicals, lasers, electrodes and freezing methods. The lesioning may also be complemented by neuroimaging.

Although none of these newer techniques can provide all of the data necessary to evaluate the function of a brain structure or system, many have been successfully used to further advance understanding of brain–behaviour relationships (Lavond & Steinmetz, 2003).

4.3.2 Electrical stimulation of the brain

Weak electrical signals are generated continuously by neurons throughout the brain. This type of activity continues for as long as the brain is alive. Electrical activity in the brain can either be stimulated or detected using an electrode — a small, electrified fine wire (or disc) that can be inserted into or placed onto a specific area of the brain. The technique is called **electrical stimulation of the brain (ESB)**. It is assumed that if electrical stimulation of a specific brain area initiates a response, such as the movement of a body part, then that area controls or is involved in the response.

ESB may not only initiate a response, it may also interfere with the functioning of a specific brain area, thereby inhibiting ('blocking') a response. For example, it may stop speech 'mid-sentence' while someone is talking. The inhibitory effect of ESB will only be apparent when a person is actively engaged in the behaviour that it blocks, and is most evident in complex functions such as language and memory.

Gustav Fritsch and Eduard Hitzig discover the motor cortex

The first reported use of ESB dates back to the 1870s when German physician Gustav Fritsch (1838–1927) and his colleague Eduard Hitzig (1838–1907) used recent improvements in the control of electricity to stimulate movement by a dog.

Fritsch and Hitzig found five sites that, when stimulated, triggered distinctive movements — on the opposite side of the body. As well as successful ESB, their experiments demonstrated *contralateral* (opposite side) function of limb movement. The brain area where these voluntary contralateral movements are initiated is now called motor cortex (Gross, 2007).

Wilder Penfield maps the cerebral cortex

Some experiments were also conducted with humans despite the limitations and risk of the technology at the time. It was not until the twentieth century that ESB procedures were perfected. This was achieved in the 1940s by Canadian neurosurgeon Wilder Penfield (1891–1976) who used ESB to map the cerebral cortex with his patients as research participants.

Working with colleague Herbert Jasper, Penfield invented a new treatment for patients with severe epilepsy — a brain function disorder involving recurring seizures (which is examined in Topic 5).

Penfield's treatment specifically involved surgically removing the area believed to be the source of epileptic seizures, but only as a last resort for patients whose seizures were poorly controlled by medications. During the surgery, Penfield had to take considerable care to avoid damaging normally functioning areas of the cortex.

In order to do this, it was important to first precisely identify the location of both the abnormal brain tissue as well as the areas that were functioning normally to avoid damaging them during surgery. The patient needed to be conscious during the procedure (under local anaesthesia) so that they could react to or report their experiences during the electrical stimulation.

When the cerebral cortex was exposed, Penfield was able to stimulate different areas using an electrode, and to ask his patients to report their experiences. He used this technique with hundreds of patients who had previously given their consent for him to undertake this exploratory procedure while their brains were exposed for surgery.

During his research, Penfield used tiny numbered tags to mark the areas of the cortex that he electrically stimulated as he developed his brain 'map', which is seen in Figure 4.16 on the next page. Then he recorded the responses of his awake and alert patients.

As Penfield touched one cortical area after another with the tip of the electrode, the conscious patient reacted in various ways. For example, when Penfield stimulated an area at the back of the brain, patients reported seeing flickering lights, spots, colours, stars and other images. In this instance, Penfield was stimulating parts of the cortex he subsequently tagged as being responsible for vision.

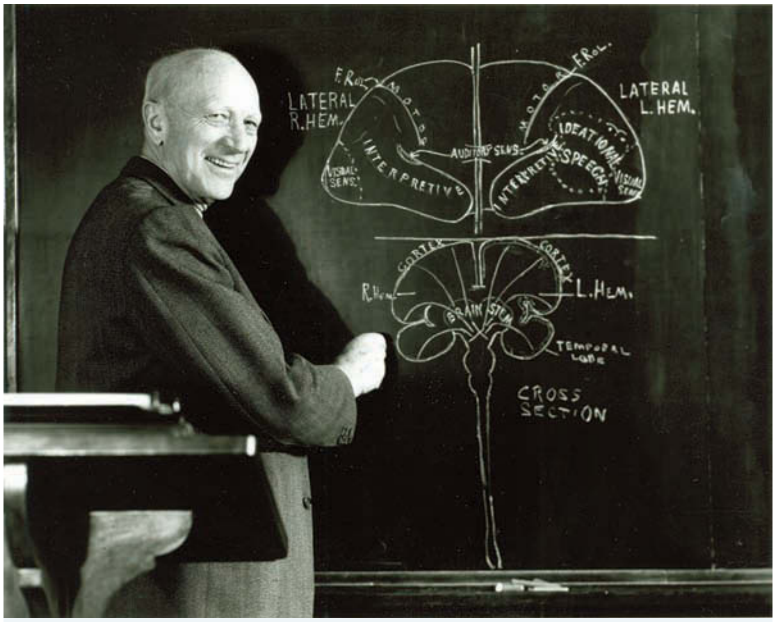


Figure 4.15 Canadian neurosurgeon Wilder Penfield (1891–1976) created functional maps of the brain's cerebral cortex using electrical stimulation. His patients would remain awake and describe their reactions as he activated or inhibited different brain areas.

When Penfield shifted the electrode to stimulate an area across the top of the brain, he found that his patients responded by moving specific body parts. As he moved the electrode along this cortical area, a different part of the body moved. This enabled him to pinpoint cortical areas involved with very specific actions, such as jaw or tongue movement (Penfield & Jasper, 1954).

Over a period of more than 20 years, Penfield and various colleagues pooled the data of nearly 300 patients with epilepsy they had carefully studied using direct stimulation. The data was used to map cortical areas and related functions, particularly the sensory and motor areas. These maps are still used today, practically unaltered.

Electrical stimulation of the brain in the manner conducted by Penfield and his predecessors is now rarely used in research studies involving human participants. It is an extremely invasive technique and potentially harmful.

The risk of either physical or psychological harm would now be unacceptable according to current ethical standards for human research. However, a contemporary form of electrical stimulation deep in the brain may be used for therapeutic reasons, for example, to treat motor symptoms of Parkinson's disease or symptoms of depression, but only in serious cases.

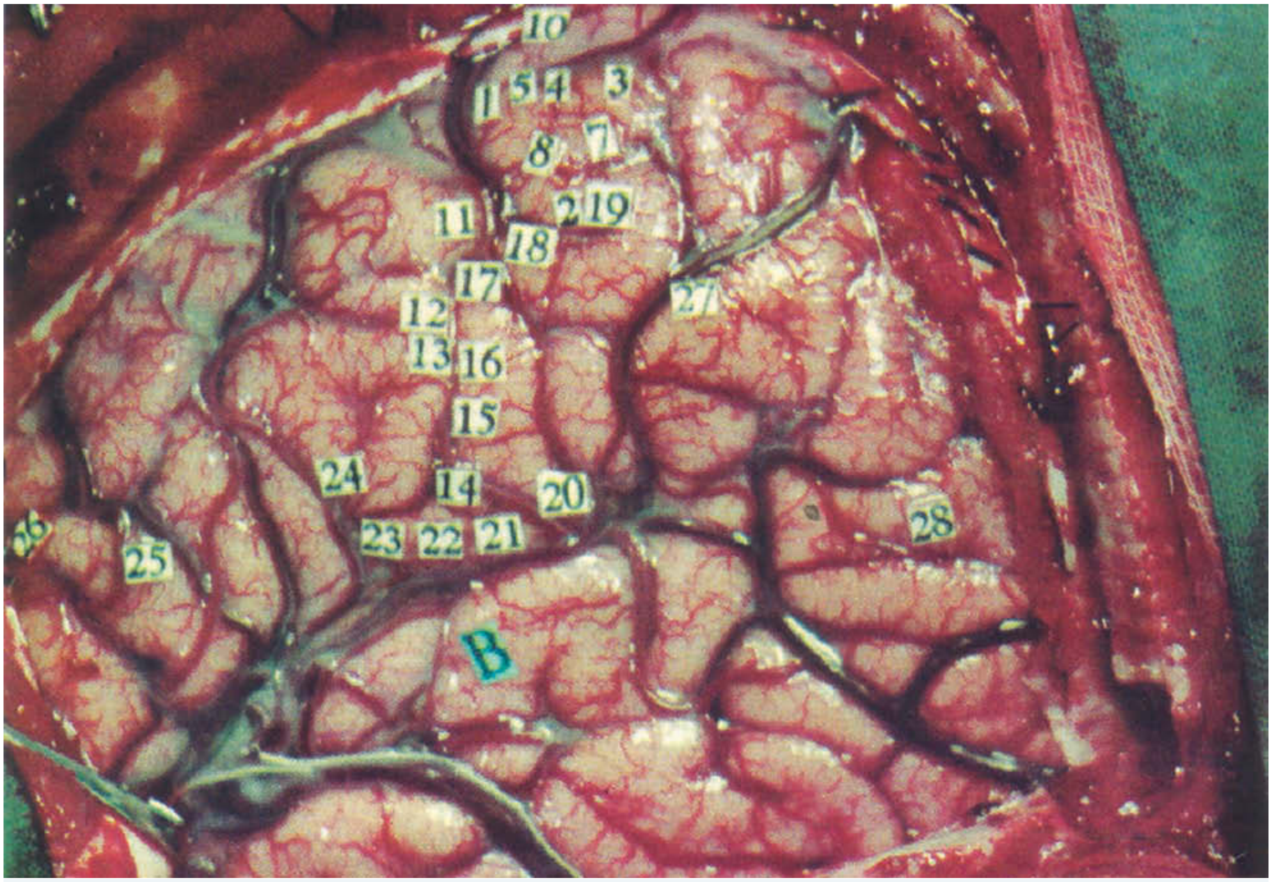


Figure 4.16 Brain mapping by Penfield during ESB. The numbers correspond to points of the cerebral cortex, stimulated electrically in a conscious patient.

on Resources

Weblinks Video outlining Penfield's research, including Penfield interviewing a participant 2 m 54 s

Video showing use of deep brain stimulation as a therapy to treat motor symptoms of Parkinson's disease 8 m 02 s

learnon

learnMORE | Electrical stimulation of animal brains

Access learnON for a description of classic research on the electrical stimulation of animal brains to study brain-behaviour links.

4.3 LEARNING ACTIVITY 1

Review

1. a. Outline what brain ablation and brain lesioning experiments involve.
   b. What are two differences between brain ablation and lesioning?
   c. What is a key assumption of both ablation and lesioning when used in experimental research on the brain?
   d. Give two examples of research findings about the brain that can be attributed to brain ablation and lesioning experiments.
   e. What is a significant limitation of these findings?
2. Explain the difference between the localisation and holistic views of brain function.
3. Explain the difference between invasive and non-invasive brain research techniques.
4. a. What is electrical stimulation of the brain (ESB)?
   b. What is the key assumption of ESB when used to study brain structure and function?
   c. Briefly describe an advantage and a limitation of the use of ESB for brain research purposes.
5. Briefly describe two key ethical issues relevant to the use of brain ablation and ESB for brain research.
6. ESB research, which has its origins in animal studies, resulted in accurate mapping of the entire human cerebral cortex. Explain whether the research with human participants should have been prohibited on ethical grounds.

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4.3.3 Split-brain experiments

American neuropsychologist Roger Sperry (1913–1994) was awarded a Nobel Prize in 1981 for his pioneering research on the relationship between the brain and behaviour. His experiments clearly demonstrated that the brain's two cerebral hemispheres ('halves') specialise in some different tasks.

Sperry studied patients who had undergone split-brain surgery as a radical treatment for their epilepsy. **Split-brain surgery** involves cutting the main band of nerve tissue connecting the two hemispheres. This tissue is called the corpus callosum, note its location in Figure 4.17.

Disconnecting the hemispheres, either partially or completely, was found to reduce the incidence and severity of epileptic seizures. However, the procedure is performed only in very serious cases of epilepsy where drugs and other medical procedures have not been effective.

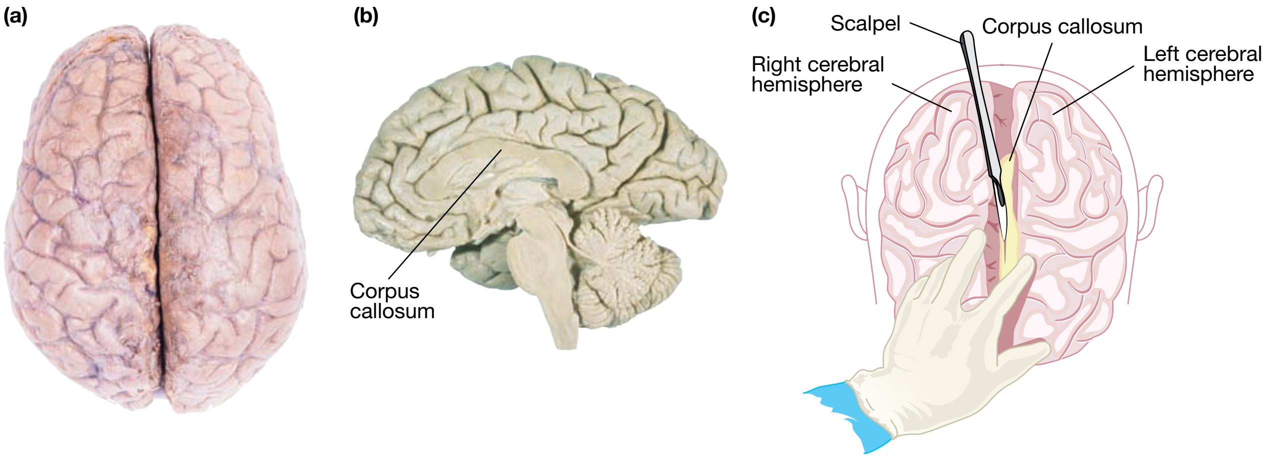


Figure 4.17 (a) The human brain has two almost symmetrical 'halves' called cerebral hemispheres. (b) The hemispheres are primarily connected by a large band of nerve tissue called the corpus callosum. There are also sub-cortical connections. (c) Split-brain surgery involves cutting strands of the nerve tissue to disconnect the two hemispheres.

Sperry and his student, Michael Gazzaniga, designed a series of experiments to test for neuropsychological side-effects of the split-brain condition. Medical reports of split-brain patients indicated that they suffered no loss of, or impairment to, brain functions as a result of the split-brain procedure. However, Sperry obtained results that indicated otherwise.

Under controlled laboratory conditions, Sperry (1968) used the apparatus shown in Figure 4.18 below to test the abilities of 11 split-brain patients and compare their responses with those of participants with no hemisphere disconnection.

Tested one at a time, each participant is seated behind a screen. The screen is used to flash a word or picture for a fraction of a second while the participant focuses on a black dot in the middle of the screen. The word or picture is flashed either to the left or right of the black dot.

In this procedure, visual information flashed to the left of the black dot is in the participant's left visual field and would therefore be sent to the participant's *right* hemisphere, while visual information flashed to the right of the black dot is in the right visual field and would therefore be sent to the participant's *left* hemisphere (see Figure 4.19).

Behind the screen and hidden from the participant are several objects such as an apple, a spoon and a pencil. Although the participant cannot see the objects, they are able to reach through a gap below the screen to touch them and therefore respond to tactile sensations, if these are experienced.

In one experiment, much like the others, Sperry (1968) asked a 'split-brain' female patient, referred to as N.G. for confidentiality reasons, to focus on the black dot. As she did so, he flashed a picture of one of the objects to either the left or right of the black dot. Each time an object's image was flashed onto the screen, Sperry asked her 'What did you see?' In response to the images flashed in the right visual field (and therefore sent to the left hemisphere), N.G. named the objects. But to images flashed in the left visual field (and sent to the right hemisphere), N.G. could not *say* what she saw and often denied that anything had been flashed on the screen.

Why was N.G. unable to identify images flashed to the left visual field? If the visual information sent to the right hemisphere cannot cross back to the left hemisphere (because the corpus callosum has been cut), then the person is unable to *say* what they saw. This occurs despite the fact that they still actually see

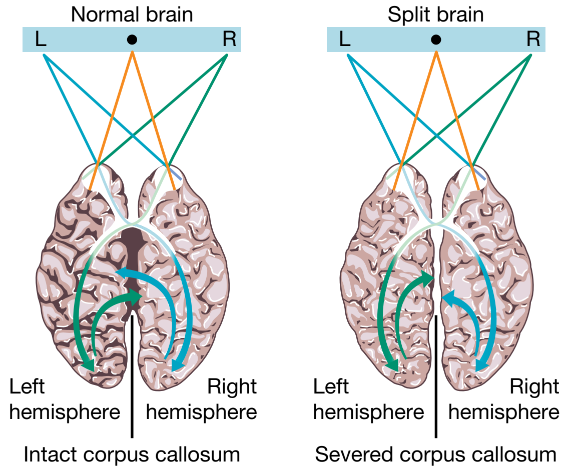


Figure 4.19 Pathways of information from the left and right visual fields to the brain in patients with and without the split-brain condition.

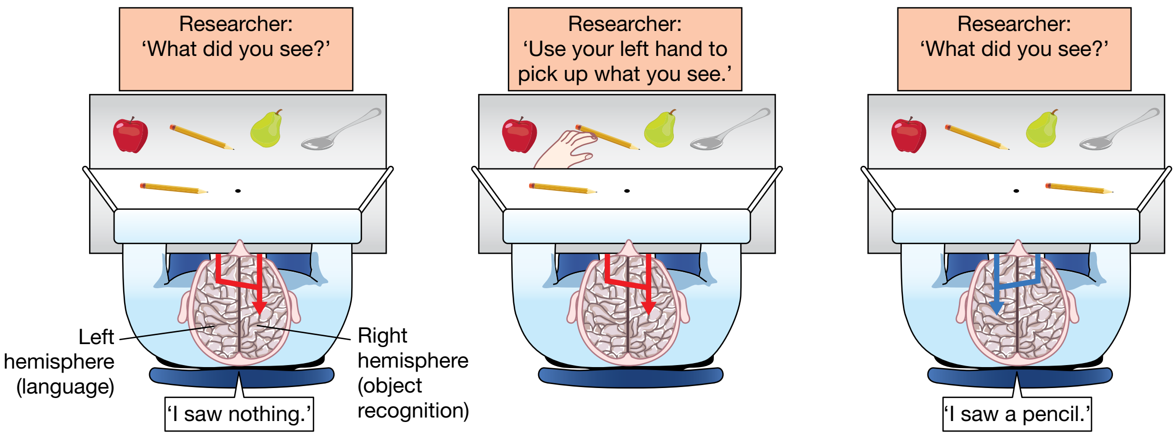


Figure 4.18 Apparatus used by Sperry in the split-brain experiments

the image, because the area of the brain responsible for speech is in the left hemisphere.

In order to check that N.G. *did* actually see an object when it was presented in the left visual field, Sperry asked N.G. to use her left hand to reach under the partition for the object. N.G. could correctly locate the object shown in the image because her left hand was controlled by the right hemisphere that also saw the image of the object. The message from the motor cortex in the right hemisphere for the left hand to move does not use the corpus callosum.

It was evident that the right hemisphere had processed information about the object because N.G. could correctly select it by feeling it with her left hand, but she could not say what it was, because only the left hemisphere could convert the information into the spoken word. Other split-brain participants responded in the same ways.

on Resources

Weblinks Video on early split-brain research narrated by Gazzaniga 10 m 43 s

Video on a recent split-brain experiment by Gazzaniga 4 m 35 s

4.3 LEARNING ACTIVITY 2

Review

1. What is a 'split-brain' experiment?
2. a. What medical procedure is used to achieve a 'split-brain'?
   b. Did Sperry perform the medical procedure?
3. a. Who were the control group in the Sperry experimental investigations?
   b. Are people with or without a severed corpus callosum best described as neurotypical or neurodiverse?
4. What are two key findings about brain function from the split-brain experiments?
5. a. If a doctor injected a sedative drug into an artery leading to your left hemisphere just before a friend visits you in hospital, in what way(s) would you be able to greet your friend?
   b. What abilities normally used to greet someone would you be unable to use?
6. Would split-brain experiments be ethically permissible today? Explain your answer.
7. Construct a flow chart to summarise the Sperry & Gazzaniga split-brain experimental procedure and results. Your flow chart should refer to a research hypothesis, the sample, the IV and DVs, the experimental design, key results and a possible limitation of the research.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

4.3 LEARNING ACTIVITY 3

Multiple-choice questions

1. In experimental research, ______ typically involves removal of part of the brain to study its function by observing subsequent changes in behaviour.
   A. ablation
   B. split-brain surgery
   C. lesioning
   D. non-surgical lesioning
2. Most of the early brain ablation or lesioning experiments would now be considered ______ if proposed for research with human participants.
   A. outdated.
   B. not useful.
   C. unethical.
   D. too difficult to perform.

3. Which procedure was primarily used in early brain experiments to temporarily activate or suppress activity in a specific brain area in order to understand its function?
   A. split-brain surgery
   B. electrical stimulation
   C. brain ablation
   D. brain lesioning
4. Which brain structure is severed for split-brain experiments?
   A. cerebrum
   B. cerebral cortex
   C. corpus callosum
   D. cerebral hemisphere
5. What understanding of brain function was primarily achieved through the early split-brain experiments?
   A. The cerebral hemispheres function independently of one another.
   B. The cerebral hemispheres specialise in certain functions.
   C. The functioning of different cortical areas can be either stimulated or blocked.
   D. Severing the cerebrum disconnects the cerebral hemispheres and disrupts their functioning.

To answer these and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

4.3.4 Neuroimaging techniques

In the second half of the twentieth century various neuroimaging techniques were developed for medical diagnostic purposes. Commonly called 'brain scanning', these techniques have been adopted for psychological research. As the name suggests, **neuroimaging** is a technique that captures a picture of the brain.

When used in research studies, participants are typically given a task for which they are required to think, feel or behave in a particular way so that images of their live, intact brain can be obtained. For example, a participant may be asked to perform a problem-solving task, listen to music, speak aloud or react to some other stimulus while changes that occur in one or more brain areas are observed and recorded. The resulting brain images allow for correlations between brain areas that may be active at that time and a participant's response.

Generally, the different neuroimaging techniques can be divided into two categories — structural and functional techniques. As suggested by the term, structural techniques are primarily used for brain structure imaging and functional techniques for brain functioning imaging. The various neuroimaging techniques can be used alone or in combination.

One important aspect of neuroimaging is that it helps overcome significant ethical constraints in studying the live, intact brain as well as the injured or damaged brain. Techniques that preceded neuroimaging were often invasive and carried unacceptable risks to research participants. Neuroimaging is relatively *non-invasive* — it can be used by researchers without entering ('invading') the brain. Therefore, the risk of harm to participants is minimal, if not negligible.

Structural neuroimaging

Structural neuroimaging (sometimes called *static neuroimaging*) refers to techniques that produce images, or 'scans', showing brain structure and anatomy, such as the CT and standard MRI.

Computerised tomography (CT)

Computerised tomography (CT), also called *computerised axial tomography* (*CAT*), uses x-ray equipment to scan the brain at different angles. A computer builds up a picture and creates an image showing a horizontal cross-section of the brain, as if it has been sliced through. CT images provide more detailed information than plain x-rays do. Images may also be produced in 3D.

For a CT scan of the brain, the research participant (or patient) may be given a substance called contrast. This is used to highlight the brain's blood vessels and enable interpretation of the resulting images.

First used in the early 1970s, CT provided a new way of looking at a live, intact human brain without using invasive or risky procedures. It is very useful for locating and identifying brain abnormalities and injury. For example, a CT scan can help identify the location and size of a tumour and the location and extent of damage caused by a brain injury due to a stroke or a blow to the head.

CT has also been used in research to look for and identify possible brain abnormalities in brain structures in people with a mental health disorder such as schizophrenia and depression. CT has also enabled observation of physical changes in the brains of patients with Alzheimer's disease, Parkinson's disease and many other brain-related disorders.

Although CT has been valuable for brain research, it has significant limitations. The black and white images show only brain structure, and not as well as other scanners that do not rely on x-ray technology. X-rays emit radiation and are not particularly good for imaging tissue.

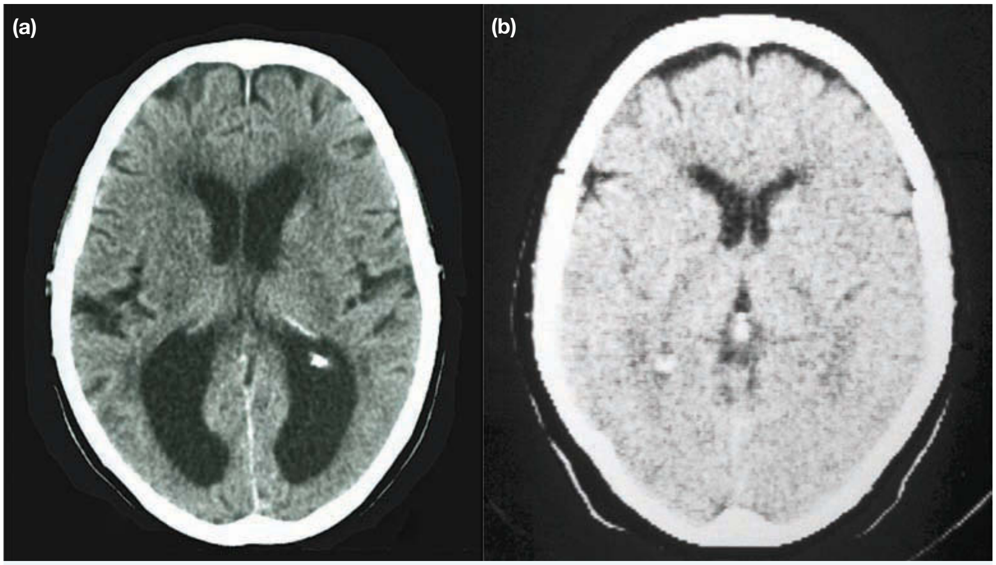


Figure 4.20 (a) CT scan of the brain of a person with Alzheimer's disease. Dead brain cells (neurons) produce a darker image then do healthy, living cells. Note the size of the black areas showing abnormal tissue compared to (b) the image of a healthy brain.

Figure 4.21 A researcher is shown reviewing CT scans of a participant's brain.

Magnetic resonance imaging (MRI)

Magnetic resonance imaging (MRI) uses harmless magnetic fields to vibrate atoms in the brain's neurons and generate a computer image of the brain. Like CT, scans are taken within a long, metal cylinder in which the participant must lay very still.

The MRI technique is more sensitive than CT. Consequently, MRI images are clearer and more detailed than CT. They can also be produced in full colour, which can assist researchers to distinguish between different brain areas and structures.

Like CT, the standard MRI has primarily been used for diagnosing structural abnormalities of the brain. It cannot reveal brain function. However, MRI can be used to detect and display extremely small changes in the brain's anatomy.

MRI is more sensitive and can more clearly distinguish between subtle changes in brain tissue, such as loss of the protective layer of myelin surrounding nerve fibres that is characteristic of multiple sclerosis. The image can also reveal nerve or tissue degeneration in the nervous system that may be associated with a neurological disorder and blood clots or leaks from blood vessels that may have caused a brain injury due to a stroke.

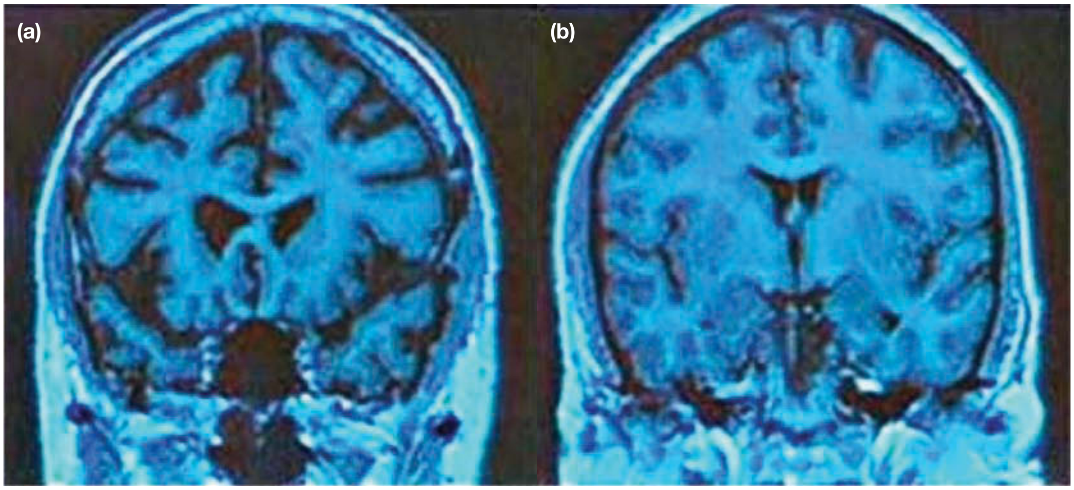
Functional neuroimaging

Functional neuroimaging (sometimes called *dynamic neuroimaging*) refers to techniques that provide views of some aspect of brain function by showing images of the brain 'at work'. They also provide information about brain structure. PET and fMRI are two examples of functional neuroimaging.

Positron emission tomography (PET)

CT and standard MRIs produce useful images of brain structures. They can give information on what brain areas look like but do not reveal their activity during any given mental process or behaviour. This limitation was overcome in the late 1970s through PET.

Positron emission tomography (PET) produces 2D or 3D colour images showing brain structure, activity and function. In brain research, PET is used to record the level of activity in different brain areas while the participant engages in some kind of mental activity such as imagining, remembering, listening, talking or moving a body part. The type of task given to participants is limited by the size of the chamber, which is like a CT and MRI scanner.



Normal 43-year-old   Alcoholic 43-year-old

Figure 4.22 MRI images showing areas of normal and abnormal tissue in the brain of an adult with a long history of alcohol dependency compared to someone of the same age who never drank alcohol.

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Weblink Video on MRI brain scan procedure 1 m 14 s

PET provides images of the 'working brain' by tracking a glucose solution containing a short-lived radioactive tracer. This is usually injected into the bloodstream before scanning. When it reaches the brain, the amount used during a given task is recorded. It is assumed that brain areas that require increased blood flow have increased neuronal activity (and vice versa). About 20% of the blood flowing through the heart is pumped to the brain.

Each PET scan uses a colour code to indicate areas of high and low activity brain activity. In descending order, the colours red, yellow, green, blue and violet each represent different amounts of activity. For example, if a person is listening to someone talking during the PET procedure, the areas of the brain involved with speech comprehension will be activated and highlighted in the PET scan by red and yellow. This enables the researcher to identify the level of activity of different brain areas in speech comprehension.

As shown in Figure 4.23, a PET scan can look like a coloured 'map' of the brain's activity, with different colours indicating areas of greatest and least activity. PET scans show brain activity, whereas standard MRI scans do not. However, PET images in themselves are less detailed than MRI images. PET scans are therefore often performed using a chamber that is a combined PET and CT scanner to achieve a more detailed image.

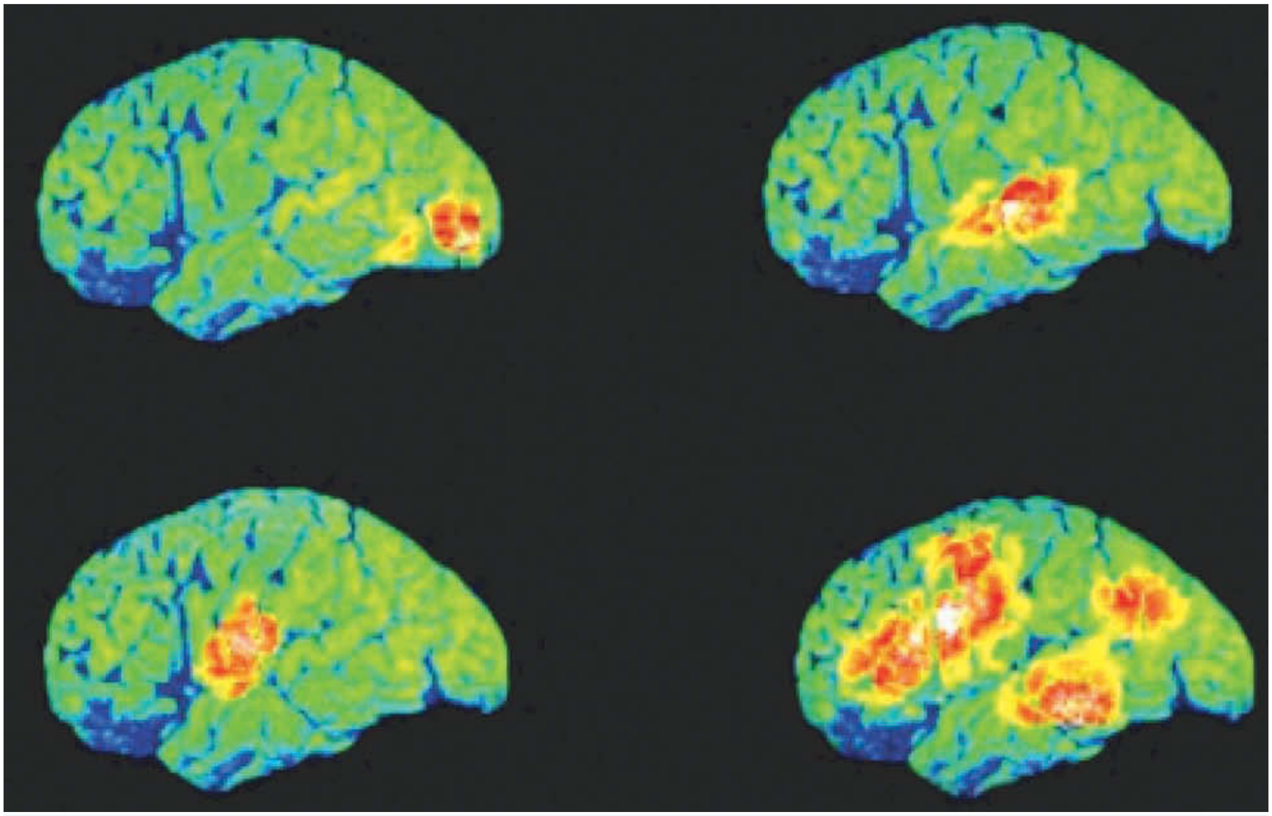

Figure 4.23 PET scans of left hemisphere areas activated during sight, hearing, speaking and thinking. In PET scans, the 'warmer' colours of red and yellow indicate the highest level of activity and the 'cooler' colours of blue and violet indicate lowest activity. Shown upper left, sight activates visual cortex at the back of the brain in the occipital lobe. Shown upper right, hearing activates the auditory cortex in the temporal lobe. Shown lower left, speaking activates speech production areas in the frontal and temporal lobes. At lower right, thinking about verbs and speaking them generates widespread activity in frontal, temporal and parietal lobe areas.

on Resources

Weblink Video on PET use to study language processing in the brain 6 m 25 s

Functional magnetic resonance imaging (fMRI)

PET scanning was the preferred neuroimaging technique for brain research before fMRI technology became available in the early 1990s. Like PET, **functional magnetic resonance imaging (fMRI)** detects and records brain activity by measuring oxygen consumption across the brain. However, it does not expose participants to radioactive tracers.

The fMRI exploits the fact that blood is more oxygenated in highly active parts of the brain. Brain areas that are more or less active during a given task are identified by detecting changes in oxygen levels in the blood as it flows through the brain.

fMRI uses standard MRI technology, producing 2D or 3D images like those of a PET scanner, but more precise and detailed. As with the PET, the colour variations reflect the level of activity of different brain areas and structures while a participant engages in an experimental task.

fMRI is often preferred in psychological research because it can take numerous pictures of the brain in rapid succession and can therefore detect brain changes as they occur from moment to moment. Consequently, it can provide an image of brain activity averaged over seconds, rather than the several minutes required by PET. This also means that fMRI images of brain structures and activity are more highly detailed and more precise.

More recently, researchers have adapted the fMRI to simultaneously scan the brains of two participants; for example, when engaged in social interaction, joint problem-solving, arguments, making small movements, touching each other, and so on (Lee, et al., 2011). In **dyadic functional MRI (dFMRI),** an MRI scanner is fitted out for dual scanning of two participants while they lie side by side, as shown in Figure 4.25 on the next page.

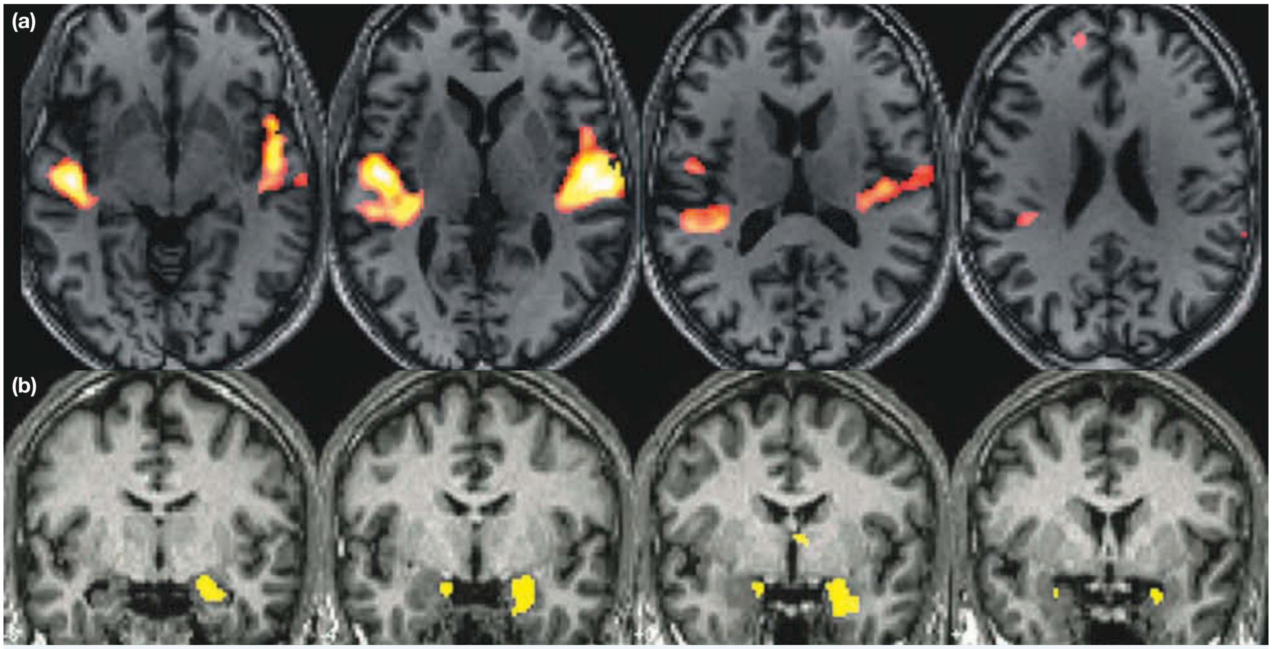

Figure 4.24 Examples of fMRI images from scans of healthy human brains. (a) Brain activity when listening to the sounds of classical music. Highlighted areas show activity mainly in auditory cortex within the temporal lobes. (b) Brain activity when smelling. Highlighted areas show activity mainly in the olfactory cortex within the frontal lobes.

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Weblink Video on fMRI use for decision-making research 6 m 41 s

Figure 4.25 fMRI technology is used to simultaneously scan two interacting brains as the participants respond to an experimental task.

Source: Lee, R.F. & Jones, D.J. (2012). Decoupled circular-polarized dual-head volume coil pair for studying two interacting human brains with dyadic fMRI. *Magnetic Resonance in Medicine, 68*(4), 1087–1096.

Other functional neuroimaging techniques

There are other functional neuroimaging techniques which researchers can access. All have strengths and limitations.

These include:

- *single photon emission computed tomography* (SPECT)
- *magnetoencephalography* (MEG)
- *diffuse optical tomography* (DOT)
- *diffuse tensor imaging* (DTI)
- *near infra-red spectroscopy* (NRIS)
- *functional near infra-red spectroscopy* (fNIRS).

Although functional techniques have a distinct advantage for psychological research on the brain, an image of more or less blood flow does not necessarily mean more or less brain activity. Similarly, just because a brain area is active (or inactive), it does not necessarily mean that it is actually engaged (or not engaged) in the mental process or behaviour under investigation.

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learnMORE | Other neuroimaging techniques

- Electroencephalography (EEG)
- Transcranial magnetic stimulation (TMS)

Access your learnON format for more information about these techniques and their use.

4.3 LEARNING ACTIVITY 4

Review

1. Distinguish between structural and functional neuroimaging.
2. Give three examples of how neuroimaging has advanced brain research and knowledge compared with research that did not have access to the technology.
3. Complete the following table. For 'Other', include an example and information about a more recently developed neuroimaging technique that may be used in brain research.

Technique	Name	Type of information obtained	Advantage	Limitation
CT				
MRI				
fMRI				
PET				
Other, e.g. SPECT				

4. Explain which neuroimaging technique(s) would be best to test a research hypothesis for three of the following topics.
   a. Determine the extent of structural injury (damage) caused by disruption of blood supply to the brain.
   b. Identify brain areas involved in visual perception.
   c. Examine the role of the cerebellum, located at the lower, rear part of the brain, in speech production.
   d. Identify specific brain areas affected by a tumour.
   e. Observe sex differences in brain functioning while reading a map.
5. In what way does the use of neuroimaging overcome ethical constraints in studying the live, intact human brain?
6. Identify and briefly describe a significant ethical considerations relevant to one of the following fictitious brain research studies.

Task descriptions

a. Study on aggression

A researcher proposes to conduct a brain study using PET with two groups of children from local kindergartens. One group will be the experimental group. This group will consist of children identified as 'aggressive' by their teachers. The control group will consist of children identified as 'not aggressive' by their teachers.

The researcher will investigate whether the children identified as 'aggressive' have any area of their brain that is more or less active when viewing a violent cartoon, as compared with the brains of children identified as 'not aggressive'. A radiologist will be in attendance to give the required radioactive substance, operate the PET scanner and help interpret the PET images. Parents will be refused entry to the research area so that the children are not distracted during the experimental procedure.

b. Study on lie detection

Following a terrorist suicide bombing that killed many innocent people in a major European city, a researcher decides that there is a need for a reliable and effective means of detecting lies and deception. The researcher proposes to conduct a series of neuroimaging studies to test the effectiveness of different neuroimaging techniques in lie detection for security purposes; for example, to screen individuals at airports.

The researcher also believes that neuroimaging techniques could be used by police, courts and parole boards for lie detection purposes and by juries to assist with decision making. Volunteer adult males who are devout members of a religious cult will be compared with adult males who are not members of this cult, and also with a group of adults who are atheists (do not believe in God). To encourage participation in the research study and compensate participants for inconvenience over a three-month period, all participants will be paid.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

4.3 LEARNING ACTIVITY 5

Multiple-choice questions

1. Neuroimaging techniques used in psychological research can be classified in two categories called ______ neuroimaging.
   A. brain and body
   B. invasive and non-invasive
   C. ethical and unethical
   D. structural and functional
2. Which neuroimaging techniques could be used to investigate whether a specific area at the front of the brain receives information from visual areas at the back of the brain during a problem-solving task?
   A. fMRI and CT
   B. MRI and CT
   C. fMRI and PET
   D. PET and CT
3. Which neuroimaging technique is based on x-rays?
   A. fMRI
   B. CT
   C. PET
   D. MRI
4. Which neuroimaging technique will produce images of brain tissue that have the least clarity or detail?
   A. fMRI
   B. PET
   C. MRI
   D. CT
5. An advantage of a PET scan for brain research when compared with a CAT scan is that
   A. a PET scan provides information about brain activity, whereas a CAT scan provides only structural information.
   B. a PET scan provides information about brain movement, whereas a CAT scan provides only structural information.
   C. a PET scan provides magnetic brain images whereas a CAT scan provides computerised cross-sectional brain images.
   D. a PET scan is non-invasive, whereas a CAT scan is invasive because radiation is used.

To answer these and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

4.4 Roles of brain areas

The **brain** is an intricate network of cells that plays a vital role in processing information from the body's external and internal environments and in directing responses. It is kept continually informed of both the ever-changing environments through sensory information detected and sent to it by the many and varied sensory receptor cells located at or near the surface of the body and also deep within the body. Because of its role in overseeing almost everything we think, feel and do, it is sometimes called the 'control centre' or 'master regulator'.

The brain is more than a mass of networked cells. Brain cells are organised into many identifiable areas (or 'regions') and structures that have specialised functions. For example, some parts are dedicated to sensory or motor functions.

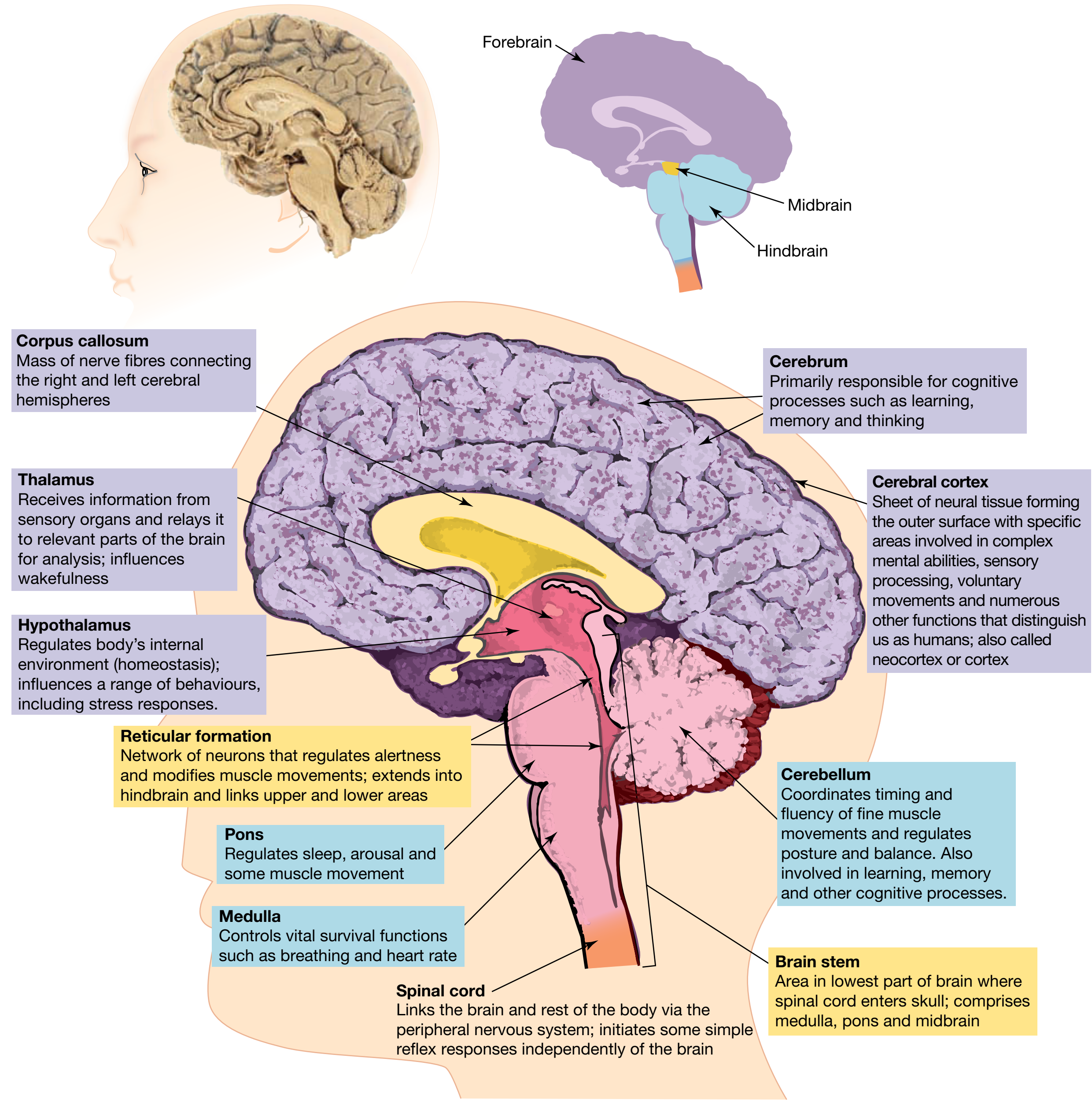


Figure 4.26 Brain structures and functions.

Most parts, however, have integrating and overlapping functions. What seems to be a simple task, such as naming a familiar object, will trigger activity in multiple structures and areas throughout your brain. These include parts at the back and side to process visual information received from your eyes, parts at the front, at the sides and near the centre to recover information from memory and to identify the object, and parts towards the front involved in language and speech production to state the name of the object.

Many brain functions involve the activation of interconnected nerve cells that form *neural pathways* which link different brain areas and structures. Within the brain, these pathways are often referred to as neural *circuits* or *tracts*. Some span short distances and others extend from one side of the brain to the other. Neural pathways also connect the brain to other parts of the nervous system and the body. This enables the brain to gain information about what is going on inside and outside the body.

When looking at the brain, the outer cerebral cortex covering most of it is the most prominent part. We examine the cerebral cortex and its functions in the next section. First, we consider areas and structures beneath the cortex.

4.4.1 Roles of the hindbrain, midbrain and forebrain

Neuropsychologists often describe the brain using a basic structure comprising three main areas — the hindbrain, midbrain and forebrain. This is based on how the brain develops early in life. Each area is associated with identifiable mental processes and behaviour. The more basic survival mechanisms develop earlier than the more 'higher order' functions and are located deep within the brain.

Hindbrain

The hindbrain is located at the base of the brain around the brain stem. The **hindbrain** is a collection of lower-level brain structures that include the medulla, pons and cerebellum. These control or influence various motor functions and vital, autonomic responses such as breathing and heart rate, as well as sleep and arousal ('alertness'). Autonomic responses occur without you having to consciously think about them.

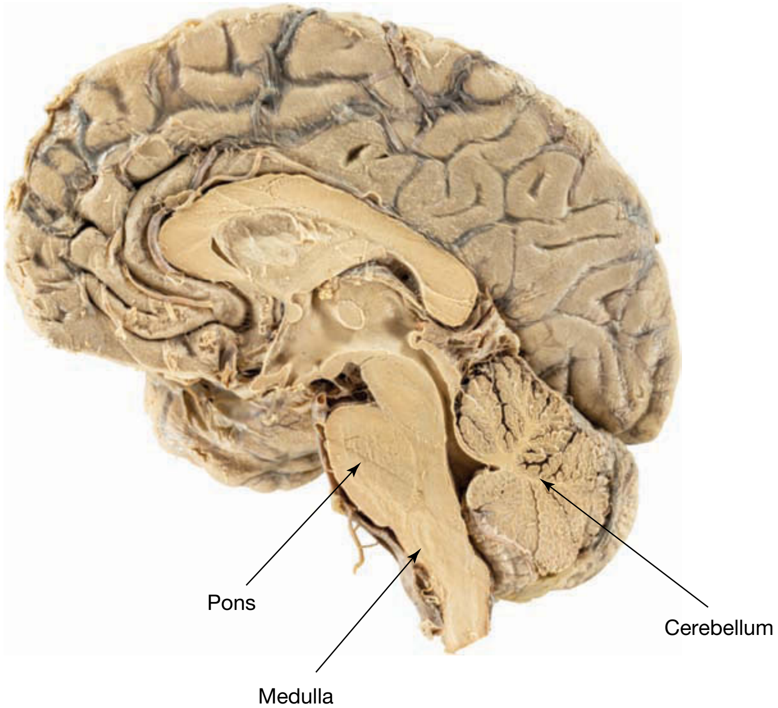


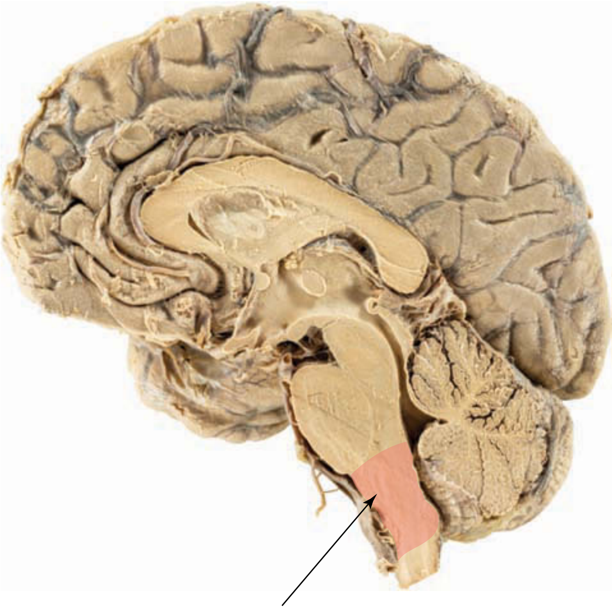
Figure 4.27 The main structures of the hindbrain are the cerebellum, medulla and pons.

Medulla

The medulla is the lowest part of the brain and a continuation of the spinal cord, so it connects to the brain.

The **medulla** controls vital bodily functions such as swallowing, breathing, heart rate, blood pressure, vomiting, salivating, coughing and sneezing, all of which occur automatically and are essential for survival. For example, in regulating the cardiovascular and respiratory systems, it determines, second by second, how rapidly and heavily we should breathe, how quickly our heart should beat, and how much blood it should pump.

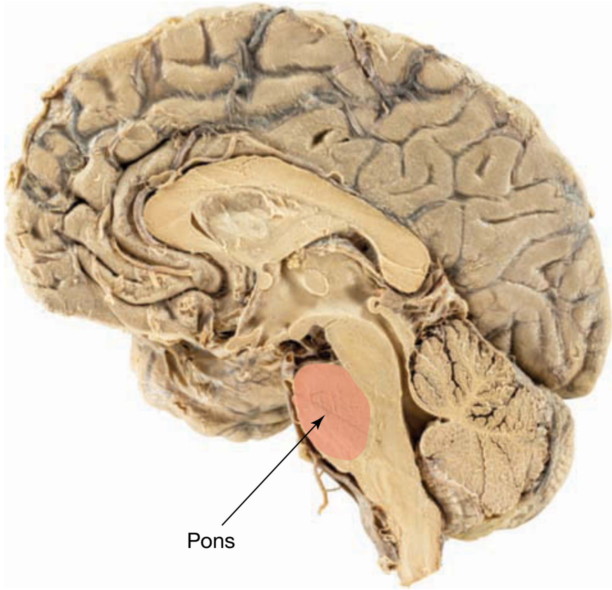
This is why a serious injury to the medulla, as could occur through a blow to the back of the head, is often fatal. Some parts of the medulla are also involved in sensations such as touch, pressure and vibration.



Pons

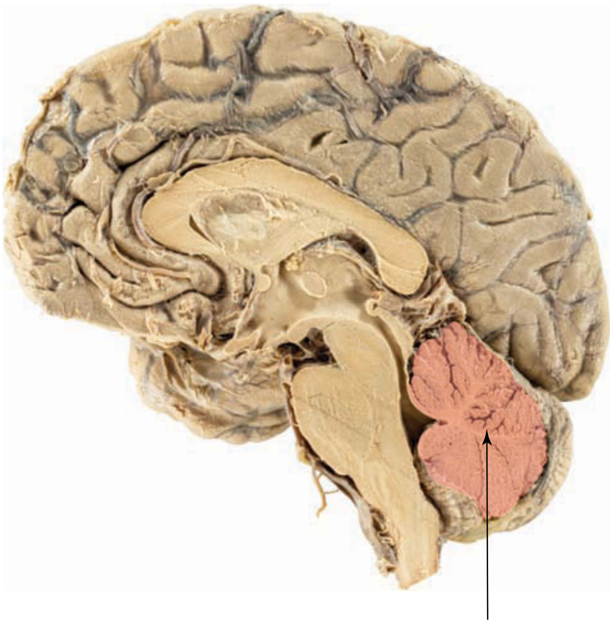
Just above the medulla is the pons, a small bundle of neural tissue about 2.5 cm long. The **pons** is involved in sleep, dreaming and arousal from sleep ('waking'), as well as helping control breathing and coordination of some muscle movements.

The pons also serves as a 'bridge' that connects parts of the brain with one another by relaying messages between the cerebral cortex and cerebellum and between the medulla and midbrain. For example, information from the ear first enters the brain from the pons, and messages for voluntary movements are passed on from the motor areas of the cerebral cortex to the cerebellum.



Cerebellum

The **cerebellum**, located at the base of the brain (attached to the brain stem), is a cauliflower-shaped structure about the size of a tennis ball in adult brains. It is the second largest part of the brain with 10% of the brain's mass, yet contains about 80% of the brain's neurons (Herculano-Houzel & Lent, 2005).



The cerebellum coordinates fine muscle movements and regulates posture and balance. Although the commands for movement are initiated higher up in the brain, the cerebellum organises and adjusts muscle activity to help ensure movement is smooth and precise so that it's performed more or less automatically. The cerebellum makes rapid-fire calculations about which muscles must be activated and by exactly how much.

Figure 4.28 The cerebellum coordinates fine muscle movements and regulates posture and balance.

The cerebellum is involved in activities requiring a rapid and skilled sequence of movements, such as when speaking and texting. It is particularly active when you learn a new movement or when you perform a sequence of movements where the next movement cannot be predicted in advance. It is also involved when you make everyday voluntary, purposeful movements, such as when reaching to pick up a cup of coffee, so that your arm and hand make one continuous movement.

Damage to the cerebellum makes it difficult to coordinate muscle control for everyday activities such as reaching, walking, throwing a ball or riding a bike. There are problems with balance, and damage can also contribute to difficulties with speech, which involves intricate movement control.

The cerebellum is also involved in learning and memory associated with movement in particular. For example, when we learn to speak or play a musical instrument, the necessary, detailed control information is believed to be processed and temporarily stored within the cerebellum, before it is transferred to the cerebral cortex for more permanent storage. Research findings suggest that the cerebellum may also play a role in other mental processes, including spatial learning, navigation and spatial memory (Bergland, 2015).

Midbrain

As the name suggests, the midbrain is in the central part of the brain. It is about 2.5 cm long and contains neural pathways connecting upper and lower brain areas. The **midbrain** is a collection of structures involved with movement, processing of visual, auditory and tactile sensory information, sleep and arousal.

The midbrain receives a large amount of information from the eyes and ears and processes this to help produce orienting movements. For example, if you are walking and hear a car braking suddenly and loudly, the sound registers in your midbrain, which then triggers muscles in your neck and for eye movements to enable you to turn your head to look in the direction of the sound. This is coordinated movement, but not as complex as coordination by the cerebellum.

Other midbrain structures are also involved with movement, particularly limb movement. For example, the *substantia nigra*, which has an important role in the control of voluntary limb movements, is located above the brain stem. Movement disorder symptoms of Parkinson's disease (such as slowness of movements and tremors when the limbs are at rest) are related to damage to the substantia nigra (and its interaction with other parts of basal ganglia that are located in the forebrain), particularly the neurotransmitter ('brain chemical') produced there.

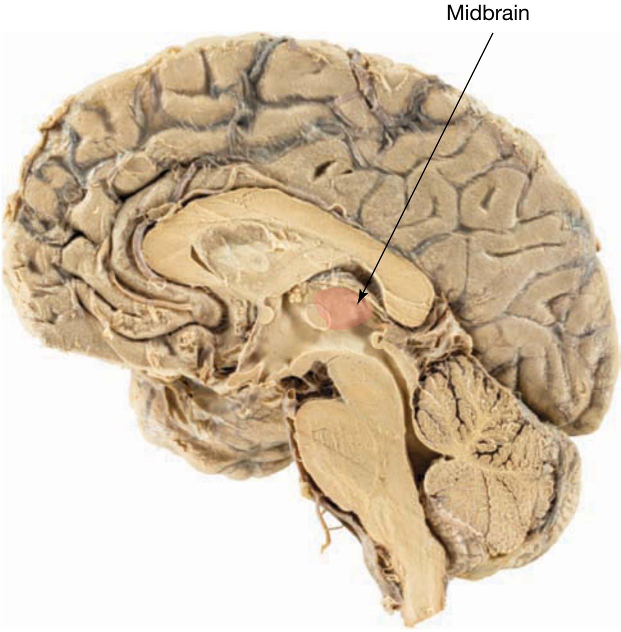
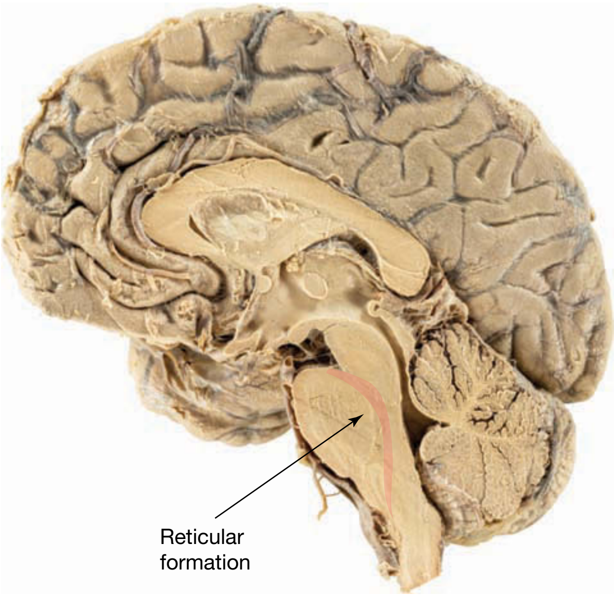


Figure 4.29 The midbrain is a collection of structures involved with movement, processing sensory information, sleep and arousal.

Reticular formation

Running through the centre of the midbrain and the hindbrain (which includes the brain stem) and upward to the forebrain is the reticular formation, a network of neurons, about the thickness of your middle finger. When viewed through a microscope, it resembles white netting or lacing, which is why it is called reticular (reticular means 'like a network').



The **reticular formation** helps screen incoming information so as not to overload the brain, alerts higher brain centres to important information, helps maintain consciousness, and regulates arousal (such as awakening from sleep) and muscle tone (tension).

A part of the reticular formation is called the *reticular activating system* (RAS) that extends in many directions from the reticular formation to different parts of the brain and to the spinal cord. The RAS looks something like a bicycle wheel hub, with spokes running in all directions. Its ascending pathways (upward 'tracts') extend to the cerebral cortex and its descending pathways (downward 'tracts') extend to the spinal cord, as shown in Figure 4.30 below.

The RAS regulates arousal by either increasing or dampening arousal in response to feedback from upper and lower brain areas. It influences whether we are awake, drowsy, asleep or in some state in between. When our RAS is less active, we go to sleep. Many general anaesthetics work by reducing the activity of the RAS, making the patient unconscious. Damage to the RAS can seriously disrupt the sleep–waking cycle and even result in a coma or chronic vegetative state.

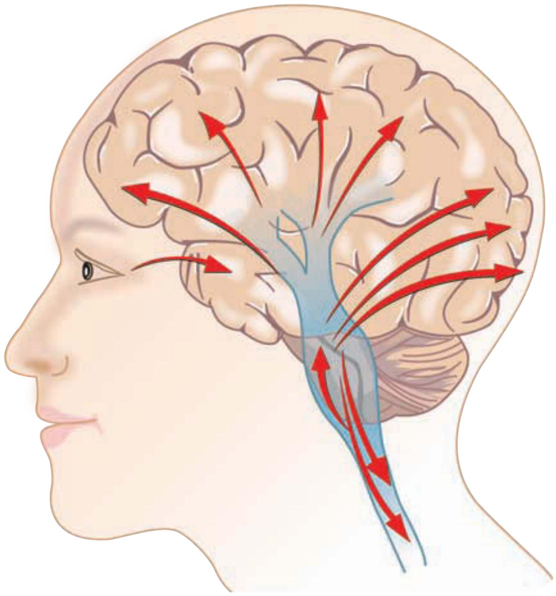


Figure 4.30 The reticular activating system (RAS) is a part of the reticular formation within the midbrain. It has both ascending and descending pathways through which arousal and muscle tone are regulated.

In regulating arousal, the RAS also influences what we pay attention to. Neurons of the RAS send out a steady stream of impulses that keep upper brain areas (cerebral cortex) active and alert, taking account of the incoming flow of sensory and motor information. The RAS can 'highlight' information of potential importance, directing attention towards potentially significant events. For example, the sleepy driver in outback Australia who snaps to attention when a kangaroo appears in the middle of the road can thank the RAS for arousing the rest of their brain.

Through its descending pathways the RAS influences muscle tone and consequently the degree of muscle movement. The extent of muscle tension or relaxation affects how much the muscle will move; that is, a relaxed muscle will produce less movement than a tense muscle. The RAS does not cause or initiate muscle movement; rather it modifies movement once it has begun.

Forebrain

The forebrain is the largest and most prominent part of the brain. It is located above the midbrain and extends across the top of the brain. Its numerous neural pathways connect with structures in the midbrain and hindbrain to coordinate brain activity.

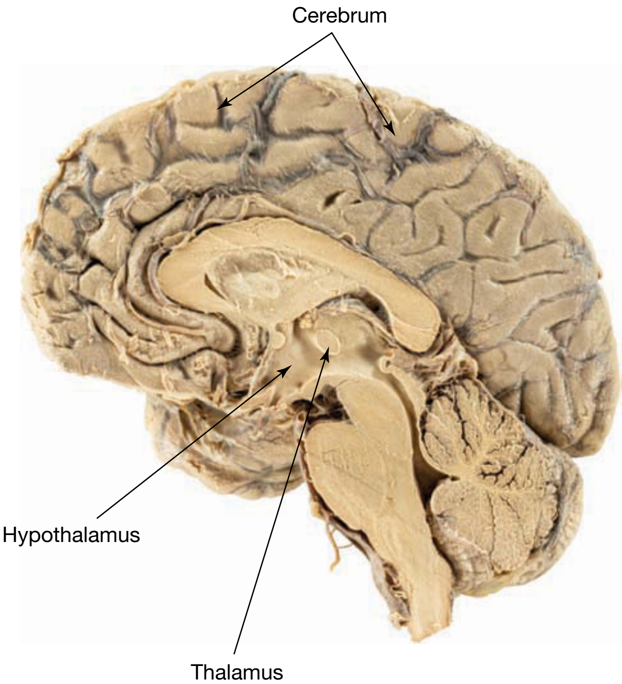
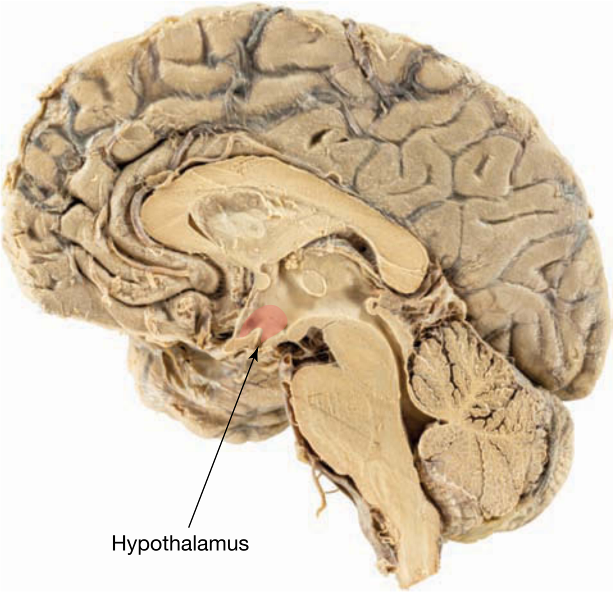


Figure 4.31 Structures of the forebrain include the hypothalamus, thalamus and cerebrum.

The **forebrain** is a collection of upper-level structures that include the hypothalamus, thalamus and cerebrum. Together with other brain areas and structures, the forebrain regulates complex cognitive processes such as thinking, learning, memory and perception, as well as various aspects of emotion and personality.

Hypothalamus

Although only about the size of a sultana grape, the **hypothalamus** has a vital role in maintaining the body's internal environment (i.e. homeostasis) and takes part in numerous behaviours. Its main functions include regulating the release of hormones from various glands in the body (through its control of the *pituitary gland*) and influencing behaviours associated with basic biological needs, such as hunger, thirst and sleep.



The hypothalamus is a part of the limbic system so it is also involved in emotions such as anger and fear. The *limbic system* is an interconnected group of forebrain structures located along the base of the cerebral cortex and includes the amygdala, hippocampus and hypothalamus.

The limbic system generally controls emotional and motivated behaviour and certain types of memories, but its specific structures have more prominent roles in these functions. For instance, the *amygdala* is involved in the production and regulation of emotions (especially fear) and the *hippocampus* in the formation of new long-term memories.

The amygdala is often described as the 'emotion centre of the brain' but it does not have exclusive control of emotions. The experience of emotion usually has a cognitive component underlying the way in which it is expressed, so other forebrain areas are also involved.

Damage to the hypothalamus can have a very significant effect on a person's lifestyle. Depending on exactly where and how severely the hypothalamus is damaged, it could result in an inability to regulate internal body functioning (such as maintaining a constant body temperature), problems with the normal sleep and waking cycle, an overwhelming urge to eat, uncontrollable anger, or the degeneration of sex organs and a significant reduction in sex drive (in males only).

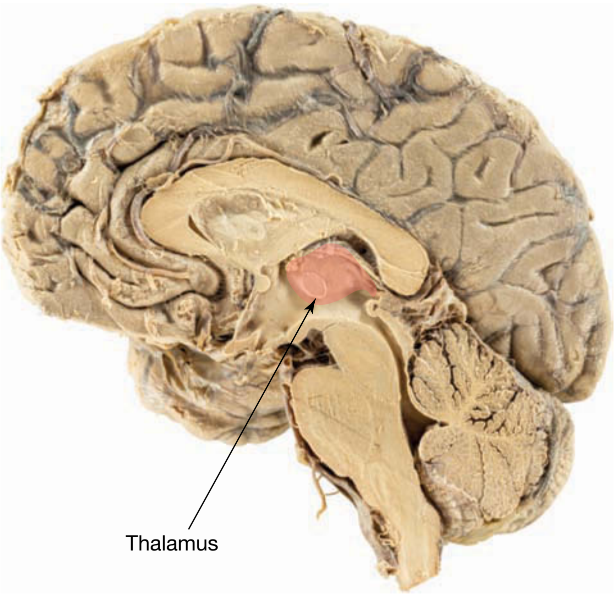
Thalamus

Imagine sticking an index finger in each of your ears and pushing inward until they touch. That is where you would find the thalamus. It is about 3 cm in length and comprises two parts that look like oval-shaped footballs. Each one of these lies within a different hemisphere. Given its location and functions, the thalamus is often described as the gateway from the lower part of the brain to the cortex in the upper part.

The **thalamus** filters information from almost all the receptor sites that detect sensory information (except the nose), then passes it to relevant areas of the brain for further processing. For example, one part of the thalamus receives visual input from the eye via the optic nerve and sends this information to the visual cortex for processing and interpreting. Thus, the thalamus functions like a 'relay station' in the brain.

A considerable amount of information from the cerebral cortex also passes through the thalamus to lower brain structures, the spinal cord and out to the rest of the nervous system. For example, the thalamus has neurons that relay messages between motor cortex areas and movement control centres in the brain stem (such as the cerebellum).

The thalamus appears to play a role in attention as well. Its function is not just to route messages to the appropriate brain areas and structures. The thalamus actively filters the vast amounts of incoming to-be-attended-to sensory information, highlighting and giving more weight to some inputs and de-emphasising or giving less weight to others.



Areas of the thalamus also have a crucial role in regulating arousal through their connection to the reticular formation and nerve pathways that form the reticular activation system. Damage to these areas results in lowered arousal, ranging from lethargy to coma. Damage to the thalamus may also result in visual or hearing impairment, or an inability to feel sensations when touched.

Neural activity involved with the sense of smell completely bypasses the thalamus. This perceptual system has its own individual 'relay station' called the *olfactory bulb*, which is located near the area of the brain that controls emotion. This may help explain why certain smells, such as the odour of a particular perfume or the smell of a cake cooking, may bring back certain emotions or memories of particular experiences in your life (Wade & Tavris, 1990).

Cerebrum

The cerebrum is located above and in front of the cerebellum and occupies most of the forebrain. The **cerebrum** consists of an outer surface called the cerebral cortex and masses of neural tissue where neurons form connections with each other and receive and process incoming and outgoing information. The cerebrum and its outer cortex are primarily responsible for almost everything we consciously think, feel and do.

The cerebrum (including the cortex) is divided into two cerebral hemispheres. There is one on the left and one on the right of a deep groove that runs from the front to the back (called the *longitudinal fissure*). Both hemispheres remain connected, mainly by the corpus callosum which enables information exchange and coordinated functioning of the brain. Each hemisphere can be further subdivided into four areas called *lobes*, which are described in the next section.

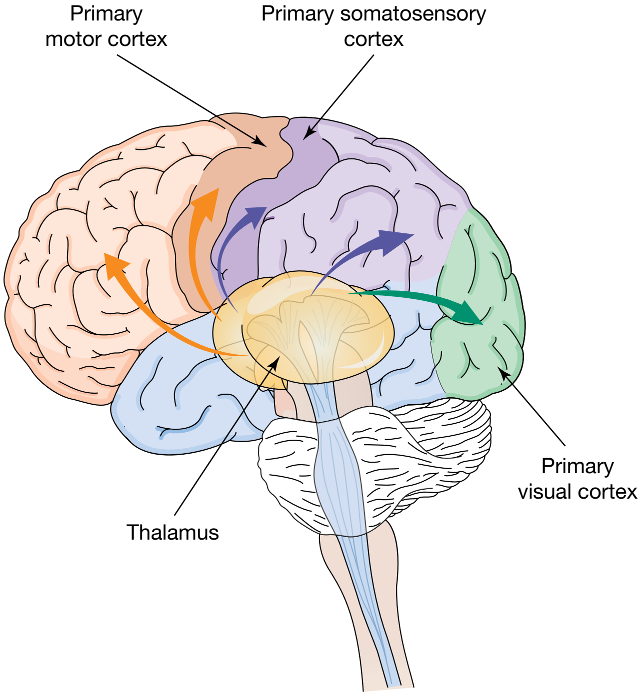


Figure 4.32 Almost all sensory and motor information going to and from the cerebral cortex is processed through the thalamus. This diagram shows some of the neural pathways from different regions of the thalamus to specific areas of the cerebral cortex.

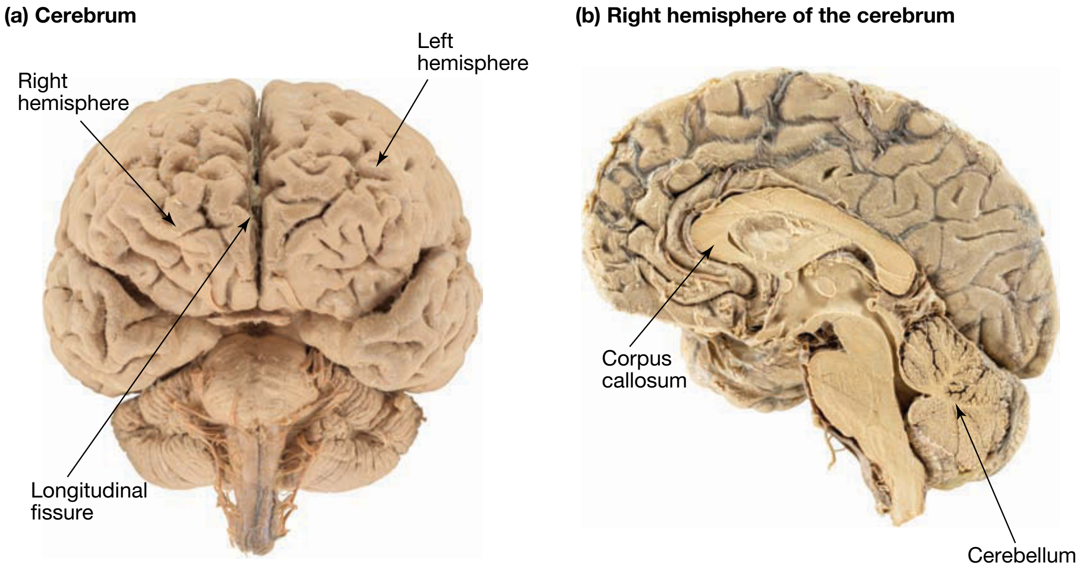


Figure 4.33 (a) The nearly symmetrical hemispheres of the left and right hemispheres of the cerebrum shown front on. (b) A side view of the cerebrum's right hemisphere revealing the corpus callosum and cerebellum.

4.4 LEARNING ACTIVITY 1

Review

Complete the table to summarise roles of structures in different brain areas.

Area	Structure	Main functions
Hindbrain	medulla pons cerebellum	
Midbrain	reticular formation	
Forebrain	hypothalamus thalamus cerebrum	

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

4.4 LEARNING ACTIVITY 2

Review

1. Label the brain and show the location of each area and structure named in learning activity 1.

2. 'The cerebellum is most active when you perform a sequence of movements where the next movement cannot be predicted in advance.' Give an example of when this may occur.
3. Which structure is a continuation of the spinal cord?
4. How many of each of the following structures are there in the brain?
   a. cerebellum
   b. reticular formation
   c. thalamus
   d. hypothalamus

5. In many American states, a police officer may ask a driver to walk a straight line as a simple and quick measure of a potential drink-driving offence. An intoxicated driver will usually be unable to consistently remain on the line or walk precisely, smoothly and steadily. Considering the driver's impairment, which brain structure is likely to be most affected by the alcohol?

6. a. Doctors have determined that a patient's hindbrain has been injured as the result of an accident. What changes could be expected in the patient's thoughts, feelings and/or behaviour if the injury occurred specifically to the:
      i. medulla
      ii. pons
   b. Which neuroimaging technique would provide the clearest scan of damage?
   c. If the patient demonstrated obvious and lasting changes in personality, what other brain area or structure should be investigated?
7. How does the hypothalamus primarily regulate behaviour and the internal bodily state?
8. a. Why is the thalamus described as a 'relay station'?
   b. What other brain structure consistently relays information?
9. In terms of structure and function, how does the cerebrum in humans differ from that of other animals?
10. What behaviour and mental processes could be expected with only the brain stem intact and undamaged? Explain your answer.

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4.4 LEARNING ACTIVITY 3

Analysis and evaluation of research on the thalamus

A study providing evidence for the role of the thalamus in filtering and directing attention to sensory input was conducted by American psychologist David LaBerge and psychiatrist Monte Buchsbaum (1990).

In one condition, participants had to attend to the presence or absence of a single letter. In a second condition, participants had to 'look out' for the same letter embedded among other letters. The second task required more 'attention' than the first because there was now a requirement to filter or sift through the assortment of letters to find the target letter.

A PET scanner was used to observe areas of the brain's activity as participants completed the tasks. Analysis of the scans showed that the second condition brought about greater PET activation of a specific area of the thalamus than the first condition, even when stimulus complexity was accounted for.

a. Name the experimental research design.
b. Identify the independent and dependent variables.
c. i. What is a potential extraneous or confounding variable that may have influenced the results?
   ii. Name and describe a procedure for controlling this variable.
d. What do the results suggest about the role of the thalamus?

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4.4.2 Roles of the cerebral cortex

This outer part of the brain is easily recognised by most people although many are unaware of its actual size. The cerebral cortex appears wrinkled like a walnut because it is crumpled up to fit into the limited amount of space available in the skull. It is only a few millimetres thick and if it were flattened out, this sheet of tissue would cover about four pages of a textbook. Only one-third of it is visible when looking from outside the brain. The rest of it is hidden within the many wrinkles and folds.

The **cerebral cortex** covers the cerebrum and is involved with complex, 'higher order' mental abilities such as perception, learning, memory, language, thinking and problem-solving. It also processes incoming sensory information and is involved with the planning and control of voluntary bodily movements. It will be active whenever you read, speak, experience an emotion, feel hot or cold, estimate time, recall an answer to a test question, plan what you will do over the weekend, appreciate a new song, come up with a creative idea, catch a tennis ball, walk up stairs or go for a jog.

Some areas of the cerebral cortex are dedicated to specific functions. For example, the primary visual cortex is almost entirely involved in receiving and processing information from the eyes. Most areas, however, do not have such specific localised functions. Instead, they perform multiple functions to enable us to think, feel and behave as we do.

Generally, the areas of the cerebral cortex and their main functions can be organised into three broad categories: **sensory areas** which receive and process sensory information, **motor areas** which initiate voluntary movements, and **association areas** which surround sensory and motor areas and deal with more complex functions that require integration of inputs of information from different areas, such as when learning strategies for a new game app, problem solving, using language, designing a new Ferrari, planning a party, language and regulation of emotions.

The largest and most recently evolved part of the cerebral cortex is called *neocortex* (meaning 'new cortex'). It is found in the brains of all mammals. Most of the cerebral cortex is neocortex. The rest is called *allocortex* or *mesocortex*. Neocortex is anatomically distinguished by its six layers of neurons. Generally, the terms cortex, neocortex and cerebral cortex are used interchangeably.

Figure 4.34 A close-up of a human brain's cerebral cortex. The protective membranes (meninges) have been peeled back to reveal the detail of the folds or bumps (gyri) and the grooves between them (sulci).

4.4.3 Cerebral hemispheres

The **cerebral hemispheres** are two almost-symmetrical brain areas running from the front to the back of the brain. They are connected by the corpus callosum and are referred to respectively as the left hemisphere and the right hemisphere.

The left and right hemispheres not only appear to be alike in overall size, shape and structure, but they also have many of the same functions. The specific area of the hemisphere responsible for each of these functions is located in approximately the same place in each hemisphere. For example, each hemisphere has motor and sensory areas that perform the same motor and sensory functions, each for a different side of the body (i.e. contralateral function). The left hemisphere receives sensory information from the *right* side of the body and controls movements on the *right* side. The right hemisphere receives sensory information from the *left* side of the body and controls movements on the *left* side.

In addition to the hemispheres having common functions, each hemisphere also has specialised functions. For example, human language is primarily a function of the left hemisphere, and the right hemisphere is primarily involved in many functions that do not depend on language, such as spatial and visual thinking and recognition of faces and tunes.

4.4.4 Hemispheric specialisation

The idea that one hemisphere has specialised functions or exerts greater control over a particular function is called **hemispheric specialisation**. The terms *hemispheric dominance* and *hemispheric lateralisation* are also sometimes used.

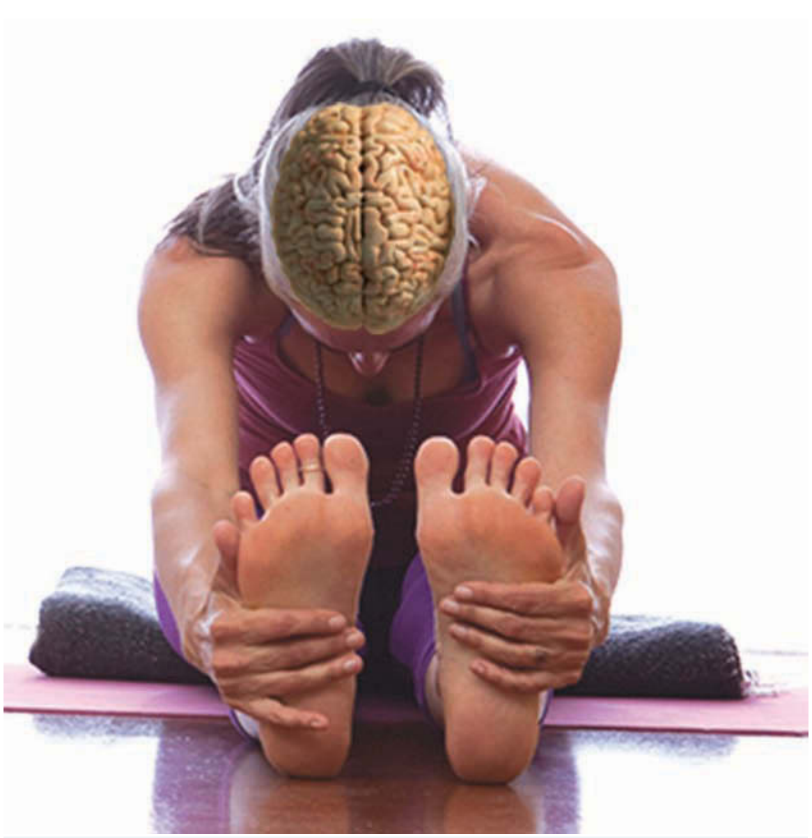


Figure 4.35 When viewed from directly above the top of the head, only the cerebral cortex covering the two cerebral hemispheres is visible. The hemispheres are alike in size, shape and structure.

Although each hemisphere can specialise or exert greater control in various functions, both the left and right hemispheres are actually involved in nearly all functions, usually acting together in a coordinated and interactive way. Ordinarily, we do not use the left hemisphere of our brain any more than the right hemisphere, and vice versa.

The earliest evidence for hemispheric specialisation came from observations of people who had suffered a brain injury affecting one hemisphere but not the other. It was observed that damage to the left hemisphere often resulted in difficulties with language-related activities such as understanding speech and talking fluently. Damage to the right hemisphere often resulted in difficulties with tasks that did not depend on language. These were mainly dependent on visual and spatial abilities, such as when using a map to navigate through an unfamiliar location.

Left hemisphere specialisations

The left hemisphere specialises in verbal and analytical functions.

Verbal functions involve the use or recognition of words such as in reading, writing, speaking and understanding speech, all of which are important in language.

Analytical functions essentially involve breaking a task down into its key parts and approaching it in a sequential step-by-step way. This is required, for example, when you use logical reasoning to interpret and apply a formula to solve a mathematics problem, critically evaluate an experimental design in psychology, or prepare a meal at dinner time.

Analytical functions are also involved when you develop an argument for a debate, plan how to save up enough money to buy a car or find enough time to complete all the homework for six different subjects.

Right hemisphere specialisations

The right hemisphere specialises in *non-verbal functions* that do not depend on language skills. Its non-verbal functions include:

- spatial and visual thinking, such as completing a jigsaw puzzle, reading a map or visualising the location of objects or places
- recognising faces, patterns and tunes
- appreciating music and artworks (but not necessarily producing them)
- creative thinking
- daydreaming.

The right hemisphere is also more involved in recognising emotions from facial cues ('signals'), such as a raised eyebrow or trembling lips, and in non-verbal emotional expression.

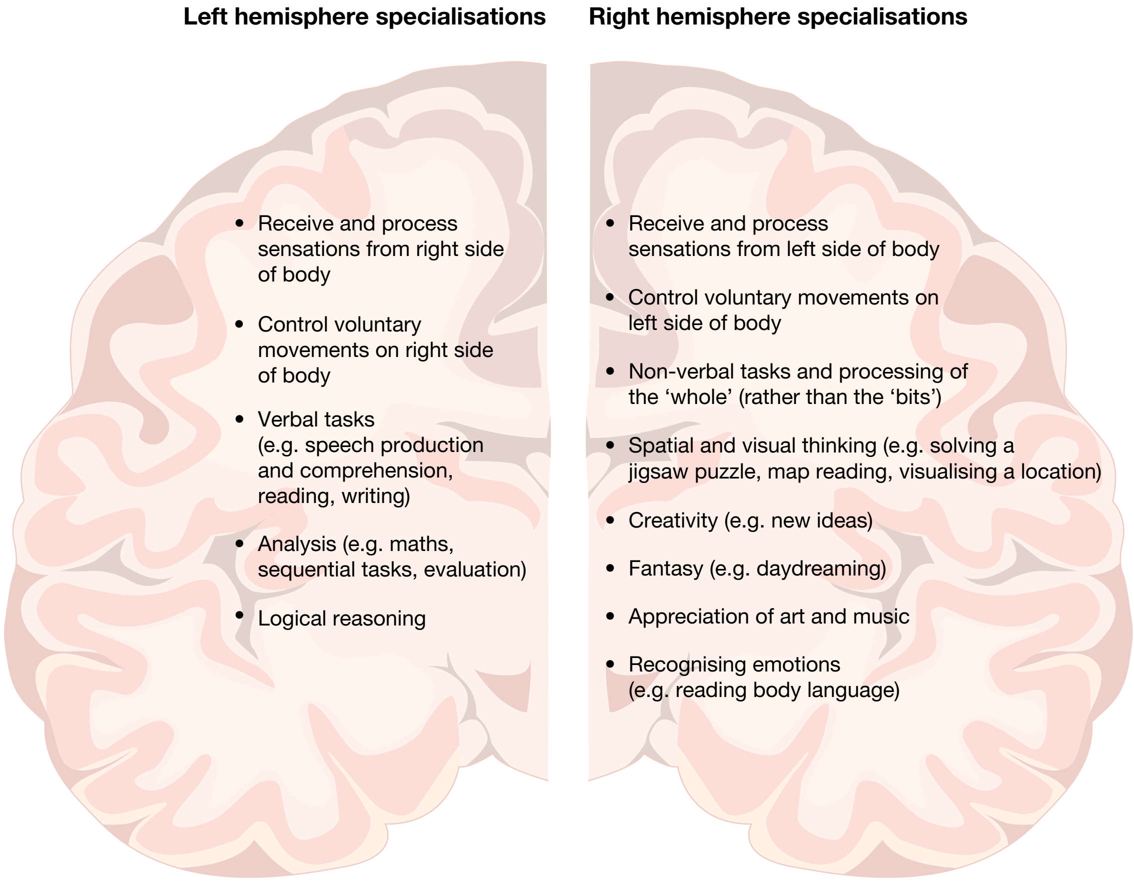


Figure 4.36 Specialised functions of the cerebral hemispheres.

Resources

Weblinks Examples of online left brain/right brain tests to demonstrate and review from an empirical evidence perspective.

Teacher digital document Practical activity — eye gaze as an indicator of hemispheric specialisation

4.4 LEARNING ACTIVITY 4

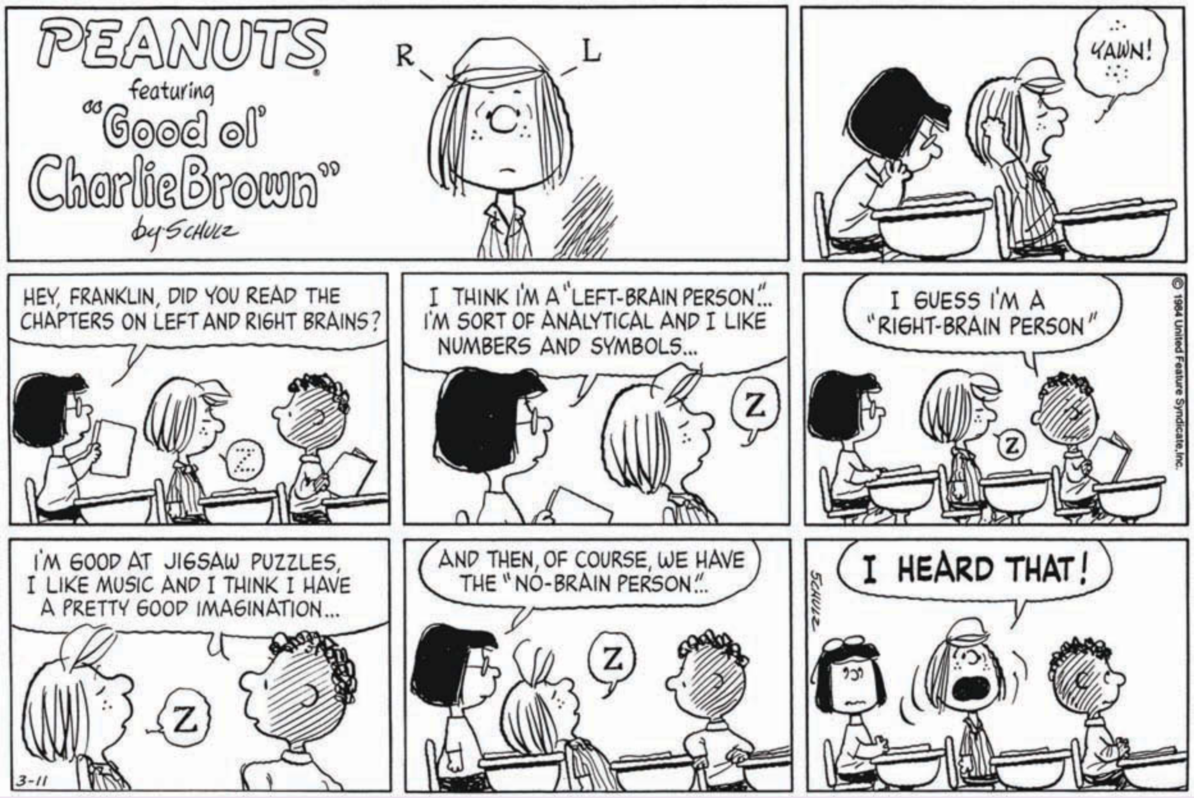
Review

1. Construct a definition of the cerebral cortex that refers to its locations and functions.
2. List three key functions that the cerebral hemispheres have in common.
3. Explain the meaning of the term hemispheric specialisation.
4. Identify the hemisphere that specialises in each of the following functions. Enter L or R in the spaces provided.
   a. ________ appreciating the beauty of a forest
   b. ________ judging whether a car will fit into a parking space
   c. ________ kicking a football with the left foot
   d. ________ listening to someone speak
   e. ________ applying logic in an argument
   f. ________ working out if you have enough money for a holiday
   g. ________ daydreaming about being rich and famous
   h. ________ finding your way around a maze
   i. ________ speaking on the telephone
   j. ________ playing golf on a video game
   k. ________ playing Scrabble® on an iPad
   l. ________ playing Tetris™ on a smart phone
   m. ________ working out the meaning of a grin on someone's face
   n. ________ arranging a bouquet of flowers
   o. ________ giving someone the correct change for their purchases
   p. ________ recognising classmates from an old class photo
   q. ________ working out when you have to get up in the morning to get to school on time
   r. ________ raising your right hand to answer a question in class
5. A friend tells you about an internet test that determines 'hemispheric dominance' of the test-taker. The test seems very formal and involves a mixture of verbal and non-verbal tasks. Your friend did the test and one of the results indicated that they have no musical ability because of their dominant left hemisphere.

   What two key arguments could be used to dispute this result?
6. Frogs, turtles and fish have no cerebral cortex at all. Small mammals such as mice and rats have a tiny cortex; dogs and cats have relatively small cortices. But primates such as chimpanzees and humans have a much greater proportion of cortical area.

   What do these observations suggest about the relationship between cortical size and mental abilities associated with behaviour people in our society tend to regard as intelligent?

7. Study the cartoon below.



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a. How accurately does the cartoon represent left and right hemisphere specialisation? Explain with reference to examples in the cartoon.
b. To what extent is the description of any individual as either a 'left-brain' or 'right-brain' person accurate? Explain with reference to the real meaning of hemispheric specialisation or dominance.

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4.4.5 Cortical lobes

Cortical lobes are areas of the cerebral cortex associated with different functions. Each cerebral hemisphere has four lobes — the frontal lobe, parietal lobe, occipital lobe and temporal lobe. Each lobe has areas involved with sensory or motor functions, as well as association areas.

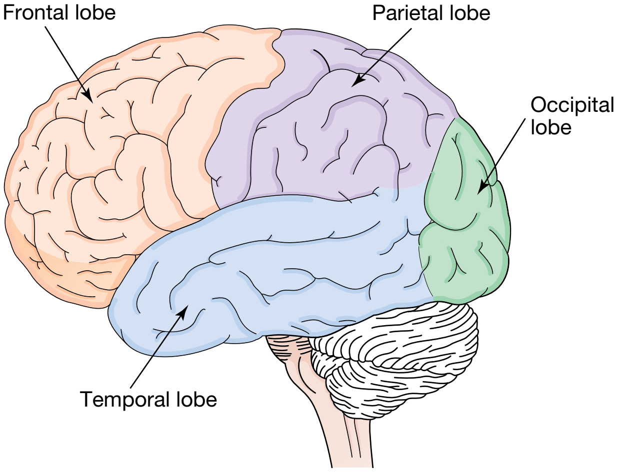

Figure 4.37 The lobes of each cerebral hemisphere

Frontal lobe

The **frontal lobe** is the largest of the four lobes and is located in the upper forward half of each cerebral hemisphere. At the front, just behind the forehead, is an association area called prefrontal cortex, which occupies more than one-quarter of the entire cerebral cortex.

The frontal lobe has numerous connections linking it to other brain areas, including other lobes and areas deep in the folds of the cerebral cortex such as gustatory cortex for taste perception (which also stretches under areas of the parietal and temporal lobes). Interconnections through neural pathways allow the cortex to receive and combine information from throughout much of the brain to perform many functions, particularly the more complex ones.

The *prefrontal cortex* is involved with sophisticated mental abilities such as reasoning, planning, problem solving, decision making and symbolic thinking (such as when using words as to represent language or numbers, letters and other 'symbols' to represent maths or music). It is also involved with attention (picking out relevant information through the senses), regulation of emotions and expression of emotional reactions, self-awareness and aspects of personality such as initiating appropriate and inhibiting inappropriate behaviour.

Some psychologists refer to this part of the frontal lobe as having an 'executive' role in all our thinking, feeling and behaving. This is because it coordinates many of the functions of the other lobes and determines our responses.

As shown in Figure 4.38, the frontal lobe is also responsible for planning and initiating voluntary bodily movements. Generally, the prefrontal cortex plans the required motor sequence then sends the instructions to an area called the premotor cortex towards the back of the frontal lobe. The *premotor cortex* prepares the appropriate movement sequence and sends the information to the adjacent primary motor cortex.

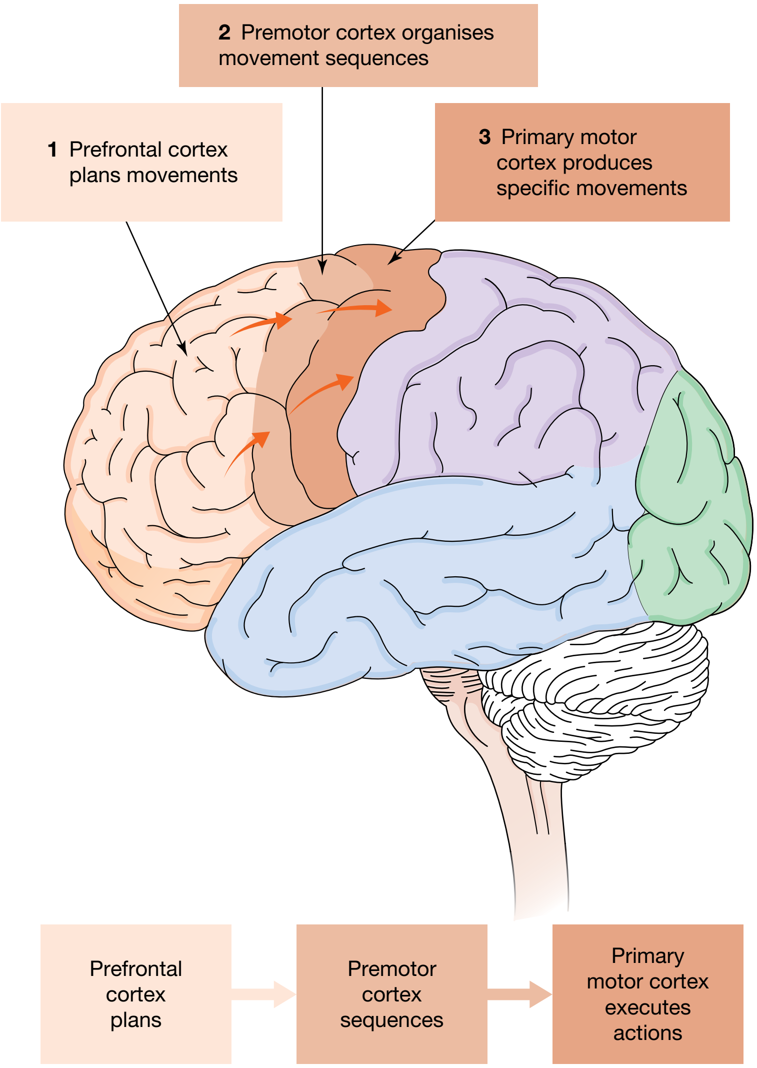

Figure 4.38 Initiating and executing voluntary motor activity within the frontal lobe.

The primary motor cortex is a strip of neural tissue located at the rear of each frontal lobe and running roughly across the top of your head. The **primary motor cortex** initiates and controls voluntary movements through its control of skeletal muscles. When you want to text a friend, the primary motor cortex activates and guides your fingers to press the desired sequence of numbers.

The primary motor cortex in the *left* frontal lobe controls voluntary movements on the *right* side of the body. Likewise, the primary motor cortex in the *right* frontal lobe controls voluntary movements on the *left* side of the body.

As shown in Figure 4.39, a different area along the primary motor cortex is involved with the movement of each specific body part. For example, a specific area of the cortex in the left frontal lobe controls movement of the thumb on the right hand. Similarly, a specific area of the cortex in the right frontal lobe controls movement of the left leg, and so on.

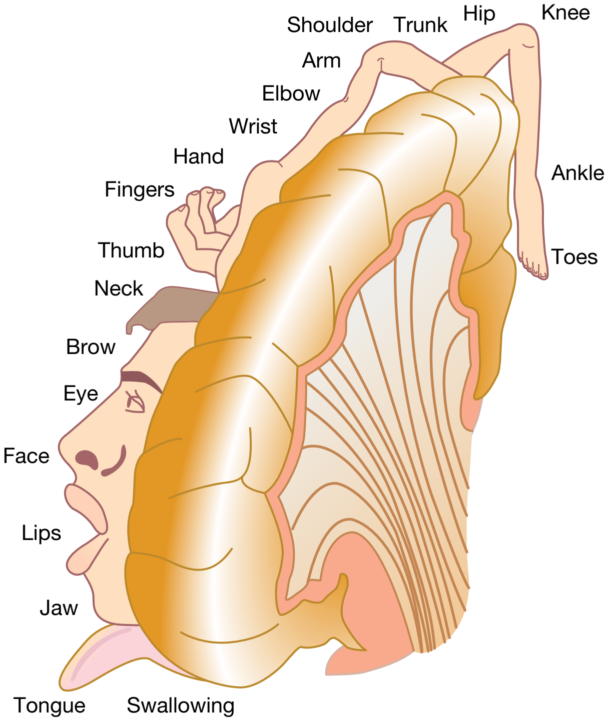

Figure 4.39 This diagram shows the organisation of the primary motor cortex. More of the cortex is devoted to body parts involved in finely tuned movement than to other parts. In addition, the lowermost parts of the body are located on the uppermost areas of the cortex and vice versa.

The amount of cortex devoted to a particular body part corresponds to the complexity, or 'fineness', of its movements. Parts that we are able to move with the greatest precision (such as the fingers and tongue) take up more cortical space than parts over which we have less control (such as the shoulder and thigh).

A specific area of cortex located next to the primary motor cortex in the frontal lobe of the left hemisphere of right-handed and of most left-handed individuals coordinates movements of the muscles required for speech and supplies this information to the appropriate motor cortex areas. This is called Broca's area.

Broca's area, shown in Figure 4.40, has a crucial role in the production of articulate speech; that is, speech that is clear and fluent. If you were to read this section of text aloud, Broca's area would coordinate messages to your lips, jaws, tongue and vocal cords to enable you to state the words clearly and fluently.

As with voluntary movements, speech production involves several different brain areas. Broca's area is linked to and interacts with other areas of the cerebral cortex that are involved with language. For example, specific areas provide information about the meaning of words and the structure of sentences, as well as the specific parts of speech such as adjectives, prepositions and conjunctions.

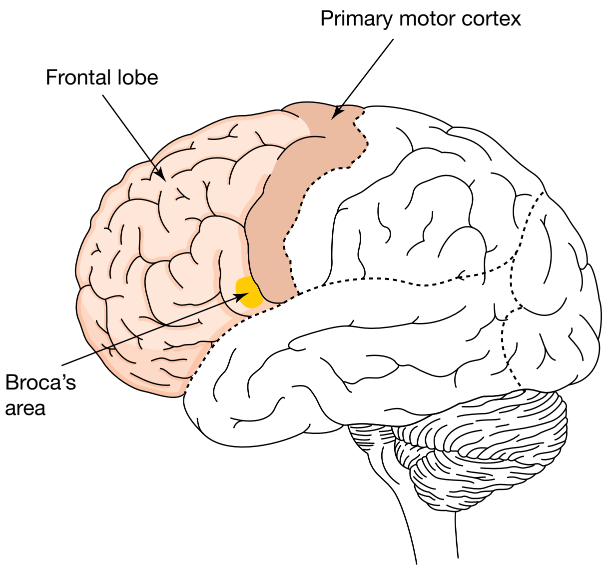

Figure 4.40 Broca's area has a crucial role in speech production.

4.4 LEARNING ACTIVITY 5

Review

1. Print a copy of the primary motor cortex in Figure 4.39. Trace another copy using transparent paper. Use the reverse side of the traced copy to create the right primary motor cortex.

   Use arrows to identify the specific area(s) of the left and right cortices that would initiate each of the following voluntary movements:
   - bending your right arm
   - wriggling the toes on your left foot
   - opening your mouth for the dentist
   - sucking on your thumb
   - winking with your right eye
   - clenching your left fist
   - kissing
   - crossing your legs
   - bending your right knee to walk up a step
   - talking.

2. Suppose you mapped the primary motor cortex of an orangutan. What would you expect to find with regard to the distribution of body parts in this cortical area? Explain your answer with reference to the proportion of the primary motor cortex likely to be occupied by four different body parts, including the arms and legs.

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Parietal lobe

The parietal lobe is located behind the frontal lobe and occupies the upper back half of the brain, but not the rearmost area.

The **parietal lobe** receives and processes bodily, or 'somatosensory', information. This sensory information includes touch and temperature (from the skin) and information about muscle movement and the body's position (from muscles, tendons and joints).

Located at the front of each parietal lobe, near the primary motor cortex, is a strip of cortex called the primary somatosensory cortex. The **primary somatosensory cortex** receives and processes sensory information from the skin and body parts such as arms, hands, legs, feet, lip, tongue and so on.

Like the primary motor cortex, the primary somatosensory cortex in the *left* parietal lobe receives and processes sensory information from the *right* side of the body. Likewise, the primary somatosensory cortex in the *right* parietal lobe receives and processes sensory information from the *left* side of the body.

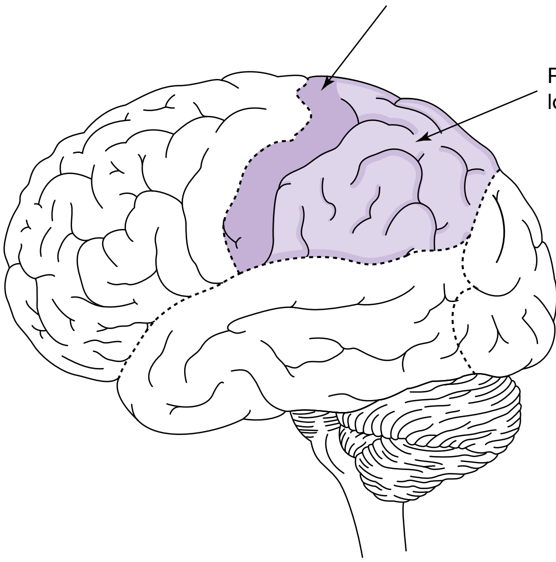

Figure 4.41 The parietal lobe and primary somatosensory cortex.

As shown in Figure 4.42, different areas of this cortex are involved with sensations of touch received from specific body parts. The amount of cortex devoted to a particular body part corresponds to the sensitivity and amount of use of the body part. For example, your lips, fingers and tongue, which are very sensitive to touch and frequently used in everyday behaviour, have more cortical space than parts that are less sensitive and used less frequently, such as the back of your legs and your hips.

The misshapen appearance of the person called a *homunculus* shown in Figure 4.43 represents the disproportionate areas of primary somatosensory cortex devoted to different parts of the body.

The parietal lobe also has association areas that are involved in functions such as attention, spatial reasoning and judging the position of our body in space. In addition, a section of cortex deep within the folds of this lobe (called *insula cortex*) is involved in taste perception.

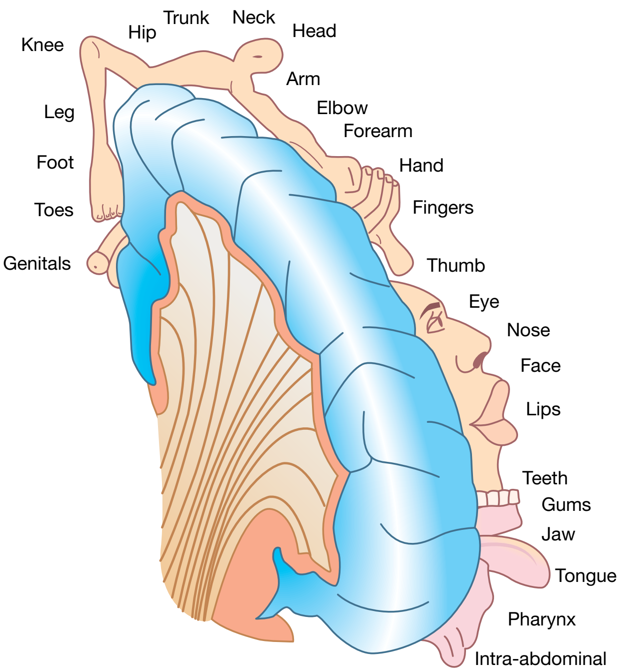

Figure 4.42 This diagram shows the organisation of the primary somatosensory cortex. More cortical area is devoted to the more sensitive body parts than to other parts. In addition, the lowermost parts of the body are located on the uppermost areas of the cortex, and vice versa.

Figure 4.43 This misshapen person (called a homunculus) represents the body parts in terms of the relative size of the area each body part occupies along the primary somatosensory cortex.

ACTIVITY: Sensitivity of the primary motor somatosensory cortices

The following two activities provide quick ways of helping you understand the sensitivity of your primary motor cortex and your primary somatosensory cortex.

1. *Primary motor cortex*. Try wiggling each of your fingers one at a time. Now try wiggling each of your toes.

   Note how in Figure 4.39 (see page 335) the area of your primary motor cortex is much larger for your fingers than for your toes, which relates to the greater sensitivity and more precise control in your fingers.
2. *Primary somatosensory cortex*. Ask a friend to close their eyes. Using a random number of fingers (1–4), press down on the skin of your friend's back for one or two seconds and ask your friend to report how many fingers you are using. Now repeat the same procedure on the palm or back of your friend's hand.

   Your friend should be much better at guessing the number of fingers used when you're pressing their hand than when you're pressing their back. As in Figure 4.42, the area of the primary somatosensory cortex is much larger for the hands than for the back, which is reflected in more sensitivity and greater accuracy of detection for finger pressure on the hand.

Occipital lobe

The occipital lobe is located at the rearmost area of each cerebral hemisphere, at the back of your head. The **occipital lobe** is almost exclusively devoted to the sense of vision. Damage to the occipital lobe can produce serious visual impairments, even if the eyes and their neural connections to the brain are normal. Although the occipital lobe is primarily involved in vision, areas in the other lobes also have important visual functions.

The occipital lobe is divided into many different visual areas. The largest by far is the primary visual cortex. The **primary visual cortex** is located at the back of each occipital lobe and this is the major destination of visual information from the two eyes. The information comes to the primary visual cortex from visual sensory receptors located on the retina at the back of each eye.

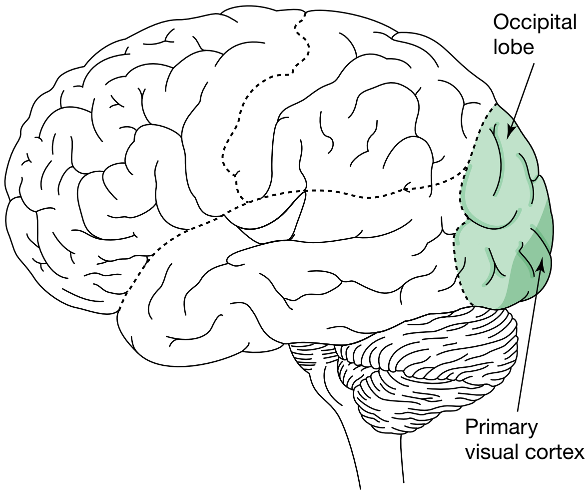

Figure 4.44 Occipital lobe showing the primary visual cortex.

Each hemisphere receives and processes half of the visual information. The left half of *each* eye (which receives visual sensory information from the right half of the visual field) sends information only to the visual cortex in the left occipital lobe. The right half of each eye (which receives visual sensory information from the left half of the visual field) sends information only to the visual cortex in the right occipital lobe.

Neurons in the primary visual cortex and surrounding 'secondary' visual areas are specialised to respond to different features of visual information arriving there; for example, such features as orientation ('direction') of a line, and edges, shape ('forms'), motion and colour. Some neurons respond to specific features (e.g. shape or colour), while other neurons respond to two or more features (e.g. shape and colour).

Association areas in the occipital lobes also have important roles in vision. These interact with the primary visual cortex in each occipital lobe to select, organise and integrate visual information. They also interact with association areas in the frontal, parietal and temporal lobes to integrate visual information with other information such as memory, language and sounds.

Temporal lobe

The temporal lobe is located in the lower, central area of the brain, above and around the top of each ear. The **temporal lobe** is involved with auditory perception and also plays an important role in memory, aspects of visual perception such as our ability to identify objects and recognise faces, and our emotional responses to sensory information and memories. A part of the gustatory cortex, which is involved with taste perception, is located deep within the folds of the temporal lobe.

The **primary auditory cortex** in each temporal lobe receives and processes sounds from both ears so that we can perceive and identify different types of sounds. Different areas of this cortex are specialised to register and respond to different features of sound. For example, if you were listening to classical music, the deep, low-pitched sound of a bassoon will be registered in a different place on the auditory cortex than where the high-pitched sound of a tin flute will be registered.

A specific area of cortex in the temporal lobe of the left hemisphere, located next to the primary auditory cortex and connected to Broca's area by a bundle of nerves, is called Wernicke's area.

Wernicke's area has a crucial role in the comprehension of speech; more specifically, in interpreting the sounds of human speech. When you hear a word, the primary auditory cortex of the left temporal lobe processes the auditory sensation, but you cannot understand the word until the information has been processed by Wernicke's area.

Like Broca's area, Wernicke's area is also involved in speech production. The two areas interact in performing their speech functions, and this is made possible through neural pathways connecting them.

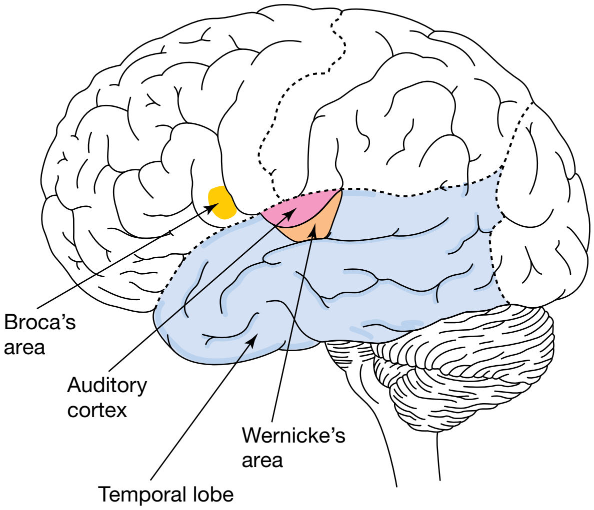

Figure 4.45 Temporal lobe, showing the location of cortical areas with crucial roles in speech production and comprehension.

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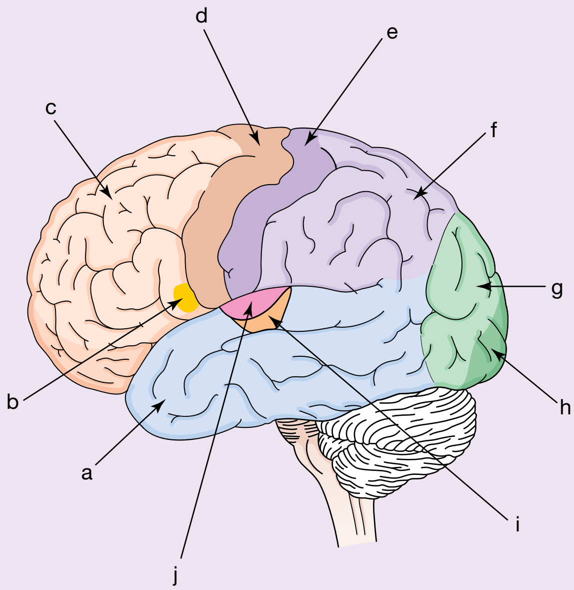
learnMORE | The brain and language

Access learnON for a description of the areas of the brain required for language.

4.4 LEARNING ACTIVITY 6

Review

1. Name the brain areas and structures shown in the following diagram.



a. ______________________

b. ______________________

c. ______________________

d. ______________________

e. ______________________

f. ______________________

g. ______________________

h. ______________________

i. ______________________

j. ______________________

2. Complete the following table or summarise the relevant information using a copy of the diagram of the brain in question 1 and additional labels where required.

Lobe	Key structures or areas	Main functions
Frontal	primary motor cortex prefrontal cortex Broca's area	
Parietal	primary somatosensory cortex association areas	
Occipital	primary visual cortex	
Temporal	primary auditory cortex Wernicke's area	

3. Most mental processes and behaviours do not exclusively involve any one of the lobes. Demonstrate interaction between the lobes by using arrows on a diagram of the brain to link the lobes in two different functions.
4. Following a head injury sustained in a car accident, Sofia is unable to feel any sensation of touch or temperature in an area on the left side of her face between her cheeks and her lower jaw. Fortunately, Sofia did not injure her spine.
   a. Which brain area is likely to be affected?
   b. Explain your answer to part (a).
   c. In which lobe is this area located?

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

4.5 Review

Topic summary

- **Approaches over time to understanding the role of the brain**
  - Brain versus heart debate
  - Mind–body problem
    - Mind–brain problem
  - Phrenology
- **First brain experiments**
  - Brain ablation and lesioning experiments
    - Pierre Flourens pioneers experimental ablation
    - Karl Lashley's search for the location of learning and memory
  - Electrical stimulation of the brain
    - Gustav Fritsch and Eduard Hitzig discover the motor cortex
    - Wilder Penfield maps the cerebral cortex
  - Split-brain experiments
  - Neuroimaging techniques
    - Structural neuroimaging
    - Functional neuroimaging
- **Roles of brain areas**
  - Roles of the hindbrain, midbrain and forebrain
    - Hindbrain
    - Midbrain
    - Forebrain
  - Roles of the cerebral cortex
  - Cerebral hemispheres
  - Hemispheric specialisation
    - Left hemisphere specialisations
    - Right hemisphere specialisations
  - Cortical lobes
    - Frontal lobe
    - Parietal lobe
    - Occipital lobe
    - Temporal lobe

Key terms

association area p. 329
blood–brain barrier p. 291
brain p. 319
brain ablation p. 303
brain lesioning p. 303
brain versus heart debate p. 295
Broca's area p. 335
cerebellum p. 321
cerebral cortex p. 329
cerebral hemisphere p. 330
cerebrospinal fluid p. 291
cerebrum p. 325
computerised tomography (CT) p. 311
corpus callosum p. 308
cortical lobe p. 332
dyadic functional MRI (dFMRI) p. 315
electrical stimulation of the brain (ESB) p. 305
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functional magnetic resonance imaging (fMRI) p. 313
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thalamus p. 325
Wernicke's area p. 338
white matter p. 292

Note: The **References** for the entire title can be accessed in learnON and are also available as a downloadable PDF.

on Resources

Digital documents Key terms glossary — Topic 4 (doc-37349)
Topic summary — Topic 4 (doc-37350)
Key diagrams PowerPoint — Topic 4 (doc-37352)

4.5 Topic 4 test

Section A: 20 marks **Section B:** 30 marks **Total:** 50 marks

Access learnON to answer the following test questions online and receive **immediate feedback**.

Section A — Multiple-choice questions

Choose the response that is **correct** or **best answers** the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Question 1

The neural tissue covering the cerebral hemispheres is called the

A. cerebrum.
B. cerebral cortex.
C. meninges.
D. association cortex.

Question 2

Experimental research using ablation involves _____ a brain structure or area to observe the effect on behavioural or mental functions.

A. removing
B. stimulating
C. inhibiting
D. stimulating and/or inhibiting

Question 3

The term contralateral in relation to brain function means

A. contradictory function.
B. interconnected.
C. opposite side.
D. interdependent.

Question 4

The brain structure that is most prominently involved in regulation of eating, drinking and body temperature is the

A. cerebellum.
B. reticular formation.
C. thalamus.
D. hypothalamus.

Question 5

The brain structure that plays a prominent role in coordinating bodily movements to ensure precise and smooth execution is the

A. cerebellum.
B. cerebrum.
C. medulla.
D. hypothalamus.

Question 6

The brain area primarily involved in regulating bodily activities that are vital for survival is the

A. cerebral cortex.
B. hindbrain.
C. forebrain.
D. midbrain.

Question 7

Which of the following statements about hemispheric function is correct?

A. The left and right hemispheres control voluntary movements on both sides of the body and receive sensory information from both sides of the body.
B. The left and right hemispheres exchange and process sensory information before deciding which side of the body requires control of voluntary movements.
C. The right hemisphere controls voluntary movements on the right side of the body and receives sensory information from the right side of the body.
D. The left hemisphere controls voluntary movements on the right side of the body and receives sensory information from the right side of the body.

Question 8

An advantage of a PET scan when compared with a CAT scan is that

A. a PET scan provides information about brain movement, whereas a CAT scan provides only structural information.
B. a PET scan provides information about brain activity, whereas a CAT scan provides only structural information.
C. a PET scan provides magnetic brain images whereas a CAT scan provides computerised cross-sectional brain images.
D. a PET scan is non-invasive, whereas a CAT scan is invasive because radiation is used.

Question 9

Which brain structure screens then redirects incoming sensory information to the relevant cortical area?

A. thalamus
B. hypothalamus
C. medulla
D. cerebrum

Question 10

The brain vs heart debate

A. has its origins with the development of neuroimaging techniques in the 1970s.
B. is about the source of human mental processes and behaviour.
C. was first proposed by the philosopher Descartes.
D. proposes that both the heart and brain contribute to human mental processes and behaviour.

Question 11

Which of the following neuroimaging techniques would provide the most precise and detailed information on brain function?

A. fMRI
B. PET
C. MRI
D. CT

Question 12

Three prominent hindbrain structures are the

A. cerebellum, reticular formation and hypothalamus.
B. thalamus, cerebrum and hypothalamus.
C. thalamus, reticular formation and pons.
D. cerebellum, medulla and pons.

Question 13

The largest part of the forebrain is the

A. reticular formation.
B. cerebellum.
C. cerebrum.
D. medulla.

Question 14

Which of the four lobes has an area of cortex that initiates voluntary movements of body parts?

A. occipital
B. frontal
C. parietal
D. temporal

Question 15

Which of the four lobes is primarily involved in vision?

A. occipital
B. frontal
C. parietal
D. temporal

Question 16

A neurosurgeon electrically stimulated parts of a patient's primary somatosensory cortex. If the patient was conscious during the procedure, which of the following was probably experienced?

A. 'hearing' faint sounds
B. 'seeing' random visual patterns
C. a sense of having the skin touched
D. movement of one or more of the larger body parts

Question 17

The amount of primary motor cortex devoted to a specific body part reflects the

A. degree of stimulation required to activate the part.
B. degree of precise control required by the part.
C. sensitivity of the sensory receptors controlling the body part.
D. sensitivity of the body part to stimulation.

Question 18

Which of the following tasks is a specialised function of the right cerebral hemisphere?

A. reading a novel
B. logical reasoning
C. following the directions in a recipe
D. finding one's way around a maze

Question 19

The area of the brain that, if injured, is more likely to adversely affect mental abilities such as symbolic thinking, planning and decision making, is the

A. forebrain.
B. midbrain.
C. hindbrain.
D. cerebellum.

Question 20

You have an itchy leg, so you scratch it. The sensation of the itch is processed by the _____, whereas the scratching movements are controlled by the _____.

A. frontal lobe; parietal lobe
B. parietal lobe; frontal lobe
C. primary somatosensory cortex; primary motor cortex
D. primary motor cortex; primary somatosensory cortex

Section B — Short answer questions

Question 1 (1 mark)

Which cortical lobe directly receives then processes auditory information?

Question 2 (1 mark)

Who proposed dualism theory to argue that the mind and body are distinct, separate entities but interact?

Question 3 (1 mark)

Brain _____ involves disrupting or damaging the normal structure or function of part of the brain.

Question 4 (1 mark)

The watery-like substance that helps protect the brain from knocks to the head is called _____ fluid.

Question 5 (2 marks)

The cerebral cortex is primarily made up of _____ matter which is largely composed of _____ cell bodies and their connections to each other.

Question 6 (4 marks)

Wernicke's area is located in the _____ lobe and is primarily involved in speech _____; whereas, Broca's area is located in the _____ lobe and is primarily involved in speech _____.

Question 7 (1 mark)

Which cortical lobe directly receives then processes visual information?

Question 8 (1 mark)

Explain the meaning of 'localisation' in relation to brain function.

Question 9 (4 marks)

Use the following brain image to indicate the approximate location of each of the following. Ensure you clearly mark and label each area or structure.

a. medulla
b. occipital lobe
c. thalamus
d. forebrain

Question 10 (2 marks)

Describe the mind–body problem.

Question 11 (2 marks)

a. Define phrenology. 1 mark
b. Why is phrenology best regarded as pseudoscience? 1 mark

Question 12 (2 marks)

During a car accident, Stephen suffered a brain injury. Fortunately, he did not injure his spine. Afterwards, he found that he could not detect any sensations (such as touch, hot or cold changes) on both sides of his face between his cheekbones and lower jaw.

Which of Stephen's cortical areas is likely to have been affected by the brain injury, and in which lobe is this cortical area located?

Question 13 (3 marks)

Explain the relationship between the brain and conscious experience of the world with reference to the thalamus and reticular formation.

Question 14 (3 marks)

Briefly describe three key functions the cerebral hemispheres have in common.

Question 15 (2 marks)

Popular magazines sometimes describe people as 'left-brained' or 'right-brained', suggesting that one hemisphere is entirely dominant over the other in certain activities or that we may be able to make one hemisphere more dominant and therefore improve or even excel in some abilities.

Write a counterargument to this view ensuring you refer to hemispheric function and a relevant example.

---

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Go to learnON to access answers to the Topic 4 test. A customisable Word version of the test can also be downloaded from the **Digital documents** tab of the Resources panel.

learnMORE | What comes first — conscious experience or brain activity?

The mind–body problem, or mind–brain problem as it is now known, has not yet been resolved in a way that is universally agreed on by contemporary psychologists. However, it is clear that the mind and body are intertwined and that mental processes may be triggered by events in the brain, or that mental processes may, in turn, trigger brain events and therefore influence our behaviour.

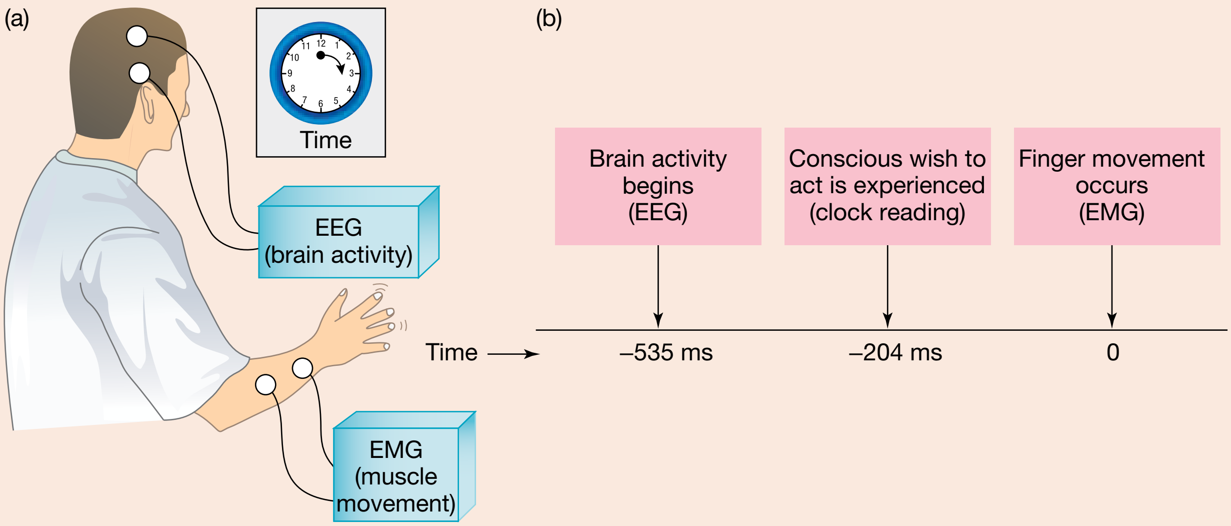
Research studies conducted by American psychologist Benjamin Libet in the 1980s showed how the mind–brain problem could be scientifically tested. These studies also provided evidence that activity in the brain may actually *precede* activity of the conscious mind.

Libet's (1985) procedure involved using an EEG (electroencephalogram) to record the electrical activity in the brains of volunteer participants through sensors placed on their scalps during a decision-making task involving finger movement.

As shown in the figure below, participants observed a dot moving rapidly around the face of a clock. Whenever they consciously decided to move their fingers, they had to state the position of the dot at the precise moment of decision-making. An EMG (electromyograph) was used to record the precise moment of finger movement.

Usually, electrical activity is evident in the brain about half a second (535 milliseconds) before a voluntary movement. This is not surprising since brain activity is probably required to initiate a voluntary movement. Libet's results, however, showed that electrical activity was evident *before* each participant made a conscious decision to move. As shown in the figure, the brain became active in less than one-quarter of a second (204 milliseconds), which is more than 300 milliseconds before participants reported that they were consciously trying to move their fingers.

According to American psychologist Daniel Wegner (2002), the feeling that we 'consciously will' actions may be a consequence of brain activity rather than a cause. It makes sense that we first consciously think of an action and then perform it. However, Libet's research findings suggest that our brain starts the required activity before either the thinking or the doing, possibly preparing the way for both thought and action. It may appear to us that our mind is leading our brain and body, but the order of these events may be the other way around.



(a) In Libet's (1985) experiments, each participant was required to report the exact moment when they consciously decided to move their fingers; (b) EEG sensors that detect electrical activity of the brain timed the onset of brain activation and EMG sensors that detect muscular activity timed onset of finger movement.

Source: Adapted from Schacter, D.L., Gilbert, D.T., & Wegner, D.M. (2009). Psychology. New York: Worth. p. 297.

Many researchers have replicated Libet's experiments using the same procedures as well as variations with stimuli other than a clock; for example, using sounds. Some have obtained similar results, others have found that the timings of intention and action can actually be the same (which suggests that our intentions are the factors that cause our actions), and still others have found voluntary movement decisions can be initiated unconsciously (which suggests that our actions precede their conscious awareness). In sum, a growing body of evidence suggests that the relationship between neural activity and conscious awareness is more complicated than previously thought (Guggisberg & Mottaz, 2013; Miller, Shepherdson & Treyena, 2011).

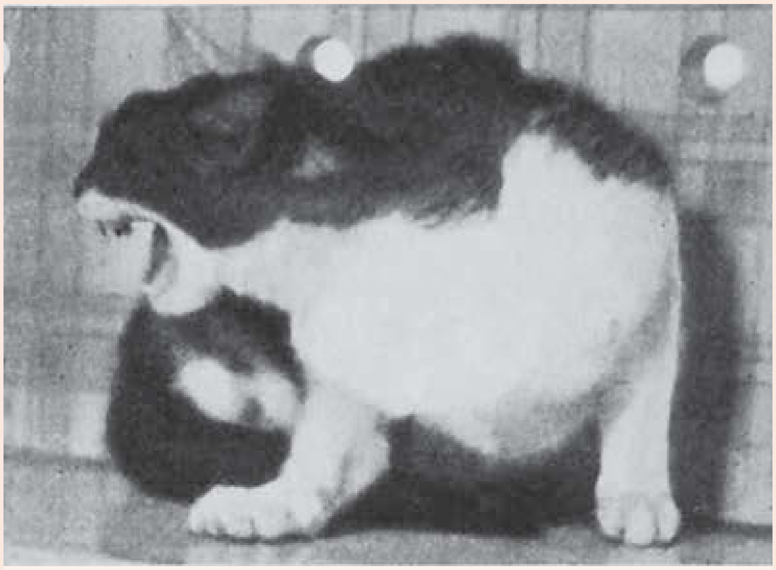
learnMORE | Electrical stimulation of animal brains

Electrical stimulation of animal brains

In the early 1950s, Walter Hess, a Swiss neuroscientist and Nobel Prize winner, pioneered the use of electrodes to stimulate structures located deep within the brain. This type of research is unethical with humans, so Hess used cats because they are mammals with brains like ours, but with a far smaller cerebral cortex.

Hess (1957) carefully recorded the behavioural consequences of stimulating each of 4500 brain sites in nearly 500 cats. For example, Hess inserted a radio-controlled electrode into a cat's hypothalamus, a tiny structure located just above the brain stem. By pressing a button, he could send a weak electrical current to the hypothalamus at the point of the electrode.

Hess found that, when the hypothalamus was electrically stimulated, an otherwise gentle cat made aggressive responses, observed when fearful or threatened. As shown in the figure below, the cat spat, growled, lashed its tail, extended its paws, and its fur stood on end. Hess concluded that neuronal activity arising from the hypothalamus appeared to produce fear-provoked aggression. The press of a button would instantly turn on the aggression, and would turn it off just as abruptly.



With an electrode implanted in its hypothalamus, this cat postures aggressively when electrical stimulation is applied.

An even more dramatic exhibition of electrical stimulation apparently affecting aggressive behaviour was staged by José Delgado, a Spanish physiologist.

Delgado (1969) implanted a number of radio-controlled electrodes in the brain of a bull bred specifically to be aggressive in the bull ring. Delgado claimed stimulation would stop the charging bull. Standing in the bull ring himself at the moment of the bull's charge, Delgado activated the electrode, which made the bull stop abruptly.

Although the mass media emphasised that Delgado was able to control the bull's aggression, Delgado had actually implanted the electrodes in motor cortex areas. When activated, this forced the bull to stop moving forward and then caused it to turn to one side.

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Teacher weblinks Video on bull and cat tests conducted by Delgado in the 1960s 1 m 2 s

learnMORE | Electroencephalography (EEG)

First used in the 1920s, electroencephalography preceded all the current neuroimaging techniques. Even though it cannot produce an image of the brain, it is still in common use.

The *electroencephalogram* (EEG) detects, amplifies and records general patterns of electrical activity in the brain over a period of time. The electrical activity is spontaneously and continuously produced by the brain's neurons, particularly neurons in the cerebral cortex just below the scalp. This is detected by electrodes attached to multiple areas of the scalp, usually through an 'EEG cap'.

(a)

(b)

(a) This infant's electrical activity in the brain is being recorded during research on facial perception. (b) An EEG recording showing the brain's normal electrical activity in the form of distinctive brain wave patterns.

The EEG translates the electrical activity into a visual pattern of brain waves. The brain waves are displayed as squiggly lines on a chart (see figure (b) above). The lines correspond with different cortical areas. The different types of brain wave patterns are named after Greek letters of the alphabet such as alpha, beta, delta and theta.

For example, the alpha pattern is apparent when a person is resting quietly with their eyes closed, beta when wide awake and alert, and delta when in a deep sleep.

The EEG has been widely used in all kinds of experiments, particularly to study different states of consciousness such as when awake or sleeping. It is also useful in the diagnosis and study of various brain disorders such as epilepsy and Parkinson's disease. More recently, the EEG has identified distinctive brain wave patterns often occurring in people with schizophrenia. Different types of brain waves are seen as abnormal only in the context of variations from what would normally be expected for the individual whose brain is being assessed.

A limitation of the EEG is that it can't detect neural activity deep inside the brain very well. Nor does it provide detailed information about which particular structures of the brain are activated and what their specific functions might be, especially areas beneath the cortex. The electrodes detect information from relatively large areas of the brain and there is also a lot of 'background' brain activity detected as well, so it can be difficult to pinpoint the specific area of the brain that is the source of the activity.

on Resources

Weblink Video on EEG use for psychological research 6 m 01 s

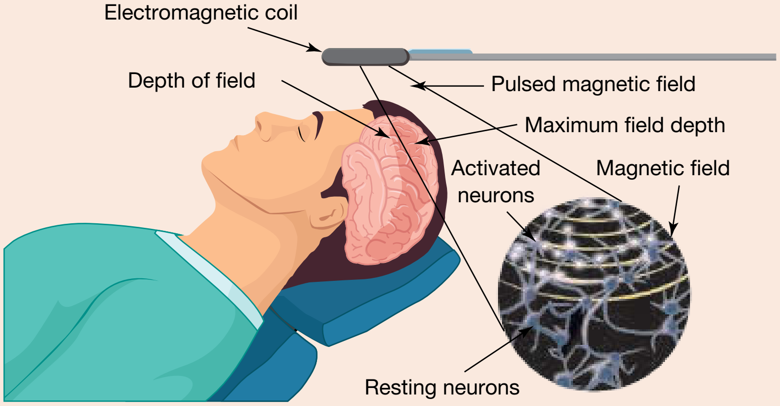
learnMORE | Transcranial magnetic stimulation (TMS)

If you've ever held a magnet under a wooden tabletop and used it to drag a needle or pin across the table's surface, you know that magnetic fields can pass relatively unimpeded through insulating material (non-conductors of electricity). The human skull is no exception.

Transcranial magnetic stimulation (*TMS*) is a general term for a direct brain stimulation technique that delivers a magnetic field pulse through the skull and temporarily activates or disrupts the normal activity of neurons in a specific area of the cerebral cortex. The magnetic field induces a harmless electric current in time-varying charges ('pulses'). While receiving stimulation, the person is fully awake and alert.

TMS is a non-invasive procedure and there is no need for any substance to be taken or for anaesthetic to be administered. When TMS is used in procedures involving the delivery of a single pulse, it is called *single pulse TMS* or *non-repetitive TMS*. This is in contrast to *repetitive TMS* (*rTMS*) which is used in procedures involving repeated, but not necessarily rapid, delivery of a pulse.

As shown in the figure below, the magnetic field pulse is transmitted from a small copper electromagnetic coil that is enclosed in plastic and placed next to the scalp. An electric current is sent through the coil, which induces a magnetic field around the coil and creates the pulse. The single pulse is then directed through the skin and scalp to underlying clusters of neurons. This activates the neurons and they send a burst of neural impulses ('electrical activity') to adjacent neurons, activating them, which in turn activates other adjacent neurons.



In TMS, a magnetic field pulse is directed through the skin and scalp to the cortical surface for a short period to activate or disrupt neuronal function in a specific area of the cerebral cortex.

Using this procedure, a specific area of the cerebral cortex can be activated for a short period. A brief single pulse can cause a burst of brain activity. For example, when the coil is placed just above the skull over an area of the visual cortex in the occipital lobe, the participant usually detects flashes of light. If placed over the motor cortex in the frontal lobe, the result is a brief muscle twitch somewhere in the body, depending on which part of the cortex is activated. The pulse does not directly affect the whole brain. It affects only that part of the brain that lies immediately below the skull, about 2–3 cm into the brain directly beneath the coil. In this way, researchers can use TMS to study functions of specific areas of the cerebral cortex.

TMS can also be used in clinical settings for diagnostic purposes to help pinpoint specific areas of critical brain damage and to track patient recovery.

When rTMS is used, the consecutive pulses cause the neurons to lose their ability to fire. This results in suppression of their activity and consequently brain activity in the stimulated area. Essentially, this is 'turning off' a small area of the brain without causing any damage or unwanted side effects. For example, if the coil is held over Broca's area in the left hemisphere, the person will probably be unable to speak fluently while the current is on but will resume fluent speech as soon as the current is stopped. Using this kind of procedure, researchers can temporarily create a brain 'malfunction' and simulate brain damage, permitting them to perform experiments with human participants that would otherwise not be possible.

It is located on the left hemisphere of right-handed and most left-handed individuals.

TMS can be used for brain research and in clinical settings for diagnostic purposes to help pinpoint specific areas of cortical brain damage and to track patient recovery.

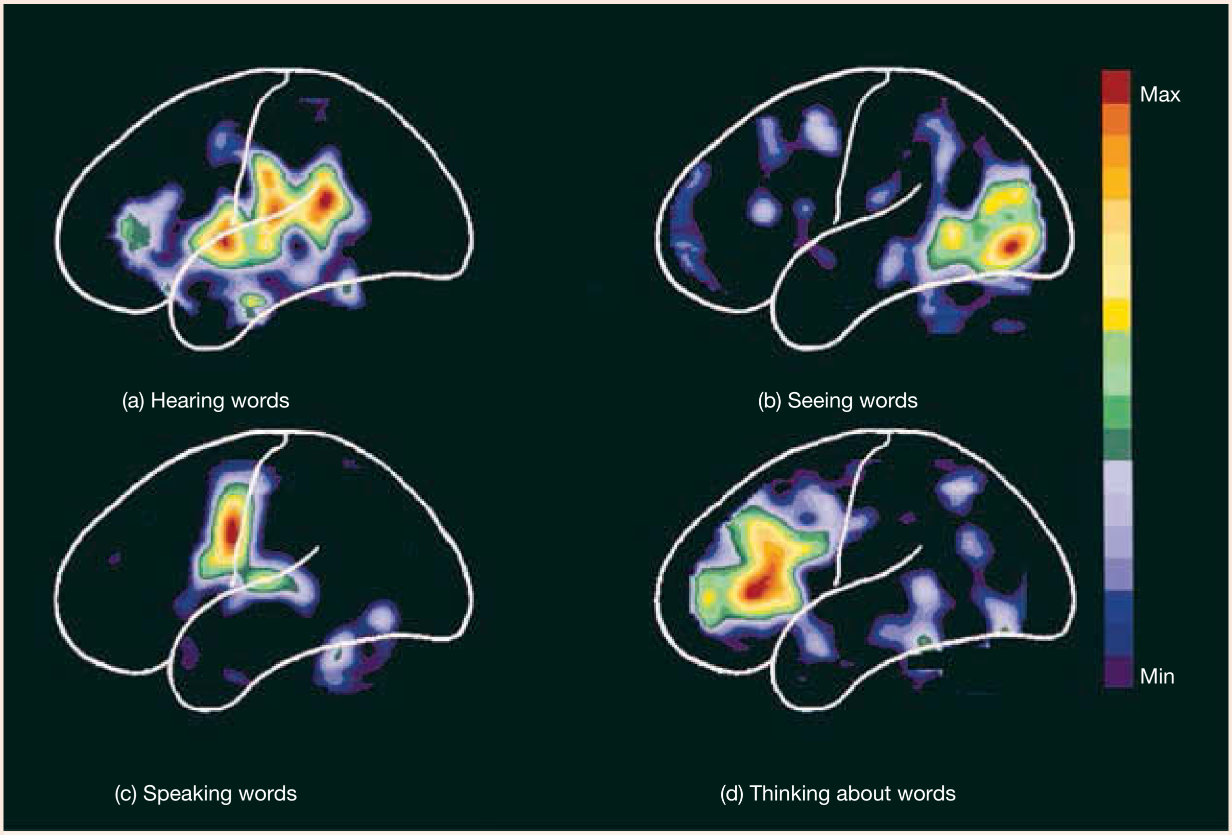
learnMORE | The brain and language

Human language is a complex mental ability that involves the intricate coordination of many brain areas. An example of the complexity of language is that impairments in language often result from injury to several different cortical areas. Depending on where the injury occurs, a person may be able to speak fluently but be unable to read, or may be able to comprehend what they read but be unable to speak. Others can write but not read, read but not write, read numbers but not letters, or sing but not speak.

We tend to think of speaking and reading, or writing and reading, or singing and speaking, simply as variations of the same general ability, but studies of patients with certain brain injuries suggest otherwise.

For example, in 1861, Paul Broca found that damage to a specific area in the left frontal lobe of one of his patients severely impacted their ability to clearly pronounce words, although they were quite capable of singing and understanding speech and writing. The area, shown in Figure 4.40, is named after Broca, however, *Broca's area* is just one of the brain areas involved in language. Even in reading this text aloud, other areas of the cerebral cortex are involved. For example, years after Broca's discovery, it was found that the *angular gyrus*, located towards the bottom of the left parietal lobe, is needed to receive visual information from the visual cortex and recode it into an auditory form from which *Wernicke's area* (in the left temporal lobe) derives its meaning.

As shown in the figure below, many different areas of the cerebral cortex are activated when language is spoken, seen or heard.

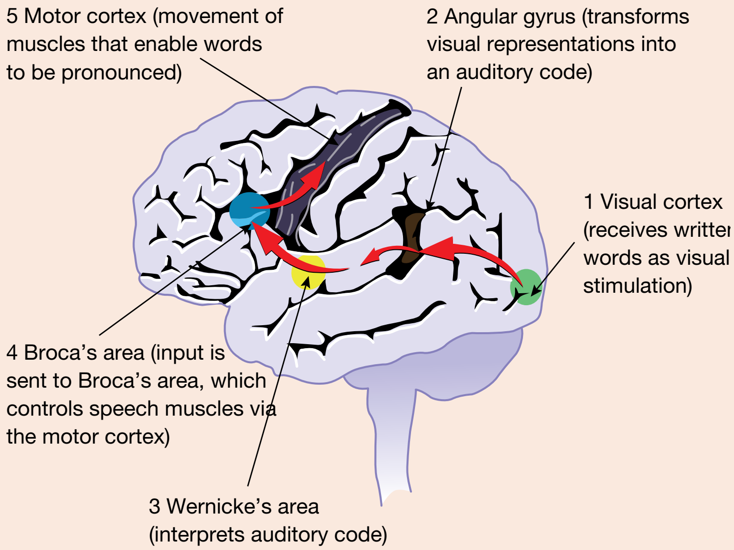


These PET scans of left-facing individuals show levels of increased activity in specific brain areas: (a) when hearing words (auditory cortex and Wernicke's area); (b) when seeing words (visual cortex and angular gyrus); (c) when repeating words (Broca's area and the motor cortex); and (d) when generating verbs, a more complex language task, activating the most amount of brain. The colours violet, blue, green, yellow and red, in that order, represent increasing amounts of activity.

Different areas of the cerebral cortex are even activated when we use specific forms of grammar or concepts. For example, in 1985, two adult females who had experienced a stroke both suffered damage to language-related parts of the association cortex in the left hemisphere. Neither had difficulty with nouns but both had difficulty with verbs. Their respective problems, however, were opposite. One could speak verbs but had difficulty writing them, whereas the other could write verbs but could not say them. Interestingly, the female who could speak verbs was able to say 'I watch TV' (where 'watch' is used as a verb) but was unable to say 'My watch is slow' (where 'watch' is a noun). Yet another person, an adult male with damage to a different language-related brain area, lost the ability to say a particular group of nouns, specifically, the names of any fruit. He could say any noun from abattoir to zoo, but when it came to the name of a fruit he was 'lost' for words (Hart, Berndt & Caramazza, 1985).

Prominent American neurologist Norman Geschwind (1972) combined many findings from research and linked the roles of different brain structures in explaining how we use language.

According to Geschwind, when you read aloud, the words first register in the visual cortex. These are then relayed to the angular gyrus, which then transforms the words into an auditory code. This code is received and understood in the neighbouring Wernicke's area and sent to Broca's area. Broca's area directs the action of the motor cortex to create the pronounced word. This pathway from written to spoken word is shown in the figure below.



Five steps appear to be involved in reading aloud.

More recent research has found that the right hemisphere also has a role in language. For example, some people with extensive damage to the left hemisphere are capable of swearing and using other emotionally charged words, or singing and producing well-learnt phrases. In some cases, these individuals can sing sentences they are unable to say, thereby making use of the right hemisphere's musical function. In relation to comprehension, some frequently used concrete words, such as *car, television* and *food*, are understood by the right hemisphere, even if the patient is unaware that they have been shown the word. The right hemisphere also appears to have the ability to comprehend the overall context or theme present in a sentence (Andrewes, 2001).

In sum, most current models and explanations of language are not unlike Geschwind's. They are based on the knowledge that language is widely distributed in cortical areas and other brain structures. The brain's language areas work together as a coordinated network, with some parts involved in multiple functions. So it's not simply a matter of one brain area doing one thing in isolation. There is also evidence that even single words are widely distributed throughout the brain (Price, 2012; Kolb & Whishaw, 2015; Abbott, 2016).

5 Brain plasticity and brain injury

TOPIC CONTENT

5.1 Overview

KEY KNOWLEDGE

- the capacity of the brain to change in response to experience and brain trauma including factors influencing neuroplasticity and ways to maintain and/or maximise brain functioning
- the impact of an acquired brain injury (ABI) on a person's biological, psychological and social functioning
- the contribution of contemporary research to the understanding of neurological disorders
- chronic traumatic encephalopathy (CTE) as an example of emerging research into progressive and fatal brain disease

Source: © VCAA, *VCE Psychology Study Design: 2023–2027.* p.25.

Although our brains may look very alike, no two human brains are actually identical. Genetic information directs the course of our brain's development and the experiences we have throughout life actively shape its structure and organisation.

Neurons are the building blocks of the brain and the rest of the nervous system. The entire nervous system is comprised of neurons organised into complex chains and networks that form neural pathways through which information continuously travels. From the time our brain begins to develop through to the end of life, neurons and the connections between them change in response to our experiences.

This type of change enables us to learn and remember, both of which are vital for meeting the demands of everyday life. For example, as you learn information in this topic, you are forming new connections in your brain so that you can remember what you learn. The more you repeat this information or any thought, feeling or action, the stronger those connections become and therefore the stronger the memory. Imagine what it would be like if you could not learn or remember!

The ability to form new connections also enables the brain to repair itself and for a healthy part to take over the function of a damaged area. However, despite its remarkable adaptability and capacity for change, the brain cannot recover from or repair all damage, as evident in neurodegenerative disorders such as Alzheimer's disease and motor neurone disease. Nor can it be transplanted or replaced.

In this topic we examine the adaptability of the brain in response to experience. In particular, we consider how experience can change the brain's structure, especially when damage through traumatic brain injury interferes with its normal functioning.

Neuroplasticity

The term **neuroplasticity** refers to the ability of the brain and other parts of the nervous system to change in response to experience. This includes the brain's capacity to recover from or compensate for loss of function through injury. The terms *neural plasticity* or simply *plasticity* are also used to refer to the capacity of the brain or nervous system to change. Sometimes, the term *brain plasticity* is used to refer specifically to the brain's ability to change.

The brain as a whole does not change its shape. Change occurs at the cellular level, primarily at the synapse and therefore at the microscopic level.

The **synapse** is the site where adjacent neurons communicate by transmitting neural signals to one another. Individual neurons and their connections can be modified for different reasons; for example, during brain development when we are young, during learning throughout our entire lives, when we use certain drugs, and sometimes in response to brain injury.

New neural pathways can form and link up with existing pathways and existing pathways may interconnect with other pathways. These types of changes involve neurons as well as the cells which support their activities. They result in changes to the brain's physical structure and function. For example, the brain can reorganise and reassign its neural connections and pathways based on which parts of it are overused, underused or injured. Its structure is constantly remodelled by everyday life experience and environmental demands as it adapts to meet our needs.

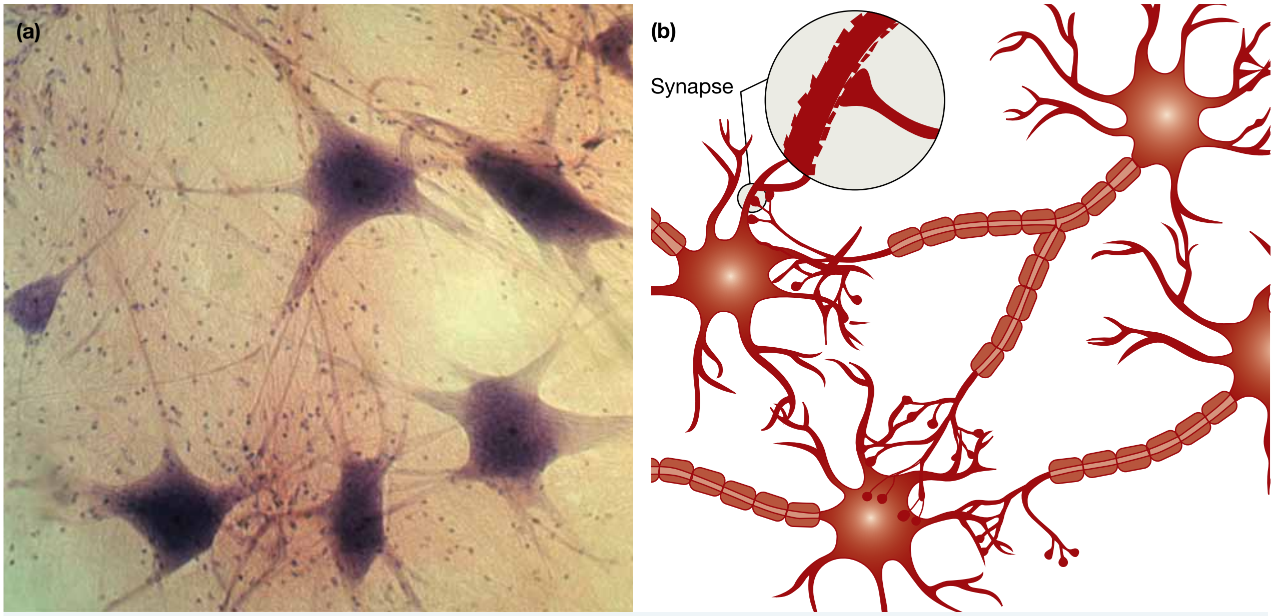


Figure 5.1 (a) Neurons are the building blocks of the brain and the rest of the nervous system. The entire nervous system is comprised of neurons which interconnect to form neural pathways, enabling the continuous communication of information around the body. (b) A representation of four adjacent, interconnected neurons. The synapse is where adjacent neurons communicate and the primary site of neuroplasticity.

Lifelong plasticity accounts for many of the learning experiences we have throughout life, such as learning our native language as a child, learning to play a musical instrument as an adolescent, learning to text message as an adult, learning to do internet banking in old age, and so on. Our genes govern the overall architecture of our brain, but experience guides, sustains and maintains the details.

Figure 5.2 The brain of a developing individual tends to have greater plasticity than that of an adult.

As we perform whatever we are learning with increasing skill, our brain incorporates the learning within its structure. The neural activity underlying this process occurs in a systematic way and not haphazardly.

Although some areas of the brain such as the sensory and motor cortices have a higher level of plasticity than others, it is unclear as to whether all brain areas have plasticity.

However, the brain of a developing individual is even more plastic than that of an adult, particularly at specific times in development (i.e. sensitive periods) when it seems that the brain is more responsive to certain types of experiences. This is one reason why infants tend to learn a new language more quickly than do adults. Similarly, infants and children recover more quickly from brain injury than do adults due to the greater plasticity of their brain (Sweatt, 2016; Breedlove & Watson, 2020).

on Resources

Weblink Video outlining neuroplasticity 4 m 8 s

Teacher weblink TED talk on neuroplasticity by an eminent neuroscientist 22 m 54 s

5.1 LEARNING ACTIVITY

Multiple-choice questions

1. Neuroplasticity of the brain refers to its ability to
   - A. learn.
   - B. grow.
   - C. develop.
   - D. change.
2. The brain's neuroplasticity is primarily evident when
   - A. organisms learn with increasing skill.
   - B. connections between neighbouring neurons change.
   - C. the brain as a whole, changes its shape.
   - D. neurons emit signals and communicate with each other.
3. Neuroplasticity occurs
   - A. during brain growth.
   - B. during brain development.
   - C. throughout the entire life span.
   - D. All of the above are correct.
4. When a brain area assumes or 'takes over' the function of an adjacent damaged brain area, this is best described as brain
   - A. plasticity.
   - B. growth.
   - C. formation.
   - D. development.
5. Which of the following statements about neuroplasticity is not correct?
   - A. Neuroplasticity is influenced by genetic factors.
   - B. Neuroplasticity involves both the brain and the rest of the nervous system.
   - C. Neuroplasticity enables the brain to change in response to experience.
   - D. Neuroplasticity enables the brain to change its shape, structure and organisation.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

5.2 Factors influencing brain plasticity

Genes provide the biological basis of the brain's plasticity (and all neuroplasticity) but our experiences influence the process and changes that take place. Consequently, experience itself is an important influence on neuroplasticity. In addition, the type of experience and its timing are influential. This has led psychologists to distinguish between two general types of plasticity in the healthy brain — experience-expectant and experience-dependent.

5.2.1 Experience-expectant and experience-dependent plasticity

Experience-expectant plasticity involves brain change in response to environmental experience that is ordinarily expected. It occurs largely during development and is described as 'species-wide' because all members of the relevant species usually have the particular experience. In addition, different brain structures and sensory systems require specific types of environmental input at certain times in order to develop in accordance with genetic instructions.

For example, among humans, it is important to have exposure to light and access to patterned visual information early in life for normal development of the visual cortex. The visual cortex 'expects' these inputs and is genetically programmed to use them for normal development. It is also important to experience complex sounds, tactile stimulation through touch and exposure to language early in life. Each of these experiences contributes to the brain's development.

Experience-expectant plasticity works to fine-tune aspects of development that cannot proceed to the best possible outcome as a result of genetic factors working alone. The relevant synaptic connections are most easily made and the neural pathways are most easily formed when there is exposure to the appropriate environmental stimulus (Greenough et al., 1987; Shonkoff & Phillips, 2000).

If the experience does not occur when expected, ideally in its sensitive period, then brain development may not occur as it should. Other species need different kinds of sensory inputs, as appropriate to the species. For example, young Zebra finches must hear adult birds sing primarily at 35–65 days of age in order to be able to learn those songs and reproduce the sounds. Birds deprived of the experience at that stage will sing, but differently. Development of neural structures involved in learning the songs has been affected. Their brains do not develop in the optimum way (Jones et al., 1996).

Figure 5.3 The type of experience and its timing are two important influences on neuroplasticity.

Experience-dependent plasticity involves brain change that modifies some part its neuronal structure that is already present. It depends on exposure to various environmental experiences that are unique to each individual and may occur at any time during the life span. Unlike experience-expectant plasticity, there is no sensitive or critical period so it is not time-dependent.

Experience-dependent plasticity is evident in everyday experiences, especially when we learn something new. Whether the learning involves physical or mental activity, the brain's structure will be refined in one or more ways in relation to that experience. The nature and type of change will be influenced by the intensity or frequency of the experience.

For example, neuroimaging studies using PET and MRI show that in musicians who play string instruments, the area of the somatosensory cortex that represents the fingers of the left hand (the hand requiring greater motor learning for fine finger control) is larger than the area that represents the right hand (which is used to manipulate the bow), and larger than the left hand area in non-musicians.

Similarly, concert pianists have larger than usual cortical areas for finger control and professional quilters have highly developed areas for the thumb and forefinger, which are critical to their craft. The change in size is most commonly due to the growth of synapses, their connections and the greater density of synaptic connections (Nelson, 1999; Kolb & Whishaw, 2021).

There is also evidence that other brain areas can increase in size through extensive use. For example, to become a taxi driver in London, individuals have to go through a comprehensive training course (averaging about 34 months) and then pass a strict test of their ability to find the shortest route between any two locations. As a result of this type of training and assessment, London taxi drivers have become renowned for their ability to efficiently navigate their way throughout one of the most complex and largest metropolitan areas in the world without using a street directory (or GPS).

When MRI scans of London taxi drivers (who find new routes daily) are compared with London bus drivers (who follow a limited number of set routes daily), they show that the rear part of the hippocampus of taxi drivers, which is involved in spatial navigation (and memory formation), is significantly larger. And, the more years an individual has driven a taxi, the larger the hippocampal area, and vice versa (Maguire et al., 2000; Maguire et al., 2003).

Not all experience-dependent plasticity is positive or adaptive. For example, exposure to mind-altering drugs such as amphetamine ('speed' and 'ice'), cannabis, cocaine and morphine produce alterations in synaptic connections. Change will vary in relation to such factors as the particular drug, the amount ingested and the frequency of use. Nonetheless, some maladaptive behaviours observed among people addicted to drugs may result from and be maintained by drug-related changes to the brain (Kolb & Whishaw, 2021).

Figure 5.4 Certain brain areas, such as the hippocampus, can be significantly enlarged with extensive use.

5.2.2 Neuroplasticity in response to brain injury

Experience-dependent plasticity does not only occur as a consequence of everyday experience. It also occurs in response to brain injury. This enables the brain to recover from or compensate for lost function and/or to maximise remaining functions in the event of brain injury. In such cases, neuroplasticity is often referred to as *functional plasticity* or *adaptive plasticity* to distinguish it from plasticity primarily associated with the developing brain.

How the brain changes in response to injury, and the effectiveness of its response, depends on the cause, location, degree and extent of the damage, and the age at which the injury occurs.

For example, a brain injury may be due to a neurodegenerative disorder or involve a malignant, rapidly spreading tumour that is unstoppable, let alone recoverable. Similarly, some parts of the brain are unable to recover to any extent from injury, especially hindbrain or brain stem structures. And some injuries to these areas are so severe that the patient may remain on life support in a coma indefinitely.

Neuroplasticity is also age-dependent. Generally, it is quicker and more substantial in the earlier years, particularly in infancy and early childhood. As we grow older the brain gradually loses the ability to compensate for damage, but not necessarily altogether. Recovery from traumatic brain injury by children in particular can be remarkable. However, there are also cases among children where any measurable recovery does not occur.

5.2.3 Types of change

Generally, neuroplasticity enables the brain to compensate or recover by reorganising its structure, more specifically, its neural connections. This may involve the generation of new neural connections and pathways or changes in the organisation of the remaining intact neuronal networks. There is also evidence that it may be possible for new neurons to be generated to replace some lost neurons in damaged areas beneath the cortex. The most substantial change, however, involves reorganisation. This can occur immediately or continue for years (Grote & Hannan 2007; Kolb & Whishaw, 2021).

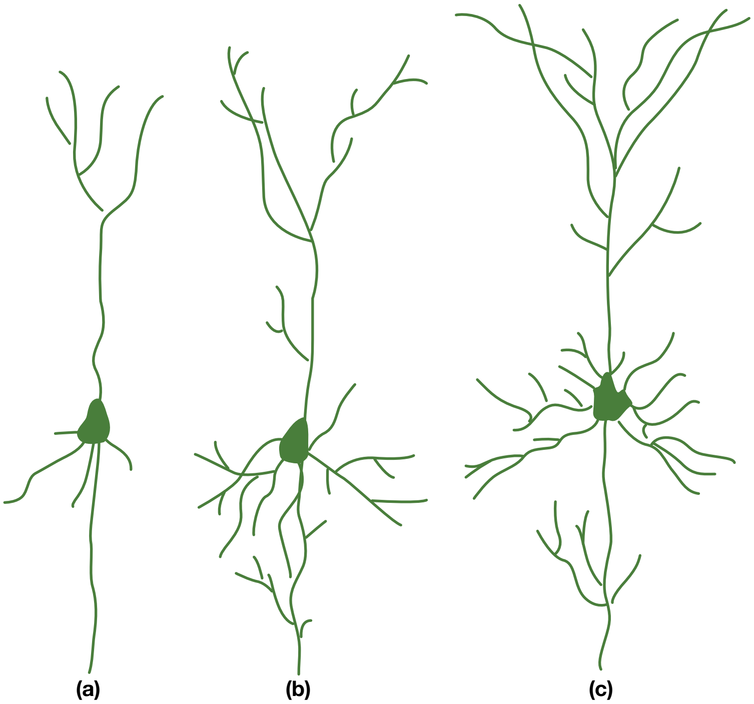


Figure 5.5 Neurons damaged through a brain injury can grow new connections to replace lost ones in a process called sprouting. Figure (a) shows a damaged neuron before sprouting. Figures (b) and (c) show the progressive growth of additional branches from where new connections with neighbouring neurons can be formed.

Generation of new networks

At the neuronal level, neuronal connections and networks that have been disrupted by injury may change by forming new connections. For example, an undamaged neuron that has lost a connection with an active neuron may seek a new active neuron and connect with it instead. In some cases, it is also possible for a damaged neuron to do the same. The end result is that brain function lost through injury is rerouted via new connections.

This essentially means that the brain's plasticity enables it to take over or shift functions from damaged to undamaged areas. Such plasticity can occur at all levels of the central nervous system, from the cerebral cortex down to the spinal cord.

In order for neurons to reconnect or form new connections, they need to be stimulated through repetitive activity. Relevant types of experience during recovery from brain injury are therefore important influences on the speed of recovery.

For example, depending on the location and degree of brain damage, stroke or accident victims often need to 'relearn' tasks they previously performed routinely such as reaching, walking, speaking or reading. The younger the individual, the greater the likelihood of successful 'relearning' and subsequent new learning.

Reassignment of function

Through neuroplasticity, functions that were performed by certain areas of the brain can sometimes be reassigned to other undamaged areas of the brain to compensate for changing input from the environment. Either a part or all of a function previously performed by the injured area may be transferred.

For example, an extraordinary amount of stimulation of one finger can result in that finger 'taking over' a part of the somatosensory cortex that usually represents other adjacent fingers. If you lost your middle finger in an accident, the area of the somatosensory cortex that represents that finger will initially be unresponsive because there is no longer any sensory input received from the location of the missing finger. You might expect the 'left middle finger neurons' of the somatosensory cortex to degenerate and eventually disappear. Instead, over time, that area of the somatosensory cortex will begin to receive input from the adjacent fingers and become responsive to stimulation of these fingers.

This has been demonstrated experimentally in studies in which researchers have surgically destroyed areas of the somatosensory cortex of monkeys. The results of such studies typically show that the somatosensory cortical 'map' representing the destroyed areas gradually shifts to undamaged adjacent areas of the parietal lobes, restoring the ability to experience bodily sensations (Thompson, 2000).

Figure 5.6 In order for neurons to reconnect or form new connections following an acquired brain injury, they need to be stimulated through repetitive activity. Constraint-induced movement therapy may be used with some patients as part of the rehabilitation process to induce neuroplasticity. This involves immobilising a non-affected limb to force usage of the affected limb.

A dramatic example of the brain's reassignment of functions to other areas is evident when a function is taken over by the opposite cerebral hemisphere if injury destroys the part of the hemisphere where the function is primarily located. Recovery from other types of extensive brain injury by adults through plasticity can also be quite dramatic. Some patients with a paralysed hand or arm, for example, can recover its use within a few months.

An even more dramatic example of the brain's plasticity involves recovery of language following loss of a hemisphere. A 5-year-old boy had almost all the cerebral cortex of the left hemisphere surgically removed to treat his uncontrollable and life-threatening epileptic seizures. The boy had been experiencing as many as 10 to 12 seizures a day since he was 3. The results of various tests conducted before the radical surgery led to a psychological diagnosis that 'following onset and continuation of seizures, speech and learning steadily regressed and the patient was classified as retarded'. At first, the boy's language abilities worsened, but then improved rapidly.

Long-term follow-up tests over the next 21 years revealed above average language abilities and intelligence. It appeared that loss of most of the left hemisphere during early childhood had not impaired language development. The boy had gone on to complete a university degree and was assessed as also having an excellent memory and highly developed visual spatial abilities and motor skills.

Whereas surgical removal of the left hemisphere of an adult's brain usually results in severe impairment of language, affecting both speech and writing, surgical removal of the left hemisphere during early childhood does not necessarily have permanent consequences for cognitive and behavioural functions (Smith et al., 1988; Devlin et al., 2003; Breedlove & Watson, 2020).

on Resources

Weblink	Video on neuroplasticity following childhood hemispherectomy 5 m 54 s
Teacher weblink	Video presentation on how the brain can change — Norman Doidge and Australian researchers 44 m 49 s

Figure 5.7 Young children with a surgically removed hemisphere have been observed to gradually recover lost abilities through neuroplasticity.

Neurogenesis

Until recently, most psychologists and neuroscientists thought we were born with all the neurons we were ever going to have. In 1962, American neurobiologist Joseph Altman challenged this belief when he obtained evidence of **neurogenesis** — the production or 'birth' of new neurons. He found this occurred in the hippocampus deep inside the brain of an adult rat. Altman later reported that the new neurons migrated from their place of origin to other brain areas where they became part of the circuitry.

During the 1970s, American neuroscientist Michael Kaplan confirmed Altman's findings in the rat brain, and in 1983 he reported a similar process in the brain of an adult monkey.

These discoveries about neurogenesis in the adult brain were surprising to other researchers who didn't think they could be true in humans after the period of embryonic development before birth. But in the early 1980s, a researcher trying to understand how birds learn to sing suggested that neuroscientists look again at neurogenesis in the adult brain and begin to see how it might make sense.

In a series of experiments, Argentinian-born neuroscientist Fernando Nottebohm and his colleagues showed that the numbers of neurons in the forebrains of male canaries dramatically increased during the mating season. This was the same time in which the birds had to learn new songs to attract females.

Why did these bird brains add neurons at such a critical time in learning? Nottebohm believed it was because fresh neurons helped store new song patterns within the neural circuits of the forebrain, the area of the brain that controls complex mental processes and behaviours. These new neurons made learning possible. If birds made new neurons to help them remember and learn, Nottebohm thought the brains of mammals might too (NINDS, 2022a).

Other researchers believed these findings could not apply to mammals, but in the 1990s, American psychologist Elizabeth Gould (1999) found evidence of newborn neurons in a distinct area of the brain in monkeys, and American psychologist Fred Gage and Swedish neuroscientist Peter Eriksson (1998) showed that the adult human brain produced new neurons in a similar area (NINDS, 2022a).

The extent to which new neurons are generated in the adult brain is a controversial subject among neuroscientists. Although the majority of neurons are already present in our brains by the time we are born, there is a growing body of scientific evidence showing that neurogenesis is a lifelong process. The evidence offers intriguing possibilities about the role of adult-generated neurons in learning and memory and for treatment of neurodegenerative disorders and brain injuries.

These specific areas are rich in concentrations of *neural stem cells* (also called *neural precursor cells*). These cells have the potential to generate most, if not all, of the different types of neurons found in the brain.

Neuroscientists have observed how neural stem cells behave in the laboratory. Although this may not be exactly how these cells behave when they are in the brain, it yields valuable information about how they could be behaving when they are in the brain's environment (QBI, 2019; Owji & Shoja, 2020; NINDS, 2022a).

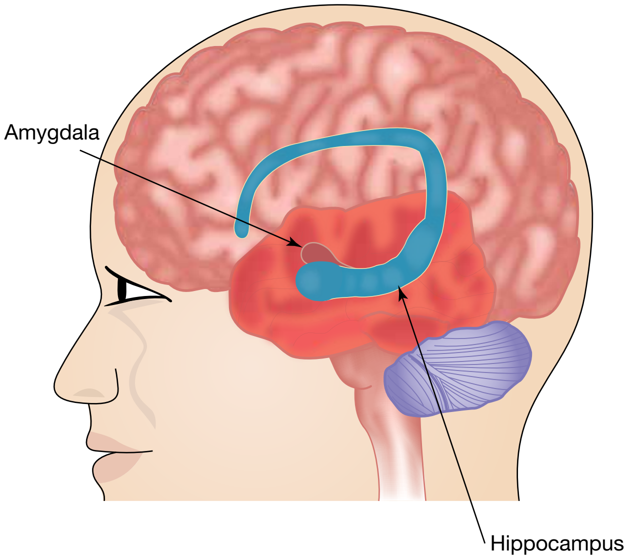


Figure 5.8 Adult neurogenesis has been found to occur in three areas in the mammalian brain — the hippocampus, the amygdala and in ventricles.

on Resources

Weblink Healthy Brain Program

learnon

learnMORE | Juggling and brain plasticity

Access learnON for a description of an experiment that found structural changes occurred in the brains of research participants who were taught how to juggle.

learnon

learnMORE | Neuroplasticity and phantom limb syndrome following amputation

Access learnON for an explanation of phantom limb syndrome — the experience of sensations from where a missing limb was located — in the terms of neuroplasticity.

5.2 LEARNING ACTIVITY 1

Review

1. Explain the meaning of plasticity in relation to the brain.
2. Explain why the brain is considered to have plasticity with reference to two key points.
3. In what way does neuroplasticity account for the fact that no two human brains are identical?
4. a. What role do genes play in brain development and neuroplasticity?
   b. Describe two important influences on neuroplasticity, other than genes.
5. In what way is experience-expectant plasticity similar and different to experience-dependent plasticity?
6. Explain whether or not all neuroplasticity is experience-dependent.
7. a. Explain the meaning of functional plasticity with reference to brain injury.
   b. Give two examples of the type of structural change in the brain that may result from functional plasticity.
8. Will the brain recover to some degree from all types of injuries? Explain your answer.
9. What role does rehabilitation play in plasticity and recovery from brain injury?
10. Does brain plasticity mean that 'brain training' programs and exercises may be effective? Does it depend on the type of program and how it is used? Discuss with reference to an example. You may wish to consider information and examples at the Brain Foundation website using the **Healthy Brain Program** weblink in the resources panel.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

5.2 LEARNING ACTIVITY 2

Multiple-choice questions

1. The concept of brain plasticity describes how the brain
   A. matures through experience during the entire life span.
   B. may change through experience in everyday life.
   C. may learn through experience in everyday life.
   D. grows and develops throughout the entire life span.
2. When neural connections are repeatedly used, then it is likely that they will
   A. strengthen.
   B. weaken.
   C. disconnect.
   D. disappear.
3. Which type of neuroplasticity is the most time-dependent?
   A. functional plasticity
   B. adaptive plasticity
   C. experience-dependent plasticity
   D. experience-expectant plasticity
4. Brain change that modifies some part of its neuronal structure that is already present is called
   A. functional plasticity.
   B. adaptive plasticity.
   C. experience-dependent plasticity.
   D. experience-expectant plasticity.
5. When a brain area assumes or 'takes over' the function of an adjacent damaged brain area, this is best described as
   A. synaptic growth.
   B. synaptic formation.
   C. synaptic development.
   D. neuroplasticity.

To answer these and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

5.3 Impact of an acquired brain injury

At most times, our brain serves us well. When intact and undamaged, it usually enables us to successfully adapt to our environment and meet the demands of everyday life. When the brain is injured, people can experience one or more impairments that may affect them physically and/or how they think, feel and behave.

Many people with a brain injury can function quite effectively in everyday life, but the impact will depend largely on the individual involved and the nature, location and severity of the injury itself. The long-term effects of a brain injury are different for each person. Appropriate treatment and the timing of the intervention also play a vital role in the level of recovery.

A **brain injury** is any type of brain damage or disorder that impairs or interferes with the normal functioning of the brain, either temporarily or permanently. The term 'brain injury' is most commonly used in relation to damage or disorders that occur after birth.

Any brain damage or disorder due to a developmental condition is not considered to be a brain injury. The term **acquired brain injury** is therefore commonly used to differentiate brain injury from neurodevelopmental disorders (such as autism and ADHD) that a person is born with.

There are many causes of an acquired brain injury. These include accidental causes such as falls and sporting incidents, intentional blows to the head, violent shaking of the head, stroke, alcohol and other drugs, lack of oxygen, brain surgery, infection (such as meningitis), brain inflammation (such as encephalitis), epilepsy and degenerative brain disorders such as Parkinson's disease, Alzheimer's disease, motor neurone disease and chronic traumatic encephalopathy (CTE). Injuries sustained by infants in the uterus such as Foetal Alcohol Spectrum Disorder are also considered a brain injury (Brain Injury Australia, 2022a; Synapse, 2022a).

Brain injury can have *sudden onset* when it occurs abruptly, often at a single point in time; for example, when caused by a blow to the head, infection, stroke or drug overdose. Alternatively, brain injury can have *insidious onset*, when it gradually develops over a period of time in an imperceptible way, showing few signs and symptoms; for example, due to prolonged use of alcohol or another substance, a tumour or a degenerative brain disease.

Brain injury is common. It is estimated that about 1 in 45 Australians have a brain injury that impairs everyday life in some way. Three out every four of them are aged under 65. As many as two out of every three of these people acquired their brain injury before they turned 25. And three out of every four people with acquired brain injury are male (Brain Injury Australia, 2022b).

Severity of brain injury

Mild
e.g. good recovery, limited concentration, able to return to work.

Moderate
e.g. improvement over time, difficulties with coordinating movements, inability to organise, may require different line of work.

Severe
e.g. decreased movement control, decreased ability to communicate, requires support with daily living, unable to return to work.

Very severe
e.g. unable to control movement, unable to communicate, requires 24-hour support, unable to return to work.

Figure 5.9 A brain injury can range from mild to very severe.

In this section we examine three types of acquired brain injuries and their impact on a person's biological, psychological and social functioning. We consider the effects of a traumatic brain injury to the frontal lobes, how injury to Broca's and Wernicke's area in the left hemisphere may produce language impairments, and problems that may be experienced when blood flow to the brain is disrupted after a stroke.

on Resources

Weblink Read some personal stories about people living with brain injuries

Teacher weblink Mind Matters: A documentary on brain injury 55 m 19 s

5.3.1 Traumatic brain injury

Traumatic brain injury is a type of acquired brain injury that occurs when an external force causes damage to the brain. This can result from a blow to the head, by the head being forced to move rapidly forward or backward, or when an object pierces the skull and enters brain tissue.

The trauma that causes the brain injury may be due to a fall, motor vehicle accident, sporting accident, assault, violent shaking, domestic violence, a gunshot wound during combat duties, or some other cause. Furthermore, the brain injury may be acquired in a single traumatic event, such as a 'king hit' or 'coward punch' to the head, or from repeated blows over time, as may occur in a boxing match or following a number of competitive contact sports games.

When the head is struck hard, the brain slams against the inside of the skull. As a result of this blow or rapid movement, brain tissue may bleed, bruise, stretch, tear, twist or become swollen. Within the tissue, neurons may be killed out outright or slowly starved of the oxygen and nutrients they need to survive. The effects can be mild, moderate, or severe, depending on the extent of the damage to the brain. There may be a momentary loss of consciousness through to a long-term bout of unconsciousness or coma.

Sometimes a traumatic brain injury results in very serious and often life-threatening problems. As well as injury to the brain caused by the initial trauma, there are secondary effects that can arise from bleeding, bruising, lack of oxygen and increased pressure within the skull (NINDS, 2022b; Synapse, 2022b).

One of the earliest and best known cases of a traumatic brain injury was experienced by Phineas Gage over 150 years ago. The trauma damaged cerebral cortex in his frontal lobes.

Brain injury to the cerebral cortex has different effects on different people, both in the short term and long term. When the cerebral cortex is damaged, some other part of ourselves will also be affected. Even a mild injury can result in a serious disability that will interfere with a person's daily functioning and personal activities, often for the rest of their life. The extent of some of these changes may only become apparent as time progresses. In this section, we examine the traumatic brain injury sustained by Gage and its effects.

Figure 5.10 Unintentional falls are the leading cause of traumatic brain injury (TBI) in Australia. Falls by females are more likely to occur by slipping, tripping, stumbling or on steps. Males are more likely to have falls involving collisions, scaffolding, ladders, trees, playground equipment, skates, skis or skateboards, and building structures (AIHW, 2021; Brain Injury Australia, 2022c).

Phineas Gage case study

In September 1848, 25-year-old Phineas Gage was working as a construction foreman on a new railway line in the US state of Vermont. To remove a large rock in the way of the track, Gage poured gunpowder into a deep, narrow hole drilled into the rock. The gunpowder was packed in tightly with an iron rod before a fuse was lit to ignite it. The rod was more than a metre long, 3.5 centimetres in diameter and weighed 6 kilograms.

As Gage was packing down the gunpowder, a spark from the rod ignited the gunpowder and blew the rod into his cheek and out through the top of his skull. After going through his skull, the rod is said to have landed somewhere between 20 and 50 metres away, depending on which report is read.

Gage was pushed backwards and fell to the ground. His body began to shake uncontrollably, but he was still alive. He had suffered a massive head injury that seriously injured his frontal lobes. However, within minutes of the accident, he is reported as sitting up and talking to people near him. The doctor attending him was able to stop the bleeding, and cleaned out loose bits of brain tissue and bone before dressing the wound (Blakemore, 1977).

There was no immediate indication that Gage's mental or physical abilities had been affected by the accident, despite injury to both his frontal lobes, including the prefrontal cortex. However, the once friendly, considerate and quietly spoken Phineas Gage is reported to have become impatient, crudely spoken, aggressive, irresponsible and hard to get along with. His friends and acquaintances said that he had changed so much he was no longer the person they had known. Twelve years later, at the age of 36 or 37, Phineas Gage died (Macmillan, 2021).

Gage's doctor, John Harlow (1848), wrote a detailed account of the accident as well as of Gage's condition and symptoms. Years later, when he learned of Gage's death, he petitioned Gage's family to exhume the body and allow him to keep Gage's skull and the rod as a 'medical record'. These are on display in a museum at Harvard University in America.

Some 150 years later, American psychologist Hanna Damasio and her colleagues (1994), examined the metal rod and damage to Gage's skull. Using skull measurements and computer imaging techniques, they reconstructed the pathway of the rod to more

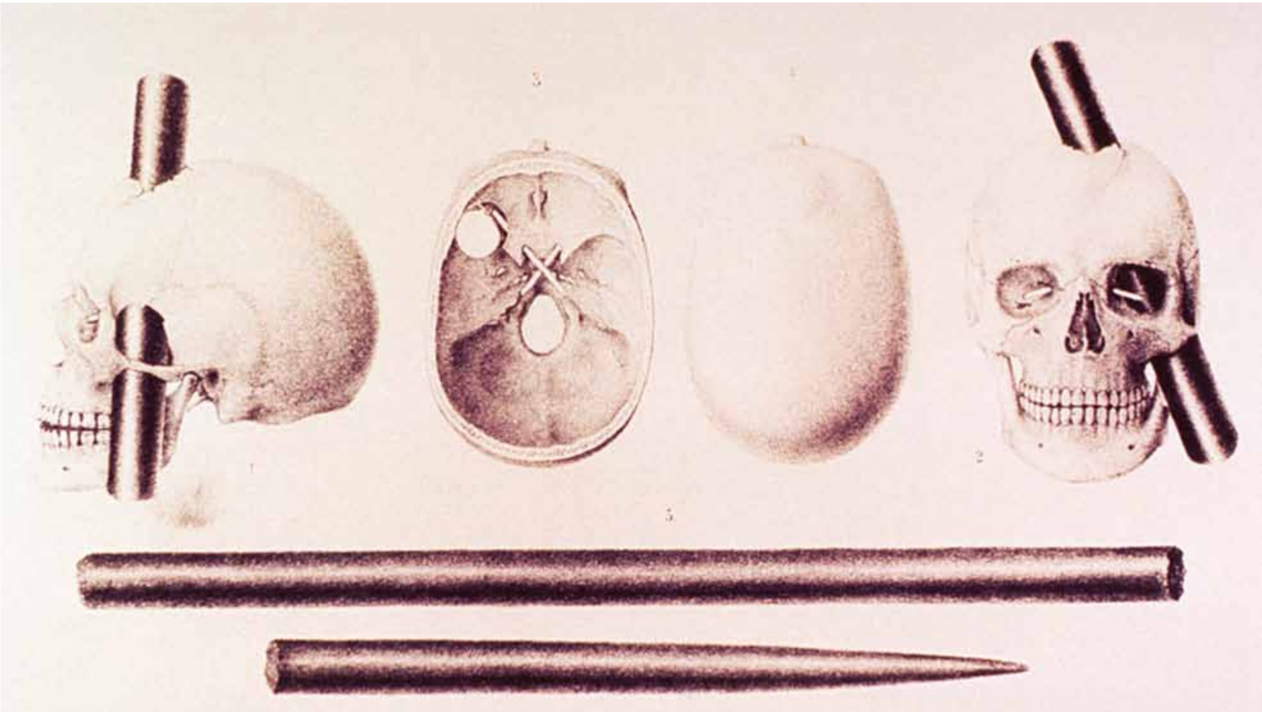


Figure 5.11 Phineas Gage's skull and the iron rod that penetrated his frontal lobes, especially the prefrontal cortex

accurately pinpoint the brain injury (see Figure 5.13). Then, they searched for case studies of patients with a known injury in the same area of cortex as Gage's injury. They examined these isolated case study reports and found that Gage's symptoms were consistent with those reported by other patients.

Common among individuals with an injury to the forward part of the frontal lobes (in the prefrontal cortex) is an unusual collection of biological, psychological and social changes.

Biological changes

Biological changes are primarily physical in nature. Individuals with a severe injury to the prefrontal cortex often have a range of problems with motor activities. In particular, their overall level of motor activity and ordinary voluntary, spontaneous movements are markedly reduced. For example, facial expressions tend to become blank and head and eye movements are minimal. Some reflexes that are evident only during early infancy, such as the grasping reflex of the hand, may also reappear.

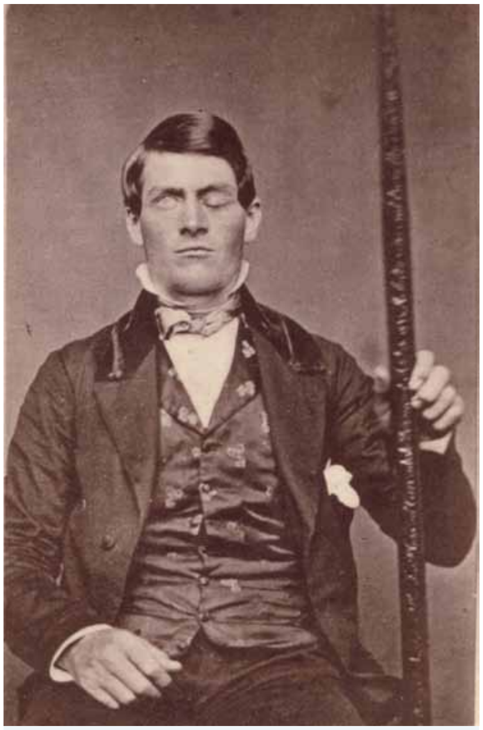


Figure 5.12 Phineas Gage (1823–1860) holding the iron rod that injured his frontal lobes

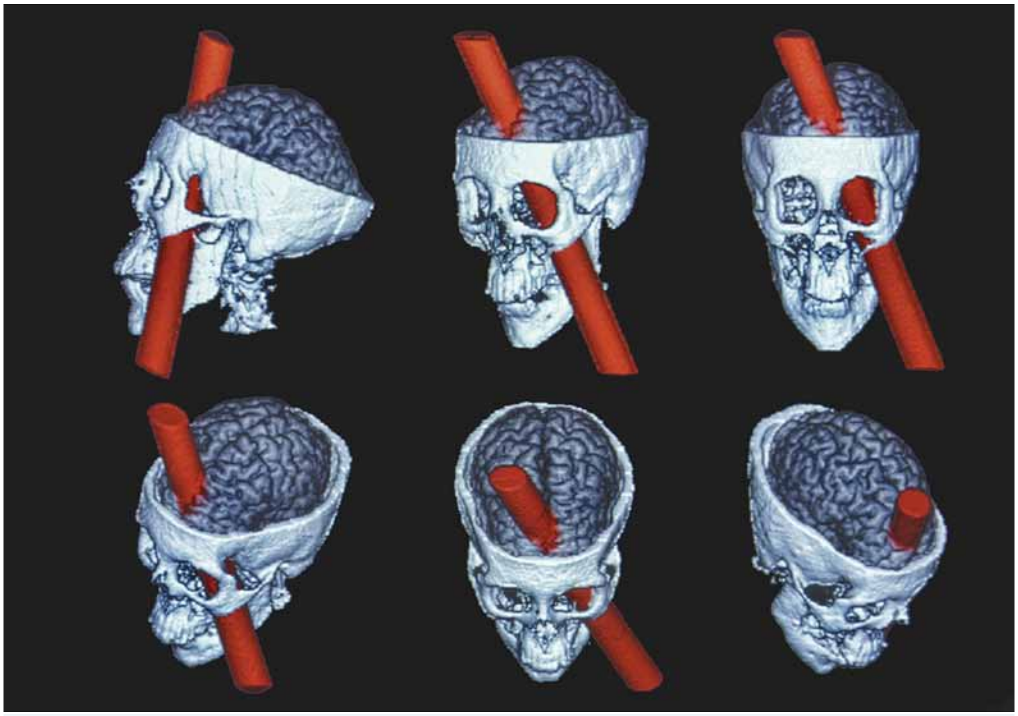


Figure 5.13 This computer reconstruction, based on measurements of Phineas Gage's skull, shows from several different perspectives the brain areas that are most likely to have been injured in his accident. The red cylinder shows the path of the iron rod, which entered the skull below the left eye and exited through the top of the head, severely injuring both frontal lobes, especially prefrontal cortex areas.

Psychological changes

Psychological changes primarily involve emotion, personality, social processes and cognition, which in turn impact on behaviour.

Emotional changes often include a persistent apathy (lack of concern about anything) and lack of emotional responsiveness, including lack of concern for the past or present. However, individuals often experience episodes in which this apathy is dramatically broken by bouts of euphoria (extreme excitement), impulsive behaviour, disregard for social norms, verbal and physical aggressiveness, boastfulness, silliness and, sometimes, unrestrained sexual activity.

Collectively, these types of changes are often perceived by others as changes in the individual's personality. A reduced responsiveness to pain is also commonly reported.

In relation to cognitive abilities, general intelligence — as measured by IQ scores — shows only slight changes. There do not seem to be problems with general knowledge or memory in general. However, creative thinking and

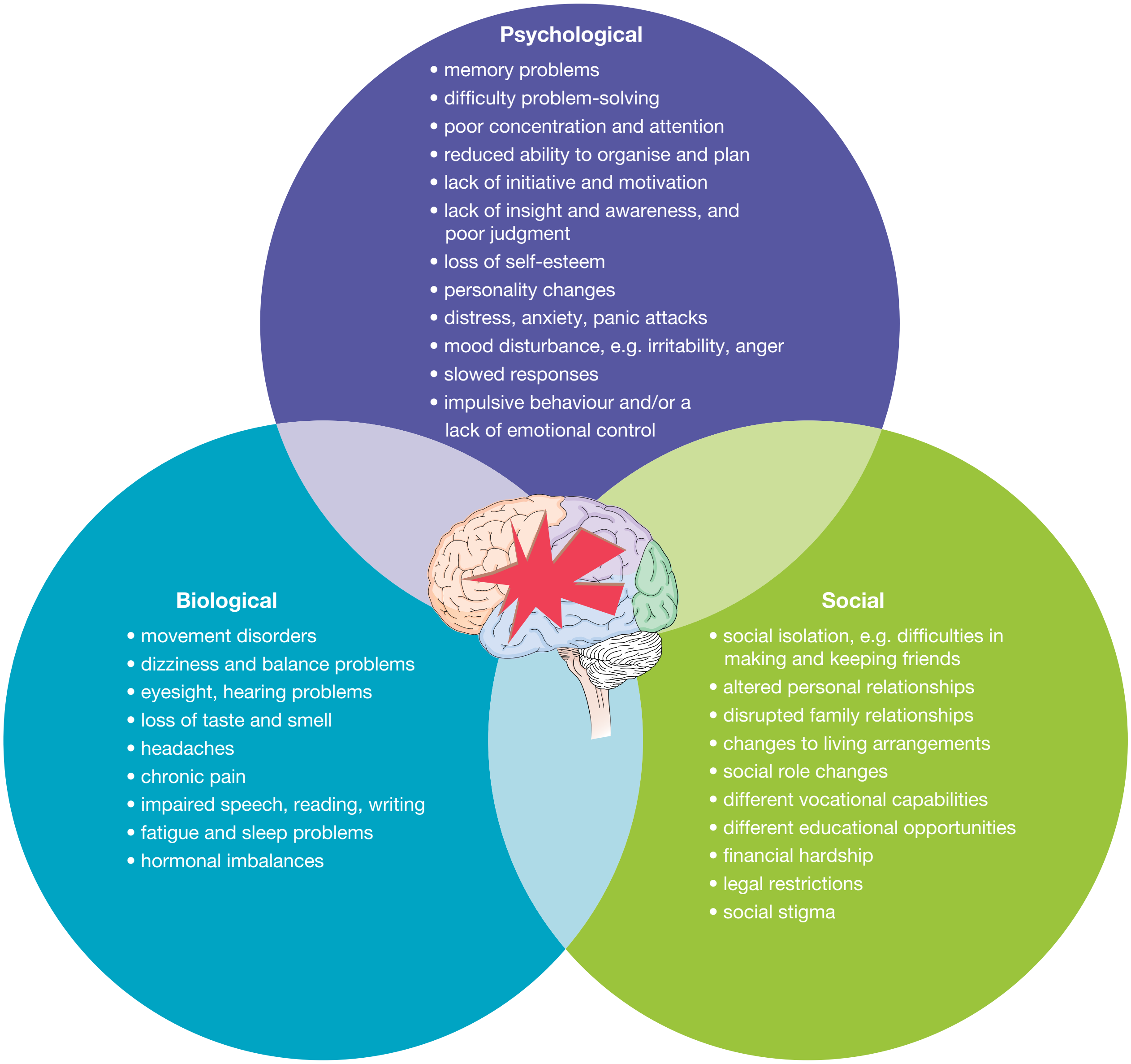


Figure 5.14 Acquired brain injury may impair biological, psychological and social functioning. The long-term effects are different for each person, and will vary depending on the individual involved and the nature, location and severity of the injury, access to treatment and timing of the intervention (Li et al., 2021; Synapse, 2022).

problem-solving tend to be affected, and forgetfulness is shown in some tasks requiring continual attention.

Case study reports of patients with a severe frontal lobe injury involving the prefrontal cortex have also emphasised problems with goal-directed behaviour, especially an inability to plan activities and use foresight. Daily activities of these individuals seem disorganised and without a clear direction of where these activities are leading or why they are being undertaken. For example, a patient given a simple set of errands may be unable to complete them (if able to do any at all) without numerous false starts, backtracking and confusion (Breedlove & Watson, 2020; Centre for Neuro Skills [CNS], 2021).

Social changes

Biological and psychological changes associated with frontal lobe injury, particularly personality changes and onset of socially inappropriate behaviour, can be difficult for partners, family members, friends, work colleagues and others in the individual's social network. This can lead to a breakdown in personal relationships and loss of social support. In addition, the individual may experience difficulty establishing new social relationships. For example, people with damage to prefrontal cortex have been found to have difficulties understanding what other people are thinking and feeling emotionally connected to others.

Injury to the cerebral cortex puts the individual at an increased risk for unemployment, lack of affordable housing and social isolation (Grison et al., 2015; CNS, 2021, Synapse, 2022c).

on Resources

Teacher weblinks Mini documentary on Gage and frontal lobe damage 5 m 41 s
Authoritative site on Gage
Movies, documentaries and videos about acquired brain injury

learnON

learnMORE | Lobotomy: Injuring the frontal lobe to treat mental disorders

Access learnON for a description of how a brain lobotomy was used to intentionally damage the frontal lobes in order to treat mental disorders.

learnON

learnMORE | Case studies of patients with cerebral cortex injuries

Access learnON for examples of case studies reported by eminent neurologist Oliver Sacks.

5.3 LEARNING ACTIVITY 1

Review

1. a. Explain the meaning of traumatic brain injury with reference to an example.
   b. Distinguish between brain injuries with sudden or insidious onset with reference to two examples of each type.
2. Explain why boxing is a dangerous sport, especially professional boxing for which protective headwear is not required during bouts.
3. a. Explain why Phineas Gage's injury may be called a traumatic brain injury.
   b. Which area of Gage's brain was injured?
   c. What did his injury indicate about the role of this brain area in mental processes and behaviour?
   d. How accurately and completely do Gage's symptoms represent symptoms of most people who damage the same brain area?

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

5.3.2 Aphasia

Aphasia is a language disorder that results from an acquired brain injury to an area responsible for language production or processing. Primary signs of the disorder include difficulty in expressing oneself when speaking, trouble understanding speech, and difficulty with reading and writing.

The type and severity of language impairment depends on the precise location and extent of the damaged brain tissue. Aphasia can be so severe as to make communication with the person almost impossible, or it can be very mild. It may affect mainly a single aspect of language use, such as the ability to retrieve the names of objects, or the ability to put words together into sentences, or the ability to read. More commonly, however, multiple aspects of communication are impaired (National Aphasia Association [NAA], 2022).

Aphasia is always due to an acquired brain injury. Although it is primarily seen in individuals who have suffered a stroke, aphasia can also result from a brain tumour, infection, inflammation, head injury, or neurodegenerative disorders such as Alzheimer's disease and other dementias that affect language-associated areas of the brain.

Language disorders due to severe intellectual impairment, loss of sensory input (especially vision or hearing), paralysis or impairment in the coordination of muscles involved in mouth movement or the hand (for writing) are not considered to be aphasic disorders. However, these disorders may accompany aphasia.

Aphasia in itself does not affect intelligence, nor is it a mental health disorder. The disorder may change over time through speech and language therapy contributing to neuroplasticity. Improvement tends to be a slow process. Some people continue to improve over a period of years and even decades. However, if caused by a stroke and the symptoms of aphasia last longer than 2 or 3 months after a stroke, a complete recovery is unlikely. Aphasia is generally viewed as a disorder that cannot be cured (NAA, 2022; NINDS, 2022c; Synapse, 2022d).

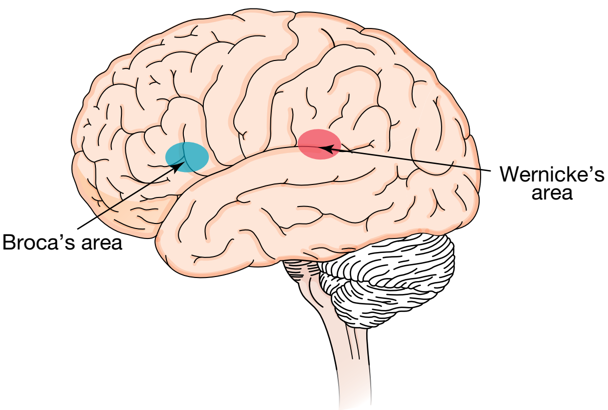


Figure 5.15 Broca's area and Wernicke's area

Types of aphasia

Different types of aphasia have been identified and there are various ways of classifying them. One of the more contemporary classification systems uses three broad categories:

- *fluent aphasias* — speech is easily produced and flows freely (i.e. fluent) but the sentences don't make sense and the person often has difficulties understanding what is heard or read
- *nonfluent aphasias* — difficulties in speaking clearly, often in short sentences with words omitted; speech is effortful and includes only key words necessary for communication, but no difficulties understanding what is heard or read
- *pure aphasias* — there are specific impairments in reading (*alexia*), writing (*agraphia*) or recognising spoken words despite being able to hear them (*word deafness*).

Within each of these broad categories, eight subtypes of aphasia are distinguished, including Broca's aphasia and Wernicke's aphasia. We examine the latter two.

Figure 5.16 To speak sensibly, you must think of words to convey an idea or message, formulate them into a sentence according to grammatical rules and then use your lungs, vocal cords and mouth to create sounds.

Broca's aphasia

In the 1860s, French doctor Paul Broca examined a patient who had lost the ability to say much more than the syllable tan. Following an autopsy of the patient and eight more cases with similar speech impairments over the next 2 years, Broca found that all had sustained damage to the relatively small area in the frontal lobe of the left hemisphere that is now named after him.

Damage to Broca's area results in Broca's aphasia. A person with **Broca's aphasia**, also called *nonfluent aphasia, expressive aphasia* or *motor aphasia*, has considerable difficulty producing speech. Reading and writing are also impaired. Speech comprehension is relatively good for everyday conversation with other people, but there is considerable difficulty understanding complex speech and lengthy verbal instructions.

Speech production is laboured and hesitant. It consists of very short sentences, typically three or four words, and these words are mainly verbs and nouns. The small parts of speech, such as *to* and *the*, are omitted, as are proper grammatical endings of words, such as -*ing* and -*ed*. For example, if you were to ask someone with Broca's aphasia what they did today, they might answer '*Went house visit cousin*' or '*Walk park today*'. The ability to utter 'automatic speech', however, is often unaffected. Such speech includes greetings ('*Hello*'), short, common expressions ('*Oh no*') and swear words (Breedlove & Watson, 2020).

Most people with Broca's aphasia are usually aware of their own language difficulties and have a relatively clear understanding of their condition. Interestingly, deaf people with brain damage to Broca's area can have difficulty producing sign language (Stirling, 2002).

Studies of individuals with Broca's aphasia have revealed that damage to any part of the area can result in the typical speech production problems. However, many studies have also failed to show a clear and consistent relationship between location of damage and the area originally described by Broca.

Nonetheless, the damage is always found in left frontal lobe areas, indicating the role of the left frontal lobe in speech production. Furthermore more recent studies using neuroimaging technology indicate that Broca's area and nearby areas in the left frontal lobe play an important role in the spontaneous expression of speech (Andrewes, 2001).

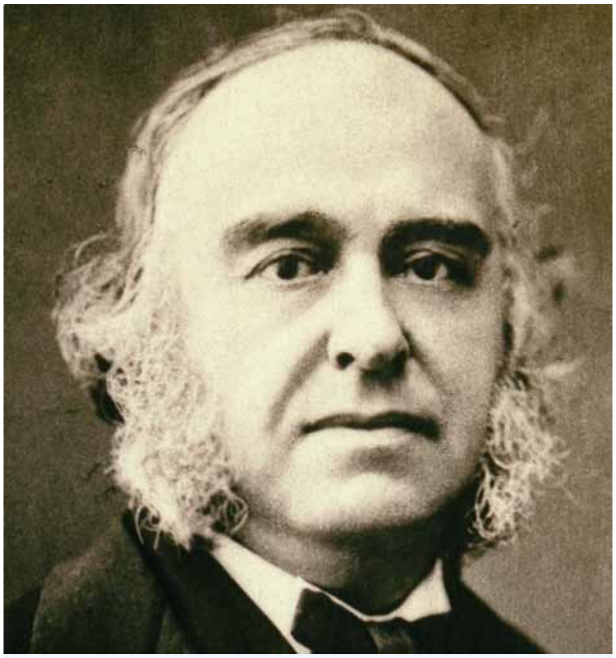


Figure 5.17 French doctor Paul Broca (1824–1880). Post-mortems of patients who could not speak fluently led him to the finding that they all had damage to the area in the left frontal lobe named in recognition of his discovery.

Example of speech of a Broca's aphasia patient

Cinderella's story

'a mother/ … three kids/ … bad mother/
one kid beautiful/ … rich/Italian/ … stepmother/
… talk about Cinderella/Cinderella/clean my
house/ … you Cinderella/close the door/ …
Cinderella like jail/ … mother … three kids/
… I love mother/ … Cinderella walk ball/ …
people ball/ … rich rich people/ … man and
Cinderella dance dance dance party/ … one/
… dance dance dance/ … dance every time/
… ball beautiful people/ … people watched
Cinderella/ … Cinderella … beautiful clothes
… and garments/ … twelve o'clock night/
Cinderella/oh no/oh no/ I'm sorry/I'm sorry
people/I love you baby/ … walk walk/tumble/
… one shoe bye-bye/ … Cinderella … pumpkin
cab/ … oh shoe/oh please/oh well/walk/walk
pumpkin car/.'

Source: Saffran, E.M., Berndt, R.S., & Schwartz, M.F. (1989). The quantitative analysis of agrammatic production: procedure and data. *Brain and Language, 37*, 440–479. In D.G. Andrewes (2001). *Neuropsychology: From theory to practice* (p. 303). New York: Psychology Press.

Wernicke's aphasia

Wernicke's aphasia, also called *fluent aphasia, receptive aphasia* or *sensory aphasia*, is a type of aphasia whereby a person has considerable difficulty understanding spoken or written language and speaking in a meaningful way. The individual hears the voice or sees the print but cannot make sense of the words.

Unlike someone with Broca's aphasia, a person with Wernicke's aphasia will speak fluently, but what is said makes no sense. For example, they can produce, or 'string together', a clearly spoken sequence of words or even proper phrases, but what they say is generally unintelligible. Their speech often has the correct rhythm and general sound of normal speech, but the content is odd, conveys little information and sounds like a word salad. For example, they might say something like *'I feel very well'. In other words, I used to be able to work cigarettes. I don't know how. Things I couldn't hear from are here* (Thompson, 2000; Schacter et al., 2009).

Most people with Wernicke's aphasia also have little or no conscious awareness or understanding of their condition. They talk nonsense without realising it, and lack awareness that other people cannot understand what is being said (Stirling, 2002).

Wernicke's aphasia is associated with damage to Wernicke's area, located in the temporal lobe of the left hemisphere. Its identification in 1874 by German doctor Carl Wernicke provided evidence of a second major language centre in another lobe of the left hemisphere. Like Broca's aphasia, Wernicke's aphasia is most commonly caused by a stroke.

Subsequent research has repeatedly confirmed the link between speech comprehension and production problems associated with Wernicke's aphasia and damage to Wernicke's area. However, other research has also identified left hemisphere areas in addition to Broca's area and Wernicke's area that are involved in language. These have been found elsewhere in the left hemisphere and beneath the cerebral cortex (i.e. sub-cortically). Furthermore, it has been found that right hemisphere areas also has a role in language.

For example, some people with major destruction to the left hemisphere are capable of swearing and using other emotionally charged words, or singing and producing well-learnt phrases. In some cases, these individuals can sing sentences they are unable to say, thereby making use of the right hemisphere's musical function.

In relation to comprehension, some frequently used concrete words, such as car, television and food, are understood by the right hemisphere, even if the patient is unaware that they have been shown the word. The right hemisphere also appears to have the ability to comprehend the overall context or theme present in a sentence (Andrewes, 2001).

Figure 5.18 German doctor Carl Wernicke (1848–1904) identified an area in the left temporal lobe that is involved with speech comprehension and speaking in a meaningful way. This observation was based on a post-mortem of one of his patients who had problems comprehending and producing speech.

on Resources

Weblinks Video about Aphasia: The Australian Aphasia Association 19 m 6 s
Video featuring a patient with Wernicke's area damage 1 m 30 s
Video featuring a patient with Broca's area damage 3 m 59 s

5.3 LEARNING ACTIVITY 2

Review

1. What is aphasia?
2. Distinguish between fluent, nonfluent and pure aphasias.
3. Complete the following table to compare and contrast Broca's aphasia and Wernicke's aphasia.

Characteristics	Broca's aphasia	Wernicke's aphasia
Specific brain area damaged		
Hemisphere involved		
Lobe involved		
Main language or communication difficulties		
Individual's awareness of language difficulties		

4. What do studies of people with aphasia indicate about the roles of the different hemispheres in language?
5. Olivia has recently suffered serious head injuries as a result of a car accident. Apparent effects of her injury are in her use of speech and her comprehension of speech. While she strings lengthy sentences together, they make little sense. Likewise, she seems to have great difficulty making sense of what others say.
   a. Identify the brain area likely to be damaged and therefore the probable cause of Olivia's speech problems. In which brain lobe is this area located?
   b. Explain the role this area plays in people whose brains are not affected by stroke, injury or disease.
6. Following a stroke, Carlo's speech consisted of very short sentences that were incoherent. For example, the sentences were often made up of a few nouns and verbs that weren't linked properly.
   a. Identify the brain area that is most likely linked to Carlo's speech problems. In which brain lobe is this area located?
   b. Explain the role this area plays in people whose brains are not affected by brain damage.

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5.3.3 Stroke

The most common cause of acquired brain injury is stroke. A **stroke** occurs when blood supply to part of the brain is interrupted.

Blood is carried to the brain by blood vessels called arteries. Like all organs, the brain needs the oxygen and nutrients provided by blood to function properly. If the supply of blood is restricted or stops moving through an artery, brain cells do not get enough oxygen or nutrients. When brain tissue is deprived of blood, the brain cells die within minutes resulting in brain damage to the affected area. The area of brain damage is called a *cerebral infarct*.

Types of stroke

There are two types of strokes which may also be described as causes of stroke:

- *Ischaemic* — when blood supply is restricted or stopped in one of the blood vessels because it is blocked. This is often due to a blood clot that has formed elsewhere in the body and travelled to the blood vessels supplying the brain. These blood clots typically form in areas where the arteries have been narrowed or blocked over time by deposits of fatty materials called plaques.
- *Haemorrhagic* — when a blood vessel supplying the brain becomes weak and bursts causing bleeding in the brain. This is often due to high blood pressure, which weakens the vessel wall, causing it to burst.

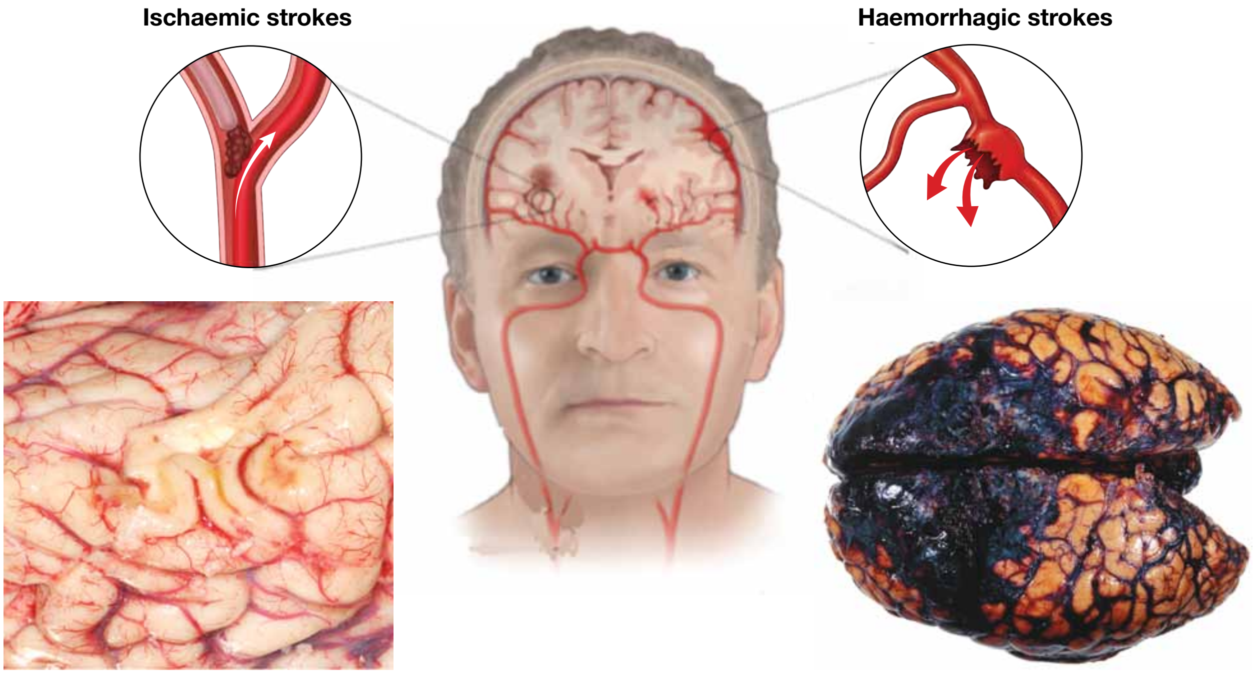
Ischaemic (is-key-mick) strokes are the most common type, representing over 85% of all strokes. There is also a related condition called a *transient ischaemic attack* (TIA), where the blood supply to the brain is temporarily interrupted. This causes what's known as a 'mini-stroke'. The effects last a few minutes to a few hours and fully resolve within 24 hours. The clot either breaks up very quickly or the affected area receives blood from nearby blood vessels. A TIA is often a sign that another one may follow and the person is at a high risk of having a full stroke in the near future.

It is estimated that about one in four people globally will have a stroke in their lifetime. About 500 000 Australians are presently living with the effects of stroke and every 19 minutes there is one Australian experiencing a stroke for the first time. Stroke does not just affect adults. A stroke can happen at any age. There are over 600 childhood strokes a year in the Australia, affecting infants and young children (Stroke Foundation, 2022a).

There are various reasons stroke occurs and a number of well-established risk factors. Some of these can be controlled or changed and others cannot. Older age, being male, family history and already having experienced a stroke are risk factors that cannot be controlled. There are also medical conditions such as type 2 diabetes and various heart disorders that increase the likelihood of a stroke.

Risk factors associated with lifestyle can be controlled. These include high cholesterol, high blood pressure (i.e. hypertension), smoking, being overweight and/or obese, poor diet (especially too much salt and saturated fat), lack of physical exercise and drinking too much alcohol too often.

Overall risk increases when multiple risk factors are present (Stroke Foundation, 2022b).



(a) The area of dead cortical tissue (pale yellow) caused by an ischaemic stroke. The cerebral infarct is a result of a lack of blood flow to that area of the brain, caused by a blockage in a blood vessel.

(b) The dark area of clotted blood is the large accumulation of blood from a burst blood vessel that caused a haemorrhagic stroke. The bleeding would have led to reduced blood supply to the brain tissue (causing brain damage), pressure on the brain, and ultimately death.

Figure 5.19 Brains at autopsy of two patients who died from different types of stroke. The brain area damaged by a stroke is primarily determined by which blood vessel(s) is affected. The brain receives its blood supply from four main arteries that ascend from the neck (two on each side) and branch out in the brain.

Symptoms of stroke

According to the Stroke Foundation (2022c) facial weakness, arm weakness and difficulty with speech are the most common symptoms or signs of stroke (including a TIA), but they are not the only signs. The following may occur suddenly, alone or in combination:

- numbness or weakness in the face, arm or leg, especially on one side of the body
- speech disturbance, such as slurring or decreased speech fluency or comprehension
- trouble walking, dizziness, loss of balance or lack of coordination
- trouble seeing in one or both eyes
- headache, usually severe with no known cause
- difficulty swallowing
- nausea or vomiting.

A stroke is a medical emergency and urgent treatment is essential. The sooner medical help is obtained, the better the chance of recovery.

Effects of stroke

How a stroke affects a person depends on the individual, type of stroke, the location of the blocked or burst artery, the brain area that was damaged, how much brain tissue is damaged and how badly. Every individual's brain is different, so individuals who have experienced the same type of stroke will often display different symptoms depending on precisely where and how much of the brain was deprived of oxygen and where cortical tissue death or damage has occurred.

The brain hemisphere and lobe in which the stroke occurred will suggest the potential effects. The left hemisphere of the brain controls most functions on the right side of the body and the right hemisphere controls most functions on the left side. There are also cortical areas within lobes that have significant roles in one or more functions. Therefore, if brain damage occurs in the left hemisphere, then one or more functions on the right side of the body will be affected, and vice versa.

For example, if motor cortex damage occurs in the right hemisphere, then the individual may experience paralysis or weakness of voluntary movements on the left side of the body. If somatosensory cortex damage occurs in the parietal lobe in the left hemisphere, then the individual may experience impairments with touch sensations on the right side of the body. If a language area in the frontal or temporal lobe in the left hemisphere is damaged then the individual may experience aphasia. If the visual cortex in the occipital lobe is damaged then vision will be affected.

Damage to the cerebellum may affect the individual's coordination and balance. Deep inside the brain, damage to the pons or thalamus can result in a permanent coma, damage to the hippocampus may affect memory and damage to the hypothalamus may cause disruptions in body temperature regulation and sleep.

There may also be changes in mood, emotions, personality and behaviour. These could be associated with brain damage and/or psychological problems arising from lifestyle adjustments that have to be made due to the stroke experience.

A stroke can lead to permanent brain damage, disability or death. For those who recover from its effects, the time taken to recover, functions that are recovered and the extent of their recovery will be different for each individual. Recovery time can take weeks, months, or even years. Some people may recover fully, whereas others are often left with long-term impairments caused by their brain injury.

Figure 5.20 The extent of recovery after a stroke varies with each person and can be a long process.

on Resources

Weblinks Stroke Foundation: F.A.S.T test for quickly assessing whether someone is having a stroke
Videos on life experiences of stroke sufferers:
- A Year 12 student 3 m 33 s
- A 44-year old man 4 m 33 s
- A young Wiradjuri woman 2 m 17 s

Diagnosis and treatment

Strokes are primarily diagnosed by carrying out a physical examination, checking the results of blood tests and studying neuroimages. Generally, a physical examination will check heart rate, blood pressure and other symptoms, blood tests can be used to assess blood clotting, blood sugar level and the presence of infection, and neuroimaging can be used to evaluate the type of stroke, the brain area affected and the severity of the injury. Collectively, these types of assessments are also used to ensure the symptoms are definitely due to a stroke and not another possible cause.

The treatment will depend on the type of stroke and brain damage. However, there is no medical treatment that will actually repair the brain damage. Recovery and improvement are dependent on stroke rehabilitation therapy and activities.

Rehabilitation helps someone re-learn or find new ways of doing things that were affected by their stroke. The timing of the rehabilitation is important. Generally, the sooner it begins, the greater are the chances to recover lost skills and function.

Figure 5.21 A stroke is the leading cause of acquired brain injury in Australia. The white area towards the centre of this CT scan shows brain damage caused by a burst aneurysm which is a common cause of a haemorrhagic stroke. An aneurism is a weak or thin spot in the wall of an artery that has swelled and ballooned out. As the aneurysm gets bigger, it becomes thinner and weaker and often will leak or burst, which releases blood into the brain.

Research shows the most important element in a rehabilitation program for stroke (or any other neurological disorder) is carefully directed, well-focused, repetitive practice to stimulate neuroplasticity. The rehabilitation program must be customised to practice those skills impaired due to the stroke, such as weakness, lack of coordination, problems walking, loss of sensation, problems with hand grasp, visual loss, or trouble speaking or understanding (NINDS, 2022d).

Research using neuroimaging shows that the functions previously located in the area of damage can be reassigned to other brain areas and practice helps drive this neuroplasticity process. The case of a 25-year-old female who was an accomplished pianist highlights this fact. She had a stroke that damaged left hemisphere areas of her brain and was unable to speak and lost complete use of her right hand. It was a devastating loss at a young age, and her inability to play the piano only added to her distress.

The woman participated in a rehabilitation program that involved repeated attempts to engage the right side of her body, including speech therapy and piano playing. After several months of rehabilitation, she regained nearly full use of her right hand, and she was again able to speak. She also demonstrated exceptionally rapid finger movements in both hands, displaying speed and coordination beyond those of the average (non-stroke-affected) person. She eventually resumed her piano playing and fully recovered her abilities to the virtuoso levels attained before the stroke (Azari & Seitz, 2000).

Figure 5.22 Neuroplasticity enabled a stroke patient to fully recover her exceptional motor skills used as a concert pianist. Rehabilitation was an important part of her recovery.

on Resources

Weblink Video featuring a stroke sufferer's rehabilitation experience 4 m 29 s

5.3 LEARNING ACTIVITY 3

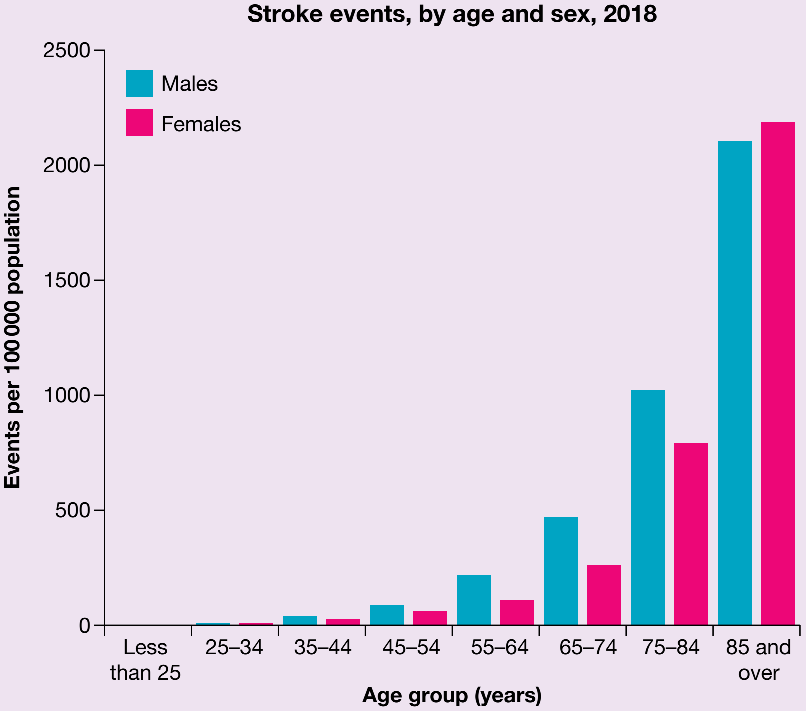
Review

1. Construct a definition for stroke that includes a reference to brain injury or damage.
2. Distinguish between ischaemic and haemorrhagic strokes.
3. What is the technical term for a mini-stroke?
4. The Australian Stroke Foundation and medical practitioners recommend the F.A.S.T test as a way to quickly identify the most common signs that someone is having a stroke. What do each of the letters in the test stand for and what action is each letter intended to trigger?
5. List four factors that may influence the brain injury that occurs due to a stroke.

6. Complete the following table by inserting a possible effect of brain damage to each area.

Brain area damage	Impairment
Broca's area	
primary motor cortex, left hemisphere	
prefrontal cortex	
parietal lobe, right hemisphere	
auditory cortex	
medulla	
substantia nigra	
reticular activating system	

7. A stroke patient will commence a rehabilitation program that has targeted recovery of lost motor function in one of their arms. What advice, based on and with reference to the principle of neuroplasticity, should be given to enable the best possible recovery?
8. Consider the data shown in the graph.



Source: Australian Institute of Health and Welfare, 2021. *Heart, stroke and vascular disease — Australian facts.*

What conclusion can be drawn about the relationship between:

a. age and stroke events?
b. sex and stroke events?

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5.4 Neurological disorders

Neurological disorders are nervous system disorders, often described as 'diseases' of the nervous system. These disorders may involve any part of the nervous system — the brain, spinal cord, the peripheral nervous system and its subdivisions, or any of the nerves or nerve parts. Muscles may also be involved as these are controlled by messages from the nervous system to produce movement and keep organs such as your heart and lungs functioning.

There are over 400 different neurological disorders, so hundreds of millions of people worldwide are affected by them. These disorders include epilepsy, stroke, aphasia, Alzheimer disease and other dementias, migraine and other headache disorders, multiple sclerosis, Parkinson's disease, motor neuron disease, cerebral palsy, brain tumours, traumatic disorders of the nervous system due to head injury, and infections of the nervous system due to bacteria (e.g. Meningococcal disease), viruses (e.g. HIV) and parasites (e.g. malaria) (WHO, 2016).

Epilepsy is one of the most common neurological disorders and affects people of all ages, races and socio-cultural backgrounds. More than 65 million people worldwide have epilepsy. It is more common in children, adolescents, and people over 60. About 4% of the Australian population will develop epilepsy at some stage in their lives, including 1 in 200 children (WHO, 2016; The Florey, 2022).

5.4.1 Epilepsy

Epilepsy is a neurological disorder involving recurrent, spontaneous seizures brought on by interference in normal brain activity. Seizures typically occur suddenly, without warning. They are triggered by bursts of electrical activity from clusters of neurons that start and spread from somewhere in the brain. They may start in a specific area and spread or start in both hemispheres and affect almost all the brain.

Neurons normally generate electrical and chemical signals that act on other neurons, muscles and glands to enable us to think, feel and behave as we do. During a seizure, many neurons fire (send a signal) at the same time, much faster than normal. This surge of excessive electrical activity occurring at the same time disrupts normal neuronal activity and causes involuntary changes in a person's movement, behaviour, level of awareness and/or feelings. Specific reactions during a seizure depend on the type of seizure and the area of the brain being affected (NINDS, 2022e).

Under certain circumstances, anyone can have a seizure. For example, a high fever, low blood sugar, high blood sugar or a brain injury can trigger a seizure. However, these may be health conditions that are not associated with epilepsy.

People who have sustained a traumatic brain injury from falls, car accidents, sports injuries and other accidents are more likely to experience seizures or epilepsy than those without a history of brain injuries. The more times a person has experienced a head trauma, the more likely they are to have seizures, but not necessarily epileptic seizures (Johns Hopkins Medicine, 2021).

Seizures can be *provoked*, which means something can trigger the seizure (e.g. stress, flashing lights). Seizures can also be *unprovoked*, meaning there is no known trigger for the seizure. However, seizure triggers do not cause epilepsy.

To be diagnosed with epilepsy, a person must experience recurring seizures, or at least two unprovoked seizures. Therefore, when a person has a single seizure this does not necessarily mean that they have epilepsy.

In Australia, around 10% of the population will experience a seizure in their lifetime, but much fewer will be diagnosed with epilepsy. It is estimated that about 50% of people who have one epileptic seizure go on to have more seizures (Epilepsy Foundation, 2022a).

Seizures vary, and can be very brief or last for much longer. Most seizures are generally over in less than 2 minutes. Some seizures are severe and some very subtle. While seizures can be frightening, in most instances they stop without intervention. Once the seizure is over, the person gradually regains control and re-orients themself to their surroundings, generally without any ill effects (Epilepsy Australia 2022a; Epilepsy Action Australia 2022; NINDS, 2022e).

5.4.2 Types of epilepsy

Epilepsy is not a single condition. There are many different types resulting from a variety of causes and experiences differ greatly within and between individuals. Some types of epilepsy are age-limited and the person eventually stops having seizures. For others, epilepsy is a life-long condition. The term *epilepsies* is now used to highlight the diversity of types and causes. However, one of the features all epilepsies have in common is that seizures start somewhere in the brain.

Epilepsy is also considered a spectrum disorder because of its different causes, different seizure types, its ability to vary in severity and its impact from person to person. For example, epilepsies range from severe, disabling and life-threatening, to ones that are much more benign. Some people may have convulsions (uncontrolled shaking) and lose consciousness. Others may simply stop what they are doing and have a brief lapse of awareness. Others will be unaware and unable to respond to those around them during a seizure. They may then not remember the seizure at all, or only remember certain aspects before or after the seizure.

Following a seizure, the person may feel tired and sleepy, confused, angry, sad or worried. Confusion following a seizure can last several hours, days or sometimes even weeks.

Some people may experience seizures when awake, others when asleep, others at any time. Moreover, some people have seizures very infrequently, others at a particular times of the day and others may experience hundreds of seizures throughout each day (Epilepsy Australia, 2022a; Epilepsy Foundation, 2022a).

Figure 5.23 Epilepsy is a diverse condition with many different causes. The term 'epilepsies' is now used to highlight the diversity of types and causes.

on Resources

Weblink Videos of epilepsy sufferers

The main symptom of any epilepsy is repeated seizures. There are no other symptoms that can be applied to all epilepsies. However, three particular symptoms tend to occur in many types:

1. *Onset of an aura* — an unusual subjective sensation (e.g. a strange feeling that's hard to describe), perceptual experience (e.g. unusual smells or tastes) or motor experience (e.g. tingling in arms or legs) that precedes and marks the onset of an epileptic seizure; an aura may act as a warning of an impending seizure.
2. *Loss of consciousness* — a loss of awareness ranging from complete loss to simply staring blankly into space for a brief period, often accompanied by amnesia in which the person forgets having had a seizure and the period of lost consciousness.
3. *Movement* — abnormal movements after onset of a seizure, such as jerking movements, twitching of the arms or legs, repeated shaking or chewing; sometimes there is a total loss of muscle tone and postural support causing the person to collapse.

The different epilepsies are distinguished in terms of the type of seizure experienced during an epileptic episode.

5.4.3 Types of seizures

There are at least 40 different types of seizures. As shown in Figure 5.24 on the next page, they are divided into three major categories — focal seizures, generalised seizures and seizures with unknown onset. There are different seizure types in each of these categories. Specific types are classified according to where they begin in the brain, whether the person is aware during the seizures and other features of seizures, such as whether they involve movement. Some people experience more than one seizure type (Epilepsy Foundation, 2022a).

- *Focal seizures:* Originate in one brain area in one hemisphere (a 'focal point') and affect the part of the body controlled by that brain area; may affect a small area in one of the lobes or a large part of one hemisphere; usually last for less than 2 minutes; may spread to both hemispheres (and become a focal to bilateral seizure).

- *Generalised seizures:* Originate in both brain hemispheres simultaneously and therefore tend to involve the whole body; there is no focal onset; many different subtypes; almost always affect awareness and loss of consciousness is common.
- *Seizures with unknown onset:* Neither focal or generalised as onset of seizure is not known; classification may be due to insufficient information for a diagnosis to be made or the symptoms of the seizure are unusual.

5.4.4 Causes of epilepsy

The epilepsies have many possible causes. Anything that disrupts the normal pattern of neuronal activity in the brain can lead to seizures. Many cases can be traced to an abnormality of the structure or function of the brain, especially after a traumatic brain injury. However, in at least half of all cases, epilepsy is *idiopathic*. This means that the cause is unknown. Some of the possible causes of epilepsy include:

- traumatic brain injury
- lack of oxygen to the brain for a long period, e.g. due to a stroke, birth trauma, cardiac arrest, drowning, drug overdose
- brain infection, e.g. meningitis, encephalitis
- brain abnormality at birth, e.g. brain damage during foetal development or birth
- brain tumour
- neurodegenerative disease, e.g. Alzheimer's disease
- genetic factors, e.g. abnormalities or genetic conditions with associated brain malformations.

There are also events that can bring on a seizure. These are commonly called *seizure triggers*. Some people living with epilepsy experience seizures triggered by certain events, whereas others will have no seizure triggers at all.

According to the Australian Epilepsy Foundation (2022b), common seizure triggers include:

- missed medication
- sleep deprivation, e.g. being overtired, not getting enough sleep or not sleeping well
- stress
- infection or illness
- hormonal changes (puberty, menstruation, menopause)
- dehydration
- low blood sugar
- alcohol or illicit drug use
- use of certain medications
- bright, flashing or flickering lights.

When triggers can be identified, there is more opportunity to manage seizure occurrence, risks and safety.

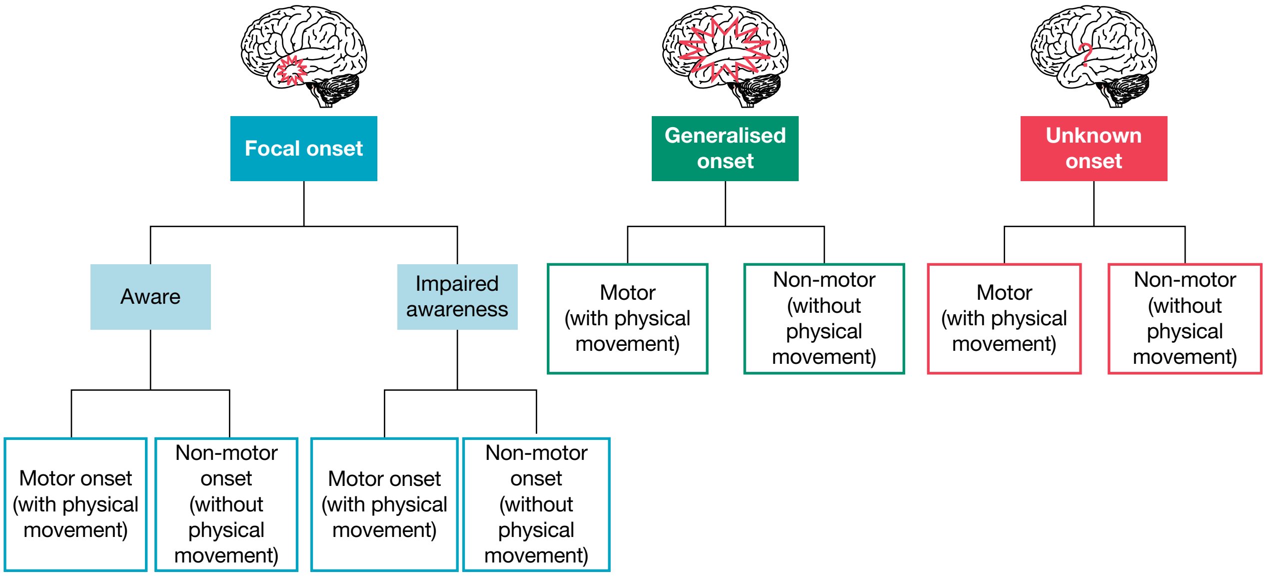

Figure 5.24 International classification system used for epileptic seizures. There are three major categories, with different types in each category. Not all seizure types and sub-types are shown in the chart. The formal definition of an epileptic seizure is a 'transient occurrence of signs and/or symptoms due to abnormal excessive or synchronous neuronal activity in the brain' (Fisher et al., 2005).

5.4.5 Diagnosis and treatment

Diagnosis of epilepsy typically involves a neurological examination along with other tests. This often involves assessment of the brain's electrical activity using an electroencephalogram (EEG) and brain scans using neuroimaging techniques such as CT and MRI. Accurate identification of the type of epilepsy helps ensure the most appropriate treatment.

Epilepsy cannot be cured but over two-thirds of people with epilepsy become seizure free if properly diagnosed and treated. Anti-epileptic medication is usually the first choice of treatment and is very effective for controlling seizures in the great majority of people with epilepsy. For others, the seizures may be controlled with diet, a brain stimulation device that delivers electrical signals to areas involved in seizures, and/or surgery.

Surgery is usually the last choice of treatment. This might be beneficial to patients who respond poorly to drug treatments. If an option, surgery usually involves removal of damaged brain tissue that may be a focal point for seizures (WHO, 2019; Epilepsy Australia, 2022b).

Most seizures do not cause brain damage, but ongoing uncontrolled seizures may cause brain damage. People who are newly diagnosed with epilepsy may have difficulty adjusting, particularly if they need to take new medicines or make lifestyle changes. For example, it may no longer be permissible to drive a car if seizures cannot be controlled, which can have significant consequence for many people.

It is also not uncommon for people with epilepsy, including children, to develop psychological or behavioural problems in conjunction with seizures. Issues may also arise as a result of the stigma attached to having epilepsy, which can lead to embarrassment, teasing, bullying or avoidance of school and other social settings.

For many people with epilepsy, the risk of seizures restricts their independence and various everyday activities. For example, there may be lack of participation in school, work or recreational activities due to fear of seizures.

Epilepsy can be a life-threatening condition. Some people with epilepsy are at special risk for abnormally prolonged seizures or sudden unexplained death in epilepsy. For example, the risk of premature death in people with epilepsy is up to three times higher than in the general population, with the highest rates of premature mortality found in low- and middle-income countries and in rural areas. (WHO, 2019; NINDS, 2022e).

Figure 5.25 Assessment of brain wave activity assists the diagnosis and treatment of epilepsies.

learnON

learnMORE | Electroencephalography (EEG)

Access learnON for a description of the EEG, its applications and limitations.

5.4 LEARNING ACTIVITY

Review

1. a. What is epilepsy?
   b. Why is epilepsy classified as a neurological disorder?
   c. Why can epilepsy be described as a spectrum disorder?
2. a. Define the meaning of epileptic seizure.
   b. List six characteristics of epileptic seizures.
   c. Distinguish between focal and generalised seizures.
3. What determines the behaviour changes that may occur during a seizure?
4. What do all known causes of epilepsy have in common?
5. What is the most common treatment for epilepsy?

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

5.5 Chronic traumatic encephalopathy (CTE)

Concussion is a type of traumatic brain injury caused by a blow to the head or by a hit to the body that causes the head and brain to move rapidly back and forth. This sudden movement can cause the brain to bounce around or twist in the skull, disrupting neuronal activity and sometimes stretching and damaging brain tissue and cells.

Concussion is a common sporting injury, particularly in body contact sports, such as boxing, AFL football and rugby, as well as recreational activities where falls are common, such as horse riding, cycling, skiing and trail bike riding. It can also occur after a sudden change in direction, such as when swerving on the sporting field or due to 'whiplash' injury in a car, both of which can cause the brain to strike against the skull. A 'black out' or loss of consciousness is not required for the diagnosis of concussion (Brain Foundation, 2022; CDC, 2022).

Concussions are commonly described as 'mild' brain injuries because they are usually not life-threatening. Problems in most cases tend to be short-lived and people return to normal functioning fairly quickly. However, the effects of a concussion can be serious. This is more likely when a person has a previous history of concussion.

Chronic traumatic encephalopathy (CTE) is a progressive brain degeneration and fatal condition thought to be caused by repeated blows to the head and repeated episodes of concussion. It is particularly associated with contact sports and was previously known as *punch drunk syndrome* or *dementia pugilistica*, reflecting a belief that it was a disease almost exclusive to former boxers. But these terms are no longer used because it's now known that the condition is not limited to ex-boxers.

CTE is a rare disorder that is not yet well understood. It was first diagnosed by an American doctor in the early 2000s during an autopsy of the brain of a former professional NFL gridiron footballer.

Over the last few years, the Australian Sports Brain Bank (2022) has started identifying CTE in ex-players of Australian Rules football, rugby league, and rugby union. There's still some debate about how common CTE is, its symptoms and its diagnostic criteria.

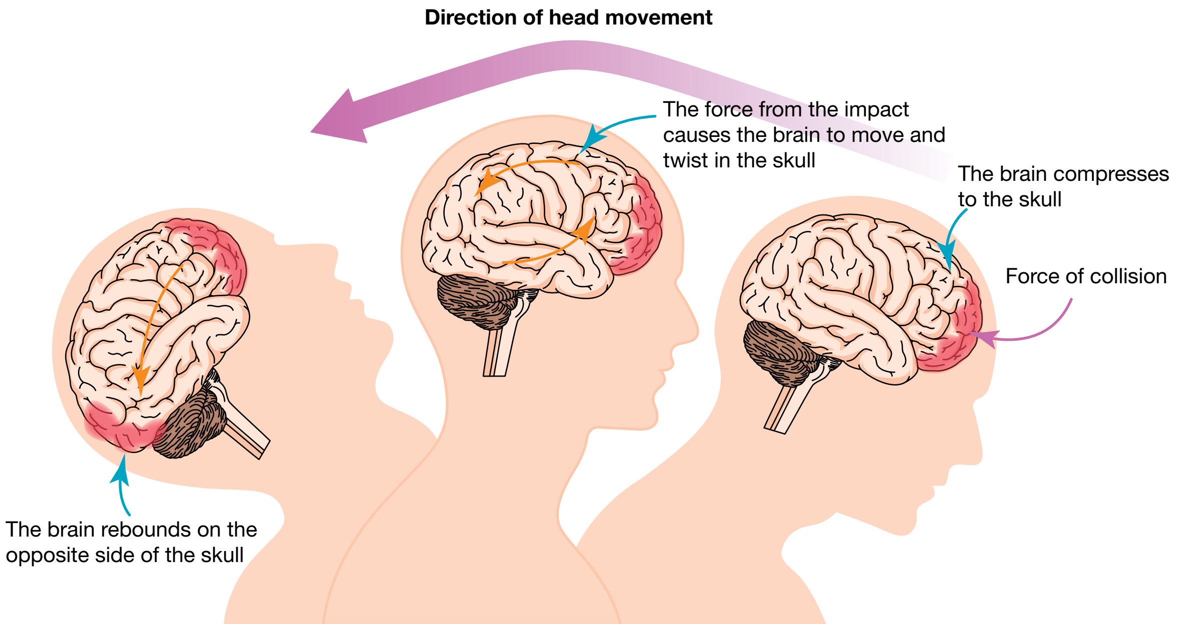

Figure 5.26 Concussion is a traumatic brain injury due to an external force causing the head and brain to move rapidly back and forth.

Figure 5.27 CTE was first diagnosed by an American doctor in the early 2000s during an autopsy of the brain of a former professional NFL gridiron footballer.

5.5.1 Symptoms of CTE

As with other brain disorders, the symptoms of CTE vary between individuals. Many symptoms are similar to those of other degenerative brain conditions such as Alzheimer's disease and Parkinson's disease, so they can be debilitating and have life-changing effects.

Generally, symptoms are initially mild but progress over time to become more severe. Furthermore, symptoms may not be experienced until years or decades after the brain injury occurs. Symptoms may include:

- loss of memory, e.g. asking the same question several times, or having difficulty remembering names or phone numbers
- mood changes, e.g. frequent mood swings, depression, feeling increasingly anxious, frustrated, agitated or aggressive
- personality changes
- difficulty controlling impulsive or erratic behaviour
- increasing confusion and disorientation, e.g. getting lost, wandering or not knowing what time of day it is
- difficulty thinking, e.g. finding it hard to make decisions, impaired judgments
- motor impairments, e.g. involuntary movement (tremor), slow movements, difficulty with balance, slurred speech.

5.5.2 Diagnoses and treatment

There is currently no medical or psychological test to diagnose CTE in a living person. Nor do changes to the brain always show up on brain scans. If they do, they may be similar to other conditions.

Diagnosis is primarily based on a history of participating in contact sports and the symptoms the individual presents. If CTE is suspected, then a range of medical and neurological assessments may be undertaken to rule out other possible causes.

CTE can only be properly diagnosed in an autopsy by examining sections of the brain. For example, the brain of an individual thought to have suffered from CTE has areas that have gradually wasted away (atrophy). There is also an abnormal build-up of a protein called tau that interferes with the functioning of neurons (and is also strongly associated with Alzheimer's disease). However, recognition of CTE during an autopsy remains limited and as a result it is not clear how often evidence of CTE goes undetected in autopsies (NINDS, 2022f).

As with most other types of neurodegenerative brain disorders, treatment for CTE is based around supportive treatments.

5.5.3 CTE research

Researchers are still trying to understand how repeated head traumas and other factors might contribute to the changes in the brain that seem to result in CTE.

Researchers do not know the number and types of head impacts that increase the risk for CTE. Furthermore, not all athletes who experience repeated concussions go on to develop CTE. Nor do most other people with a history of head or brain injuries. In addition, CTE has been diagnosed in people without a history of head or brain injuries (CDC, 2019).

According to Sports Australia (2022), the link between sport-related concussion and CTE is based on 'low-level evidence', such as case studies which cannot establish a cause-effect relationship between concussion and CTE. In addition, the contribution of potential confounding variables, such as genetic predisposition, alcohol and drug use or a co-existing dementia, 'is not adequately accounted for in the research evidence'.

Much scientific research remains to be done in order to better understand the condition. It is possible that biological, environmental or lifestyle factors could also contribute to the brain changes found in people with CTE diagnosed after death. More research is needed to learn about the causes of CTE, its symptoms, and how it affects the brain. In particular, research on the role of genetics, a person's medical history (such as age at first concussion or physical health), and other factors (such as environmental or lifestyle factors) is needed to better understand the risk factors for CTE (CDC, 2019).

Figure 5.28 CTE can only be properly diagnosed in an autopsy by examining sections of the brain.

Resources

Weblink Official trailer for the movie *Concussion*, based on the true story of forensic neuropathologist Dr. Bennet Omalu's discovery of football-related CTE

5.5 LEARNING ACTIVITY

Review

1. What is chronic traumatic encephalopathy (CTE)?
2. What is the main risk factor for CTE?
3. What is the main risk factor for concussion?
4. a. What does CTE have in common with concussion in relation to brain injury?
   b. What are two characteristics that distinguish CTE from concussion?
5. a. How is CTE diagnosed?
   b. What two changes are likely to be observed?
6. List three research findings or gaps in research evidence that have led many psychologists and medical practitioners to question the link between sport-related concussion and CTE.

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5.6 Review

Topic summary

- **Factors influencing brain plasticity**
  - Experience-expectant and experience-dependent plasticity
  - Neuroplasticity in response to brain injury
  - Types of change
    - Generation of new networks
    - Reassignment of function
    - Neurogenesis
- **Impact of an acquired brain injury**
  - Traumatic brain injury
    - Biological, psychological and social changes due to frontal lobe injury
  - Aphasia
    - Broca's aphasia
    - Wernicke's aphasia
  - Stroke
    - Ischaemic
    - Haemorrhagic
- **Neurological disorders**
  - Epilepsy (epilepsies)
    - Focal onset
    - Generalised onset
    - Unknown onset
- **Chronic traumatic encephalopathy (CTE)**

Key terms

acquired brain injury p. 356
aphasia p. 363
brain injury p. 357
brain plasticity p. 348
Broca's aphasia p. 364
concussion p. 376
chronic traumatic encephalopathy (CTE) p. 376
epilepsy p. 372
experience-dependent plasticity p. 351
experience-expectant plasticity p. 350
focal seizure p. 373
generalised seizure p. 374
insidious onset p. 357
neurogenesis p. 354
neurological disorder p. 371
neuroplasticity p. 348
pure aphasia p. 363
seizure p. 373
stroke p. 366
sudden onset p. 357
synapse p. 346
traumatic brain injury p. 358
Wernicke's aphasia p. 365

Note: The **References** for the entire title can be accessed in learnON and are also available as a downloadable PDF.

on Resources

Digital documents Key terms — Topic 5 (doc-37607)
Topic summary — Topic 5 (doc-37608)
Key diagrams PowerPoint — Topic 5 (doc-37610)

5.6 Topic 5 test

Section A: 15 marks **Section B:** 25 marks **Total:** 40 marks

Access learnON to answer the following test questions online and receive immediate feedback.

Section A — Multiple-choice questions

Choose the response that is **correct** or **best answers** the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Question 1

Which of the following is a characteristic of any type of acquired brain injury?

A. The brain injury has insidious onset.
B. The brain injury is associated with a neurodegenerative disease.
C. The brain injury is associated with a head injury.
D. The brain injury occurred at a single point in time.

Question 2

Which of the following statements about brain injuries is correct?

A. All brain injuries are life threatening.
B. All brain injuries are serious.
C. All brain injuries are traumatic.
D. All brain injuries involve brain damage.

Question 3

Which type of neuroplasticity is the most time-dependent?

A. experience expectant plasticity
B. experience dependent plasticity
C. functional plasticity
D. adaptive plasticity

Question 4

When neural connections are repeatedly used, then it is likely that they will

A. strengthen.
B. weaken.
C. disconnect.
D. disappear.

Question 5

Wernicke's area is located in the _____ lobe.

A. left temporal
B. right temporal
C. left frontal
D. right frontal

Question 6

Broca's area is located closest to the _____ cortex.

A. auditory
B. motor
C. somatosensory
D. visual

Question 7

The case study of Phineas Gage demonstrates the effects of brain injury to cortex in the _____ lobe.

A. frontal
B. parietal
C. temporal
D. occipital

Question 8

The crucial symptom for the diagnosis of epilepsy is

A. repeated seizures.
B. onset of an aura.
C. abnormal movements.
D. loss of consciousness.

Question 9

An acquired brain injury is best described as

A. a neurodevelopmental brain injury.
B. a neurodegenerative brain injury.
C. a brain injury sustained after birth.
D. a brain injury acquired due to genetic factors.

Question 10

Which of the following statements about epilepsy is correct?

A. You shake and jerk when you have epilepsy.
B. The only lasting effect of a seizure is confusion.
C. Epilepsy can start at any age.
D. Epilepsy cannot be treated.

Question 11

A synapse is

A. a neural connection.
B. a neural signal.
C. a neural pathway.
D. the place where neurons communicate.

Question 12

Which of the following statements about stroke is correct?

A. Stroke occurs in the heart.
B. You can't prevent stroke.
C. Stroke can happen to anyone at any age.
D. Neuroplasticity ensures full recovery from stroke.

Question 13

When a brain area assumes or 'takes over' the function of an adjacent damaged brain area, this is best described as

A. synaptic growth.
B. synaptic formation.
C. synaptic development.
D. neuroplasticity.

Question 14

Any brain injury due to neural degeneration

A. has gradual onset.
B. has sudden onset.
C. is idiopathic.
D. is a traumatic brain injury.

Question 15

Which of the following statements about neuroplasticity is **not** correct?

A. Neuroplasticity is influenced by genetic factors.
B. Neuroplasticity involves both the brain and the rest of the nervous system.
C. Neuroplasticity enables the brain to compensate for loss of function through injury.
D. Neuroplasticity enables the brain to change its shape, structure and organisation.

Section B — Short answer questions

Question 1 (1 mark)

The more a particular movement is performed, the stronger the neural pathways for that movement become and the easier it gets to perform that movement in the future. This neurological change is best explained by _____.

Question 2 (2 marks)

Wernicke's aphasia primarily involves difficulties with speech _____, whereas Broca's aphasia primarily involves difficulties with speech _____.

Question 3 (2 marks)

a. Name the test that can be used to quickly identify symptoms of stroke. 1 mark
b. A person suspected of having suffered a stroke cannot move the little finger in their left hand when asked to do so, but can move all other fingers. What brain structure and/or area might have been injured? 1 mark

Question 4 (6 marks)

a. Explain why epilepsy is a neurological disorder. 2 marks
b. Define the meaning of epileptic seizure. 1 mark
c. Distinguish between focal and generalised seizures. 2 marks
d. What determines the behaviour and other changes during a seizure? 1 mark

Question 5 (6 marks)

Distinguish between each of the following:

a. fluent and nonfluent aphasias 2 marks
b. ischaemic and haemorrhagic strokes 2 marks
c. experience-expectant plasticity and experience-dependent plasticity 2 marks

Question 6 (2 marks)

Explain the meaning of traumatic brain injury.

Question 7 (4 marks)

a. What is thought to cause Chronic traumatic encephalopathy (CTE)? 1 mark
b. How is CTE diagnosed? 1 mark
c. What are two characteristics that distinguish CTE from concussion? 2 marks

Question 8 (1 mark)

Explain why a head injury does not necessarily cause a traumatic brain injury.

Question 9 (1 mark)

Describe a potential biological, psychological or social change that may be caused by a severe brain injury to the prefrontal cortex.

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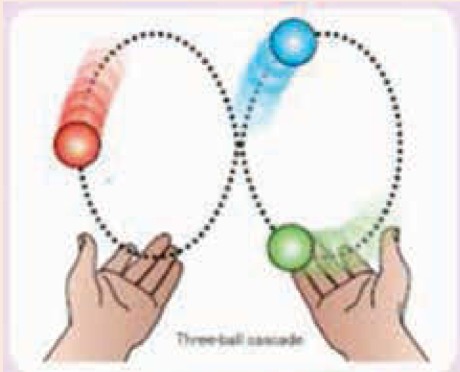
Go to learnON to access answers to the Topic 5 test. A customisable Word version of the test can also be downloaded from the **Digital documents** tab of the Resources panel.

learnMORE | Juggling and brain plasticity



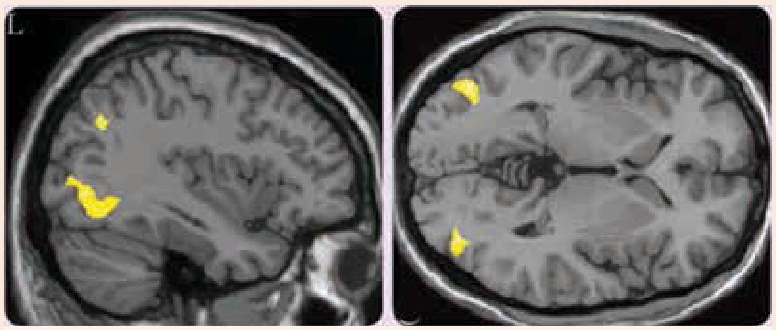
Research conducted by German psychologist Bogdan Draganski and his colleagues (2004) provides evidence that structural changes can occur in the human brain when a new skill is learnt. In their experiment, 24 adult participants (21 females and 3 males), all with no prior juggling skills, were randomly assigned to either a 'jugglers' group (experimental condition) or 'non-jugglers' group (control condition). Participants were then given MRI scans to collect baseline data on brain structure. The scans revealed no significant differences between the two groups in the amounts of grey matter and white matter in their brains.

Participants in the jugglers' group were taught a relatively uncomplicated juggling routine using three tennis balls. For the next three months, the jugglers were required to practise the routine until they could juggle three tennis balls for at least 60 seconds without error.

All participants were then given a second series of MRI scans. The scans of the jugglers' brains showed a 3 to 4% increase in the amount of grey matter when compared with their baseline scans. As shown in yellow in the figure below, these changes occurred in brain areas around the mid-temporal lobe that process and store information about how we perceive and anticipate moving objects. In comparison, the scans of the non-jugglers over the same three-month period showed no change in the temporal lobe or other brain areas.

The jugglers were then asked to stop practising their newly acquired skill. Three months later, the jugglers and non-jugglers were given a third series of MRI scans. The scans showed that three months after stopping juggling, the 3 to 4% increase in grey matter of the jugglers, compared to levels at the start of the experiment, had fallen to a 2% increase. In comparison, the same areas in the non-jugglers remained unchanged.

Draganski and his colleagues proposed that while the jugglers were learning their new skill, neurons in the affected areas were extending ('growing') and making more connections with other neurons, thereby increasing the volume of grey matter. The subsequent decrease in grey matter after juggling had ceased could not be explained. Nor did the researchers account for any possible differences between women's and men's brains.



The yellow areas in the MRIs show temporal lobe areas of the brain that temporarily increased in size in participants learning to juggle. These areas are involved in the abilities to perceive, remember and anticipate complex visual motions

The importance of these research findings is that there was a change in the anatomical structure of the brain that can be directly attributed to learning a new skill. Moreover, the results indicate that the brain can change as an adult.

Source: Hockenbury, D.H., & Hockenbury, S.E. (2006). *Psychology* (4th ed.). New York: Worth. p. 83.

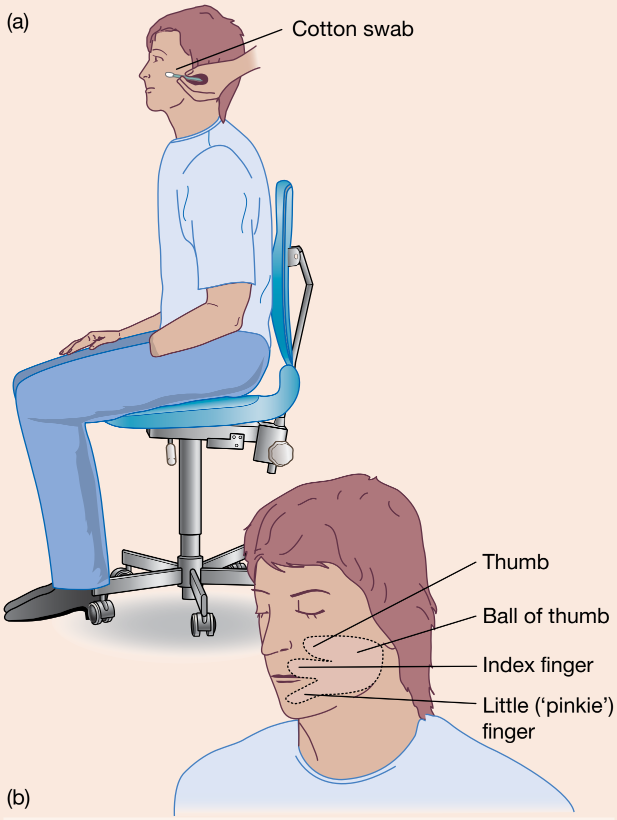
learnMORE | Neuroplasticity and phantom limb syndrome following amputation

Most people who have had a limb amputated continue to experience sensations from where their missing limb was originally located. This is called *phantom limb syndrome*. The missing limb feels as if it still exists and some even report feeling a persistent itch, extreme discomfort or chronic pain where it was located. Phantom limbs may also be experienced as moving normally, or missing arms may 'gesture' during conversations as if they really existed.

Such experiences have long intrigued psychologists and several explanations have been proposed to explain them. Psychologist Vilayanur Ramachandran, a leading researcher on phantom limb syndrome, has proposed that it can be attributed to the brain's plasticity.

Ramachandran stimulated the skin surface in various points on the face, arms and upper body while using functional neuroimaging to monitor brain activity in volunteer participants with an amputated limb. The same was done with a control group of participants who did not have an amputated body part. The scans showed areas of the somatosensory cortex that were activated when different parts of the body were stimulated by touch.

In one experiment, Ramachandran and his colleagues (1992) found that participants with an amputated hand reported that stimulation of their cheek through touch (with a cotton swab) was perceived as if the stimulation was on their now-missing hand. In some cases, this sensation was quite precise. When specific areas of the face were stimulated, participants reported sensations in a particular area, such as just one finger, of the phantom hand.



Mapping sensations in phantom limbs: (a) the researcher lightly touches the cheek of a participant's face with a cotton swab, thereby triggering sensations in their now-missing hand; (b) stimulating specific parts of the face can result in sensations in a particular area of the missing hand.

The scans also revealed that stimulating the cheek activated an area in the somatosensory cortex that previously would have been activated by their hand. Both the cheek and hand are represented next to each other in the somatosensory cortex.

Following the loss of the hand, the adjacent cortical area had both taken over the unused cortex previously representing the hand and also assumed its function. The new face and arm representations were now connected, filling in the space occupied by the hand representation. Through its plasticity, the brain had reorganised itself to compensate for the loss of sensation from the missing hand.

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Weblink Ramachandran discusses phantom limb syndrome and its explanation in terms of neuroplasticity 10 m 15 s

learnMORE | Lobotomy: Injuring the frontal lobe to treat mental disorders

In the late 1930s Portuguese neurologist Egas Moniz devised the *lobotomy*, a surgical procedure that severed nerve fibres to cut off the foremost portion of the frontal lobes from the rest of the brain. The operation was initially used to treat people diagnosed with a mental disorder, especially patients who could not control their emotions. Moniz received the Nobel Prize in Physiology or Medicine in 1949 for his advancement of the lobotomy.

In America, many doctors embraced the lobotomy and performed it on tens of thousands of people with mental disorders such as schizophrenia, major depression and obsessive-compulsive disorder.

Often called a prefrontal or transorbital lobotomy, it was a crude but simple operation, sometimes performed in a doctor's office using a local anaesthetic, with an ice pick inserted into the brain via an area under the patient's upper eyelid. The ice pick was then moved around until the connecting neural tissue was severed, in part or whole, depending on the diagnosis of the patient's disorder. The entire procedure took 3–4 minutes.

American neurosurgeon Walter Freeman demonstrates how to perform a lobotomy to mental health professionals in 1949. Freeman is shown hammering an ice pick under the patient's upper eyelid and into their frontal lobe

The operation generally had the effect of decreasing the patients' emotional responsiveness. Many became emotionally docile, remaining extremely and consistently calm even when in frustrating circumstances. As a result, the patients were much easier to manage in psychiatric hospitals. But it also left them disconnected from their social surroundings and had adverse effects on cognitive functions.

The prefrontal cortex is not only involved in regulating emotional responses, but also in the execution of many higher-order mental abilities. Consequently, the lobotomy left most patients unable to plan and organise their lives effectively as well as causing other problems associated with thinking. This eventually raised concerns about the lobotomy, although it continued to be practised until the mid 1950s when new medications were developed to treat mental disorders.

on Resources

Teacher weblinks Transorbital Lobotomy by Walter Freeman (graphic) 10 m 58 s

A brief history of the practice of lobotomy regarding Dr. Walter Freeman 5 m 10 s

learnMORE | Oliver Sacks' case studies of patients with cerebral cortex injuries

British neurologist Oliver Sacks (1933–2015) reported many case studies that describe the effects of injury to the cerebral cortex in his books, including *The Man Who Mistook His Wife for a Hat* (1985) and *Seeing Voices* (1990). There have also been movies based on some of his books.

In one case study, Sacks (1990) described the experiences of a patient whose brain injury involved an association area in the occipital lobe. The man could still see the basic features of objects, such as colour, edges and movement. He was also able to recognise basic geometric shapes.

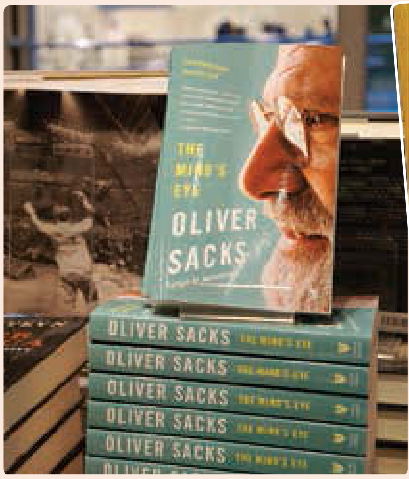
When Sacks showed the man a rose and asked him to identify it, the man responded: 'About six inches in length. A convoluted red form with a linear green attachment. It lacks the simple symmetry of the Platonic solids, although it may have a higher symmetry of its own . . . ' After some time spent continuing to reason about its parts, the man finally guessed that it might be some sort of flower.

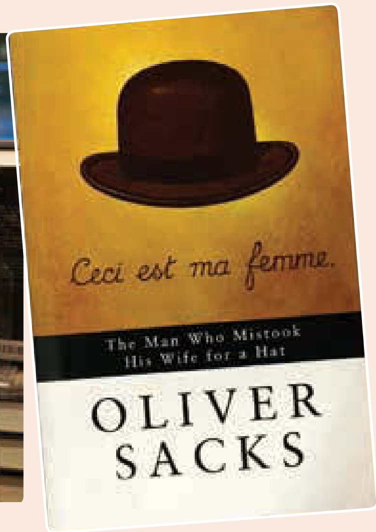
Sacks then held the rose under the patient's nose and asked him to smell it. 'Beautiful!' the man exclaimed. 'An early rose. What a heavenly smell!' The man could easily identify the rose by smell but not by sight, even though he could see every feature and describe most of them in considerable detail.

According to Sacks, the man was unable to integrate the information because of damage to an association area that would have helped him make the connection between the visual and olfactory (smell) parts of the relevant information stored in his memory.

In another case study, Sacks (1985) described the case of 'Christina' who had lost the ability to feel the position of her own body. She reported feeling disembodied, like a ghost. On one occasion when she was a patient in a hospital, she became annoyed at a visitor whom she thought was tapping her fingers on a tabletop. But it was actually Christina, not the visitor who was doing it. It was as if her hands were acting on their own and her body was doing things that she was unaware of.

Sacks diagnosed Christina as having lost all her sensory feedback about joints, muscles and positions of her limbs. For unknown reasons, the sensory neurons that would normally carry this information to the primary somatosensory cortex in the parietal lobe were malfunctioning. This case study provided important insights into *kinesthesia*, the sense of knowing where our body parts are in space.





learnMORE | Electroencephalography (EEG)

First used in the 1920s, electroencephalography preceded all the current neuroimaging techniques. Even though it cannot produce an image of the brain, it is still in common use.

(a)

(b)

(a) This infant's electrical activity in the brain is being recorded during research on facial perception. (b) An EEG recording showing the brain's normal electrical activity in the form of distinctive brain wave patterns.

The *electroencephalogram* (EEG) detects, amplifies and records general patterns of electrical activity in the brain over a period of time. The electrical activity is spontaneously and continuously produced by the brain's neurons, particularly neurons in the cerebral cortex just below the scalp. This is detected by electrodes attached to multiple areas of the scalp, usually through an 'EEG cap'.

The EEG translates the electrical activity into a visual pattern of brain waves. The brain waves are displayed as squiggly lines on a chart (see Figure (b) above). The lines correspond with different cortical areas. The different types of brain wave patterns are named after Greek letters of the alphabet such as alpha, beta, delta and theta. For example, the alpha pattern is apparent when a person is resting quietly with their eyes closed, beta when wide awake and alert, and delta when in a deep sleep.

The EEG has been widely used in all kinds of experiments, particularly to study different states of consciousness such as when awake or sleeping. It is also useful in the diagnosis and study of various brain disorders such as epilepsy and Parkinson's disease. More recently, the EEG has identified distinctive brain wave patterns often occurring in people with schizophrenia. Different types of brain waves are seen as abnormal only in the context of variations from what would normally be expected for the individual whose brain is being assessed.

A limitation of the EEG is that it can't detect neural activity deep inside the brain very well. Nor does it provide detailed information about which particular structures of the brain are activated and what their specific functions might be, especially areas beneath the cortex. The electrodes detect information from relatively large areas of the brain and there is also a lot of 'background' brain activity detected as well, so it can be difficult to pinpoint the specific area of the brain that is the source of the activity.

on Resources

Weblink Video on EEG use for psychological research 6 m 41 s

UNIT 2

How do internal and external factors influence behaviour and mental processes?

AREA OF STUDY 1

How are people influenced to behave in particular ways?

AREA OF STUDY 2

What influences a person's perception of the world?

On completion of this unit, the student should be able to:

OUTCOME 1

Analyse how social cognition influences individuals to behave in specific ways and evaluate factors that influence individual and group behaviour

OUTCOME 2

Explain the roles of attention and perception, compare gustatory and visual perception and analyse factors that may lead to perceptual distortions

Key knowledge

6 Social cognition

- the role of person perception, attributions, attitudes and stereotypes in interpreting, analysing, remembering and using information about the social world, including decision-making and interpersonal interactions
- the avoidance of cognitive dissonance using cognitive biases
- the positive and negative influences of heuristics as mechanisms for decision-making and problem-solving
- the influence of prejudice, discrimination and stigma within society on a person's and/or group's mental wellbeing and ways to reduce it

7 Factors that influence individual and group behaviour

- the influence of social groups and culture on individual behaviour
- the concepts of obedience and conformity and their relative influence on individual behaviour
- positive and negative influences of different media sources on individual and group behaviour, such as changing nature of social connections, social comparison, addictive behaviours and information access
- the development of independence and anti-conformity to empower individual decision-making when in groups

8 Perception

- the role of attention (sustained, divided, selective) in making sense of the world around us
- the role of perception in the processing and interpretation of sensory information, as demonstrated through top-down and bottom-up processing
- the influence of biological, psychological and social factors on visual perception and gustatory perception

9 Distortions of perception

- the fallibility of visual perceptual systems, for example, visual illusions and agnosia
- the fallibility of gustatory perception, for example, supertasters, exposure to miraculin and the judgment of flavours
- distortions of perception of taste and vision in healthy individuals, such as synaesthesia and spatial neglect

Source: © VCAA, *VCE Psychology Study Design: 2023–2027.* pp.28–30.

6 Social cognition

TOPIC CONTENT

6.1 Overview

KEY KNOWLEDGE

- the role of person perception, attributions, attitudes and stereotypes in interpreting, analysing, remembering and using information about the social world, including decision-making and interpersonal interactions
- the avoidance of cognitive dissonance using cognitive biases
- the positive and negative influences of heuristics as mechanisms for decision-making and problem-solving
- the influence of prejudice, discrimination and stigma within society on a person's and/or group's mental wellbeing and ways to reduce it

Source: © VCAA, *VCE Psychology Study Design: 2023–2027*. p.29.

We communicate with and interact with others on a number of different levels in everyday life. Our interactions may range from the intimacy of a close personal relationship through to the more impersonal and formal interactions with people we know less well.

The way in which we relate to another person depends, to a large extent, on the type of relationship we have with them. Our interactions with strangers will differ from the way we interact with people we know and like, and these interactions will be different again from those with people we know well, but don't like.

As we interact with others, we often try to understand the thoughts, feelings, motives and other influences that may explain why they are behaving in a particular way. When we do this, we tend to draw conclusions about them, often without even knowing them.

For example, we may decide whether we like or dislike them, whether we can trust or not trust them, whether they have acted appropriately or inappropriately, whether they have done something poorly or well, whether or not we want to work with them again, and whether or not we want to see them again. The mental processes involved are part of social cognition.

Figure 6.1 Social cognition involves information processing about our social behaviour and that of others. This often involves interpretation, categorisation and judgment.

Social cognition is concerned with how we make sense of our social world, especially our social behaviours and those of others. More specifically, **social cognition** involves how we perceive, think about and use information to understand and make judgments about ourselves and others in different social situations. This can include categorising ourselves, individuals, groups and social behaviour to assist our understanding.

Social cognition usually serves us well and we get better at understanding our own social behaviour and that of others as our cognitive abilities develop and we learn through experience. But it is not an error-free process. For example, we can decide to trust someone who shouldn't have been trusted, and someone who first impressed as likeable can turn out to be unlikeable.

Some mistakes in judgment are harmless. Other mistakes can have significant consequences; for example, when a friend trusted with an intimate secret reveals it to the 'last person' you would ever want to know or when an elderly person is exploited by an unscrupulous financial adviser who was trusted with their life savings.

There are many aspects of social cognition as it is a broad area of study in psychology in general.

In this topic we examine how factors such as our perceptions of others, the attributions we make, and our attitudes and stereotypes, can be used to understand and explain individual and group behaviours. We start by examining how we form impressions of other people and factors that influence the process.

6.1 LEARNING ACTIVITY

Multiple-choice questions

1. All forms of knowing and awareness, such as perceiving, reasoning, imagining and problem-solving involve
   - A. cognition.
   - B. emotion.
   - C. behaviour.
   - D. All of the above are correct.
2. Communication and interaction with other people in everyday life is an example of
   - A. cognitive behaviour.
   - B. emotional behaviour.
   - C. social behaviour.
   - D. All of the above are correct.
3. Social cognition primarily involves
   - A. one-way interaction.
   - B. two-way interaction.
   - C. communication.
   - D. information processing.
4. Which of the following is the best example of the social cognition process?
   - A. having a friendly conversation with a stranger at a party
   - B. going out with a group of friends to have a good time
   - C. correctly answering a complex Maths question in a Maths class
   - D. categorising someone to whom you were just introduced as boring
5. Which of the following is not an example of the social cognition process?
   - A. agreeing with a conspiracy theory that is not supported by scientific evidence
   - B. deciding that a person with a drug addiction deserves to be homeless
   - C. accurately recalling and using your PIN at an ATM to withdraw the correct amount
   - D. obeying an instruction from a person with the authority to issue that instruction

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

6.2 Person perception — forming impressions of other people

Consider the thoughts that pass through your mind when you first meet someone, or even when someone walking by catches your attention. Most likely, you form a quick impression based on a 'snapshot' of information. This could include judgments such as this person seems attractive, or someone you would like to know better, or someone who could not be trusted, or someone who is likely to be shy, confident or aggressive. The 'snap judgments' you make when forming your impression demonstrate person perception.

Person perception refers to the mental processes we use to think about and evaluate other people. Evaluating, or making judgments about others, whether they be friends, peers, acquaintances, family or strangers, is a common and vital part of our life as social beings.

These judgments, including our first impressions, guide the various types of relationships we develop with others. For example, an impression that someone is helpful might encourage you to approach that person rather than someone else for directions. An impression that someone is careless might lead you to avoid lending something that is of sentimental value to you.

Similarly, general positive or negative impressions of others — our liking or not liking them — influence our choices of companions to spend time with or share personal thoughts and feelings with and, ultimately, influence the close relationships we form (Smith et al., 2019).

Understanding other people depends on accurate information on which to base our judgments, but this is not always available. Sometimes there is little or no information. Sometimes the information is misleading or is shaped by our personal biases and expectations. Sometimes the situation in which we form the judgment dominates other information. Each of these can influence the accuracy of the understanding we achieve (Gilovich et al., 2013).

Impressions can be formed in person, from a phone conversation, a text message, an email, or from viewing an image of someone in the print, electronic or social media.

Psychologists have been particularly interested in factors that influence our impressions when we first meet someone, or even when we see someone in passing. Since we cannot actually see anyone's personality traits, values, mental state, motivations, intentions and so on, perceptions of other people begin with visible, physical cues.

6.2.1 Physical cues

First impressions are primarily based on **physical cues** — the way people look and the way they act. These cues are informative only because we believe that appearance and behaviour reflect personal characteristics, even when we know that we have observed only samples of behaviour.

We also know that the proverb 'you can't judge a book by its cover' applies to people when seeing or meeting them for the first time. Yet we can't seem to help ourselves. And even though we know that first impressions are not necessarily accurate, research evidence shows that they are so powerful that they can override what we are told about people. They can also be very difficult to change (Gunaydin et al., 2016).

Figure 6.2 First impressions are primarily based on physical cues — the way people look and the way they act. They tend to be lasting and difficult to change.

Physical appearance

Physical appearance is an important characteristic of first impressions, especially attractiveness. Many research studies have found that people we judge as physically attractive are generally perceived as more interesting, warm, mentally healthy, intelligent, independent, outgoing and socially skilled than unattractive people. In addition, good-looking people are more likely to be perceived as less lonely, less socially anxious and more popular than others or than they actually are (Aronson et al., 2021).

Individuals who are physically attractive benefit from a type of cognitive bias, or faulty thinking, called the halo effect. The **halo effect** is the tendency to allow our overall positive impression of a person, or our positive impression of a specific quality, to influence our beliefs and expectations about the person in other qualities.

For example, in relation to person perception, it is assumed that positive qualities 'go together'. So, if a person is good looking, then they will also have good personal qualities. If we judge someone as beautiful rather than ugly, we are also likely to rate that person as nice rather than mean, friendly rather than unfriendly, cheerful rather than sad, and so on. We transfer our judgment from one visible characteristic to others that cannot be seen or are unknown.

The halo effect can also influence our impressions of a person's behaviour, even when they behave badly. For example, when we really like someone, we are more likely to discount or explain away any behaviour on their part that might be considered negative while exaggerating the goodness of their positive characteristics or actions (Aronson et al., 2021).

Researchers have found a halo effect for physical attractiveness across a wide variety of situations when people have minimal information about each other. For example, physical attractiveness is a reliable predictor of whether we want to date someone. Strangers are more likely to stop and give help to a physically attractive person than to someone who is less attractive. More attractive people tend to be given higher salaries than less attractive people with the same qualifications. Judges can be more lenient with more attractive defendants when hearing bail applications and giving sentences for minor offences (but not serious crimes). Adults and adolescents are more likely to give an attractive person the 'benefit of the doubt' over a wrongdoing than they will for an unattractive person (Aronson, 2021).

Although the halo effect may influence our person perception, it is a type of bias and 'short-cut' in thinking that often leads to errors in judgment and decision-making about others, especially when it is based on a snap judgment. The reverse halo effect and the horn effect can cause similar errors in person perception.

The *reverse halo effect* involves an incorrect assumption that a positive characteristic indicates the presence of negative characteristics. For example, it may be assumed that a good-looking person is shallow, self-centred, 'stuck up' and manipulative.

The *horn effect* involves an incorrect assumption that a negative characteristic indicates the presence of one or more other negative characteristics. For example, it may be assumed that a student who is disruptive in class is a low achiever.

Figure 6.3 The halo effect would lead you to assume a good looking person will also have good personal qualities.

The actual pattern of someone's facial features can also affect the first impression. For example, researchers have found that adult males with 'baby-faced' features — large, round eyes, a large forehead, high eyebrows and a rounded, relatively small chin — tend to be perceived as more naïve, honest and kind compared to adult males with a more mature facial appearance. In addition, because of these perceptions, they also tend to be judged as being weak and submissive, so are less likely to be recommended for jobs that require characteristics found in a 'mature' person, such as leadership skills and wisdom (Gilovich et al., 2013; Alaei & Rule, 2016).

on Resources

Teacher weblinks	Mini documentary on the halo effect and attraction 11 m 33 s Ted Talk: Looks aren't everything — believe me, I'm a model 9 m

Body language

Our impression of people is also influenced by the information they convey through the silent language of non-verbal communication. For example, we often communicate inner aspects of ourselves through facial expressions, eye gaze, posture, gestures and other bodily movements — what is commonly called **body language**.

A person's body language is an expression of behaviour that enables us to make quick and often accurate judgments about them. There are also shared understandings of what many of these expressive behaviours mean. For example, generally, in Australia and many other Western cultures, tapping our fingers when waiting shows impatience, winking an eye at someone demonstrates familiarity, raising an eyebrow indicates disbelief or concern and scratching our head suggests we are puzzled.

Specific actions are also combined to form an overall pattern from which we form impressions. For example, we tend to form a positive impression of someone who orients their body towards us — when they are facing us directly, leaning towards us and nodding while we speak. In addition, we are likely to judge the person who adopts this type of posture as likeable and to perceive their actions as evidence that they like us.

Some people, however, are better at interpreting ('reading') body language than others and there are cultural differences. For example, holding up a raised thumb can be a greeting in one culture and an insult in another culture. Similarly, in many Middle Eastern cultures the left hand is reserved for bodily hygiene and is therefore not used for a handshake greeting as is done in Western cultures.

Eye contact is one of the most influential forms of non-verbal communication. People from Western cultures tend to seek eye contact when they speak to someone. They will often follow a person's gaze as they move their eyes in various directions. If the other person establishes eye contact, it will tend to be perceived as a sign of interest and attention, just as breaking eye contact and looking somewhere else is an indication that you are not interested in what is being said. If the person avoids eye contact it may be judged that they are unfriendly, shy, embarrassed, ashamed, shifty or lying.

If eye contact is maintained most of the time, it will tend to be perceived that a person is honest, straightforward, friendly and likeable. Too much eye contact, such as when staring, can be perceived as uncomfortable or unpleasant.

In addition, too much eye contact is often interpreted as communicating threat, anger, hostility or being unapproachable. For example, if a person is threatening another they will tend to stare directly at them and maintain the contact. Teachers sometimes use this technique when reprimanding students. Students in a bullying situation who are threatening others often stare. Therefore, making eye contact can show both friendship or a threat, depending upon the context in which it is used and other verbal and non-verbal cues that happen at the same time.

Figure 6.4 Some professional poker players cover their eyes with sunglasses to hide involuntary cues ('tells') about the hand they have been dealt that may be communicated to opponents.

In some Asian cultures, making direct eye contact may be considered rude and confrontational. Eye contact can also be disrespectful for Aboriginal and Torres Strait Islander people. Generally, avoidance of eye contact is customarily a gesture of respect. To make direct eye contact can be viewed as being rude, disrespectful or even aggressive. To convey polite respect, the appropriate approach would be to avert or lower your eyes in conversation. In Muslim cultures, women may especially avoid eye contact with men because it can be perceived as a sign of sexual interest (Swami & Furnham, 2008; Akechi et al., 2013; Queensland Health, 2015).

Behaviour

We also form impressions of people on the basis of their behaviour. This may be actions that we personally observe or actions we learn about from others. It also includes their verbal communication — what people say and how they say it.

Although physical appearance and body language can be helpful resources for developing an impression of another person, they are not always valid or reliable. As you are aware, we can make incorrect assumptions from what people look like and we can 'misread' the non-verbal communication signals of body language.

We are more likely to form an accurate impression of someone if we consider what people do, rather than their appearance (or their words alone). For example, if you know that someone donates hours of their free time working in a local food bank that supports disadvantaged people in their community, you may reasonably conclude that the person is helpful, caring, empathetic and even selfless. In contrast, if you find out that someone regularly steals clothing from charity donation bins, you can reasonably assume that they are dishonest, lacking in empathy and possibly self-centred.

Although there are exceptions, many behaviours are strongly linked to particular personality traits, which research shows to be characteristic ways of thinking, feeling or behaving (Smith et al., 2019).

on Resources

Teacher weblink TED talk on body language 20 m 55 s

learnMORE | Personal space

Access learnON to read about personal space and how it influences personal perception.

6.2 LEARNING ACTIVITY 1

Review

1. Describe the relationship between person perception and social cognition.
2. Explain why person perception is considered to be a vital part of everyday life with references to three relevant examples.
3. There does not necessarily have to be a social interaction for impression formation to occur. For example, a first impression may be formed for a passer-by with whom someone never interacts. Similarly, impressions can be formed through both verbal communication alone; for example, from a phone conversation, a text message or from viewing a photo of someone.
   Through what type of media alone — do you think a first impression is more likely to be:
   a. most accurate?
   b. lasting impression?
   Explain your answers.
4. a. Formulate a definition for 'first impression' in relation to person perception.
   b. Explain how each of the following factors may influence a first impression, with reference to a relevant example for each factor:
      i. physical appearance
      ii. halo effect
      iii. body language
      iv. eye contact
      v. behaviour
      vi. verbal communication.
5. Explain how the situation (context) in which any of the above factors are expressed can influence impression formation.
6. Give examples of three common gestures and describe the first impression that could be conveyed by each one. For each gesture, specify the context in which it is used.
7. What first impression might you form of the individual in each photo below?

i.


ii.


iii.


iv.


   a. What factors influenced your judgments?
   b. Are any of these factors different from those discussed in the text?
   c. What difficulties did you have in making your judgments?
8. a. Explain how you could manipulate the impression you present in a job interview to convey a positive one.
   b. Give three examples of behavioural or physical characteristics that could contribute to a negative impression.
9. Give an example of an advertisement in which a person is prominent and explain the nature of the person perception the advertisement is attempting to convey. Ensure you describe or include a copy of (or link to) the advertisement.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

6.2.2 Salience detection

Which physical cues capture our attention? Imagine sitting in a café drinking a milk shake, idly 'people watching'. You might notice that one person makes loud and rude comments to the girl at the counter taking orders, that another seated at an adjacent table adds six sugars to their coffee and that a third towers over all other people in the room. Characteristics that are different stand out. This is true for all kinds of characteristics, including unusual body language, behaviours such as sudden movements or making rude comments, and physical appearance cues like body size and tallness.

The term salience is used to describe characteristics that stand out in a specific situation and are therefore more easily detected. Salience determines which information will most likely grab our attention and have the greatest influence on our perception of people and the world.

In relation to person perception, **salience** refers to any personal characteristic that is distinctive, prominent, conspicuous or noticeable in its context and therefore attracts attention. This may be an individual's gender, race, physical appearance in general, a specific feature such as clothing, height or a facial tattoo, their behaviour, a gesture, something they are holding, and so on. A characteristic that is salient may lead to assumptions that become part of our first impression of a person (Smith et al., 2019).

Salience is usually produced by novelty, uniqueness or unexpectedness. The higher the salience of a characteristic in its surroundings, the more likely it is to be detectable and attract attention.

What is unusual or unexpected in one context may be quite normal in another. For example, the act of crying would be salient in a school classroom during a lesson but not necessarily at a funeral. And the person who towered over everyone may be salient among all others in a café but not on a basketball court when surrounded by equally tall team members. Salience therefore depends on context. Salience may also be influenced our own characteristics, such as our personal preferences, past experience, perceptual set and motivational or emotional state at the time (Taylor & Fiske, 1978).

When we have information about a person's physical appearances, their body language and some of their behaviour, those aspects that are salient are likely to be detectable, grab our attention and provide the basis for first impressions (Smith et al., 2019). However, this does not mean that all salient information is the most accurate or important.

Sometimes people adjust their appearance or behaviour in salient ways that suit the context but are not necessarily typical of them. For example, a person who persistently smiles in a job interview is not necessarily an easy-going or happy person in all contexts. They may be quite the opposite and have simply adjusted their behaviour to suit the situation and improve their chance of getting the job.

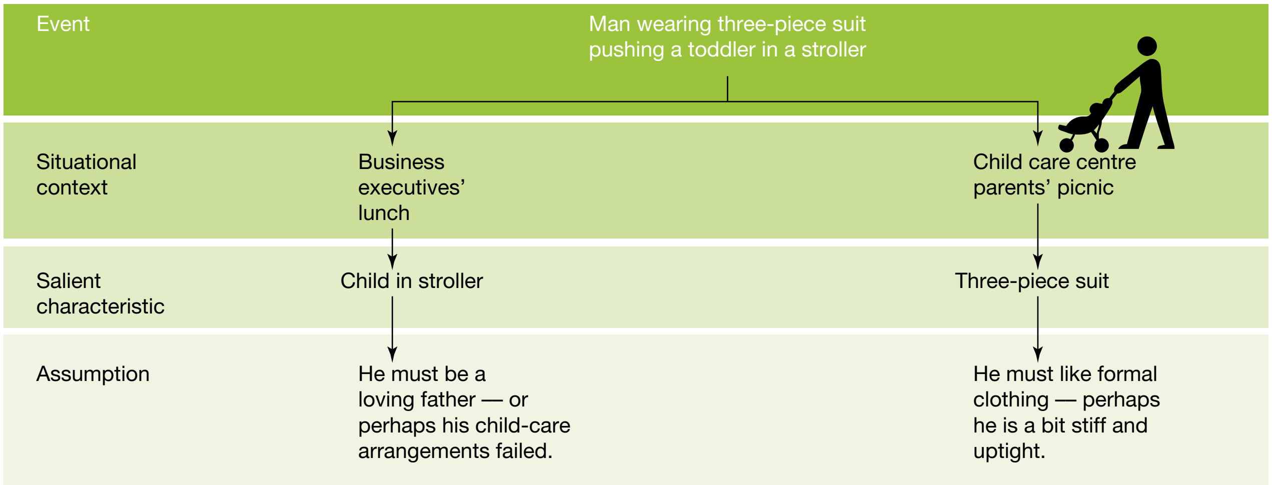


Figure 6.5 Our impression of the same person may differ greatly from one situation to another because characteristics that stand out in one context may go unnoticed in another. A characteristic that is salient may lead to assumptions that become part of our first impression of a person.

Source: Based on Smith, E. R., & Mackie, D. M. (2000). *Social Psychology* (2nd ed.). Philadelphia, Pennsylvania: Psychology Press. p.67.

6.2 LEARNING ACTIVITY 2

Multiple-choice questions

1. In relation to person perception, salience detection refers to
   - **A.** a method of detecting personal characteristics.
   - **B.** personal characteristics that stand out and attract attention.
   - **C.** personal characteristics that are more easily influenced by context.
   - **D.** personal characteristics that are not easily detected due to their salience.
2. Which individual is likely to be salient to passers-by?
   - **A.** a police officer walking into a police station
   - **B.** a police officer standing outside a police station
   - **C.** a police officer standing at the front of a school classroom
   - **D.** a police officer standing amongst other police officers for a group photo
3. Which of the following variables tends to have the most important influence on salience detection?
   - **A.** the context
   - **B.** the observer
   - **C.** the person being observed
   - **D.** the number of people present
4. Which characteristic is likely to be salient in a public library?
   - **A.** a dim light
   - **B.** a bright light
   - **C.** a loud noise
   - **D.** a book on a shelf
5. Which individual is most likely to be salient at a fancy dress party?
   - **A.** the only person dressed as a cartoon character
   - **B.** the only person dressed as a superhero
   - **C.** the only person dressed as a celebrity
   - **D.** the only person not in fancy dress clothing

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6.2.3 Social categorisation

As person perceivers, we routinely classify each other into different groups on the basis of common characteristics. This is called **social categorisation**. Sometimes we do this consciously, but social categorisation more often occurs automatically without our conscious awareness.

Gender, age and race are the most common social categories, but they are not the only characteristics we use. For example, uniforms may be used to help us categorise people as students, by occupation or even as 'bikies'. Similarly, we may use name tags or 'tools of the trade' to classify people into occupational groups, accent to identify an individual's nationality and clothing or the type of car that is driven may be used to classify people as 'socio-economically advantaged' or 'disadvantaged.

Social categorisation is useful and possibly adaptive. It allows us to form impressions quickly and use past experience and what we have learnt through the media and our culture to guide new social interactions. With so many things to pay attention to in our social worlds, we can save time and effort by using people's group memberships to make assumptions about them. We don't have to deal with all the unique aspects of every individual we meet.

Nor is it realistically possible to find the time to get to know every person we come in contact with as well as we might want to. Instead, through social categorisation, we can focus on characteristics with which we are familiar, quickly establish expectations about how they may behave, and ignore information that is irrelevant to the interaction.

Of course, social categorisation can lead to errors and come at a cost. For example, it can make us blind to individuality, can lead us to exaggerate or overestimate the differences between groups, and to underestimate the differences within groups (Smith et al., 2014; Kassin et al., 2017, Aronsen et al., 2021).

American psychologist Gordon Allport (1954) proposed that people tend to categorise themselves and others into 'ingroups' and 'outgroups' which can in turn influence their attitudes towards the members of those groups.

Allport described any group that you belong to or identify with as an **ingroup**. For example, your friendship groups, peer group, family, school, religion, sex, race, culture, the country in which you live and even the AFL team you barrack for would be called your ingroups. An **outgroup** is any group you do not belong to or identify with.

When we categorise our social world in this way, we tend to believe that people belonging to our ingroups have individual differences but are generally more like us. Consequently, we tend to view them positively and more easily develop loyalty to them due to common membership of the same group. However, we tend to consider people belonging to an outgroup to be less like us and more like each other. We therefore are more likely to view them negatively.

Allport argued that this type of categorisation of members of ingroups and outgroups involves stereotyping and can lead to prejudice towards members of outgroups, which we examine later in the topic.

Figure 6.6 An ingroup is any group to which an individual belongs to or identifies with. Any friendship group is an ingroup.

6.2 LEARNING ACTIVITY 3

Multiple-choice questions

1. A social category is
   - A. another term for 'group'.
   - B. a context in which socialisation occurs.
   - C. a group of individuals who interact in some way.
   - D. a group of people who share one or more characteristics.
2. Which of the following is a social category?
   - A. a smart watch
   - B. a banking app
   - C. a mobile phone
   - D. a Facebook group
3. Social categorisation is best described as the process of
   - A. stereotyping people.
   - B. classifying people into ingroups and outgroups.
   - C. placing people into social groups on the basis of common characteristics.
   - D. classifying people into a social groups on the basis of salient characteristics.
4. An ingroup is the group which
   - A. an individual identifies with.
   - B. most people want to join.
   - C. results in social categorisation.
   - D. is a result of stereotyping or prejudice.
5. Which of the following is not a social category?
   - A. homelessness
   - B. social psychology text books
   - C. social influencers
   - D. Aboriginal and Torres Strait Islander peoples

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

6.3 Attributions — explaining behaviour

Why do we fall in love with some people but not others? Why did that girl get so drunk at the party? Why was that boy so rude to the bus driver this morning? Why would someone run into a burning house to rescue a stranger? Why would someone go on a reality TV show? Why do some people succeed and others fail? Why do some people ignore pleas for help? Why do some people laugh when others cry?

To make sense of our social world, we try to understand the causes of own and other people's behaviour, especially when we interact with them. We look for reasons and explanations to help our understanding. We make attributions to arrive at explanations. According to Austrian psychologist Fritz Heider (1958) who is credited with devising attribution theory, when we develop 'logical' explanations for why things happen, we feel safer and more in control. But what kinds of explanations do we make and how do we come up with them?

Attribution is the process by which we explain the cause of our own or another person's behaviour. The term is also used to refer to the explanation we come up with. According to attribution theory, whenever we observe someone's behaviour, our explanation of why it occurs will primarily refer to either internal or external factors associated with the individual.

6.3.1 Internal attributions

An **internal attribution** is an explanation due to the characteristics of the person involved, such as their personality, ability, attitude, motivation, mood or effort. If we attribute behaviour to internal factors, then we have decided that the person's behaviour is due mainly to some aspect of their character (or 'disposition').

For example, if we hear that Mario has lost his job because he failed to let his team leader know that he was not going to work for a week, we may think it was typical as he was always unreliable and irresponsible. We are deciding that the cause of Mario's behaviour has something to do with him and therefore attributed it to internal, personal or dispositional factors. Consequently, an internal attribution is also called a *personal attribution* or *dispositional attribution*.

6.3.2 External attributions

Suppose we learn that Mario's behaviour occurred because his mother was seriously ill in hospital and he was therefore too preoccupied with her wellbeing and feeling too stressed. In this case, we are making an external attribution.

An **external attribution** is an explanation of behaviour due to factors associated with the situation the person is in. The cause of the behaviour is external to the person involved, such as the actions of another person, the task, luck, fate or some other aspect of the situation or environment. Consequently, an external attribution is also called a *situational* or *environmental attribution*. When we make an external attribution, we often assume that most people would respond the same way in that situation.

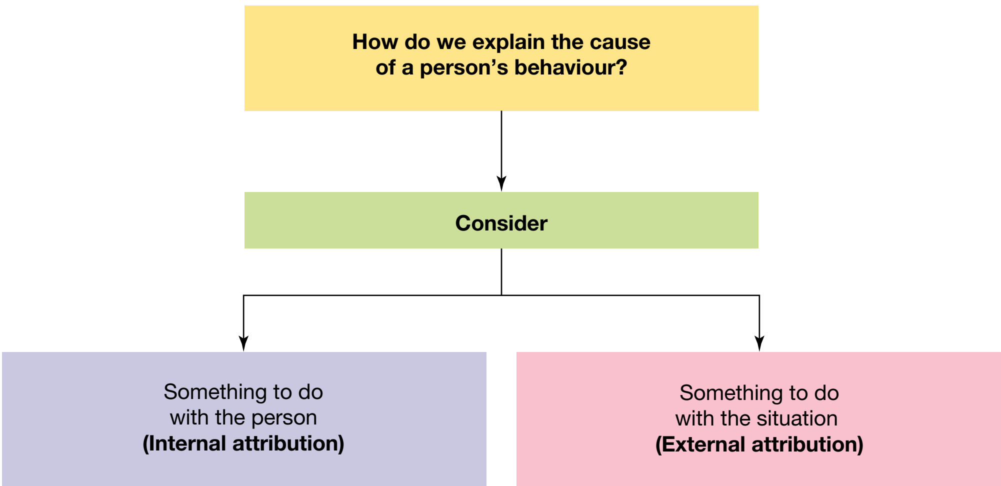


Figure 6.7 Attribution — explaining our own and others' behaviour

Attribution is sometimes described as a two-step process whereby we automatically make an internal attribution and then consciously adjust it to take account of external, situational factors. The first step occurs quickly and spontaneously without much mental effort, whereas the second step requires more effort and conscious attention.

For example, suppose your class was given homework to learn a concept described by the teacher as vital. When next in class, the teacher questions another student about the homework. Their answer is totally wrong and you automatically make an internal attribution about the student. When followed-up by the teacher, the student reports that they didn't do the homework because of a very plausible reason. You then adjust your initial attribution from step 1, taking into account the external factors and form your final attribution.

6.3.3 Biases affecting attributions

Our explanations of behaviour are often reasonable and accurate, but we are vulnerable to cognitive bias that impacts on our judgments and leads to mistaken attributions. Researchers have identified various types of bias or errors that often affect our attributions. Three of the more common types are called the fundamental attribution error, actor–observer bias and self-serving bias.

Fundamental attribution error

If you see a new student arguing with a teacher in the school yard at lunchtime, you might conclude that the student is rebellious, argumentative and/or rude. You might not consider that something in the situation, such as being blamed for rubbish that someone else dropped, caused the behaviour.

Figure 6.8 The attribution process has been described as a two-step model. For example, if you see a footballer sustain an injury while diving onto the ball, you may automatically attribute their behaviour to thoughtlessness (an internal attribution due to the person's character). As they lay on the ground motionless and the support staff rush onto the ground and carry them off on a stretcher, you may then consider the fact that the player had made a goal-stopping dive during the time-on period (an external attribution due to the situation) and consciously form your final attribution.

When explaining the behaviour of others, we tend to focus on the role of factors associated with the person and underestimate the influence of the situation. This bias is so common that it is called the fundamental attribution error.

The **fundamental attribution error** is the tendency to overestimate the influence of personal factors and underestimate the impact of situational factors on other people's behaviour. When we do this, we attribute a person's behaviour to internal rather than external factors.

One explanation of why we make this error is that the person's behaviour tends to be more conspicuous and therefore more noticeable (salient) than the situation in which it is occurring. This is called *saliency bias* because the person is standing out in the foreground of your visual scene and captures your attention whilst the situation is barely noticeable in the background.

When we focus on the person, we tend to do so with a perspective that the world is a just and fair place. The *just-world belief* (also called *just-world hypothesis* and *just-world fallacy*) refers to the belief that the world is a just place in which people generally get what they deserve and deserve what they get. This belief allows us to better understand and feel safer in a world where we do not always have control over our circumstances and can therefore be exposed to cruel twists of fate. According to the just-world view, the individual believes that bad things happen to bad people and good things happen to good people (Lerner, 1980).

This just-world belief influences our thoughts and perceptions of others, often in a way that leads us to blame people for their misfortunes. When something bad happens to someone, we tend to believe the victim must have done something to deserve their fate rather than believe situational factors were responsible for it.

Examples include beliefs that crime victims are careless, victims of family violence provoke their attackers, people on unemployment benefits are lazy bludgers, homeless people are unmotivated, First Nations Australians deserved to be treated badly by the British colonisers, and that people whose houses are inundated by flood water deserve it for choosing to live in a flood-prone area.

Figure 6.9 According to the just-world belief, this person deserves to be poor because she failed to make the most of her opportunities in life and is therefore responsible for her circumstances.

In contrast, we may explain good things that happen to ourselves or others because we deserve them because of the decisions we make about life, not because of good luck, fate or having been in the right place, at the right time.

Actor–observer bias

One exception to the fundamental attribution error occurs when it comes to explaining our own behaviour. Instead of blaming the person, we blame the situation.

Actor–observer bias refers to our tendency to attribute our own behaviour to external or situational factors, yet attribute others' behaviour to internal factors (Jones & Nisbett, 1971). For example, if you fail an exam you may blame your failure on too many trick questions or an overcrowded exam room with too many distractions, but you might say Maria failed because she is not very intelligent or did not study enough.

Similarly, when someone cuts you off when driving it is attributed to their careless and reckless driving, but when you cut someone off it is because your view was blocked. And a government minister who makes the same mistake as a member of the opposition party did when in government is likely to say the blunder was unavoidable under the circumstances, rather than being due to their lack of planning or wisdom.

Actor–observer bias is sometimes called the *actor–observer discrepancy* because there is a mismatch between the attribution that is made when the individual is the 'actor' in a given situation and the attribution that is made when the same person is the 'observer' of someone else's behaviour in the same situation.

Self-serving bias

Self-serving bias is evident when the teacher hands back a test and a student attributes a good result to their ability and hard work, or a bad result to external factors such as unfair questions, the teacher marking too hard or a sick student who coughed throughout the test. It is also evident when a gambler attributes a win to skill and a loss to bad luck and when someone believes they are personally responsible for a group's success but assigns the blame for a bad performance to the other group members.

When judging ourselves we tend to take the credit for our successes and deny responsibility for failure, which is blamed on external, situational factors. This is a kind of self-deception called **self-serving bias**.

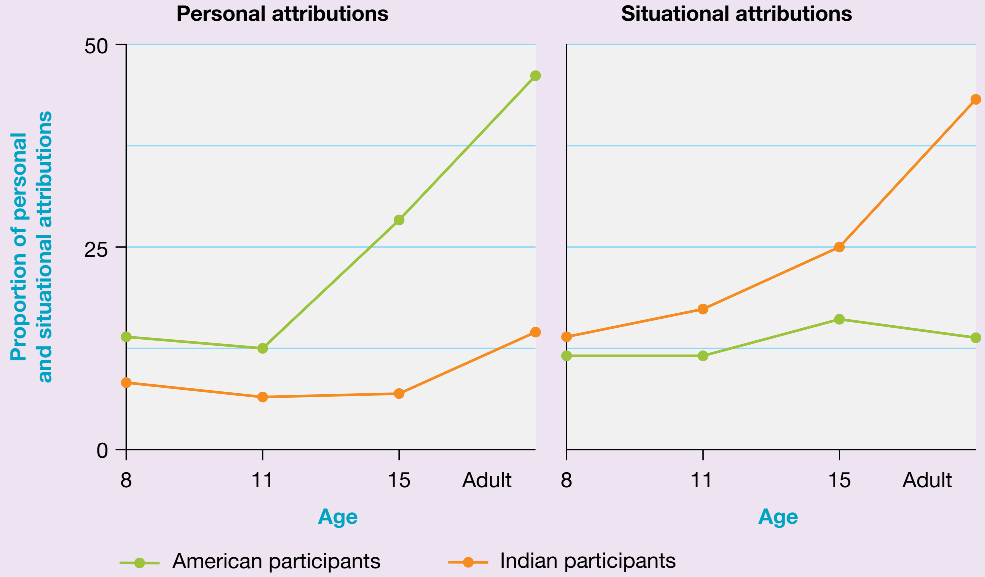
The most common explanation of this cognitive bias is that we are motivated by a desire to maintain our self-esteem so we distance ourselves from failure, even if that means distorting reality by changing a belief or some other thought, or even blaming someone or something else for our shortcomings (Heider, 1958).

Figure 6.10 Self-serving bias means that this person will deny any responsibility for the accident despite rear-ending the other vehicle. He is probably explaining his accident by listing external, situational factors (such as sunlight glare or the other driver braking too quickly) rather than internal, personal factors (such as carelessness or inattention).

6.3 LEARNING ACTIVITY 1

Review

1. Explain the meaning of attribution.
2. Distinguish between internal and external attributions with reference to your own example(s).
3. Name and describe three types of cognitive bias or errors that can influence attribution. Give an example of each type, preferably from your own experience.
4. What is the relevance of the just-world belief to attribution?
5. Briefly outline the two-step attribution process.
6. In one of the earliest studies on cultural differences in attributions, American psychologist Joan Miller (1984) asked Hindu Indians and North Americans of varying ages to explain the cause of positive or negative everyday behaviours in terms of internal, personal or external, situational factors. The graphs below show the results. Draw two conclusions from the results.



Source: Miller, J. G. (1984). Culture and the development of everyday social explanation. *Journal of Personality and Social Psychology, 46*(5), 961–978.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

6.3 LEARNING ACTIVITY 2

Multiple-choice questions

1. A male, conservative radio announcer claims that females are responsible for harassment in the workplace if they wear inappropriate clothing. The radio announcer's claim has been influenced by
   A. actor–observer bias.
   B. self-serving bias.
   C. the just-world belief.
   D. the fundamental attribution error.
2. An elderly driver is cut off by a speeding car and mentally abuses its driver as a 'lunatic road-rager', not realising that the driver is taking their seriously injured child to the hospital. The elderly driver's behaviour has been influenced by
   A. actor–observer bias.
   B. self-serving bias.
   C. the just-world belief.
   D. the fundamental attribution error.

3. A teenager skateboarding with his friends blames his fall during a trick on a stone that got stuck in a wheel. The skateboarder's attribution demonstrates
   - A. actor–observer bias.
   - B. self-serving bias.
   - C. the just-world belief.
   - D. the fundamental attribution error.
4. Jake and Trinh work as casual waiters. Jake thinks Trinh is clumsy when Trinh accidently drops a glass. When Jake does the same later on he blames it on the slippery glass. Jake's attribution demonstrates
   - A. actor–observer bias.
   - B. self-serving bias.
   - C. the just-world belief.
   - D. the fundamental attribution error.
5. Zeta said that the new student in psychology gave her the impression of being somewhat cold and 'stuck up' when she first saw her, but she turned out to be 'a really nice person' when Zeta met her at a party. Zeta's person perception has been influenced by a type of cognitive bias or error called
   - A. actor–observer bias.
   - B. self-serving bias.
   - C. the just-world belief.
   - D. the fundamental attribution error.

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6.4 Attitudes

Should poker machines ('pokies') be banned? Should any VCE student be allowed to leave the school grounds when they are not required to be in class? Is a one-year 'gap' break between VCE completion and tertiary studies worthwhile? Should there be an age limit to open a TikTok account? Should politicians be legally obligated to tell the truth? What is the best age at which to get married, if at all? Should all public transport be free? Should we change refugee and asylum seeker policies? Should January 26 be formally changed from Australia Day to Invasion Day?

Your reactions to these questions reflect your likes and dislikes about objects, people, groups, events and issues. These reactions are what psychologists generally call attitudes.

We have intense feelings about some of our attitudes, but others are less important to us. Although some of our attitudes are not as strong as others, the attitudes we form tend to last.

Our attitudes are learned through experience. They reflect our unique experiences as individuals, as well as our socio-cultural background. As we interact with different individuals and groups, and as we are exposed to various kinds of media and life in general, we form attitudes, are influenced by them, display them to others, argue about them and sometimes change them. We are aware of many of our attitudes, but there are some of which we are unaware until we need to express them.

Attitudes can be viewed as ideas that we hold about ourselves, others, objects and experiences. A commonly used definition in psychology describes an **attitude** as an evaluation a person makes about an object, person, group, event or issue. This definition indicates that we can form attitudes towards anything; for example, Ferris wheels and iPads (objects); ourselves and politicians (people); our friendship group and Greenpeace (groups); Easter and elections (events); and compulsory vaccination and climate change (issues).

In defining an attitude, the term evaluation refers to a judgment being made, either positive, negative or neutral, about some specific aspect of our lives and the world in which we live. This means that attitudes involve reactions — likes and dislikes, feelings for and against, preferences and aversions, or non-involvement (where an actual response is not necessary). However, the judgment must be relatively consistent and lasting for it to be called an attitude.

Figure 6.11 We form attitudes towards all kinds of objects, people, groups, events and issues. A key characteristic of an attitude is that it involves a judgment which may be positive, negative or neutral.

6.4.1 Tri-component model of attitudes

Psychologists have proposed various theories and models to describe and/or explain what attitudes are, how they are formed and the circumstances under which they may change. The most influential and widely used model is called the tri-component, or multi-component, model. The **tri-component model of attitudes** proposes that any attitude has three related components — the affective, behavioural and cognitive components — which are sometimes called the 'ABCs of attitudes'.

The **affective component** of an attitude refers to the emotional reactions or feelings an individual has towards an object, person, group, event or issue. Thus, it is based on a judgment which results in a positive response (such as liking or favouring), a negative response (such as disliking or hating) or a neutral response (such as lack of interest or concern). The affective component is reflected by expressions such as 'I like to share my enjoyable activities on Facebook' (positive), 'I hate country music' (negative) and 'I'm not interested in politics' (neutral).

The **behavioural component** of an attitude refers to the way in which an attitude is expressed through our actions (or how we might behave should the opportunity arise). For example, running to keep fit or protesting about an increase in tertiary HECS fees are actions that reflect the behavioural component of your attitudes towards fitness and the requirement to pay more for university studies.

The **cognitive component** of an attitude refers to the beliefs we have about an object, person, group, event or issue. Our beliefs are linked to what we know about the world. They develop as a result of our experience throughout the course of our lives.

Some beliefs are based on fact. For example, the belief that vaccination helps the immune system develop protection from a disease is true. Other beliefs may be false. For example, it is not true that all psychologists do the same kind of work. Furthermore, some beliefs can be verified and others cannot be proven. For example, we can verify the belief about vaccination by asking a doctor or by checking an authoritative website. However, we cannot verify the belief that there is intelligent life in another galaxy. An attitude involving a verifiable belief is more easily changed than an attitude involving an unverifiable belief.

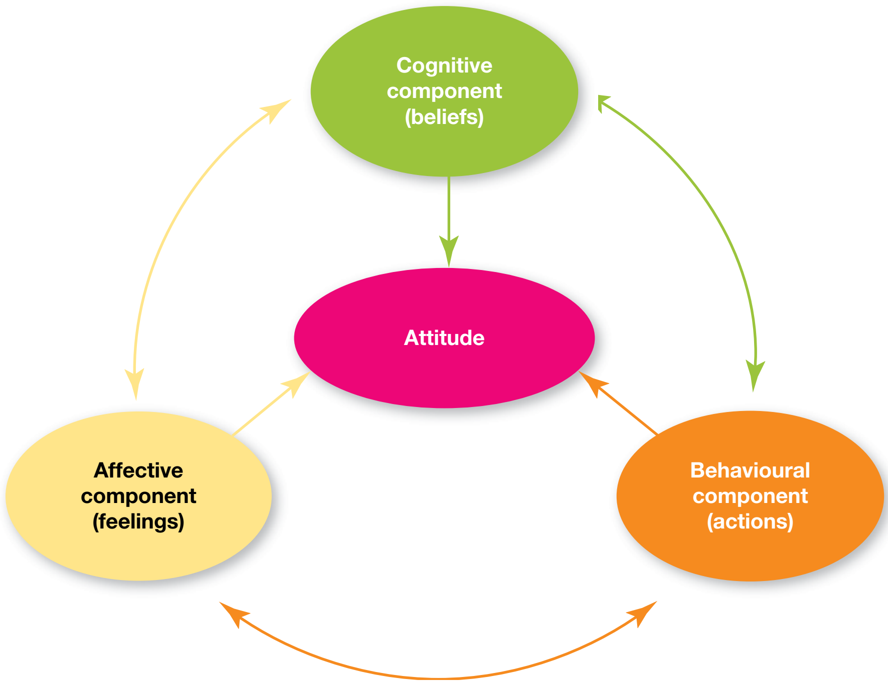

Figure 6.12 The tri-component model of attitudes proposes that all attitudes have three related components.

Consistency between the components

Although the affective, cognitive and behavioural components of an attitude have been described separately, the tri-component model proposes that all three components must be present before it can be said that an attitude exists.

In many cases, the affective, cognitive and behavioural components are consistent. For example, you might feel good about going to school (affective component) and work hard in and out of class (behavioural component) because you believe that good grades are required to get into the tertiary course of most interest to you (cognitive component). Similarly, you might avoid a spider (behavioural component) because you are scared of spiders (affective component) and believe spiders can harm you (cognitive component).

Inconsistency between the components

Some psychologists believe that there are possibly only affective and cognitive components of attitudes because a person's behaviour does not always reflect the attitude they hold; that is, the behavioural component is often inconsistent, or 'out of sync', with the affective and cognitive components of the attitude.

Figure 6.13 A person may be in love with their partner (affective component), have doubts about the future of the relationship (cognitive component), but continue in the relationship (behavioural component), so the affective and behavioural components do not correspond with the cognitive component, and the 'heart has ruled the head'.

For example, a person may dislike watching test cricket (affective component) because they believe it takes too long for a result (cognitive component), but they may choose to attend a match because their friends are going (behavioural component). Furthermore, a person may know that dental hygiene is important and agrees that 6-monthly dental visits are vital (cognitive component), but refuses to go to the dentist (behavioural component) because the sound of a dental drill makes them feel anxious (affective component).

There are also times when the behavioural component is consistent with one other component, but these two components are inconsistent with the third component. This often results from one or more of the components being stronger, or more intense, than the other(s).

For example, a person may be in love with their partner (affective component), have doubts about the future of the relationship (cognitive component), but continue in the relationship (behavioural component). In this example, the affective and behavioural components do not correspond with the cognitive component, and the 'heart has ruled the head'. Consider also the example of a person who hates pumpkin soup (affective component) but eats it when staying at a friend's place (behavioural component) because the person believes it is the polite thing to do (cognitive component). In this case, the 'head has ruled the heart'.

6.4.2 Attitudes and behaviour

Attitudes and behaviour are frequently linked because many people believe that attitudes play a significant role in influencing or even directing behaviour. Therefore, it is sometimes assumed that understanding a person's attitude enables us to predict their behaviour with considerable accuracy. However, this assumption has been challenged by research findings.

There is evidence that a person's attitudes and behaviour are not always consistent and sometimes a person's attitudes and observable behaviour will be unrelated or only slightly related. Conversely, our actual behaviours may not always reflect our true attitudes.

It is unrealistic to expect attitudes to always correspond perfectly with behaviour because it seems that behaviour is rarely the product of a single influence — there are many influences on our behaviour besides our attitudes. But this does not mean that attitudes and behaviour are *never* closely related. Under certain conditions, attitudes and behaviour are more likely to match.

There are many factors that influence whether attitudes and behaviour will be consistent. Researchers have identified a number of conditions when it is more likely that attitudes and behaviour will match. Some of the more important conditions involve how strongly we hold the attitude, how easily the attitude comes to mind, the situation we are in, and our personal belief that we can actually perform the behaviour associated with an attitude.

Figure 6.14 Our attitudes and behaviour are not always consistent, nor does the expression of an attitude or behaviour accurately reflect the expression of the other.

6.4 LEARNING ACTIVITY 1

Review

1. a. Give a psychological definition of the term attitude.
   b. Suggest a simpler definition without compromising accuracy.
2. How can an attitude be distinguished from a 'passing thought' about someone or something?
3. a. Outline what the tri-component model of attitudes is, ensuring you refer to its key assumptions.
   b. Give a brief description of each component, with reference to an example of each component different from those used in the text.
   c. Give an example that illustrates when the three components are consistent and an example of when they are inconsistent. Use examples different from those used in the text.
4. Consider the following attitude statements and identify the affective, behavioural and cognitive components that may form the attitude of each statement.
   a. 'VCE students are young adults and therefore should not have to bring a note when absent from school. I resent being treated like a child.'
   b. 'I don't care if someone doesn't get a job if they don't dress appropriately for the job interview. They don't deserve the job.'
   c. 'I'd rather play basketball than netball because it's much more exciting and you are less likely to be injured.'
   d. 'I'm not particularly interested in Australian Rules football and I don't know much about it so there's no way I would go to a match.'
   e. 'There should be harsher penalties for drink-driving. It was devastating when my friend was seriously injured as a result of a drink driver's recklessness. I'll never drink when I'm responsible for driving.'
5. Can someone's attitude be used to reliably predict their behaviour? Explain your answer.
6. There are many instances in everyday life when a person's behaviour does not reflect their attitude. For example:
   - someone who criticises her friend for being unfaithful to her boyfriend, because the boyfriend is her brother, but who does the same thing herself and claims 'it is different'
   - someone who claims that Australia should not accept Asian migrants, but who enjoys travelling to Asia.

   From your experiences, give an example of a mismatch between an attitude which has been expressed and the behaviour which took place.

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6.4 LEARNING ACTIVITY 2

Analysis and evaluation of research on attitudes and behaviour

One of the first and best-known research studies on the relationship between attitudes and behaviour was conducted by American sociologist Richard LaPiere (1934). LaPiere was interested in finding out whether there was consistency between a person's attitudes towards others with different racial backgrounds and their behaviour towards such people, as demonstrated by discrimination (treating them differently).

Over a two-year period, beginning in 1930, LaPiere travelled 16 000 km around the United States with a Chinese couple. They stayed in 66 hotels, motels or caravan parks, and dined in 184 different restaurants. LaPiere expected that he and his Chinese companions would experience considerable discrimination, because there was widespread prejudice against Asians in America at that time. However, they were actually refused service on only one occasion. LaPiere also found that their treatment overall was 'good' in nearly 50% of the places they visited.

Six months later, he sent a questionnaire and accompanying letter to the manager of each restaurant and the places at which they had stayed. In the letter he asked the question, 'Will you accept members of the Chinese race as guests in your establishment?' LaPiere received replies from about 50% of the places they had visited. In these replies, only one response stated that they *would* accept Chinese visitors as guests. As indicated by their responses, their attitudes clearly differed from their actual behaviour towards the Chinese couple.

On the basis of his results, LaPiere concluded that attitudes do not reliably predict behaviour.

a. State a possible aim for the research.
b. Formulate a possible research hypothesis.
c. Identify the operationalised independent and dependent variables for the research.
d. Identify the participants and how they were selected.
e. Briefly state the main results obtained.
f. Briefly state the conclusion that was drawn from these results.
g. Identify two possible limitations of the research method.
h. Identify two ethical issues of particular relevance to the research.

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6.5 Stereotypes

'Girls wear too much make-up', 'boys are insensitive', 'toddlers throw tantrums when they don't get what they want', 'adolescents are rebellious', 'old people are set in their ways', 'criminals had troubled childhoods', 'news readers are trustworthy', 'politicians are dishonest', 'Australians are sports-lovers', 'Asians are good at Maths' and 'Americans are obsessed with guns'. These are all examples of stereotypes.

A **stereotype** is a generalisation about the personal characteristics of the members of a social group. The characteristics are attributed to people on the basis of their group membership and are therefore the product of social categorisation process whereby we sort people into particular social groups. In most cases, a stereotype is typically an oversimplified belief or idea that is assumed to be true for virtually all people in the group to which it applies, regardless of the size of the group or the individual differences among its members.

There are stereotypes for all kinds of social groups, both positive and negative. For example, the gender stereotype 'females are nurturing' is positive, whereas 'females are weak' is negative. Most stereotypes, however, are negative rather than positive. Stereotypes can also be offensive. As shown in Table 6.1 on the next page, common stereotypes of Aboriginal and Torres Strait Islander people are both negative and offensive. Regardless of the type, any stereotype still applies a generalised assumption that most, if not all, individuals in a particular group have the same characteristics.

Because it is not possible for us to intimately know everyone we meet, as with social categorisation, stereotypes simplify and make person perception more efficient. For example, they involve a type of mental shortcut that reduces the amount of thinking,

Figure 6.15 This nun's public behaviour may not fit the stereotype many people have about nuns.

Table 6.1 Examples of entrenched negative stereotypes of Aboriginal and Torres Strait Islander peoples

First Nations of Australia peoples...
• are primitive and nomadic • lack complex laws and social organisation • are drunks • are violent • live in the outback • are uneducated no-hopers • are involved in too much crime • receive too much from welfare • get more than the whites • eat the wrong foods (white sugar, flour, McDonald’s, etc.) • don’t have a religion, have sinned and need to pray for forgiveness • don’t use the land they get for free • get treated too leniently by police and courts • do not want to work and are lazy • must fit the image of a dark-skinned, wide-nosed person (i.e. a ‘full-blood’) • live a traditional tribal/ancient lifestyle • are not really attached to their land because they live on the fringe of towns and cities • are like leeches and drain away each other’s resources • are problems (‘the Aboriginal problem’) and Aboriginal people have problems

Source: *Creative Spirits (2021). Stereotypes about Aboriginal Australians* [Aboriginal culture > People > Stereotypes & prejudice of ‘Aboriginal Australia’]. Retrieved January 28, 2022, from https://www.creativespirits.info/aboriginalculture/people/stereotypes-prejudice-of-aboriginal-australia#stereotypes-about-aboriginal-australians

mental effort or information processing when we meet a new person.

Stereotypes also influence our expectations of ‘what someone is like’ and assist us in knowing how we should react to new people we meet. For example, if you are at a party, meet an attractive person, then discover that they are police officer, your behaviour towards them may be influenced by the stereotypical view of police as being always ‘on the job’.

A problem with stereotypes is that they can be inaccurate. They are often based on incorrect or inadequate information. Most are formed on the basis of little or no research evidence. The bigger the group, the more likely it is that the stereotype will be not be true for all group members.

When we apply stereotypes to people, we ignore their individuality. Stereotypes overlook our uniqueness. Each of us has our own set of life experiences and inner world of thoughts, feelings, attitudes, beliefs, values, ambitions, desires and so on.

Research evidence shows that stereotypes tend to be fixed and resistant to change. This occurs even when we encounter someone with characteristics that do not match our stereotype. For example, if we meet a male professional wrestler who likes ballet more than football or an elderly female who likes hip hop more than easy listening music, we don’t recognise that our stereotypes are inaccurate or change them.

Instead, we tend to disregard information about the individual that does not fit the stereotype we have of them. We are more inclined to pay attention to information that is consistent with a stereotype and ignore information that is not consistent with it. By doing this, we maintain order and structure in our social world by not having to change the impressions we have of people (Schacter et al., 2009; Aronson et al., 2021).

Another problem with stereotyping is that it can lead to **social stigma** — negative labels and attitudes associated with disapproval or rejection by others who are not labelled in that way. When an entire social group is stigmatised, or negatively evaluated, then members of that group can be unfairly discriminated against and feel like outcasts who are devalued, ignored and rejected by others, simply because they are members of the stigmatised group. In turn, this can lead to feelings such as shame, disgrace, lower self-esteem, loss of self-confidence and restricted ambitions in life. Social stigma can also have harmful effects on overall psychological wellbeing, particularly when membership of the stigmatised group is an important part of the individual's self-concept or self-image (Crocker et al., 1998; SANE Australia, 2021).

Finally, stereotyping can also lead to prejudice. Research studies have found that when stereotypes involve an 'us and them' type belief, this can provide a foundation from which prejudice develops. 'Us and them' is evident when we categorise ourselves and others into 'ingroups' and 'outgroups'. We are more likely to be prejudiced towards members of outgroups and give preferential treatment to, or discriminate in favour of, members of our ingroup when the opportunity arises. Research studies have provided evidence of this type of attitude and behaviour in both children and adults (Hewstone et al., 2002; Aboud, 2003).

on Resources

Teacher digital document Practical activity — examining a stereotype

6.5 LEARNING ACTIVITY

Review

1. Define the meaning of the term stereotype.
2. What characteristics are common in stereotypes for each of the following people? Use two or three key words for each person.
   a. someone who drives a Ferrari
   b. someone who has had considerable facial cosmetic surgery
   c. someone who has a pitbull terrier as a pet
   d. someone who belongs to a bikie gang
   e. someone who is a union leader
   f. someone who is a vegetarian
3. Give an example of a positive stereotype and an example of a negative stereotype.
4. Apply your understanding of stereotypes to formulate a definition for each of the following:
   a. gender stereotype
   b. gender role stereotype.
5. How accurate are stereotypes? Explain your answer.
6. Describe the relationship between social categorisation and stereotypes.
7. Give an advantage and disadvantage of stereotyping.

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6.6 Cognitive dissonance

Cognitive dissonance theory emerged from a participant observational study of a small UFO cult conducted over 70 years ago. The cult believed that a great flood would destroy the world on December 21, 1954 and that aliens would arrive in a flying saucer just before the hour of the apocalypse and take the true believers to safety on another planet. Members of the cult left their jobs and families and gave away money and possessions to prepare for the arrival of the superior beings from outer space.

American psychologist Leon Festinger (1956) wanted to find out how the cult members would cope and react when they realised that the apocalypse did not occur. Festinger and three other researchers joined the cult and interacted with its members in various cult meetings over many weeks before and after the predicted apocalypse.

Festinger observed that when neither the flying saucer nor the apocalypse arrived at the appointed time, the committed cult members did not abandon their doomsday beliefs despite the fact that they had been clearly discredited. Instead, they accepted their leader's explanation that 'the little group, sitting all night long, had spread so much light that God had saved the world from destruction' and became even more fanatical about their beliefs.

Festinger proposed that the cult members experienced psychological tension when they realised that they were holding two conflicting cognitions: (1) the firm belief that there will be an apocalypse at a predicted time and (2) the thought of what may be true in reality — that the predicted apocalypse did not actually occur. Furthermore, their uncomfortable psychological state created an inner drive to reduce the tension. They did so by choosing the easiest option.

Instead of admitting error, 'members of the group sought frantically to convince the world of their beliefs,' and they made 'a series of desperate attempts to erase their dissonance by making prediction after prediction in the hope that one would come true'. Their beliefs about the apocalypse had actually strengthened. Other researchers have since found that people will go to great lengths to achieve or maintain consistency among their beliefs, even when they prove to be blatantly wrong.

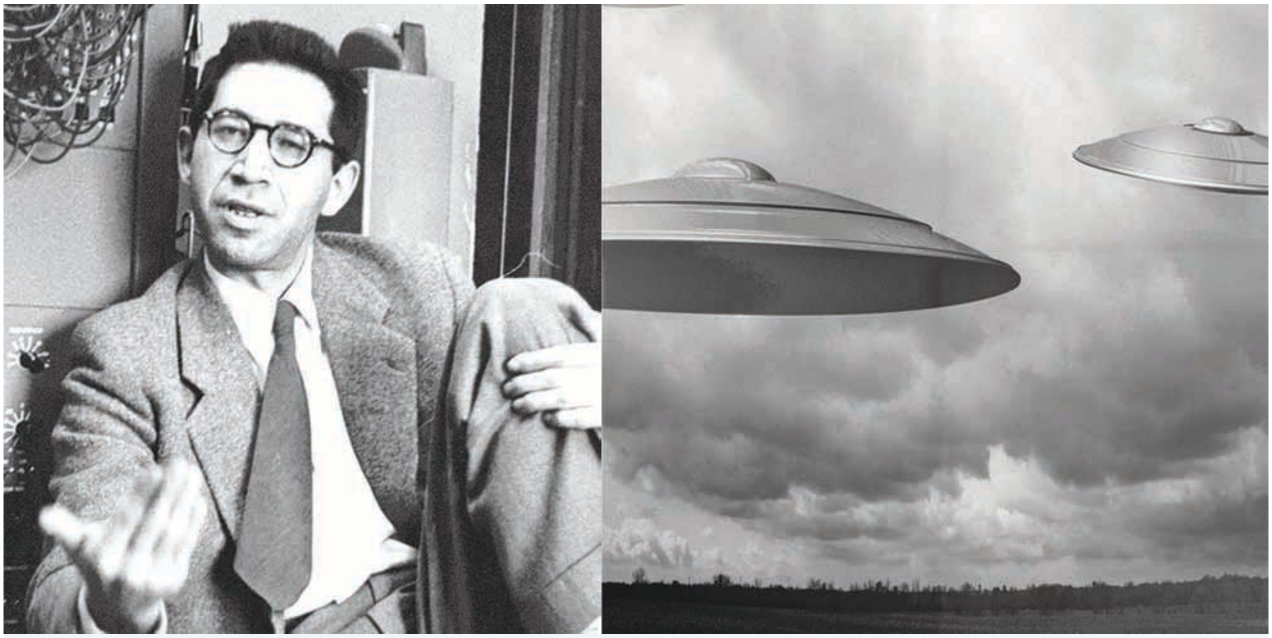

Figure 6.16 Cognitive dissonance theory was proposed by American psychologist Leon Festinger (1919–1989). It emerged from a participant observation study of a cult which believed that the earth was going to be destroyed by a flood and that aliens would arrive in a flying saucer just before the apocalypse and save the cult's members.

Cognitive dissonance is an unpleasant psychological state that occurs when people become aware that there is inconsistency among their various beliefs, attitudes or other 'cognitions', or, that their behaviour conflicts with their cognitions. For example, dissonance is likely to be experienced by someone when their behaviour is different from the way they believe they should behave. A student who believes cheating is wrong but does so on a test is likely to experience cognitive dissonance, as will people who continue to smoke even though they know that smoking is harmful to their health. Dissonance is more likely and stronger when there is inconsistency among cognitions and actions of importance to the individual involved.

Festinger (1957) proposed that the experience of cognitive dissonance can be so unpleasant that people are not only motivated to avoid it, but will actively work at reducing or abolishing it. People will typically choose the easiest course of action to reduce or avoid dissonance. Festinger also proposed that there are three basic ways in which we can reduce dissonance.

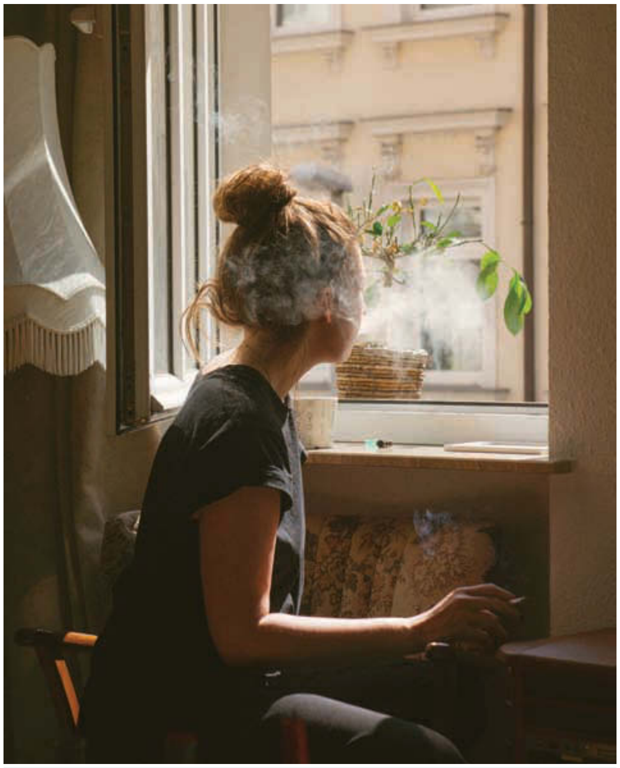

Figure 6.17 Most cigarette smokers know it is bad for their health and actively work at reducing or abolishing the cognitive dissonance it causes.

One way is to change our dissonant cognition. For example, if you absolutely adore your boyfriend or girlfriend and they leave you for someone else, dissonance may occur. To minimise or avoid psychological discomfort you might reduce the importance of what happened and think that it was only a crush and you are glad it is over. Similarly, if you miss out on a job for which you were interviewed you may conclude that the job was not what you really wanted anyway.

Sometimes, we change our cognition by convincing ourselves that our thinking is faulty or by further justifying a belief. For example, if you hold the belief that sport is necessary to maintain good health yet do not play any sport, you might think, 'playing strenuous sport is not such a good idea and I probably get enough exercise in daily activities anyway'.

A second way of reducing dissonance involves changing the behaviour to suit the dissonant cognition. For example, if experiencing dissonance because you do not play sport, you could reduce it by taking up running, basketball or some other physical activity.

A third way is to add new cognitions or supportive elements to outweigh the dissonant cognition or to rationalise or justify the behaviour. Using the sport example again, you might think 'I don't play sport because I have a bad knee'. Or, if you are on a diet but feel like eating the supermarket pizza in the freezer, reading the label on the packet may provide some information about nutritional content which will be comforting and thereby reduce dissonance. In the case of someone who experiences dissonance after cheating on a test, they may rationalise or justify their behaviour by thinking that 'Everyone else cheats, so why not me?', or, 'It was OK to cheat because I didn't have enough time to study'.

Some people cope with dissonance in ways that aren't healthy. For example, they may block out contradictory thoughts or numb themselves with drugs and alcohol. Others engage in activities in order to distract themselves, like watching a lot of television or going online for long periods of time. In such cases, cognitive dissonance can contribute to the onset of addictions (Sarkis, 2017).

Sometimes, however, people make no attempt to reduce or avoid dissonance. This may occur because they can tolerate some level of dissonance, particularly if the conflict is not too strong.

Cognitive dissonance plays a role in many of our decisions and interpersonal interactions. Being aware of dissonance, recognising how conflicting cognitions can impact on these aspects of our lives, and knowing how dissonance can be resolved in healthy ways can enhance our self-understanding and relationships with others, and help improve our ability to make better choices.

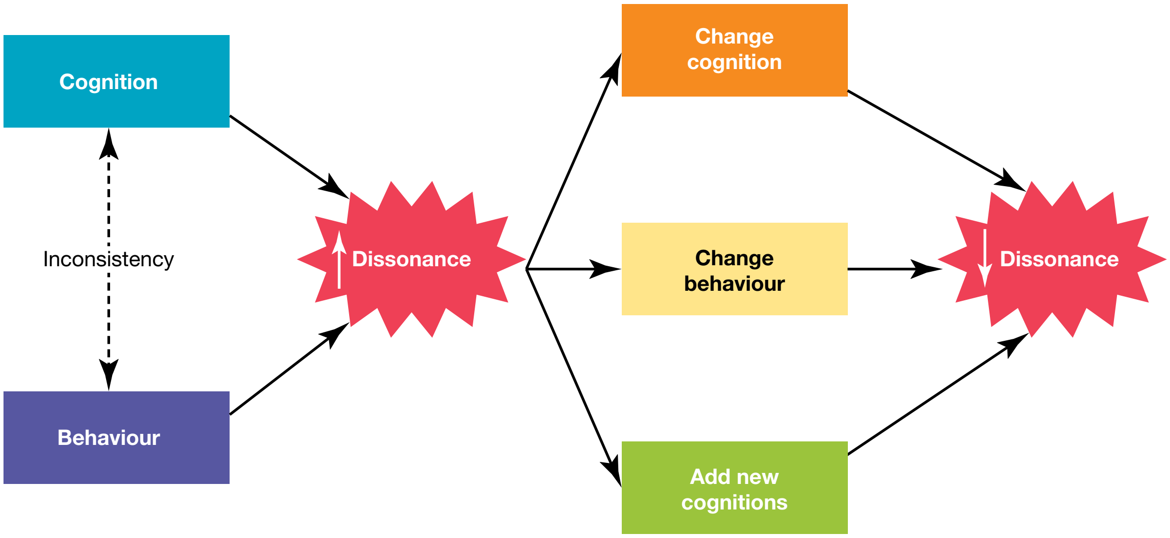

Figure 6.18 Cognitive dissonance theory

6.6 LEARNING ACTIVITY

Review

1. Define the meaning of cognitive dissonance.
2. Does cognitive dissonance theory indicate that human behaviour can be predicted? Explain your answer.
3. Complete the following table by inserting an example for each of the ways in which a cigarette smoker may reduce their cognitive dissonance caused by a belief that smoking is bad for their health.

Way of reducing cognitive dissonance	Example
Change the cognition	
Change the behaviour	
Add new cognitions	

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6.7 Cognitive bias

As much as we would like to believe our thinking and decisions to be logical and rational, it is not always the case. We all make mistakes in thinking and do not always think rationally, especially when taking mental short-cuts and making quick decisions without considering possible options.

This occurs naturally, often without knowing we have made a mistake or how it came about. In some situations, we may keep making the same type of mistake that can't be attributed to some temporary factor such as a lapse in memory, boredom or not feeling well at the time. There is a distinctive pattern of thinking which may be a type of cognitive bias, sometimes called a cognitive distortion.

Cognitive bias is a systematic error of judgment and faulty decision-making. Essentially, it is a distorted or mistaken way of thinking that usually leads to inaccurate or unreasonable conclusions.

Cognitive bias is considered to be a 'systematic error' because:

- it is flawed thinking attributable to the person who thinks in a biased way (like an inbuilt fault)
- it tends to occur naturally, often without their conscious awareness of its use
- it occurs constantly and predictably under certain circumstances (rather than randomly).

In sum, people tend to think in the same kind of erroneous way when confronted with the same type of judgment or decision-making situation.

The flawed mode of thinking associated with cognitive bias has been explained in terms of a number of different contributory factors. These include limitations in the cognitive abilities of the individual involved, underlying motivational factors, over-confidence, social influence, or because information has been interpreted according to the individual's personal likes, dislikes and experiences. As with systematic errors that may be found in research investigations, cognitive bias can be detected and corrected (Wilke & Mata, 2012; Maclean & Dror, 2016).

Although cognitive bias is a 'normal' psychological process that can occur in all people to a greater or lesser extent, it can become a habitual way of distorted thinking which negatively impacts on a person's personal and professional life.

According to the Israeli psychologists who first described the concept in the 1970s, cognitive bias can have a powerful influence not only on how we think, but also on how we feel and behave. In particular, it can affect decision-making and choices in a wide range of areas, including personal and social behaviour, medical practice, mental health care, education, entrepreneurship, finance, and management (Tversky & Kahneman, 1974).

Figure 6.19 Everyone makes mistakes, often without even realising how they did it. Cognitive bias is a systematic error of judgment and faulty decision-making.

Cognitive bias is not necessarily always 'bad'. In some situations, it can be adaptive and enhance survival. For example, it may lead us to favour healthy foods or to reach decisions quickly and err on the side of safety in potentially dangerous or threatening situations. Cognitive bias can also be a means of avoiding or dealing with contradictory beliefs that produce cognitive dissonance (Wilke & Mata, 2012; Maclean & Dror, 2016).

Since the 1970s, researchers have identified and studied numerous types of cognitive bias. These include actor–observer bias, the halo effect and self-serving bias which were previously described in relation to attributions. We consider some other biases that have been the focus of psychological research.

Anchoring bias

Anchoring bias is the tendency to rely heavily on the very first piece of information received (called the anchor) when making a decision and to not modify this anchor sufficiently in light of later information. This can lead to bad judgment and decision-making when the first available information is incorrect or when over-reliance on early information blocks objective consideration of more important later information.

For example, suppose you are shopping online for a hoodie and first see one you really like that is priced at $450 and way above your budget. You will be prone to thinking that any amount below that is good value, even if it isn't, and therefore possibly not search for a better deal. In this case, your decision is influenced by an 'anchor' (the first price seen) which is serving as a reference point for your decision-making.

Similarly, if making a decision about whether to get vaccinated and you first learnt that it has potentially serious side-effects, your decision will be more heavily influenced by this initial information, rather than by information learnt later that the vaccine has only minor side-effects. You then decide not to get vaccinated on the basis of the initial information only, which may turn out to be a bad decision if you catch the disease. In this case, you interpreted the newer information from the reference point of the 'anchor', instead of seeing it objectively and changing your decision.

Attentional bias

Attentional bias is the tendency to prioritise attention to certain information (or other stimuli) over other information. This means that when making a decision, we may not identify and weigh up all the pros and cons, or consider all options and possible outcomes.

For example, when buying a hoodie within your budget you may focus on its colour, size and overall look and feel, disregarding how warm or weather-proof it may be, whether it is made of colourfast material, or if it can be washed at home or needs expensive dry-cleaning to avoid wrecking it after a few washes.

Figure 6.20 Cognitive bias can affect decision-making when making everyday choices.

Similarly, when problem-solving, attentional bias may lead someone to become preoccupied with an existing train of thought and fail to consider alternative possibilities that may offer a better solution. Or, another person with attentional bias may be more likely to see only positive outcomes or only negative outcomes when challenged by a decision that needs to be made. Cognitive dissonance can also be avoided by selectively attending to information consistent with one's beliefs.

Confirmation bias

Confirmation bias is the tendency to seek, recall or interpret information in a way that confirms existing beliefs or expectations, while dismissing or failing to seek contradictory evidence. This can lead to bad choices or decision-making due to the failure to access or consider all possible information that may yield a better outcome in a rational, open-minded manner.

Confirmation bias is considered a means of avoiding or dealing with cognitive dissonance when evidence or opposing views do not support beliefs that are of importance to us. It can help an individual justify their beliefs and downplay or not see contradictory information, thereby avoiding dissonance.

For example, someone who has a strong pre-existing belief that climate change is a myth rather than a fact will seek and favour information that supports their belief and ignore opposing information. They will prefer media and information sources that share their views and avoid, ignore, downplay or criticise arguments or facts that go against their views, regardless of the quality or strength of supporting evidence to the contrary. They may see the flaws in arguments that are contradictory to their own but are unable to see weaknesses in their own side.

False-consensus bias

False-consensus bias is the tendency to overestimate the extent to which other people are like them in terms of sharing beliefs, personal characteristics or behaviours. Essentially, this means that people often assume that others are much more like them than they actually are — an assumption that others like what we like and do what we prefer to do.

For example, someone may assume that all their friends agree with the racist and sexist comments they make despite the fact that they actually find them offensive but haven't spoken up. Or, this type of bias, also called the *false-consensus effect*, can cause someone with extreme political beliefs to incorrectly

Figure 6.21 Confirmation bias involves seeking out media and information sources that share or affirm their preconceived views.

assume that the majority of the population agrees with them and shares those beliefs, even though most people don't.

Similarly, a manager may believe that all staff are much more in agreement with a business decision that's just been made than the staff actually are. They have not considered individual differences and that other people can have different perspectives. They may even consider alternative views as inappropriate, uncommon or deviant.

Hindsight bias

Hindsight bias is the tendency, only after an event has occurred, to overestimate the extent to which the outcome could have been foreseen. This occurs regardless of the randomness or unpredictability of the event. Events are incorrectly understood to be more predictable than they actually are.

For example, people with hindsight bias believe they should have anticipated certain outcomes, which might only be possible, if at all, with the benefit of knowledge and perspective following the event's completion. They may overlook the possibility that at the time of the event, important information was not actually available.

Hindsight bias is apparent when someone states that they 'knew all along' that a particular team would win the match, a particular individual would be elected to the SRC, a particular question would be on an exam, a specific decision would be made by a manager, that share prices would tumble, and so on.

A problem with hindsight bias is that it can lead people to take unjustifiable risks when making judgments or decisions. Some risky decisions can have outcomes that are actually unpredictable, unwanted, expensive or even dangerous.

Misinformation effect

The **misinformation effect** is the tendency for information acquired after an event to influence the accuracy of the memory of the original event. A person will mistakenly recall information acquired after an event as being part of that event instead of accurately recalling the information that had been acquired during the event.

For example, if someone gives their version of a car accident you saw, this new information may interfere with the accuracy of your eyewitness memory. It is possible for the new information to become part of your memory of the event even though it didn't occur or you didn't actually witness it.

The misinformation effect emerged from experiments on the reliability of eyewitness memory. It has demonstrated that eyewitness memory can be inaccurate because it is vulnerable to revision when the eyewitness receives new information after the event; for example, new information planted in a leading question asked by a prosecutor or defence lawyer during a court room trial.

Similarly, in everyday life, reading or watching a media report of an event may change how you remember the event due to the misinformation effect. Hearing a friend or someone else describe an event from their perspective can also change your memory of what happened. The new information may be integrated with the older memory or used to fill a gap in the memory. The misinformation effect can lead to inaccurate memories and, in some cases, even result in the formation of false memories.

Some people exploit the misinformation effect by planting fake news stories in social media. The consequences of the misinformation effect can range from the trivial to significant and far reaching. For example, misinformation that you're more likely to die from a vaccine than you are from the serious disease for which it gives you immunity can result in death.

Figure 6.22 The misinformation effect was identified through research on how leading questions can change the accuracy of eyewitness testimony.

Optimism bias

Optimism bias is the tendency to overestimate the likelihood of experiencing positive events and underestimate the likelihood of experiencing negative events in the future. This bias can be motivating and lead someone to take on difficult challenges and to believe that they are more likely to attain success and less likely to experience misfortune than others.

For example, optimism bias can lead someone to assume that they will be unaffected by negative life events such as a poor ATAR score, job loss, a serious accident, loss of a loved one in the foreseeable future, or inability to save enough money for a good car or house.

Similarly, a person biased in this way will tend to have an unrealistically optimistic view about a particular health risk, believing it is higher for other people than themself. They may, for example, not consider themself at risk from flu, assuming they are healthy, not susceptible to flu, and strong enough to fight it if they somehow caught it.

They may also make poor decisions such as taking up smoking or maintaining a poor diet because of a distorted belief that they will not get cancer, diabetes or some other disease. Their ‘bad things won’t happen to me’ bias may also tempt some to shoplift or commit some other crime with the belief that they’ll ‘get away with it’.

Dunning–Kruger effect

The **Dunning–Kruger effect** is a type of cognitive bias whereby people overestimate their knowledge or ability, particularly in areas with which they have little to no knowledge or experience. This leads them to reach incorrect conclusions and make inappropriate choices, and they do not have the cognitive ability to recognise their own incompetence.

It is this combination of a lack of knowledge about a particular subject, poor self-awareness of their ignorance, and low cognitive ability, that leads them to overestimate their own capabilities and think of themselves as more expert than those who are better informed.

Figure 6.23 The Dunning–Kruger effect has been used to explain why some people are influenced by fake news and disinformation (such as conspiracy theories).

The effect is named after the psychologists who found through research that the more poorly people performed on tests of logical reasoning, grammar and humour, the more they overestimated their own performance. Conversely, the outstanding participants significantly underestimated their own performance (Kruger & Dunning, 1999).

Believing that we are much better than we really are and being unaware of our shortcomings can have a profound effect on decision-making in everyday life, especially if we believe that our decisions are better than is actually the case.

For example, the Dunning–Kruger effect can lead people to make decisions to do something with a high likelihood of a negative outcome. They may engage in jobs or activities that are of danger to themselves or others due to their lack of self-awareness that they do not have the necessary knowledge or skills. At school or work, the effect can make it difficult for people to recognise their bad decisions or poor performance and to do something about it or to learn from their mistakes.

We do not like the psychological discomfort of feeling bad about ourselves when we lack the necessary knowledge or skills, even if what we want to achieve is not particularly important. As with other types of cognitive bias, the Dunning–Kruger effect can reduce cognitive dissonance and protect our self-esteem when there is a possibility that we could realise that we are lacking in ability or are bad at something, especially if we compare ourselves to our friends and peers.

6.7 LEARNING ACTIVITY 1

Review

Complete the table to summarise the different types of cognitive bias.

Cognitive bias	Description
1. actor–observer bias	
2. anchoring bias	
3. attentional bias	
4. confirmation bias	
5. false-consensus bias	
6. halo effect	
7. hindsight bias	
8. misinformation effect	
9. optimism bias	
10. self-serving bias	
11. Dunning–Kruger effect	

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6.7 LEARNING ACTIVITY 2

Multiple-choice questions

1. A fashion designer believes their clothing designs are far more popular than they really are. The designer's belief is primarily influenced by
   A. confirmation bias.
   B. self-serving bias.
   C. false-consensus bias.
   D. optimism bias.
2. After the SRC election results are released, Jess announces that 'I knew all along that I wasn't going to win'. Jess's thinking has most likely been influenced by
   A. confirmation bias.
   B. self-serving bias.
   C. hindsight bias.
   D. actor–observer bias.
3. Kate enters the 'Search for a Star' talent competition on TV with the belief that she is a far better singer than she actually is. Kate is unaware of her lack of singing ability and the likelihood of public humiliation, and is very confident that all the judges will be impressed by her ability to sing.

   Kate's thinking is most likely influenced by
   A. optimism bias.
   B. the halo effect.
   C. the Dunning–Kruger effect.
   D. the misinformation effect.
4. Imelda is not backward in taking on new challenges, even when there is a genuine risk of self-harm. She seems to go through life with an attitude that 'bad things won't happen to me'. Imelda's thinking is most likely influenced by
   A. optimism bias.
   B. self-serving bias.
   C. attentional bias.
   D. the Dunning–Kruger effect.
5. Jack is overly influenced by his first impression of a new class mate and holds onto this despite feedback from friends during the week that contradicts what he thinks.

   Jack's thinking has most likely been influenced by
   A. anchoring bias.
   B. self-serving bias.
   C. confirmation bias.
   D. the halo effect.

To answer these and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

6.8 Heuristics

Heuristics are another type of mental short cut we use to make judgments quickly and efficiently. They are practical, experience-based strategies that are relatively simple and generally work well when problem-solving and decision-making. But they may also involve or lead to cognitive bias.

A **heuristic** is a strategy for solving a problem or making a decision that is based on experience with similar types of problems but cannot guarantee a correct outcome. For example, a heuristic learnt through experience in playing classic Monopoly is to purchase as many properties as possible, particularly those that enable hotel rental payments. This heuristic will not ensure winning, but using it does increase one's chance of doing so. Given a heuristic is based on past experience, it is sometimes referred to as a 'rule-of-thumb'.

Many different types of heuristics have been described. These include the availability heuristic, the representativeness heuristic and the affect heuristic.

Availability heuristic

The **availability heuristic** involves making a judgment based on how easy or difficult it is to bring specific examples to mind. There is a preference to use information we can quickly recall. The more available information is from long-term memory, the more likely it is that we will base our judgment on that information.

For example, when deciding whether to drive or fly to Queensland for a schoolies experience, a recent media report showing graphic images from the scene of a horrific accident on the highway you would travel along may pop into mind and sway you to fly rather than drive. The availability heuristic has therefore enabled you to quickly reach a decision, but not necessarily the correct decision. When the time arrives to travel to schoolies, an airline strike may be called that messes up your arrangements and prevents you from getting there as soon as you planned to, if at all.

Although using information that is more easily recalled from memory can save us time and effort, a problem with the availability heuristic is that it may lead to errors of judgment. When certain events are very easily available in memory, we may be led to believe that those kinds of events are far more common than they actually are and overestimate the likelihood of their happening in the future. Such events include those which are high-profile, unusual, dramatic, sensational or emotionally-laden, thereby being salient and 'standing out' in memory.

For example, if we can readily recall a well-publicised road accident, plane crash or shark attack, we may be led to believe that those kinds of events are far more common than they actually are and overestimate the likelihood of their happening in the future. As a consequence, we may decide that driving, flying or ocean swimming are far more dangerous than they really are, and possibly even avoid such activities where possible.

Figure 6.24 The availability heuristic following a recent media report may lead us to believe that shark attacks are far more common in Australia than they really are, despite an estimated annual average of about 15 unprovoked incidents per year throughout the past 200 years.

Similarly, when information is relatively unavailable in memory, as may occur with less well-publicised causes of death such as diabetes and pneumonia, it may lead us to believe that those kinds of events are less common or likely than they are.

The tendency to think that examples of things that we can quickly recall are more or less common than is actually the case is called *availability bias.*

Representativeness heuristic

The **representativeness heuristic** involves categorising a person, object, event or anything else by judging how closely it matches our idea of a typical member of the category. When using this heuristic, we are making a judgment by comparing people or things to concepts (ideas) or templates we already have in mind.

For example, if given a choice of the two categories outlaw bikie and school teacher, we are more likely to assign a bearded, heavily tattooed male wearing an old leather vest and dirty jeans to the bikie category. Through past experience, we have an idea of what outlaw bikies may look like based on physical characteristics they seemed to have in common. The bearded male is a much better match for our concept of a typical outlaw bikie than he is for our school teacher concept, so there is also a higher probability of them being an outlaw bikie than a school teacher.

Similarly, we may base our judgment entirely on a single characteristic that we believe adequately represents a category when decision-making. For example, we know that high-quality products are expensive. Therefore, if something is expensive, we might assume that it is of high quality. So, if we see two bottles of fragrance on the shelf in a department store and one has a much higher price, we may quickly decide that it is the better fragrance. We would have selected one feature (price) from among many others that we could have focused on, such as smell, brand, size, packaging and country of origin, and used that to make the purchase decision.

We may also use the representative heuristic when classifying and categorising people on the basis of personal characteristics. For example, when deciding if someone is trustworthy, kind, gentle, aggressive, racist, sexist, and so on, we may compare one or more known aspects of their character to relevant mental concepts we hold.

The representativeness heuristic is based on the assumption that 'like goes with like'. This can be a useful assumption that is time-saving when making judgments about people, objects and events. It often results in accurate conclusions and decision-making. But, as you would expect, this heuristic can also lead to poor judgments and bad decisions. For example, high price does not always mean high quality. Furthermore, when used for person perception, this heuristic has the potential for inaccurate impressions of people and the other kinds of problems associated with social categorisation and flawed stereotyping.

Affect heuristic

The **affect heuristic** involves making a judgment that is influenced by the emotion being experienced at the time. Our current emotional state, be it happiness, sadness, surprise, fear, disgust, and so on, plays a significant role in our decision-making and problem-solving.

This heuristic tends to be used when judging the risks and benefits of something during the decision-making process. Generally, when we are in a positive emotional state (e.g. feeling happy or 'great'), we are more likely to judge the risks associated with a decision as low and the benefits as high. We will consequently make a favourable decision; for example, to purchase a particular item, accept an invitation to go out on a date, attend a protest meeting, or do the bungy jump we are contemplating.

Figure 6.25 If you are scared of heights, the affect heuristic may influence you to ride on a cable car when in a positive emotional state.

Similarly, when we are in a negative emotional state (e.g. feeling sad or 'down'), we are more likely to judge the risks as high and the benefits as low. Our focus will tend to be on the potential downsides of a decision rather than the possible benefits.

You can probably think of several examples, when your decision-making has been swayed by your emotional state at the time. This may occur for both big and small decisions. As with other heuristics, the outcome may not have been correct or the best possible one. The affect heuristic can distort our choices.

Many advertisements try to exploit the affect heuristic in order to influence our purchasing decisions. For example, consider the fast food and soft drink advertisements which show young people smiling, laughing and generally having a great time whilst buying or consuming the product. The intention is that consumers will learn to associate the product with a positive emotional state and consequently decide to buy it rather than another brand.

While heuristics can shorten problem-solving and decision-making time by allowing us to cut corners and process information quickly, they aren't a good fit for every situation. Heuristics do not guarantee a solution or the right outcome. Just because something has worked in the past, it does not mean that it will work again. Furthermore, many heuristics involve systematic bias or can lead to cognitive bias and therefore illogical or inaccurate judgments. Relying on a heuristic can also make it difficult to see alternative solutions or come up with new ideas.

6.8 LEARNING ACTIVITY

Multiple-choice questions

1. A heuristic
   A. is an experience-based strategy.
   B. produces illogical decisions.
   C. guarantees a solution to a problem.
   D. relies on too much information.
2. Which heuristic involves cognitive bias?
   A. availability heuristic
   B. representativeness heuristic
   C. affect heuristic
   D. All of the above are correct.
3. The use of fear in a public safety campaign to deter people from engaging in unsafe behaviour will most likely to be based on which heuristic?
   A. availability heuristic
   B. representativeness heuristic
   C. affect heuristic
   D. All of the above are correct.
4. Which heuristic is most reliant on salient information in memory?
   A. availability heuristic
   B. representativeness heuristic
   C. affect heuristic
   D. All of the above are correct.
5. Which heuristic is based on the assumption that 'like goes with like'?
   A. availability heuristic
   B. representativeness heuristic
   C. affect heuristic
   D. All of the above are correct.

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6.9 Prejudice and discrimination

There is considerable research evidence that prejudice and discrimination are common in Australian society, as they are throughout the rest of the world. Nor are they limited to certain social groups, such as ones based on sex, race and age. Virtually all people are exposed to prejudice, discrimination or both at some time in their lives.

Unfortunately, both tend to cause more harm than good and need to be reduced or eliminated when harmful. In order to understand effective ways of reducing prejudice and discrimination, it is first important to clarify understanding of what they are and the functions they serve.

6.9.1 Prejudice

The term prejudice literally means ‘prejudgment’. Because prejudice involves a judgment, it is usually considered to be an attitude, but specifically one for which the focus is people.

Like other attitudes, prejudice can be positive or negative. For example, someone may be prejudiced in favour of heavy metal musicians or against heavy metal musicians. This means that if you were to meet the lead singer of a famous heavy metal band, you will be inclined to either like or dislike them and to expect them to have certain personal characteristics based on your stereotypic view of ‘famous musicians’ or ‘famous heavy metal bands’.

Psychology has focused on the study of prejudice as a negative attitude, mainly because of the mental health and social problems that prejudice towards other people can cause. Consequently, **prejudice** is commonly defined in psychology as a negative attitude towards another person or social group, formed in advance of any experience with that person or group (APA, 2022).

Any group (or person) can be the focus of prejudice. The group may be small, big or span an entire society or culture. The group may be women, men, Aboriginal and Torres Strait Islander people, members of an ethnic group such as Chinese or Greeks, members of a particular religious group or political party, teenagers, elderly people, police, people with a mental health disorder, people with a physical disability or with a particular sexual preference, certain occupations such as artists or truck drivers, or even people who behave in a particular way, such as bullies or shy people.

A person who is prejudiced against some group tends to evaluate its members negatively, merely because they belong to that group. Their individual characteristics or behaviour are usually overlooked. It does not matter if the information about an individual or a group is faulty or incomplete. They are viewed in a negative way simply because they belong to the specific group.

Prejudice often involves members of a majority group holding negative attitudes towards the members of a minority group. Members of a majority group are greater in number and are sometimes described as the ‘ingroup’, whereas members of a minority group are fewer in number and are sometimes described as the ‘outgroup’.

According to American sociologist Herbert Blumer (1961) who was a pioneering researcher on prejudice, there are four basic characteristics of prejudice which can often be observed among members of a majority social group who hold a prejudiced attitude towards members of a minority group:

1. they tend to believe that they are superior to the minority group to whom the prejudice is directed
2. the majority group tend to believe the minority group is different from them and that they ‘do not belong’
3. the majority group tend to believe that they are more powerful and important than the minority group
4. a majority group that displays prejudiced attitudes is insecure, fearing the minority group may become more powerful and important than itself.

These four characteristics continue to be relevant in contemporary societies and cultures across the globe.

Old-fashioned and modern prejudice

Psychologists have distinguished between old-fashioned (or traditional) and modern forms of prejudice. Although a clear distinction can be made between them, these two forms of prejudice tend to be closely related.

Australian psychologists Anne Pederson and Iain Walker (1997) describe **old-fashioned prejudice** as a form of prejudice in which members of the majority group openly reject minority group members and their views towards the minority group are obvious and recognisable to others. More specifically, the views of people with old-fashioned prejudice are much like those described by Blumer.

For example, old-fashioned racial prejudice typically involves a view that non-Indigenous Australians are superior in many ways to Aboriginal and Torres Strait Islander peoples and that the races should be segregated; that is, non-Indigenous and Indigenous peoples should be separated or isolated from one another.

People who are prejudiced in an old-fashioned way towards another race tend to believe that segregation should occur in all aspects of life, such as employment, schooling, housing and the like. Many also believe and express strong racial stereotypes such as 'Aboriginals are lazy and dumb' and 'Aboriginals are alcoholics and rely on government handouts'.

Pederson and Walker describe **modern prejudice** as a form of prejudice which is more subtle, hidden and expressed in ways more likely to be accepted within the majority group. For example, modern racial prejudice includes the belief that Aboriginal and Torres Strait Islander peoples have the right to opportunities available to all members of society, but they want more rights than anybody else and probably do not deserve these rights.

Someone with an attitude involving modern prejudice might publicly support an affirmative ('positive') action program to help overcome the disadvantages experienced by minority group members in obtaining employment or access to tertiary education. However, they may have reservations about the fairness of such a program to members of the majority group. They are also more likely to keep their real views private and not share them openly when it is believed that those views may be socially unacceptable and may reflect on them in an unfavourable way.

Figure 6.26 Research findings show that prejudice against Aboriginal and Torres Strait Islander peoples in Australia has persisted over time and may still be widespread, despite the reduced likelihood of it being openly expressed.

In Australian society, and most other Western societies, modern forms of prejudice are more common than old-fashioned forms. This is mainly because open expressions of prejudiced attitudes and behaviour such as name-calling, abuse and discrimination are illegal and not socially acceptable.

However, this does not mean that prejudiced attitudes towards people in certain social groups have dramatically reduced or do not exist. Prejudice may be still be widespread, but more difficult to observe than in previous times when it was more openly expressed (Australian Human Rights Commission [AHRC], 2021, March).

For example, the 2021, Australia Talks National Survey conducted by the ABC and Melbourne University found that 'the majority of us — across all demographics and political persuasions — believe there is a lot of racism these days' and that '64 per cent of us believe most Australians are prejudiced against Indigenous peoples, whether or not they realise it'. This survey asked more than 60 000 Australians from across every state and territory and every federal electorate about their attitudes, behaviours and experiences.

More recently, psychologists have tended to distinguish between explicit and implicit prejudice to emphasise whether the prejudice is consciously or unconsciously held.

Explicit prejudice is defined as prejudice that is consciously held and usually deliberately thought about. Like old-fashioned prejudice, it is typically openly expressed by the person holding it and is within their control. In contrast, **implicit prejudice** is prejudice that is typically unconsciously held; that is, the person holding such prejudice is not usually aware that they do so. Implicit prejudices are not usually within the control of the person holding them (APA, 2022).

6.9.2 Discrimination

Prejudice can also be expressed through behaviour. When this occurs, it is called discrimination. **Discrimination** takes place when a person or a social group is treated differently than others. The treatment may involve positive or negative behaviour.

When discrimination is a result of prejudice, it typically involves negative, unfavourable treatment.

In contrast, *positive* or *reverse discrimination* is the favourable treatment of a person or social group who is a victim of prejudice (APA, 2022). It aims to promote greater equality by supporting people who face, or have faced, ongoing discrimination so they can have similar access to opportunities as others in the community (AHRC, 2022a).

Of particular concern to psychologists (and all people who support human rights and equal opportunity) is discrimination involving negative or unfavourable treatment.

Discrimination can take many forms. For example, it may involve behaviour such as ignoring people, excluding people from places or positions, bullying, putting people down, or, in its extreme form, it may be expressed in physical violence against a particular individual or group, or even genocide. Genocide involves the extermination of an entire group, such as Hitler's attempts to kill all Jewish people during World War II.

The Australia Talks National Survey 2021, found that 76% of Australians from non-European backgrounds have been discriminated against because of their ethnicity. Furthermore, 61% reported that they know people who tell racist jokes and over 80% of women believe that men and women don't share a level playing field (compared with 50% of males).

Direct and indirect discrimination

The Victorian Equal Opportunity & Human Rights Commission (2021) describes two forms of discrimination — direct and indirect discrimination. In Victoria, it is against the law for someone to discriminate, or propose to discriminate, against another person in an area of public life because of a personal characteristic they have or are assumed to have. Personal characteristics include age, sex, race, marital status, disability, physical features and political beliefs. Areas of public life include clubs, shops, schools and the workplace.

Direct discrimination happens when someone is treated unfavourably because of a personal characteristic protected by the law. For example, direct discrimination would occur if someone was overlooked for a job specifically on the basis of their age, sex, or some other relevant personal characteristic.

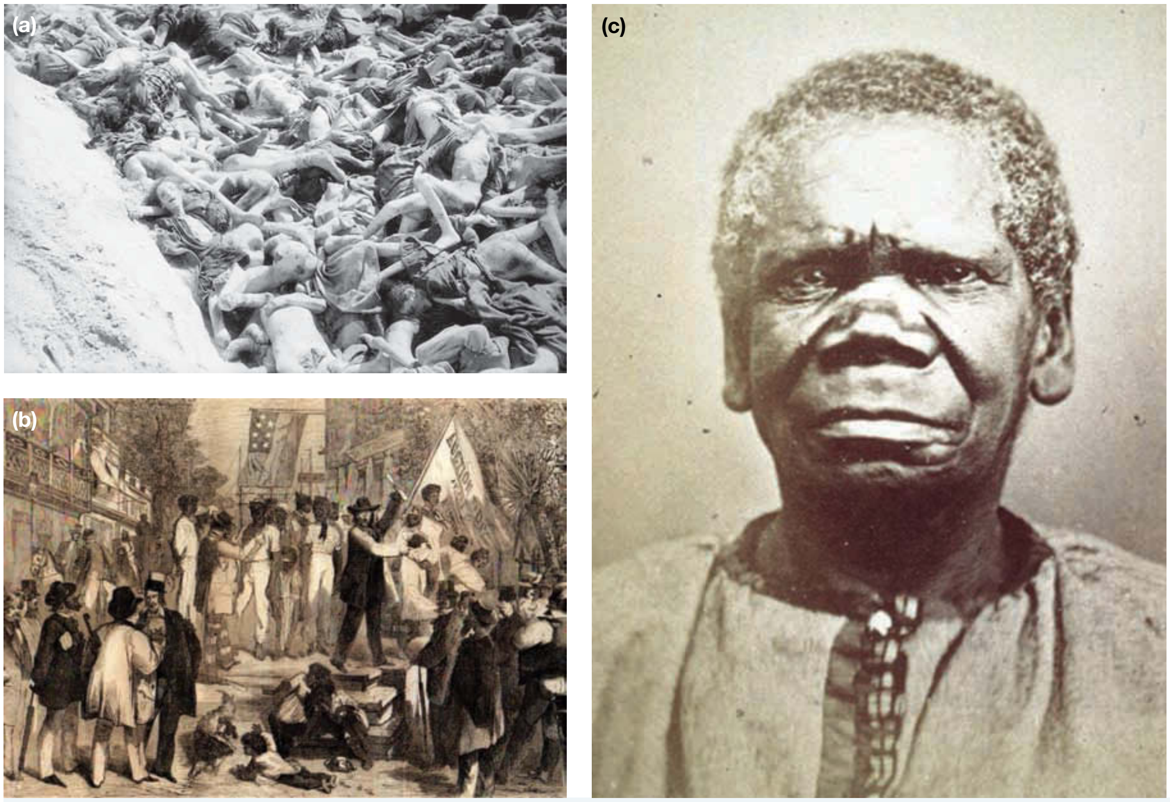

Figure 6.27 Prejudice and discrimination have been the cause of many atrocities worldwide throughout the course of history, including (a) the starvation and subsequent extermination of many Jews by the Nazis, (b) the auctioning of Africans as slaves in North America, and (c) the mass slaughter and dispossession of Australia's First Nations people, particularly in Tasmania, where Truganini and many others were transported to a makeshift settlement and forced to adopt European culture.

Direct discrimination often happens because people make unfair assumptions about what people with certain personal characteristics can and cannot do. This would occur, for example, if an adolescent applied for casual work and was told by the employer that they missed out because 'teenagers are unreliable'.

Two other examples of direct discrimination given in the *Equal Opportunity Act 2010* (Vic) are:

- An employer advises an employee that she will not be trained to work on new machinery because she is too old to learn new skills. The employer has discriminated against the employee by denying her training in her employment on the basis of her age.
- A real estate agent refuses an African man's application for a lease. The real estate agent tells the man that the landlord would prefer an Australian tenant. The real estate agent has discriminated against the man by denying him accommodation on the basis of his race.

Indirect discrimination happens when there is an unreasonable requirement, condition or practice that disadvantages a person, or a group of people, because of a personal characteristic. For example, if an employer refuses to allow employees to wear any head covering in the workplace, this may be indirect discrimination against employees whose cultural or religious background requires that they wear a particular type of head covering.

Similarly, suppose that a factory requires all employees to start at 6 am. This might seem to treat everyone equally, but it could disadvantage employees who need to care for children, who are usually women. If it is not a reasonable requirement, this will be indirect discrimination.

Two other examples of indirect discrimination given in the *Equal Opportunity Act 2010* (Vic) are:

- A store requires customers to produce photographic identification in the form of a driver's licence before collecting an order. This may disadvantage a person with a visual disability who is not eligible to hold a driver's licence. The store's requirement may not be reasonable if the person with a visual disability can provide an alternative form of photo ID.
- An advertisement for a job as a cleaner requires an applicant to speak and read English fluently. This may disadvantage a person on the basis of their race. The requirement may not be reasonable if speaking and reading English fluently is not necessary to perform the job.

There are some exceptions in the Equal Opportunity Act that mean it's not against the law to discriminate in particular circumstances. For example, discrimination is not against the law if there is a real risk to someone's health, safety or property.

Distinguishing between prejudice and discrimination

The basic difference between prejudice and discrimination is that prejudice is an attitude and discrimination is behaviour arising from prejudice.

When prejudice and discrimination are directed at people who are members of a particular racial or ethnic group, for example, Aboriginal and Torres Strait Islander people, Somalians or Muslims, it is called *racism*. When directed at women or men because of their sex, it is called *sexism*. When directed at people because of their age, it is called *ageism*.

Generally, the attitudes and behaviour of a person who is racist, sexist or ageist are often affected by the person's belief that people of different races, sexes or ages have different personal characteristics and abilities. Furthermore, racism, sexism and ageism often result because a person (or group) feels superior to an individual or group in terms of race, gender or age, and regards them as being inferior or less able in one or more ways.

Figure 6.28 It is against the law to sexually harass or victimise someone, or to vilify someone because of their race or religion. (a) Sexual harassment is unwelcome sexual behaviour that causes a person to feel offended, humiliated or intimidated. (b) Victimisation is treating someone badly or unfairly because they have made a complaint about discrimination, sexual harassment or racial and religious vilification, it is believed they intend to make a complaint, or they've helped someone else to make a complaint. (c) Vilification is behaviour that incites hatred, serious contempt for, or revulsion or severe ridicule of a person or group of people because of their race or religion.

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6.9 LEARNING ACTIVITY

Review

1. Define the meaning of prejudice, with reference to an example.
2. a. List Blumer's (1961) four characteristics of prejudice.
   b. Apply these characteristics to analyse a prejudice you believe is held by a majority social group in Australian society towards a minority group. Which characteristics do you believe may or may not be true? Explain your answer.
3. The following table shows an analysis of gender prejudice in terms of the tri-component model of attitudes.

Attitude components	Components of gender prejudice towards females
Cognitive (belief)	Believes females are inferior (negative stereotype of females)
Affective (feeling)	Dislikes females (negative feelings about females)
Behavioural (action)	Discriminates against females (negative actions toward females)

   Analyse another type of prejudice in terms of the model.
4. a. Explain the difference between old-fashioned (traditional) and modern prejudice.
   b. In what way are explicit and implicit prejudice like or unlike old-fashioned and modern prejudice?
   c. Which form of prejudice do you believe occurs most frequently in Australian society? Explain your answer with reference to an example(s).
5. Explain the difference between direct discrimination and indirect discrimination with reference to an example of each type of discrimination different from those used in the text.
6. a. Describe the relationship between prejudice and discrimination.
   b. What is the key difference between prejudice and discrimination?
7. a. Explain the meanings of the terms racism, sexism and ageism.
   b. How do 'racists', 'sexists' and 'ageists' tend to view someone of another race, sex or age?
   c. Give an example of a racist, sexist or ageist comment.

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6.10 Ways to reduce prejudice

Anti-discrimination laws have led to a significant reduction in the number of observable expressions of prejudice in Australian society. This legislation, which has been accompanied by education campaigns about the legislation, its purpose and the harmful effects of prejudice and discrimination, has also led to increased opportunities for women and members of minority groups in our society. However, the Australian Human Rights Commission (2021, December) maintains that Federal (national) discrimination laws remain inadequate.

The media has also played an important role in combating prejudice. For example, social media posts, podcasts, TV current affairs programs and investigative journalists have highlighted problems and issues faced by individuals and groups who are the targets of prejudice and discrimination. This not only informs us about the existence of continuing or new problems and issues around prejudice, but also creates public debate that increases our understanding of these problems and issues, and puts political pressure on governments to 'do something'.

However, changes in legislation and reporting by the media do not mean that prejudice and discrimination have ceased to be problems in Australia. For example, although the attitudes of many non-Aboriginal Australians towards Aboriginal and Torres Strait Islander peoples have improved in the past 20 years or so, the physical, material and spiritual struggle of the First Nations people has not.

For example, the Australian Human Rights Commission (2022b) has reported research findings that 97% Aboriginal and Torres Strait Islander people in Victoria had experienced racism within the previous year and that two out of every three people had experienced eight or more incidences of racism a year.

The Commission adds: 'Aboriginal and Torres Strait Islander people are also still dealing with the effects of past laws and government policies which resulted in them being removed to missions and reserves or taken away from their families. These laws and policies have caused huge amounts of hurt and pain for individuals, families and communities, which shows up in lots of different ways — poor health, high rates of mental illness and family breakdowns. In many cases this disadvantage has been passed from one generation to the next, meaning that many Aboriginal and Torres Strait Islander peoples today miss out on the opportunities that other Australians take for granted.'

Similarly, although the stereotype of women is more positive than it was 20 years ago, women still experience inequality and discrimination in many important parts of their lives. At work, for example, women continue to face a gender 'pay gap' and barriers to leadership roles. They continue to find it difficult to gain access to leadership roles and positions of power in our society that have traditionally been held by men. Many encounter reduced employment opportunities because of the time they give to family and caring responsibilities. Sexual harassment and gender-based violence also threaten women's basic right to feel safe and respected at work, in public, in places of study and at home (AHRC, 2022c).

Although legislation and education through the media (and in schools) have helped reduce prejudice and discrimination, changing laws and informing people about prejudice and discrimination does not necessarily mean that people will stop being prejudiced. Consequently, further reducing prejudice and discrimination in our society still remains a very important challenge and alternative strategies to tackle these issues need to be considered.

Findings from psychological research indicate there are other methods that can also help reduce prejudice and discrimination. Generally, no one particular method will effectively eliminate prejudice and discrimination so a number of methods need to be used in combination. These must be directed at the individual as well as society.

One way of reducing prejudice is through *intergroup contact*. This involves increasing contact between groups who are prejudiced against each other. Ways of reducing prejudice through intergroup contact were the focus of many research studies throughout the 1950s and 1960s, particularly in America where prejudice towards African Americans created major personal, social, political and economic problems.

More recently, psychologists have focused on ways of reducing prejudice through *cognitive interventions*. This involves changing the way in which prejudiced people think about prejudice and people who are the victims of prejudice.

Intergroup contact

Prejudice can be reduced through **intergroup contact** — by increasing direct contact between two groups who are prejudiced against each other. However, research findings indicate that the contact between the groups will reduce prejudice only under certain conditions. In particular, it is more likely that prejudice will be reduced if there is close and ongoing contact between the two groups, if the two groups have to rely on each other for some reason and if each group has equal status in the contact situation.

Extended contact

Suppose that someone from an outlaw bikie gang reported in the media as engaging in drug deals and criminal activity moves into your neighbourhood. Although you may have occasionally 'heard' about the gang, you have previously had nothing to do with any of its members. However, your past experience has led you to form a stereotype and develop a prejudicial attitude towards the gang and its members.

When you first see your new neighbour, his rough, tough, tattooed appearance, his manner of dress and the fact he owns a loud, 'chopper' motorbike reinforces your stereotype. You decide to have as little contact with him as possible. However, the fact that he lives in the house opposite yours makes this difficult. You see him often, sometimes even doing 'normal' things like taking the wheelie bin out for rubbish collection and collecting mail.

In time, you start to briefly exchange pleasantries whenever you see him out in the street or at the local shops. In fact, as you get to know him better, he turns out to be quite friendly and pleasant. Although you believe that this person is different from you in too many ways to ever become your friend, your **extended contact** with him — that is, sustained or ongoing contact either directly or indirectly over a period of time — has helped break down a stereotype that was substantially based on minimal information obtained from secondary sources.

However, extended contact alone doesn't necessarily mean that you will stop stereotyping all other people in future, including outlaw bikies. Stereotyping and stereotypes are learnt and tend to be resistant to change. Nonetheless, chipping away can make a difference in many cases.

Figure 6.29 A prejudiced attitude toward bikies might make you nervous if this man moved into your neighbourhood. However, extended contact might help break down your stereotype and reduce your prejudice.

The contact hypothesis

Does it follow that direct contact between groups who are prejudiced towards one another will help break down stereotypes and reduce prejudice? The possibility was first raised by eminent American psychologist Gordon Allport in 1954 and has come to be known as the contact hypothesis.

The **contact hypothesis** proposes that certain types of direct contact between members of different groups can reduce prejudice. The assumption is that close, prolonged contact of a fairly direct nature (one-on-one or face-to-face) leads to a re-evaluation of incorrect stereotypes about the other group and its members, thereby reducing intergroup stereotyping and prejudice. For example, if members of different groups are able to socialise, they will be able to exchange information and learn things about each other that challenge or break down the stereotypes behind the prejudice.

This suggests that direct intergroup contact over a period of time may be an effective means of eliminating, or at least reducing, prejudice. However, reality indicates otherwise. For example, consider the high level of contact between men and women, non-Aboriginal Australians and Aboriginal Australians, and younger and older people since Australia was first colonised. Despite the ongoing and frequent contact, many men still hold prejudiced attitudes towards women, as do non-Aboriginal Australians towards Aboriginal Australians and younger people towards the elderly.

Consider also the high level of contact between Palestinians and Israelis, Muslims and Christians, black and white Americans. None of these situations of sustained contact has on its own been successful in significantly reducing or eliminating prejudice.

Mere contact over time is insufficient. According to the contact hypothesis, a number of specific conditions must be present for the sustained contact to be effective in reducing prejudice. One condition which must be present for contact to be effective is that the two different groups must have contact that makes them dependent on each other. This is called mutual interdependence.

Mutual interdependence

If two rival groups who dislike and are prejudiced against each other are placed in a contact situation in which they are mutually interdependent — that is, dependent on each other — there is a greater likelihood that the rivalry and negative stereotypes can be broken down, thereby reducing the prejudiced attitudes the groups hold about each other.

This contact condition was first demonstrated in a classic experiment conducted by Turkish-born American psychologist Muzafer Sherif (1956). The experiment was conducted in three phases and has come to be known as the *Robber's Cave Experiment* because of its location at a place called Robber's Cave.

Sherif's experiment involved two groups of children who developed negative attitudes towards each other, became bitter rivals and were constantly in conflict, a condition he and his colleagues created at a 3-week summer vacation camp.

The participants were 22 white, middle-class, Protestant boys aged 11 to 12 with no record of school, psychological or behavioural problems. To confirm this information obtained from school records, the researchers observed the children's behaviour in the playground. The researchers also obtained the boys' informed consent in the presence of their parents. The experiment was described generally and relatively accurately, with the participants (and parents) being led to believe that the researchers were studying the formation of friendship groups and various aspects of group behaviour.

Phase 1

In the first phase of the experiment, the boys were randomly allocated to one of two groups. The two groups arrived at the campsite in separate buses and were kept apart in different areas of the camp so that they would be unaware of each other's presence. In this first phase, Sherif's aim was to promote the development of cohesion within each group; that is, a sense of belonging and 'togetherness'.

Group cohesion was achieved by organising activities that involved cooperation and required the members of each group to be highly interdependent on each other. For example, within each group, the boys cooperated in preparing meals, building a rope bridge, building a diving board for the swimming pool and so on.

These types of activities proved to be very effective in building group cohesion. The boys made up names for their respective groups (the 'Rattlers' and the 'Eagles'), they designed a flag and they developed certain types of behaviour and expressions that were unique to their group.

Phase 1 lasted for one week, at the end of which the cohesiveness within each group was well established and the stage was set for conflict.

Phase 2

In the second phase, Sherif organised intergroup competitions to test a hypothesis that 'when two groups have conflicting aims, their members will become hostile to each other even though the groups are composed of normal, well-adjusted individuals'.

Sherif allowed the groups to discover that they were sharing the campsite. Seeing 'those guys' using 'our ball field' and 'our equipment' created tension and rivalry. According to data collected from questionnaires completed by the boys, each group had become so closely knit that the other group was viewed as 'outsiders'. The researchers stirred up the negative feelings between the groups by treating one group better than the other some of the time and by pitting the two groups against each other in a week-long tournament involving competitions with prizes awarded to the winners.

Hostilities escalated as the tournament progressed, culminating in a flag burning when one group won the tug-of-war competition. Furthermore, while the group that won the tournament was celebrating, the other group raided their cabins and stole the prizes. In one contact situation, name-calling started and fist fights broke out. As predicted by Sherif, the experiment had transformed 22 perfectly 'normal, well-adjusted boys' into two gangs of brawling troublemakers, full of hostility towards each other.

Phase 3

In the third phase, Sherif wanted to see if he could improve relations between the two groups by increasing contact through intergroup cooperation in non-competitive situations. So he arranged for them to share meal times and watch movies together.

However, this failed as the boys in these groups had become enemies and continued to fight with each other. Once rivalry, bitter feelings and hostility between the groups had been aroused, simply eliminating the competition and bringing them together in situations involving casual, non-interactive contact did not eliminate the rivalry and associated negative attitudes and behaviour.

Sherif overcame the rivalry and negative attitudes by making the groups mutually interdependent on each other. This was achieved by creating and setting up three situations where the members of one group alone could not accomplish the required task.

The first situation involved damage to the water supply system. The only way the system could be repaired so that water once again became available was if all the boys worked together in order to repair

Figure 6.30 In Sherif's 1956 experiment, the tug-of-war competition increased the hostility and rivalry between the Rattlers and the Eagles.

Figure 6.31 Situations which required a joint effort from both groups of boys helped to reduce their prejudice against one another.

it. The second situation required all the boys to pool their money to pay the rental fee of a movie they all wanted to see. In the third situation, while the boys were on an outing, the truck that was to go and pick up their food for the day stalled. In order to get the truck going again, it was necessary for the boys to pull it up and over a steep hill. This could be accomplished only if all of them pulled together, regardless of which group they belonged to.

Hostile feelings and negative attitudes were gradually reduced through these goal-focused cooperative activities. The boys made friendships across groups and began to get along better, and the barriers between the groups were broken down to such an extent that the boys essentially viewed themselves as belonging to one larger group of campers.

Sherif reported that by the end of the camp the groups were 'actively seeking opportunities to mix, to entertain and to "treat" each other'. The boys made far fewer negative ratings of the opposing group and the prejudice and hostility seemed to have disappeared, as shown in Figure 6.32.

Sherif's Robber's Cave experiment revealed how mutual interdependence can reduce prejudice and conflict between groups. Mutual interdependence was created by setting the groups superordinate goals. This is another condition that is required if contact is to be effective in reducing prejudice.

Superordinate goals

After the two groups of boys had become bitter rivals, Sherif initially tried to improve their poor interpersonal relationships and reduce the prejudice and hostility between them by arranging for them to share meal times and watch movies together. This unstructured intergroup contact did not help reduce the tension. The boys in each group used it as an opportunity to tease and throw food at each other. When this simple form of contact failed to reduce the prejudice, Sherif presented the groups with superordinate goals and observed the effect on intergroup conflict.

A **superordinate goal** is a goal that cannot be achieved by any one group alone and overrides other existing goals which each group might have (Sherif, 1966). For example, the Paris Agreement (originally the Kyoto Protocol) is an international treaty on climate change with a superordinate goal for the reduction of greenhouse gases from the atmosphere to minimise global warming. This goal cannot be achieved unless industrialised nations throughout the world cooperate by making a commitment to the Agreement and limiting their emissions of greenhouse gases by set amounts.

In Sherif's experiment, there were three situations involving superordinate goals. These were:

1. the camp's water system broke down, and both groups had to work together in order for it to be repaired;
2. a movie which both groups wanted to see could be shown only if they cooperated by pooling their money in order to obtain it; and
3. a truck which was to collect food for both groups stalled, and could be started only if both groups pulled it.

In order for these goals to be achieved, intergroup contact involving cooperation was required — a level of cooperation in which the two groups were mutually interdependent. Sherif believed this would eliminate negative attitudes and stereotypes held by both groups towards each other, thereby reducing future conflicts between them. Establishing superordinate goals did, in fact, have these effects.

Superordinate goals improved intergroup relationships, but not immediately. After repairing the water supply, the two groups mingled good-naturedly, but they ended the day with a food fight. They rented a movie with pooled resources, but the two groups sat on opposite sides of the dining hall to watch it.

After 6 days of cooperation, however, their hostilities were greatly decreased, as can be seen in Figure 6.32.

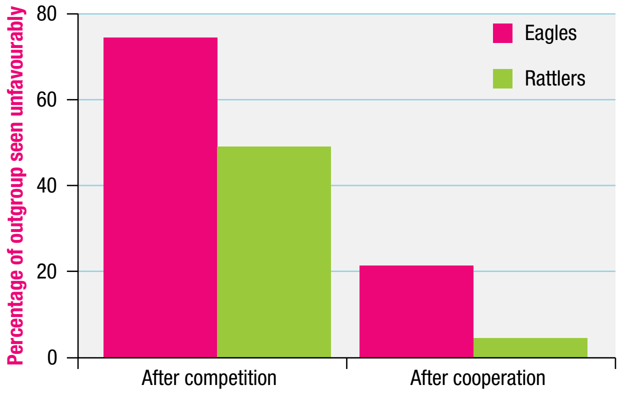

Figure 6.32 Results from the Robber's Cave experiment

In fact, when it was time to leave, they asked if they could travel home together on the same bus. As the boys took their seats, the camp staff noticed that a ‘Rattler’ was just as likely to sit next to an ‘Eagle’ as to another ‘Rattler’ (Smith et al., 2019).

Equality of status

Another condition of the contact hypothesis is that for contact between two groups to reduce prejudice between the groups, then the groups must have equal status in the contact situation. The *status* of a group refers to the importance or ‘standing’ of the group when compared with another group, as perceived by members of the group(s) making the comparison.

If one group is perceived as being more important or better in some way that is valued by the other group, then the ‘more important’ group would be described as having a *higher status* than the ‘less important’ group. Conversely, the ‘less important’ group would be described as having a *lower status*. When the members of both groups perceive their own group and the other group as being equally important, they would be described as having an *equality of status*. Generally, the more status a group has, the more power and influence it usually has over another group with less status, and vice versa.

When status between two groups is not equal, the group members tend to view the other group members differently and may also treat them differently. For example, in Sherif’s experiment, there was a lot of status attached to winning each of the competitive events in the four-day tournament. After the first event, the members of the winning group perceived themselves as better than the members of the other group, whereas the losing group members reported a higher level of resentment and other negative attitudes towards the winners.

Sherif took advantage of this by allowing the winning group into the dining room for the evening meal first, but with not enough food available for both groups. The winning group knew that the losing group would be arriving later but proceeded to select and eat the best food and leave only scraps for the other group. This made the winners feel even better but fuelled the resentment and hostile feelings of the losers. However, when the two groups were given equality of status and had to rely on each other to achieve the superordinate goals, the negative attitudes and behaviour towards each other gradually disappeared.

More recent experiments have also found that differences in perceived status between groups are an important factor that can maintain or increase prejudice, and perceived equality of status is a factor that can reduce prejudice.

All contact factors considered

In summation, contact between groups who are prejudiced towards each other may lead to a reduction in intergroup prejudice, but may also increase prejudice unless the contact occurs under certain conditions. Contact will be more likely to reduce intergroup prejudice if it occurs over a prolonged period of time, *and* if the groups are engaged in activities that require mutual interdependence, such as when working cooperatively to achieve a common, superordinate goal, *and* if the groups perceive each other as being equal in status in the contact situation.

However, it is also important that the contact situation in which these conditions are present must *also* be supported by authorities, laws or customs that favour intergroup contact and promote equal and fair treatment of both groups. For example, if prejudice is to be reduced in a contact situation, then the groups that are prejudiced against each other must believe they have the legal and moral support of authorities, such as the judicial system, government, police, employers and teachers. That is, the larger, ‘overall’ culture, its social norms and the surrounding social environment in which the contact occurs must support equality in its laws and in the actions of its officials if prejudice is to be reduced (Tavris & Wade, 1995; Pettigrew, 1998).

on Resources

Teacher digital document Practical activity — Prisoner’s dilemma to test a superordinate goal

6.10 LEARNING ACTIVITY 1

Analysis and evaluation of research on ways of reducing prejudice

Consider the Robber's Cave experiment conducted by Sherif (1956) and answer the following questions.

a. Identify the participants in the experiment.
b. Identify the two groups in the experiment and the way in which participants were allocated to the two groups.
c. Formulate a research hypothesis that could have been tested in each of the three phases of the experiment.
d. Identify the independent and dependent variables in each phase.
e. What key result was obtained in each phase?
f. State a conclusion(s) for the experiment.
g. Briefly describe two key ethical issues raised by the experiment.
h. Explain whether the results could be generalised in situations outside the Robber's Cave experimental setting.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

Cognitive interventions

Some psychologists suggest that if people are aware of the harmful effects of prejudice, they are then in a position to be able to do something about it. For instance, when they understand where prejudice comes from and how to reduce it, they have the knowledge to do something about it. This can be achieved through strategies involving cognitive intervention.

Cognitive intervention involves changing the way in which someone thinks about prejudice. For example, when used to reduce prejudice, a specific cognitive intervention strategy may require a prejudiced person or group to consider prejudice from the victim's perspective or to have their negative stereotypes challenged and broken down.

If people can be encouraged to understand others based on their individual characteristics rather than generalising some of their characteristics to stereotype them, then prejudice may be lessened. For example, paying closer attention to personal attributes rather than focusing on race, gender or age may prevent stereotyping, and therefore prejudice, from forming.

The findings of research studies provide support for the effectiveness of cognitive intervention in reducing prejudice. In one study, Canadian psychologist Kerry Kawakami and her colleagues (2000) used a cognitive intervention strategy to break down and change age-related stereotypes held by university students.

The participants first completed a computer-based training session in which they were taught about age-related stereotypes. Following the training session, the participants were required to respond to stereotype and non-stereotype photographs of elderly people who were shown on their computer screens.

If the photograph showed an elderly person in a way that was consistent with age-based stereotypes (such as frail or weak, slow or dependent on another person), they were instructed to press a 'Yes' button. If the photograph showed an elderly person in a way that was not consistent with age-based stereotypes (for example, strong, quick, independent) they were instructed to press a 'No' button. As well as recording the number of 'Yes' and 'No' responses, the researchers recorded the time taken by each participant to respond to each photo.

The results showed that, gradually over time, the participants learned to more accurately identify age-based stereotypes and that their response times to the different photographs became faster and faster.

The researchers concluded from these results that their cognitive intervention strategy had led participants to break down or 'undo' negative stereotypes of elderly people and replace them with new, positive ones.

Furthermore, in testing whether the cognitive intervention would have a lasting effect, the researchers compared the participants' results for a similar activity with those of a group who had not received any information about age-based stereotypes. They found that the participants who received the training were less likely to label characteristics and activities of elderly people in terms of a negative stereotype than were those participants who did not receive the training.

Based on her findings of research studies on reducing prejudice through cognitive intervention strategies, American psychologist Patricia Devine (1989) has proposed that reducing the prejudiced attitude of an individual requires a three-step process:

1. the individual must decide that their prejudiced attitude and behaviour are wrong and consciously reject prejudice and stereotyped thinking
2. they must hold fast to their non-prejudiced beliefs and make these an important part of their personal self-concept; that is, how they think and feel about themself as a person
3. the individual must learn to suppress or block from conscious awareness prejudicial reactions that may occur and deliberately replace them with non-prejudiced responses that are based on their personal standards.

So, according to Devine, the next time you find yourself saying, 'Oh, those A people, they're all alike — not like us B people', stop and think. Stereotyping may be a 'natural' cognitive process, but we don't necessarily have to automatically assume the prejudiced attitudes that stereotypes can promote. Nor should we act on those biases. Rather, it's important that we make a conscious effort to see each person as he or she really is — a unique individual (Huffman, 2012).

Figure 6.33 Age-based stereotypes such as 'all very old people are frail' can be broken down with cognitive interventions that challenge the negative stereotypes.

6.10 LEARNING ACTIVITY 2

Review

1. Consider the use of legislation to reduce prejudice.
   a. Name an example of Victorian and Commonwealth of Australia legislation that has been designed to eliminate discrimination arising from prejudice.
   b. Which form of prejudice does legislation affect — old-fashioned/modern, explicit/implicit or all forms? Explain your answer.
   c. Explain why legislation alone may be inadequate for reducing prejudice.
2. Psychological research has found that intergroup contact and cognitive intervention can help combat or reduce prejudice. Briefly describe the focus of each approach.
3. Intergroup contact helps reduce prejudice, but only under certain contact conditions. Briefly describe each of these contact conditions.
4. Explain what a superordinate goal is and give an example of how this type of goal setting could be used to reduce conflict between two rival groups in the school grounds.
5. Give an example of a cognitive intervention strategy for reducing prejudice. Refer to the three steps that must occur in a person's thinking in order for the strategy to be effective and lasting.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

6.11 Review

6.11.1 Topic summary

- **Person perception — forming impressions of other people**
  - Physical cues
    - Physical appearance
    - Body language
    - Behaviour
  - Salience detection
  - Social categorisation
- **Attributions — explaining behaviour**
  - Internal attributions
  - External attributions
  - Biases affecting attributions
    - Fundamental attribution error
    - Actor–observer bias
    - Self-serving bias
- **Attitudes**
  - Tri-component model of attitudes
    - Consistency between the components
    - Inconsistency between the components
  - Attitudes and behaviour
- **Stereotypes**
- **Cognitive dissonance**
- **Cognitive bias**
  - Anchoring bias
  - Attentional bias
  - Confirmation bias
  - False-consensus bias
  - Hindsight bias
  - Misinformation effect
  - Optimism bias
  - Dunning–Kruger effect
- **Heuristics**
  - Availability heuristic
  - Representativeness heuristic
  - Affect heuristic
- **Prejudice and discrimination**
  - Prejudice
    - Old-fashioned and modern prejudice
  - Discrimination
    - Direct and indirect discrimination
    - Distinguishing between prejudice and discrimination
- **Ways to reduce prejudice**
  - Intergroup contact
  - The contact hypothesis
  - Cognitive interventions

Key terms

actor–observer bias p. 402
affect heuristic p. 424
affective component p. 406
anchoring bias p. 417
attentional bias p. 417
attitude p. 405
attribution p. 400
availability heuristic p. 423
behavioural component p. 406
body language p. 394
cognitive bias p. 416
cognitive component p. 406
cognitive dissonance p. 414
cognitive intervention p. 438
confirmation bias p. 418
contact hypothesis p. 434
direct discrimination p. 428
discrimination p. 428
Dunning–Kruger effect p. 420
explicit prejudice p. 428
extended contact p. 433
external attribution p. 400
false-consensus bias p. 418
fundamental attribution error p. 402
halo effect p. 393
heuristic p. 423
hindsight bias p. 419
intergroup contact p. 433
implicit prejudice p. 428
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ingroup p. 399
internal attribution p. 400
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modern prejudice p. 427
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optimism bias p. 420
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representativeness heuristic p. 424
salience p. 397
self-serving bias p. 403
social categorisation p. 398
social cognition p. 391
social stigma p. 411
stereotype p. 410
superordinate goal p. 436
tri-component model of attitudes p. 406

Note: The **References** for the entire title can be accessed in learnON and are also available as a downloadable PDF.

on Resources

Digital documents Key terms glossary — Topic 6 (doc-37922)
Topic summary — Topic 6 (doc-37923)
Key diagrams PowerPoint — Topic 6 (doc-37925)

6.11 Topic 6 test

Section A: 30 marks **Section B:** 40 marks **Total:** 70 marks

Access learnON to answer the following test questions online and receive **immediate feedback**.

Section A — Multiple-choice questions

Choose the response that is **correct** or **best answers** the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Question 1

The statement 'All obese people eat too much' is an example of

A. prejudice.
B. discrimination.
C. stereotyping.
D. person perception.

Question 2

Which of the following characteristics is most likely to have the greatest influence on a first impression when meeting someone?

A. the person's physical appearance
B. the person's friends
C. the person's cognitive biases
D. the person's expectations

Question 3

Attribution theory generally explains why people

A. act the way they do.
B. form impressions of themselves and others.
C. perceive others as they do.
D. perceive themselves and others as they do.

Question 4

The fundamental attribution error is best described as our tendency to

A. think with cognitive bias.
B. make a basic mistake in person perception.
C. overestimate the importance of situational factors in judging our behaviour.
D. overestimate the importance of internal factors and underestimate the importance of external factors in judging someone else's behaviour.

Question 5

The relationship between behaviour and attitudes tends to be

A. direct.
B. consistent.
C. inconsistent.
D. dissonant.

Question 6

Lucio lacks empathy for 'boat' people who are kept in detention for many years. He believes everyone has opportunities in life but 'these boat people deserve their fate because they chose to arrive on a boat'.

Lucio's assumption about refugees and asylum seekers who reach Australia by boat is best explained by

A. the just-world belief.
B. the misinformation effect.
C. actor–observer bias.
D. functional-fixedness.

Question 7

Self-serving bias refers to a person's tendency to attribute their successes to _____ and their failures to _____.

A. an actor; an observer
B. an observer; an actor
C. internal factors; external factors
D. external factors; internal factors

Question 8

Which of the following behaviours best indicates old-fashioned prejudice?

A. making negative comments to a friend about the sexual preferences assumed to be true of a male nurse
B. being unconcerned about the appointment of a female to a position not traditionally held by females
C. publicly expressing a view that all people should have equal rights
D. publicly expressing a view that all people should have equal rights, but privately being against equal rights for all people

Question 9

Which of the following statements best describes discrimination?

- **A.** Discrimination involves positive action to support someone in a minority group.
- **B.** Discrimination involves negative action against someone in a minority group.
- **C.** Discrimination involves either positive or negative action towards someone in a minority group.
- **D.** Discrimination involves stereotyping all individuals in a minority group whilst overlooking individual differences.

Question 10

When two rival groups have equality of status, then prejudice

- **A.** is difficult to reduce.
- **B.** is easier to reduce.
- **C.** will probably result in discrimination.
- **D.** will probably result in intergroup conflict.

Question 11

Jane, who is working full time, applies for a credit account with a department store. She is told that she cannot have an account unless her husband acts as a guarantor. The store does not require male employees to have a guarantor. This is an example of

- **A.** stereotyping.
- **B.** equal opportunity.
- **C.** anti-discrimination.
- **D.** discrimination.

Question 12

An Australian Federal MP was reported in *The Age* newspaper as having stated that 'Aboriginal disadvantage was partly due to Aborigines late contact with developed civilisations'.

The MP's assumption about Aboriginal and Torres Strait Islander people is best explained by

- **A.** the just-world belief.
- **B.** the misinformation effect.
- **C.** actor–observer bias.
- **D.** discrimination.

Question 13

The _____ heuristic is likely to be influenced by a salient long-term memory; whereas the _____ heuristic is likely to be influenced by a stereotype.

- **A.** availability; representativeness
- **B.** affect; availability
- **C.** representativeness; availability
- **D.** availability; affect

Question 14

Someone who believes that a far greater percentage of people agree with their anti-vaccination attitude than actually do is primarily influenced by

- **A.** confirmation bias.
- **B.** self-serving bias.
- **C.** false-consensus bias.
- **D.** optimism bias.

Question 15

An essential feature of an attitude is that it involves

- **A.** an opinion.
- **B.** evaluation.
- **C.** prejudice.
- **D.** behaviour that can be observed, either directly or indirectly.

Question 16

When used to reduce prejudice, a cognitive intervention strategy will involve

- **A.** use of legislation.
- **B.** formation of stereotypes.
- **C.** changing the way in which prejudiced people think about others against whom they are prejudiced.
- **D.** a goal that is unattainable by any one group alone and overrides existing goals which each prejudiced group may have.

Question 17

Sam takes a match-winning shot at goal in the final seconds of the match and misses. He blames it on the slippery floor that caused loss of traction just as he released the ball. This is an example of

- **A.** self-serving bias.
- **B.** person perception.
- **C.** actor–observer bias.
- **D.** saliency bias.

Question 18

Which of the following statements best describes a superordinate goal?

- **A.** A goal that everyone agrees with.
- **B.** A goal that everyone believes is achievable.
- **C.** A goal that everyone agrees with and everyone believes is achievable.
- **D.** A goal that cannot be achieved by any one group alone and overrides other existing goals which each group may have.

Question 19

An ingroup is best described as a group

- **A.** to which people of a similar age or with common attitudes wish to belong.
- **B.** to which someone identifies.
- **C.** with members who have common attitudes.
- **D.** with members who like to clash with outgroups.

Question 20

The _____ bias occurs when someone overestimates the extent to which the outcome of an event could have been foreseen.

A. anchoring
B. self-serving
C. actor–observer
D. hindsight

Question 21

Prejudice between two rival groups is most likely to be reduced when the groups

A. are in contact with each other.
B. are mutually interdependent on each other.
C. compete in activities for which rewards are given to the winners.
D. have increased contact in non-competitive situations.

Question 22

Which of the following statements about attribution theory is correct?

A. Whenever we attempt to understand someone's behaviour, we attempt to determine whether it was internally or externally caused.
B. Internally caused behaviours are those that are believed to result from factors associated with the individual's personal circumstances.
C. Externally caused behaviour is seen as resulting from factors under the personal control of the individual.
D. All of the above are correct.

Question 23

Which of the following explanations is an example of a dispositional attribution?

A. He smoked a cigarette because other people were smoking.
B. He smoked a cigarette because alcohol was not available.
C. He smoked a cigarette because he enjoys smoking.
D. He smoked a cigarette because he was offered one.

Question 24

William has a tendency to read online posts and news articles that support his attitude to compulsory vaccination and dismisses or fails to seek or read sources that challenge them. William is most likely influenced by

A. self-serving bias.
B. confirmation bias.
C. anchoring bias.
D. the misinformation effect.

Question 25

Social categorisation is best described as the process of

A. stereotyping people.
B. classifying people into ingroups and outgroups.
C. placing people into social groups on the basis of common characteristics.
D. classifying people into a social groups on the basis of salient characteristics.

Question 26

A project manager consistently anticipates that a task will take much less time to complete than it actually does. The project manager's thinking is most likely influenced by

A. optimism bias.
B. self-serving bias.
C. attentional bias.
D. the Dunning–Kruger effect.

Question 27

Implicit prejudice is _____, whereas explicit prejudice is _____.

A. usually within the control of the person holding it; not usually within the control of the person holding it
B. unconsciously held; consciously held
C. usually within the control of the person holding it; modern
D. consciously held; unconsciously held

Question 28

If your decision-making has been primarily influenced by your emotional state, then you relied on

A. the availability heuristic.
B. self-serving bias.
C. the affect heuristic.
D. actor–observer bias.

Question 29

Which type of cognitive bias occurs when someone is overly influenced by the first piece of information to which they are exposed and does not adjust their belief in the light of later information?

A. hindsight
B. anchoring
C. self-serving
D. actor–observer

Question 30

Which type of cognitive bias involves overestimation of one's ability in an area where they have little or none?

A. optimism bias
B. self-serving bias
C. attentional bias
D. the Dunning–Kruger effect

Section B — Short answer questions

Question 1 (2 marks)

Define social cognition, with reference to an example.

Question 2 (2 marks)

In relation to person perception, _____ refers to personal characteristics that stand out and attract attention, which is in turn primarily influenced by the _____.

Question 3 (2 marks)

A _____ is a strategy for problem-solving and decision-making that is based on _____ but cannot guarantee a correct outcome.

Question 4 (4 marks)

Distinguish between personal and situational attributions with reference to a relevant example.

Question 5 (5 marks)

a. Explain what cognitive dissonance is and what causes it. 2 marks
b. List three strategies for reducing cognitive dissonance. 3 marks

Question 6 (5 marks)

a. In what way are cognitive biases and heuristics similar and different? 3 marks
b. Explain why cognitive bias may be described as involving a 'systematic error' in thinking. 2 marks

Question 7 (3 marks)

a. Describe the relationship between social categorisation and stereotypes. 1 mark
b. Give an advantage and disadvantage of stereotyping in relation to person perception. 2 marks

Question 8 (5 marks)

a. What is the halo effect? 2 marks
b. Give an example of its possible role in person perception. 1 mark
c. Name and describe two factors other than the halo effect, that can influence person perception. 2 marks

Question 9 (6 marks)

Mardi decided to take a gap year and complete volunteer work overseas before starting her tertiary studies. Using this example, describe the tri-component model of attitudes.

Question 10 (2 marks)

Distinguish between explicit and implicit prejudice with reference to refugees or asylum seekers.

Question 11 (4 marks)

Explain whether the sign below, displayed by the municipality of Bandol, demonstrates prejudice and/or direct and indirect discrimination.

Resources

Go to learnON to access answers to the Topic 6 test. A customisable Word version of the test can also be downloaded from the **Digital documents** tab of the Resources panel.

learnMORE | Personal space

Personal space refers to a small, 'invisible', physical area immediately surrounding our body that is regarded as our personal territory. The size of our personal space varies according to factors such as our cultural background, mood, who we are with, what we are doing and where we are. Our perceptions of others can be indicated by our physical proximity to (distance from) them.

When communicating or interacting with another person(s), the distance or space we maintain between ourself and the other person(s) is called *interpersonal distance* or *interpersonal space.*

Research on interpersonal distance was first conducted by American anthropologist Edward Hall (1966). He called this area of research *proxemics*. Hall observed people from different cultures throughout the world and then identified four main zones of interpersonal distance people tend to prefer in different situations. He suggested these zones indicate the types of relationships and interactions that we have with others.

Some people are allowed to enter the intimate zone of personal space because they have the power or authority to do so.

As shown in the table below, *intimate* distance is 0–0.5 metres — the zone in which we allow only those people with whom we feel extremely close (for example, parents and close friends), *personal* distance is a zone of 0.5–1.5 metres — the space within which we allow friends and acquaintances and *social* distance is 1.5–3.5 metres — the distance at which we interact with strangers or people we do not know. The *public* zone beyond 3.5 metres applies to situations in which an individual interacts in large groups, such as during a school assembly or a rock concert.

Hall's (1966) interpersonal distance classifications

Zone	Distance	Interaction activity	People allowed into zone
Intimate	0–0.5 metres	Informal talking and physical contact in private or public with someone you feel close to	Close family, partner, close friends
Personal	0.5–1.5 metres	Informal talking and socialising in the school grounds or at a party	Friends, work mates and acquaintances
Social	1.5–3.5 metres	Formal or informal work or business-related activity	Strangers or people we do not know well or do not know at all
Public	3.5 metres and over	Formal presentation (for example, a lecture, speech) to a large group, such as at a school assembly or concert	Anyone

To observe the effect of intruding on someone's personal space, you could stand or sit about half a metre from a friend and strike up a conversation (but not in a situation when it is normal to sit or stand at this distance). Does the person fidget, look away, back off or show other signs of discomfort? An example of the effects of personal space was demonstrated in an unusual field experiment which found that males require more time to begin urination and less time to complete the act when another male is standing at an adjacent urinal (Middlemist, et al., 1976).

learnMORE | Sexual harassment, victimisation and vilification

Sexual harassment is unwelcome sexual behaviour that causes a person to feel offended, humiliated or intimidated. Sexual harassment can be physical, verbal or written. It can include:

- comments about someone's private life or the way they look
- sexually suggestive behaviour, such as leering or staring
- brushing up against someone, touching, fondling or hugging
- sexually suggestive comments or jokes
- displaying offensive images or objects
- repeated requests to go out
- requests for sex
- sexually explicit emails, text messages or posts on social media
- suggestive behaviour
- sexual assault

A single incident is enough to constitute sexual harassment — it doesn't have to be repeated.

Victimisation is treating someone badly or unfairly because they have made a complaint about discrimination, sexual harassment or racial or religious vilification; it is believed they intend to make a complaint; or they've helped someone else to make a complaint. For example, victimisation would occur if an employee is bullied or loses their job after standing up for their rights or helping someone else to do so.

Victorian Equal Opportunity & Human Rights Commission

Source: Victorian Equal Opportunity & Human Rights Commission (2022). www.humanrightscommission.vic.gov.au

Vilification is behaviour that incites hatred, revulsion, serious contempt for, or severe ridicule of a person or group because of their race or religion. Behaviour that could be seen as vilification includes:

- speaking about a person's race or religion in a way that could make other people hate or ridicule them
- publishing claims that a racial or religious group is involved in serious crimes without any proof
- repeated and serious spoken or physical abuse about the race or religion of another person
- encouraging violence against people who belong to a particular race or religion, or damaging their property
- encouraging people to hate a racial or religious group using flyers, stickers, posters, a speech, publication, or using websites or email.

Behaviour that is not likely to be seen as vilification includes being critical of a religion or debating racial or religious ideas in a way that does not encourage others to hate racial or religious groups, and actions that offend people of a particular race or religion, but do not encourage others to hate, disrespect or abuse racial or religious groups.

Comments, jokes or other acts related to the race or religion of a person may not be seen as vilification, but they could still be the basis for a complaint of discrimination. For example, Ranjit complains that a local bus driver asked him where he was from, told him to sit at the back of the bus and sniffed loudly as he walked past. This is not racial or religious vilification, but Ranjit might be able to make a complaint about racial discrimination to the Victorian Equal Opportunity & Human Rights Commission.

7 Factors that influence individual and group behaviour

TOPIC CONTENT

7.1 Overview

KEY KNOWLEDGE

- the influence of social groups and culture on individual behaviour
- the concepts of obedience and conformity and their relative influence on individual behaviour
- positive and negative influences of different media sources on individual and group behaviour, such as changing nature of social connections, social comparison, addictive behaviours and information access
- the development of independence and anti-conformity to empower individual decision-making when in groups

Source: © VCAA, *VCE Psychology Study Design*: 2023–2027. p.29.

Humans are social beings, and as such we spend much of our time in the company of other people. In our everyday activities we interact with and influence others in a variety of ways. Each and every one of us is the product of the relationships, groups, culture and society to which we belong. The person you are today is the result of the many interactions you have with others and the influence they have over you. Just as you have been influenced by others and the culture and society to which you belong, you have also influenced others with whom you interact in the many relationships and groups to which you belong.

One widely researched topic of interest in psychology is the various conditions that lead people to behave in ways they otherwise would not, and the various conditions that prevent people from behaving in ways that they ordinarily would.

We all like to think of ourselves as independent in what we think, do and say, making our own decisions without being influenced by others and that if we do follow others, it is because we choose to and want to do so. However, researchers have found that we may be more susceptible to influence by others than we think.

Have you ever considered why we yawn when we observe someone else yawning, laugh in response to hearing others around us laughing or turn to look in a particular direction when we see a group of people looking in that direction? In these instances, the influence others exert over us is usually unintentional.

There are also many instances where influence is intentionally exerted over others. For example, when television producers include pre-recorded laughter within their comedy programs to influence viewers into believing that the show is funny, or when politicians announce inflated results from their own party's opinion polls to influence others to vote 'like everyone else'. Similarly, some street buskers might put money into their collection tins to prompt their audience to do the same and advertisers often use sports stars, celebrities and social media influencers in their attempts to persuade us to purchase their products or services.

Sometimes, it is an individual who may influence the thoughts, feelings or behaviours of others. At other times, it may be a group of people who exert their influence over someone. For example, if your close friends all wear a particular brand of clothing, you may be influenced to wear the same brand, or if your family all support a particular football team, you may be influenced to support them too. It is only when we begin to understand the effects of the various social influences on our lives that we are more able to control future attempts to influence us.

In psychology, the term social influence is used to refer to the ways in which others influence us. **Social influence** is typically defined as the effects of the presence or actions of others, either real or imagined, on the way people think, feel and behave.

Social influence is exerted in many different ways and may come from a person, a group or an institution such as a school, church or government. As described in Topic 3 in the study of typical and atypical behaviour, social influence may also be exerted through social and cultural norms that govern individual and group behaviour.

The impact of social influence may be constructive (helpful), destructive (harmful), or neutral (have no effect). In all cases, however, social influence involves a degree of pressure, varying from slight to intense, that is exerted on an individual (or group members) to change their thoughts, feelings or behaviour in some way. This pressure from others can be real or genuine pressure, or it can be imagined; that is, it does not actually occur, but it is still experienced as real pressure. We do not always give in to the pressure — social influence can be, and often is, resisted.

Figure 7.1 Fifteen-year-old Rania is shown chained to window bars as Iraqi police remove her vest loaded with explosives. The police believed that she was a suicide bomber, but her explosives failed to detonate. Their investigation revealed that her father was a suicide bomber for the al-Qaida terrorist organisation in Iraq and her mother was an 'Emira' — a princess or leader in the al-Qaida organisation. Rania was found to have willingly engaged in this potentially destructive behaviour. Psychologists have investigated why some people are more susceptible to the influence of others and why some people can exert greater influence than others.

on Resources

Weblink Video of Rania being disarmed 1 m 18 s

7.1 LEARNING ACTIVITY

Review

1. Define the meaning of social influence as used in psychology.
2. Give an example of when you (or someone you know) has experienced 'real' pressure and 'imagined' pressure to think, feel or behave in some way and managed to resist the pressure. How difficult was this in each situation?
3. Do you believe that 'imagined' pressure can be just as powerful an influence on an individual as 'real' pressure? Explain your answer.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

7.2 Social groups and culture

Since social influence has a cultural basis and most often occurs when we are in a group situation, we first examine how groups and culture are conceptualised and described in psychology.

7.2.1 Social groups

Suppose two people are waiting for a bus. They are alone, sitting at opposite ends of the bench. Neither is looking at the other, but each is aware of the other's presence. Are they a group? Are two people who go jogging together each weekend a group? Are 33 fans patiently waiting for a glimpse of the favourite pop star a group? Are the tourists who get together one time only to ride a cable car to the same destination a group? Are the students in your psychology class a group?

The word group is often used in everyday conversation to refer to any set of two or more people. It may also refer to items and all things other than people. Therefore, in psychology, the technical term for a group comprising people is *social group*, but the single word group is still used when it is known that people are the focus of what is being observed or discussed.

Importantly, a social group is considered to be more than a collection or gathering of people. Although definitions vary slightly, there is general agreement that a **social group** (or simply a **group**) is any collection of two or more people who interact with and influence one another and who share a common purpose.

It probably did not surprise you that you need at least two people to form a group. But is there an upper limit to the number of people for a group? Can you have a group of thousands of people? For example, can the 90 000 or so spectators who attend the Boxing Day test match at the Melbourne Cricket Ground be considered a group?

The *number of people* is just one of the characteristics of a group but the actual number of individuals is not so important. What is more important is that, for a collection of people to be called a group, the individuals involved must also *interact* with (for longer than a few moments) and *influence* one another. They must also share a common purpose, or *goal*. A social group also tends to be cohesive. Group *cohesion* is the unity or solidarity of a group that is indicated when all members feel a sense of belongness to the group, value and feel positively about the group, and coordinate their efforts to achieve goals.

All of these characteristics are typical of a social group but all do not have to be present every time the group or most of its members are together.

Although the MCG spectators may interact with and influence one another occasionally during the game, for example, in a 'Mexican wave', the interaction is minimal and not actually the kind associated with true interacting groups. Members of groups act and react towards one another and typically have an effect on one another. Moreover, although a 'Mexican wave' may promote a sense of belonging for some spectators, this feeling is short-lived and unlikely to be shared by everyone present. Nor is it likely that the feeling of belonging is as well developed as that held by members of true groups — the feeling of being not merely *in* the group but *part* of the group.

In sum, those at the Boxing Day test match may be best described as a gathering of people in the same location engaged in a common activity. Psychologists often use the term aggregation to describe such a gathering of people. More specifically, an **aggregation** is a collection of people in one location who have no obvious social structure or organisation, and who have minimal shared purpose, interdependence or direct interaction. The audience at a rock concert is an aggregation, as is a mob and all the people in a shopping mall (APA, 2022).

Under the definition of a group commonly used by psychologists, the two people waiting for a bus and the 33 fans waiting for the pop star in Figure 7.2 are not considered a group. The tourists in the cable car are not a group (but could become a true interacting group if the cable car got stuck mid-air). In contrast, the two joggers in Figure 7.2 would be considered a group and the students in your class would also be considered a group. In both of these groups, the individuals involved are likely to interact frequently, often for longer than a few moments, and they often have a common purpose. They probably will communicate with and affect each other at different times, they may be aware of having something in common and they are likely to have a sense of belonging.

Figure 7.2 Which of these 'collections' or 'gatherings' of people is a group?

7.2.2 Culture

Culture generally refers to the way of life of a particular society or community that sets it apart from other societies and communities. Culture includes such things as the language, customs, traditions, beliefs, values, attitudes, norms about what is right and wrong, food, art and music, as well as any other features which distinguish it from other societies or communities. These are passed on from generation to generation and are the basis for everyday behaviours and practices.

Culture may also vary within and between societies or communities. For example, a common misconception is that all Aboriginal and Torres Strait Islander people share the same culture. However, before European settlement in 1788 there were more than 250 different Aboriginal and Torres Strait Islander language groups in Australia, each with their own cultures and specific languages.

Consider, for example, that Australia is as large as Europe and has very different environments, from coastal to inland, from desert to rainforest. A boomerang is of little use in the rainforest, just as knowledge about crocodiles is in the desert. Consequently, different cultures evolved in different environments. It is estimated that there are now around 120 of these language groups, so there are still multiple cultures among Aboriginal and Torres Strait Islander people (Korff, 2018; AIATSIS, 2022).

Aboriginal and Torres Strait Islander cultures now exist and thrive in a wide range of communities throughout Australia. Aboriginal and Torres Strait Islander people may currently live in urban, rural or remote settings, in urbanised, traditional or other lifestyles, and move frequently between these ways of living.

While diversity exists across and within Aboriginal communities, some Aboriginal cultural characteristics are part of all Aboriginal cultures and unite Aboriginal people through shared history and shared experiences. For Aboriginal people, culture is the foundation upon which everything else is built. Culture underpins all aspects of life including connections to family and community, connection to Country, the expression of values, symbols, cultural practices and traditional and contemporary forms of cultural expression such as language, ceremonies, cultural events, storytelling, dance, music and art (VPSC, 2019).

The term culture is also used in relation to all types of social groups. In such cases, it refers to the characteristic attitudes and behaviours of a particular group within society, such as a sports team, profession, social class or age group, that distinguish it from other groups. For example, the term 'youth culture' is often used to describe the distinctive culture of teenagers and young adults, which often involves forms of dress, speech, music, and behaviour that are different to those of the major culture.

Finally, there is an increasing tendency to use the term culture to describe places and other contexts in which people may interact, regardless of how or how often they do so. This includes schools, workplaces, businesses, churches, mosques, sports events, and so on. For example, a school culture may include norms, values and practices that influence how it functions.

Figure 7.3 Aboriginal and Torres Strait Islander people and cultures now exist and thrive in a wide range of communities throughout Australia.

on Resources

Weblink 24 myths you might believe about Aboriginal Australia

learn**on**

learnMORE | Peer groups and cliques

Access learnON to read about specific types of groups called peer groups and cliques.

7.2 LEARNING ACTIVITY

Review

1. List four characteristics that distinguish a social group from other collections of people.
2. a. In what ways are a group and an aggregation of people similar and different?
   b. Give an example of an aggregation of people different from those used in the text.
3. Insert a tick to indicate whether each of the following collections of people is a social group or aggregation.

Collection	Social group	Aggregation
a. members of a hockey team		
b. 5000 psychologists in attendance at an international conference		
c. 20 psychologists in a workshop at an international conference		
d. all the cyclists participating in a race		
e. a duo of singers		
f. 150 VCE students in a school		
g. a church congregation		
h. 3 friends who live in the same house		
i. 23 looters raiding a store during a civil riot		
j. all campers at a camping ground		
k. 46 passengers on a bus		
l. all shop owners at a shopping centre		
m. 16 British spectators with the same face paint seated together at the Australian Open tennis tournament		
n. 90 British spectators seated together at the MCG Boxing day cricket test match, singing and chanting in unison		

4. Define the meaning of culture in relation to a social group, with reference to an example.
5. Explain whether the people in each of the following photos may be considered to be a social group.

a.


b.


c.


d.


e.


f.


g.

h.

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7.3 Status and power

Within a group, each member can have an identifiable status. In relation to group membership, **status** refers to the importance of an individual's position in the group, as perceived by members of the group.

Generally, a person can have high or low status. For example, consider your family group. Who has the highest status and who has the lowest status? Do these two individuals rate as equals in terms of the amount of power they have in the family? Does each person have a similar amount of influence or control over the other? The answer to these questions is probably 'no'.

It is important, however, to recognise that an individual's status can impact on their behaviour towards others in the group. Status can specifically affect the expectations that individuals have of each other's behaviour and how individual group members relate to one another.

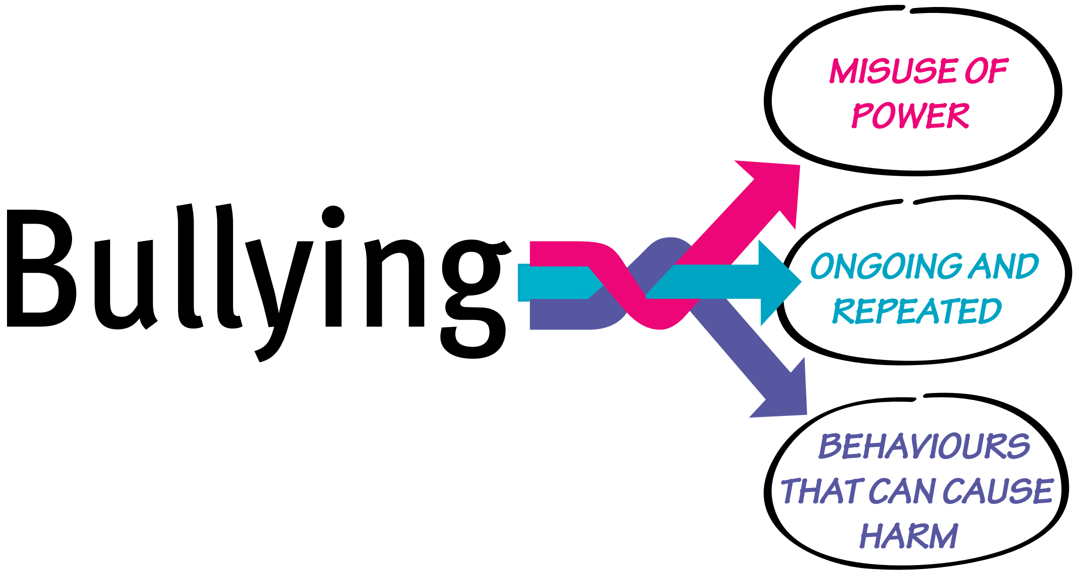

Figure 7.4 Bullying involves the misuse of social power. It occurs when an individual or group with more power repeatedly and intentionally causes hurt or harm to another person or group who feel helpless to respond. Bullying may be physical or psychological in nature and the consequential hurt or harm may include distress or fear.

Source: *Bullying. No Way*! https://bullyingnoway.gov.au/

A person's status in a group also determines the amount of power they have within the group. **Power** refers to an individual's (or group's) ability to control or influence another person (or group), even when they try to resist this influence. Interaction between any two or more individuals typically involves power to some degree. When power is involved in a social interaction, it is often described as **social power**.

Social power is a basic aspect of life as a social being and can be observed in all kinds of relationships and interactions, including those involving family, friends and lovers, as well as people we dislike. Even when individuals are unaware of how their power affects others, even when not used, this affect still exists to some extent.

There are, however, many situations where one individual will deliberately and consciously attempt to use their power to influence others. This is not necessarily 'bad' as it can result in change that is desirable or beneficial. Whether the use of social power to influence other should be of concern depends on the specific reason for it use, how it is used and its actual effect.

Psychologists have identified different types of social power. The most widely described classification system is summarised in Table 7.1. Each type arises from the *source* of that power. For example, if a person has control over something you need or want, then that person has power over you. Often, more than one type of power is used simultaneously to exert influence.

TABLE 7.1 Types of social power

Type of power	Nature of power	Source of power	Example
Reward power	Power through control over rewards	Ability to give positive consequences or remove negative consequences in response to specific behaviour	An employer has the power to give a pay rise or promotion; a teacher can reward students with grades, praise and privileges (e.g. dismiss a student early from detention).
Coercive power	Power through control over punishments or other force	Ability to give negative consequences or remove positive consequences in response to specific behaviour	An employer can dismiss an employee; a teacher can give detention or not allow a student to attend a school excursion or function.
Legitimate power	Power through a right to require and demand obedience	An individual's status or position in a group, institution or society in general gives them the right (authority) to exercise power over those with a lower status or with less authority.	A group leader, manager or captain of a team has the right to exercise power over members of the groups; a classroom teacher or police officer has the right to exercise power over others who aren't group members
Referent power	Power through respect	Individuals are attracted to, respect, identify with or want to be like or liked by this person.	A social influencer, celebrity you respect and want to be like or a friend who you want to be liked by
Expert power	Power through superior abilities	Having special knowledge and skills that are desirable or needed	A classroom teacher perceived to be knowledgeable in their subject; a supervisor of a workplace trainee or new employee is assumed to be highly skilled
Informational power	Power through access to and use of informational resources	Having access to resources or information that are relevant to a situation and are not available elsewhere	Someone who knows exactly what needs to be done to meet an important team goal within a strict deadline; someone who has had a specific experience that someone else wants to know about

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learnMORE | Social hierarchies

Access learnON to read about status and power based on social hierarchies.

7.3 LEARNING ACTIVITY 1

Review

1. Define what is meant by the terms status and social power.
2. Describe the relationship between status and social power in a group situation.
3. Give an example of a group situation in which you have:
   a. considerable status
   b. little or no status.
4. a. Describe a group situation in which you have been involved where power has been exerted on an individual(s) in the group.
   b. Using the information in Table 7.1, identify the type of power(s) that was used to influence the group member(s) in the situation described in 4(a).
   c. Consider the description of bullying in Figure 7.4. What type of power is used by a bully?
5. Identify one or more types of power that may be held or used by the character in the following cartoon asking for the latrine (toilet) to be cleaned.

6. Identify one or more types of power that may be held or used by each of the following individuals:
   a. tennis coach
   b. witness to a crime who refuses to testify
   c. clinical psychologist
   d. host of a radio talkback show
   e. the Pope
   f. dog owner
   g. parking inspector
   h. pilot of a passenger jet
   i. museum tour guide
   j. famous actor
   k. soccer player with a penalty shot at goal
   l. prison guard.

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7.3 LEARNING ACTIVITY 2

Multiple-choice questions

1. Angela promises to share a secret with Noah if he does 'a big favour' for her. Noah agrees because he has been desperate to find out what the secret is. Angela has exercised _____ power over Noah.
   A. informational
   B. legitimate
   C. coercive
   D. reward
2. You obey a flight attendant's request to sit down and fasten your seat belt because of their _____ power.
   A. reward
   B. legitimate
   C. expert
   D. referent
3. Henry hates AFL football but agrees to his girlfriend's request to go to a game and watch her play because he likes her so much. Henry's girlfriend has influenced him through her _____ power.
   A. referent
   B. legitimate
   C. coercive
   D. reward
4. Having the right to ask someone to do something involves _____ power.
   A. expert
   B. legitimate
   C. coercive
   D. reward
5. Peter is fearful of needles but reluctantly rolls up his sleeve for an injection when asked by his doctor. Peter obeyed the doctor because of their _____ power.
   A. coercive
   B. informational
   C. expert
   D. reward

To answer these and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

7.3.1 Influence of status and power

Status and power within a group are often linked to the role each individual has in the group. A **role** is the behaviour adopted by an individual or assigned to them that influences the way in which they function or act in different group situations (and life in general). A role also carries with it expectations of how to behave when in the group or on behalf of the group.

We have many roles in everyday life. Some roles are relatively temporary in the context of our life span (such as student, casual employee, babysitter, captain of a basketball team) and others are more permanent (such as female, brother, parent, friend, priest).

Regardless of whether a role is temporary or permanent, once the role is taken on, there is usually an expectation by other members of the group that the individual will behave in a way that is consistent with that role. These *role expectations* have a strong influence on an individual's behaviour within a group, especially when their role provides considerable power and status.

Generally, individuals tend to use their status and power in desirable ways and to the benefit of the group. In some cases, however, individuals misuse or abuse their power and status. One of the most significant demonstrations of the effects of power and status within a group occurred in a study that has come to be known as the Stanford Prison Experiment.

7.3.2 Stanford Prison Experiment

The Stanford Prison Experiment (SPE) was conducted in the summer of 1971 by American psychologist Philip Zimbardo at Stanford University in California. Zimbardo wanted to find out the effects of roles, labels and social expectations of being either a prison guard or a prisoner. To do this, he set up a simulated prison environment in the basement of the Stanford University psychology building, complete with cells, security doors and drab surroundings without windows or light.

Zimbardo's participant selection procedure involved placing an advertisement in the local newspaper inviting male volunteers for a study on prison life that would run for up to 2 weeks for the pay of US$15 per day (equivalent to about US$150 today). More than 70 university students replied to the advertisement and were each interviewed and assessed 'to eliminate candidates with psychological problems, medical disabilities, or a history of crime or drug abuse' (Zimbardo, 2022a).

Twenty-four 'middle class males' judged to be 'normal, intelligent and healthy' were selected to be participants in the experiment. Equal numbers of participants were randomly assigned roles and allocated to either of two experimental conditions — either a 'mock guard' or a 'mock prisoner'. This was achieved by the toss of a coin. The experiment actually commenced with nine guards and nine prisoners. The remaining guards and prisoners from the sample of 24 were 'on call' in case they were needed.

Having the role of prison guard carried considerable power and status within the entire group of research participants. Having the role of prisoner carried minimal power and little or no status. As events unfolded, power, status and role expectations associated with being a guard or prisoner brought about unexpected changes in behaviour.

To enhance reality, participants selected as prisoners were arrested at their homes by real police. This surprised the prisoners as they had been told to wait at home until 'contacted'. Following their arrest, they were taken to a police station where they were searched, fingerprinted and charged with committing an offence. They were then taken to the 'mock prison' where they were stripped naked, skin-searched, sprayed for head lice, issued with a uniform, bedding, soap and a towel and placed in a 2 × 3 metre barred cell with two other prisoners (Zimbardo, 1972; 2022a).

Figure 7.5 Philip Zimbardo (1933–)

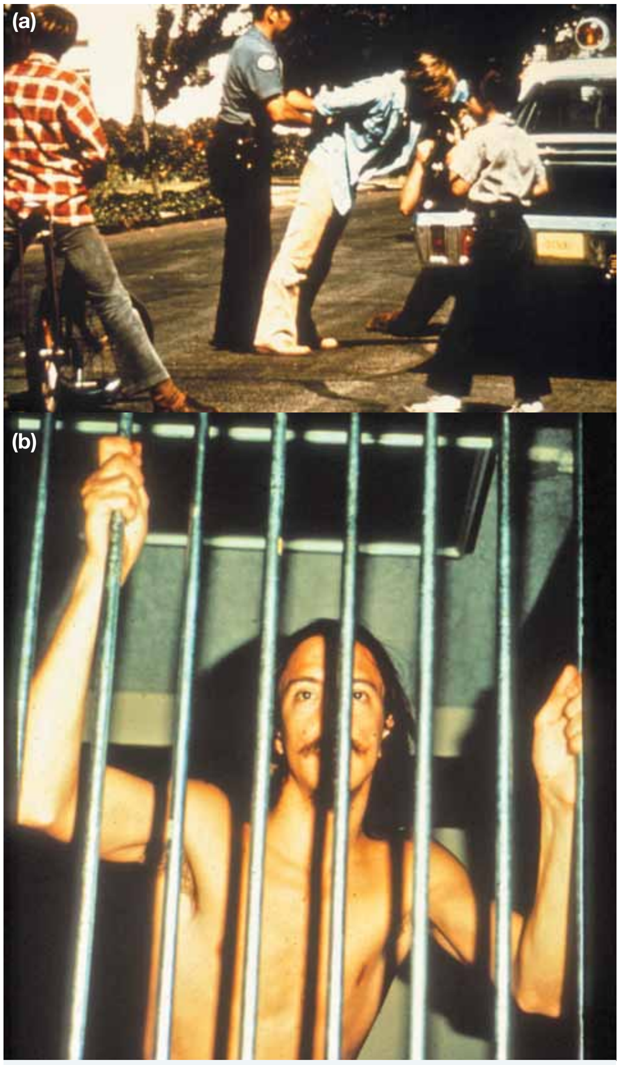

Figure 7.6 (a) In the Stanford Prison Experiment, 'mock prisoners' were arrested by local police officers. (b) The prisoners were locked up in a 'mock prison'.

The prisoners were required to ask permission from the guards to perform routine activities such as using the toilet, smoking a cigarette or writing letters. They were also required to refer to themselves and each other only by their prison numbers and to the guards as 'Mr Correctional Officer'.

Guards were given military-style khaki uniforms to wear, clubs (similar to batons) and whistles to use in maintaining order, and reflective sunglasses to conceal their identities and emotions. They worked 8-hour shifts and went home when not on duty. Although instructed not to use physical violence, guards were allowed considerable freedom in developing rules and strategies to keep the prisoners under control.

All of these procedures ensured the guards believed that they had considerable status and power. According to Zimbardo (2013), their role was 'power laden' and it took them only a day to 'adapt to their new, unfamiliar roles as dominating, powerful and coercive'.

On the second day of their imprisonment, the prisoners staged a number of disturbances, but their rebellion was quickly stopped by the guards. Over the next few days the guards behaved with increasing aggression and became more authoritarian. They used their power to make the prisoners smile, laugh or refrain from smiling or laughing, on command, for no apparent reason. They encouraged prisoners to call each other names and made them do things like clean the toilets with their bare hands.

The prisoners became increasingly traumatised, passive and dehumanised. Four prisoners had to be released during the first four days because of reactions such as hysterical crying, confusion, severe anxiety and depression. One had to be released early after developing a rash all over his body. The rash was diagnosed as being stress related. Each day the guards abused their power further by tormenting the prisoners with more frequent commands, insults and demanding tasks.

Although the experiment had been planned to last for two weeks, it was terminated after six days because it was 'getting out of control'. Every aspect of the prisoners' behaviour 'fell under the total and arbitrary control of the guards'. However, the guards were abusing their power and becoming genuinely brutal and vicious towards the prisoners who, in turn, were becoming withdrawn, submissive and bitter.

Figure 7.7 The guards repeatedly humiliated the prisoners, sometimes lining them up for a body search for no apparent reason.

on Resources

Weblink	Zimbardo's website on the SPE, including video of the experiment
Teacher weblinks	Documentary on the SPE
	SPE movie

According to Zimbardo (2013), 'we observed and documented on videotape that the guards steadily increased their coercive and aggressive tactics, humiliation, and dehumanisation of the prisoners day by day. The staff (researchers) had to remind the guards frequently to refrain from such abuses … and displays of their dominating power and authority.'

Most of the participants never forgot how they had behaved in the experiment, whether they were guards or prisoners. A number of participants temporarily suffered emotional distress which was not present prior to the experiment. At the conclusion of the experiment, one guard commented: 'I was surprised at myself … I practically considered the prisoners cattle and I kept thinking: I have to watch out for them in case they try something' (Zimbardo, 1975). While the prisoners were relieved that their ordeal was over, the guards were reluctant to give up their positions of power.

The results of this experiment showed that the behaviour of 'normal', well-educated men can be significantly affected when a role they are given involves considerable power and status.

Zimbardo (2013) reported that the findings of his experiment can be applied to the harsh and

Figure 7.8 The 'mock guards' abused the status and power which came with the role they had been randomly allocated.

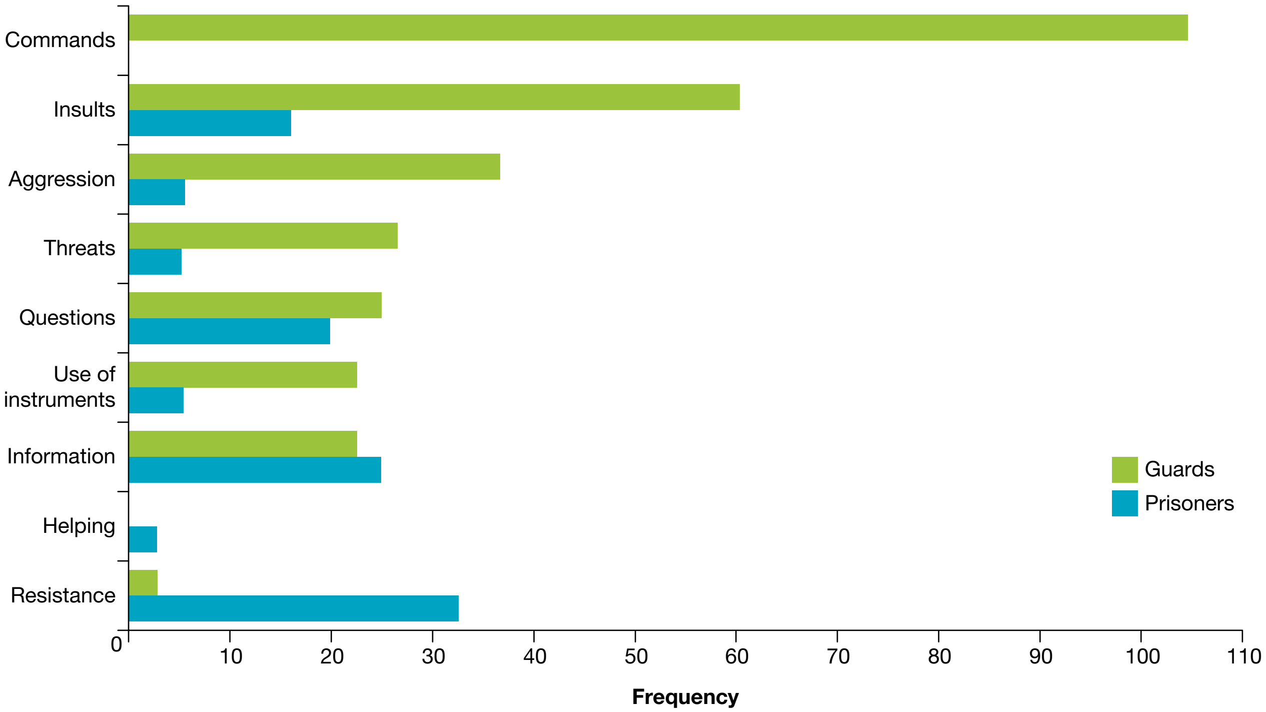

Figure 7.9 Guard and prisoner behaviour across 25 observation periods over 6 days in the Stanford Prison Experiment. Note the substantial difference between the dominating, controlling, hostile behaviour of the guards and the passive resistance behaviour of the prisoners.

Source: Zimbardo, P.G. (1996). *Psychology and life*. (14th ed.). New Jersey: Pearson Education. p.587.

sometimes inhumane treatment of prisoners in real-life prisons. He has stated that 'prisons are places that demean humanity … and bring out the worst in social relations among people. They are as bad for the guards as the prisoners in terms of their destructive impact . . . and continue to be places of evil … that are failed experiments.'

Ethical issues in the prison experiment

The Stanford Prison Experiment provides valuable insights into the effects of status and power on individual behaviour. The experiment also raises important ethical issues and has been criticised by many psychologists on ethical grounds.

Zimbardo (2013; 2022b) has addressed these criticisms by arguing that his study was both ethical and unethical. It was 'not unethical because it followed the guidelines' of the university's ethics committee that reviewed and approved it.

> *There was no deception; all participants were told in advance that, if they became prisoners, many of their usual rights would be suspended and they would have only minimally adequate diet and healthcare during the study. Their rights should have been protected by any of the many citizens who came to that mock prison, saw the deteriorated condition of those young men, and yet did nothing to intervene — among them, their own parents and friends on visiting nights, a Catholic priest … and many professional psychologists … and staff of the psychology department, all of whom watched live action videos of the study or took part in parole board hearings or spoke to participants and looked at them directly.*

Furthermore, *'we ended the study earlier than planned, ended it against the wishes of the guards, who felt they finally had the situation under their control, and that there would be no more disturbance or challenge by the prisoners'*.

Zimbardo (2015) also has stated that his study was unethical *'because people suffered and others were allowed to inflict pain and humiliation on their fellows over an extended period of time'*; all participants were exposed to *'seeing and hearing the suffering'* of prisoners who '*had done nothing to deserve punishment and abuse'*; and *'we did not end the study soon enough. We should have terminated it as soon as the first prisoner suffered a severe stress disorder on Day 2'*.

Figure 7.10 In March 2003, the Iraq War commenced with the invasion of Iraq by a multinational force. The invasion was based on a belief that Iraq possessed 'weapons of mass destruction'. These leaked photos show abuse of Iraqi prisoners of war by military personnel who were serving as guards at the prison in the town of Abu Ghraib. Investigations gradually revealed details of how the prisoners were treated inhumanely by both the male and female guards. Unlike Zimbardo's SPE, this happened in real life. The guards who committed the inhumane acts all did so voluntarily. They were all eventually sentenced to lengthy prison sentences. Zimbardo has drawn parallels between his SPE and events in Abu Ghraib.

on Resources

Weblink Interview with Zimbardo on parallels between his SPE and Abu Ghraib 13 m 59 s

CONSENT

Prison Life Study
Dr. Zimbardo
August 1971

____________________________ (date)

____________________________ (name of volunteer)

I, ____________________________, the undersigned, hereby consent to participate as a volunteer in a prison life study research project to be conducted by the Stanford University Psychology Department. The nature of the research project has been fully explained to me, including, without limitation, the fact that paid volunteers will be randomly assigned to the roles of either "prisoners" or "guards" for the duration of the study. I understand that participation in the research project will involve a loss of privacy, that I will be expected to participate for the full duration of the study, that I will only be released from participation for reasons of health deemed adequate by the medical advisers to the research project or for other reasons deemed appropriate by Dr. Philip Zimbardo, Principal Investigator of the project, and that I will be expected to follow directions from staff members of the project or from other participants in the research project.

I am submitting myself for participation in this research project with full knowledge and understanding of the nature of the research project and of what will be expected of me. I specially release the Principal Investigator and the staff members of the research project, Stanford University, its agents and employees, and the Federal Government, its agents and employees, from any liability to me arising in any way out of my participation in the project.

____________________________ (signature of volunteer)

Witness: ____________________________

If volunteer is a minor:

____________________________ (signature of person authorized to consent for volunteer)

Witness: ____________________________

____________________________ (relationship to volunteer)

Figure 7.11 All Zimbardo's participants signed a consent form with this information before the experiment began.

on Resources

Weblink Zimbardo comments on SPE ethics

7.3 LEARNING ACTIVITY 3

Review

1. Explain how status and social power can affect behaviour within a group, ensuring you refer to the Stanford Prison Experiment (SPE) and the behaviour of both guards and prisoners.
2. How might stereotyping have influenced participant behaviour in the SPE and therefore the results of the experiment?
3. Comment on whether the findings of the SPE could be generalised to prison situations in real life, including the Abu Ghraib example in Figure 7.10.
4. Comment on whether you would have behaved like the guards in the SPE and explain why you hold this belief. Would the instruction in the experiment's consent form in Figure 7.11 to 'follow directions from staff members of the project or from other participants' influence your behaviour?
5. Can the findings of the SPE be generalised to group situations in real life other than prisons? Explain, with reference to an example.
6. a. Identify and describe three of the more significant breaches of current ethical guidelines for human research that occurred in the SPE.
   b. Comment on the ethical beneficence of the research.

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7.3 LEARNING ACTIVITY 4

Analysis and evaluation of Zimbardo's Stanford Prison Experiment

Prepare a flow chart summary of the main features of Zimbardo's SPE. The flow chart should include the following. Figure 2.23 in Topic 2 shows an example of a flow chart summary.

1. a possible aim of the experiment
2. a possible research hypothesis
3. who the participants were and how they were selected
4. the experimental conditions and key variables that were measured, stated in operational terms
5. the main results obtained
6. the conclusion that was drawn from these results
7. whether the experiment has external validity, with reference to a possible generalisation
8. two main limitations or criticisms
9. key ethical issues.

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7.4 Groupthink

Have you ever reached a decision following intensive discussion with a group of friends and the decision turned out to be bad, maybe even resulting in a 'personal disaster' with 'terrible consequences' for you? If you have, you are not alone.

It can happen at the highest levels of government office where a group made up of 'experts' may be formed to make a very important decision. For example, the decision in favour of Australia's involvement in the Vietnam War of the 1960s and the decision to invade Iraq and start a war in 2003 led to thousands of deaths, injuries and psychological harm to people in wars that ultimately proved to be pointless. More recently, significant decisions on government responses to the COVID pandemic that started in 2019 proved to be poor and cost many lives, particularly of elderly people in aged care.

Bad decisions can also be made in the private sector by corporate executives who are paid multi-million-dollar salaries for their expertise. For example, the decision by the Coca-Cola company in 1985 to replace it's long-established, global market leading soft drink with a reformulated 'New Coke' made it to the *TIME* magazine's list of the 100 worst ideas of the twentieth century (alongside Crystal Pepsi).

Figure 7.12 The *Challenger* space shuttle exploded shortly after the launch killing all on board. An inquiry found that groupthink contributed to the disaster.

The *Challenger* space shuttle disaster in 1986 was also due to a poor decision. In this case, by NASA scientists. The historic flight to send the first civilian into space exploded 73 seconds after the launch, killing all seven crew members on board. A subsequent inquiry found that the NASA decision-making team for the launch knew the safety concerns about launching at the scheduled time yet disregarded the warnings from engineers about the dangers.

One benefit of belonging to a group is that goals can be achieved more efficiently and effectively through the pooling of knowledge and skills that different individuals bring to the group. Common sense suggests that if the goal of a particular group is to make a decision and the individual members of the group are specially selected because of expertise they bring to the group, then the shared expertise of that group should result in a good decision. However, psychologists have found that other factors operating within the group can affect the group decision-making process, resulting in a bad decision. One such factor is called groupthink.

Groupthink is a way of thinking by individual members of a group characterised by a strong tendency to seek agreement when decision-making or problem-solving, thereby overriding any realistic consideration of possible alternative, better options. Basically, groupthink involves a shift from focusing on making the best decision to focusing on reaching and maintaining agreement. This consensus-seeking effort interferes with effective group decision making.

Groupthink is most likely to occur under certain conditions. These include:

- the group has a high level of cohesiveness. As described previously, group cohesion is the unity or solidarity of a group that is indicated when all members feel a sense of belongness to the group, value and feel very positively about the group, and coordinate their efforts to achieve goals. Any social group can be highly cohesive or 'tightly knit', including a friendship group, family, swimming team, corporate board members and a high prestige, policy-making or advisory group.

- the group has a strong leader who takes charge and asserts their authority
- the group lacks procedures to search for and carefully consider or debate the pros and cons of alternative options
- the group is isolated from outside influences with little hope of finding a better solution than the one at hand
- the group is under stress to make a difficult or important decision within a strict timeline.

When these conditions exist, groups can become closed-minded and rationalise, or justify, their decisions as the only reasonable options. They tend to strive for quick and painless unanimous agreement, dismiss other courses of action, and become more and more convinced their decision cannot possibly be wrong. Because they value the group so highly, they try to preserve the pleasant, friendly atmosphere. This leads them to suppress personal doubts, withhold disagreement to avoid disapproval from other members, and follow the group leaders' suggestions.

The term groupthink was introduced by American psychologist Irving Janis who was interested in how acknowledged groups of experts could make terrible decisions, with very serious consequences.

Janis (1972) analysed historical records of participants and observers involved in bad group decisions of national significance, made by American presidents and their advisers. These decisions included Roosevelt's complacency before the surprise Japanese attack on Pearl Harbor in 1941, Truman's decision to go to war against North Korea in 1950, Johnson's escalation of the Vietnam War in the 1960s and Nixon's breaking into the Democratic National Committee headquarters at the Watergate Hotel in 1972.

On the basis of his analyses, Janis identified various behavioural symptoms of groupthink. He used the term 'symptom' as he viewed groupthink as a kind of 'social disease' that could 'infect' a group. The symptoms found in the decision-making groups included:

- illusion of invulnerability, e.g. an overestimation of the group's ability to make a good decision due to a distorted belief that 'everything is going to work out all right because we are a special group'
- moral correctness, e.g. a belief that the group will make the morally 'right' decision as a matter of course so there is no need to consider moral and ethical issues that may be relevant
- collective rationalisation, e.g. the group spends more time on justifying its decisions than reflecting on possible oversights or seeking information about alternatives

Figure 7.13 Groupthink explains how a group of experts can make flawed decisions. When a highly cohesive group isolates itself from the input of qualified outsiders and there is no chance to debate the pros and cons of a decision under the direction of a strong leader, then a disastrous decision become very possible.

- outgroup stereotypes, e.g. looking down at ideas sourced outside the group and the possibility that another group could come up with a better decision
- self-censorship, e.g. individuals withholding their personal concerns or dissenting opinions so that disagreement isn't expressed
- direct pressure on dissenters, e.g. pressure on doubters to conform (agree) with others in the group
- illusion of unanimity, e.g. a distorted belief that everyone is in agreement
- self-appointed mind guards, e.g. there are group members who protect the group from information that may challenge its decision (so they may actually withhold important information from the group).

Most of these symptoms were present in each of the bad decisions analysed by Janis. The first two stem from overconfidence in the group's prowess. The next pair reflect the tunnel vision used by group members. The final four are signs of strong conformity pressure within the group to stay in line with everyone and agree. Collectively, they result in a distorted view of reality, excessive optimism producing hasty and potentially reckless decisions, and a neglect of ethical issues (Janis, 1991).

Groupthink may occur in any social group, including a group of two. For example, American psychologist Karen Huffman (2012) has explained how the momentous decision to marry may show groupthink symptoms, such as an illusion of invulnerability ('We're different — we won't ever get divorced.'); moral correctness ('It would not be right to have children unless married.'); collective rationalisation ('Two can live more cheaply than one'.); shared stereotypes of outgroups ('Other couples just don't know how to communicate when they have problems.'); and direct pressure on dissenters ('If you don't support our decision to marry, we don't want you at our wedding.').

Preventing groupthink

To prevent groupthink, Janis (1982) recommended that any decision-making group should make a conscious effort to consider all information carefully and accurately. The group should consult widely with outsiders who are not members of the group, but may have important views and there should be thorough and critical review of the decision once it is reached, but before it is settled or is implemented. Janis also emphasises that the group should have a leader who genuinely encourages constructive criticism of views raised in the decision-making group. Table 7.2 on the next page summarises these and other ways of preventing groupthink.

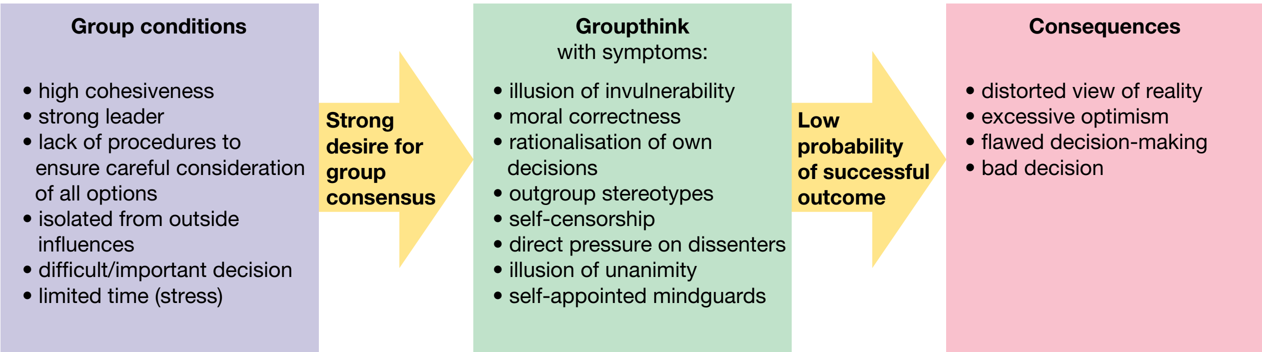


Figure 7.14 A model of groupthink. American psychologist Irving Janis (1992) who coined the term groupthink described it as a kind of social disease, which, like a physical disease, has pre-existing conditions, symptoms and long-term consequences.

TABLE 7.2 Way to prevent groupthink

- Make group members aware of groupthink, its causes and consequences
- Appoint a leader who will be impartial
- The leader should actively encourage constructive criticism, objections and doubts
- Use subgroups that meet separately, then come together to compare views
- Invite outside experts who are not permanent members of the group to participate in the group's meetings every so often, but at strategic times
- Allow group members to discuss the group's work with trusted associates and report reactions back to the group
- Treat the group's decision as a preliminary decision and have a follow-up meeting for group members to raise any remaining doubts about the decision.
- Outside experts should attend meetings on a staggered basis and be asked to challenge the group's views

7.4 LEARNING ACTIVITY 1

Review

1. Define the meaning of groupthink.
2. What is the likely consequence of groupthink?
3. An AFL team with the top draft selection has formed a group to decide on which player to select. The group comprises the senior coach, all three assistant coaches, the recruitment manager and the team captain. There is a strict timeline, it is vital that the best young player in Australia is selected, and there is widespread media discussion about who the top pick should be.
   Suppose you could attend the group meetings as an observer to watch for groupthink.
   Name three groupthink symptoms you could look for. For each symptom, give an example of a statement(s) made by the group leader that may indicate the presence of the symptom if not challenged by another member.
4. The Iraq war which started in 2003 did not end until December 2011. No 'weapons of mass destruction' were found but the human cost was devastating.
   In the lead up, there was strong opposition from long-standing allies who argued that there was no evidence of weapons of mass destruction in Iraq and that invading that country was not justified.
   Assume the Iraq war resulted from a 'groupthink decision' by a military advisory panel that weapons of mass destruction had in fact been stockpiled.
   Explain how the war may have been prevented with reference to Janis's recommendations on preventing groupthink.
5. Explain whether groupthink can ever have a positive outcome.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

7.4 LEARNING ACTIVITY 2

Multiple-choice questions

1. Overlooking serious problems in their relationship, a couple decides to marry because they believe they're very different from couples who divorce. Which groupthink symptom is likely to be reflected by this belief?
   A. mind guarding
   B. stereotyping outgroups
   C. illusion of invulnerability
   D. illusion of unanimity

2. Which of the following groupthink symptoms reflects tunnel vision?
   A. mind guarding
   B. collective rationalisation
   C. illusion of invulnerability
   D. direct pressure on dissenters
3. Which of the following groupthink symptoms is a sign of strong conformity pressure within a group?
   A. illusion of unanimity
   B. moral correctness
   C. illusion of invulnerability
   D. outgroup stereotyping
4. Which of the following groupthink symptoms involves a preoccupation with justifying the decision that has been or will be made?
   A. mind guarding
   B. collective rationalisation
   C. illusion of invulnerability
   D. direct pressure on dissenters
5. When group members withhold their personal concerns about a decision proposed by the group leader, they are engaging in
   A. moral correctness.
   B. mind guarding.
   C. dissent.
   D. self-censorship.

To answer these and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

7.5 Group polarisation

Interacting within a group not only influences our behaviour in different ways, it also influences our attitudes, beliefs, opinions and other thoughts. Although we tend to be attracted to groups whose members have similar thoughts on all kinds of matters, individual group members can still have different points of view.

What tends to happen when group members engage in a discussion about an important issue of concern to each individual member such as compulsory school uniform, smartphone access at school, prejudice, treatment of refugees and asylum seekers, climate change, euthanasia, and compulsory vaccination? If there are differing points of view within the group, in what ways might individuals change their thinking following the group discussion? Will some individuals simply hold firm on their opinions? Will others change their minds and accept a different opinion argued by someone else in the group? Will all individual members of the group eventually compromise and settle on a view towards 'the group average opinion'?

Each alternative is a reasonable possibility. However, none of them are very likely. Results of research studies since the 1960s have consistently found that what tends to happen is that group discussion leads individuals to strengthen the views they started with. In fact, individuals are likely to end up with more extreme positions after group discussion. Conservatives become more conservative, liberals more liberal, radicals more radical, reactionaries more reactionary. Talking it over intensifies pre-existing attitudes, beliefs and opinions (Brehm & Kassin, 1996). This effect is known as group polarisation.

Group polarisation is the tendency of an individual group member, following group discussion, to shift their initially held views to a more extreme position (in the same general direction). As a result, the group as a whole tends to respond in more extreme ways than one would expect given the sentiments of the individual members prior to the discussion (APA, 2022).

For example, in one well-known study, high school students responded to an initial questionnaire designed to measure racial prejudice. On the basis of their responses, individual participants were classified as high, medium, or low on racial prejudice. The researchers then organised the participants into groups in which the members were likely to get along with one another, based on the results of another questionnaire. The groups then met for a discussion about racial issues. The attitudes of individual members on these issues were measured before and after the group discussion. Group polarisation was found to be dramatic. Participants low in prejudice to begin with were even less prejudiced after the group discussion; participants moderate or high in prejudice became even more prejudiced (Myers & Bishop, 1970).

A number of explanations for group polarisation have been proposed. Group polarisation seems to result from the combined effect of a number of factors that occur during the group discussion. For example, factors such as exposure to persuasive new arguments that support our view which we take on as our own ideas, exposure to our own arguments from others which has the effect of confirming our position, and social comparison effects.

Social comparison is the process of evaluating our attitudes and abilities by comparing ourselves to other people. When we compare our views in a likeminded group, this can lead us to adopt a more extreme position so that others discover that we share their views more than they had supposed and therefore perceive us more favourably.

The theory of group polarisation helps explain extremist views and behaviour observed in everyday life, such as the adoption of more extremist views between opposing groups and the intensification of conflicts between them. For example, during social conflicts, like-minded people increasingly associate with one another, thus amplifying their shared beliefs and tendencies. Similarly, terrorist acts may arise among people whose shared grievances bring them together. As they interact in isolation from other influences that may soften their views, they become progressively more extreme.

Group polarisation may also impact on some of the important decisions we make in everyday life. Most of our daily interactions are with family and friends who share our basic values and beliefs. When most of our information comes only from these like-minded people, we're at risk of making extreme, polarised decisions. Thus, when making important decisions, such as what VCE subjects or tertiary course to study, what career to pursue, what car to buy, whether to buy or sell shares on the stock market, or where to rent or buy a home, it may be wise to seek out more objective information outside our like-minded groups (Huffman, 2012).

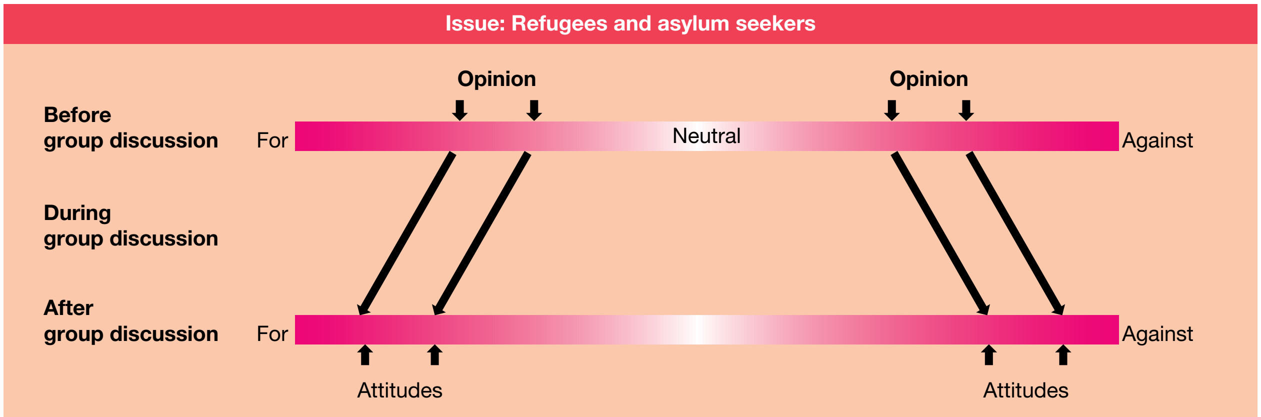
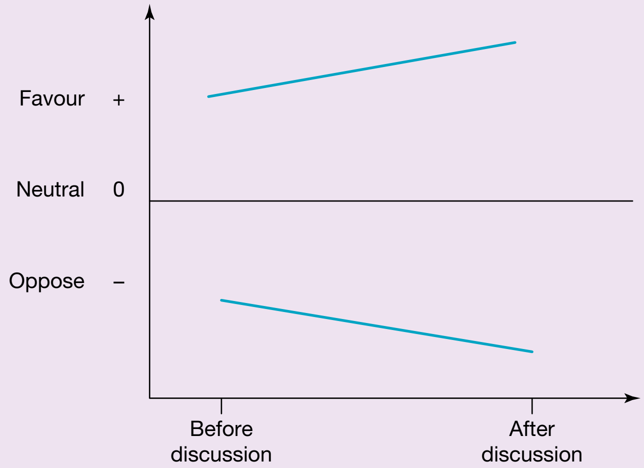


Figure 7.15 The process of group polarisation. Opinions, beliefs or attitudes shift towards a more extreme position.

7.5 LEARNING ACTIVITY

Multiple-choice questions

1. Group polarisation is an example of
   - A. social influence.
   - B. group culture.
   - C. individual behaviour.
   - D. effective decision making.
2. In some decision-making groups, individual members of the group may become so preoccupied with reaching agreement on a decision that alternative, better courses of action are overlooked, thereby resulting in a bad decision. This way of thinking by individual members of a group is an example of
   - A. groupthink.
   - B. group culture.
   - C. group polarisation.
   - D. status and power.
3. Group polarisation during the decision-making process occurs when group members
   - A. act impulsively and conform to the majority view.
   - B. collectively adopt a more extreme view than held beforehand.
   - C. seek agreement to the extent that they overlook possible alternative, better options.
   - D. experience reduced self-consciousness and feelings of personal responsibility.
4. Group polarisation theory has enhanced understanding of
   - A. why some group members do not change their views in meetings.
   - B. why some group members are more vocal than other in meetings.
   - C. why some small or large groups adopt extremist views.
   - D. how some group members go about influencing others.
5. Consider the graph below.



   The graph shows the results of an experiment on
   - A. group power.
   - B. groupthink.
   - C. group polarisation.
   - D. group cohesion.

To answer these and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

7.6 Deindividuation

Sometimes when in a large group or big crowd, we can develop a 'sense' of anonymity or feel like we have lost our individuality. In some situations, we may also feel less self-conscious than we normally do and even lose our inhibitions and say or do something that we wouldn't if alone or in a small group. We may have become deindividuated.

Deindividuation is characterised by reduced self-consciousness, inhibition, feelings of personal responsibility and inner restraint that can occur when in a group or crowd. It is a psychological state that can help explain the extreme behaviour of some people in groups and crowds, particularly in situations where high levels of arousal or emotion are involved; for example, behaviour such as screaming hysterically during a rock concert or abusing an umpire, as well as less restrained, anti-social gang or mob behaviour, street riots and the violence observed in some soccer and football crowds.

Research studies have identified several factors that bring about deindividuation. Two of the more important factors are anonymity and a shift in attention.

Anonymity in a group or crowd

A group or crowd can both incite its members to behave in certain ways and make them unidentifiable. In groups or crowds when people feel anonymous or 'invisible', and less accountable for their actions, they may choose to conform to the majority which is behaving in ways they otherwise would not. Furthermore, being part of a group, crowd or being unrecognisable through some sort of disguise, such as a uniform or fancy dress, can lead people to conform to the majority by doing things they ordinarily would not even think about.

For example, a jeering crowd protects the aggressive individual football fan from taking responsibility for threatening an umpire because 'everyone else is doing it too'. And rioters who become anonymous in a mob may loot other people's property, as is witnessed during periods of civil unrest or war. In a large group situation or crowd, people believe they can get away with such anti-social behaviour because they cannot easily be distinguished from others who are behaving in the same way.

In these situations, group members do not pass judgment on an individual's behaviour because they are all 'doing it'. To pass judgment would be to also condemn one's own behaviour. Therefore, the behaviour continues because group members blame the situation they are in, rather than taking the responsibility for their own decisions and behaviour.

Generally, the bigger the group, the greater the anonymity and the more likely it is that group members will use this anonymity to behave in ways they usually would not. In one experiment, Phillip Zimbardo (1970) dressed adult females in identical white coats and hoods so they were individually anonymous and resembled members of the racist group known as the Ku Klux Klan. Zimbardo found that female participants disguised with hoods, and therefore deindividuated, were more likely to conform to a request to give high-voltage electric shocks to a helpless female than those without hoods who were easily identifiable and not deindividuated.

Figure 7.16 The anonymity created by the hoods worn in Zimbardo's (1970) experiment resulted in the participants being more likely to give electric shocks to another female.

Shift in attention

When people are with others in a group, their attention is often focused on the activities of the group and events in the environment; that is, events 'external' to themselves. This results in fewer opportunities to focus on 'internal' thoughts. Consequently, individuals in a group are less likely to reflect on the appropriateness of their actions, and will therefore give less thought to the consequences of their behaviour.

As a result, people are more likely to act impulsively and conform to a group or situation. This is intensified when group members act 'as one', such as by wearing uniforms, clapping, singing, shouting or chanting together. The heightened emotions that accompany this type of group behaviour can hype people up, reduce their self-consciousness and make it difficult to stop (Diener, 1980; Aronson et al., 1999).

However, deindividuation does not always lead to aggressive or antisocial behaviour. When in a group, this depends on what the group's norm is. If we are at a fancy dress party with lots of people and everyone is dancing to loud music because the norm is to dance a lot, deindividuation will increase the likelihood that we will dance. If our group is angry and the norm is to act violently, deindividuation will increase the likelihood of acting aggressively. Thus, it is the specific norm of the group that determines whether deindividuation will lead to positive or negative behaviours (Aronson et al., 2021).

Figure 7.17 The loss of individuality that can occur in a group or crowd can lead people who would not normally engage in anti-social behaviour to conform to what many others are doing. (a) The riotous chair throwing shown above occurred at a darts tournament in Melbourne. (b) A social norm of darts tournaments requires spectators to wear fancy dress, which in turn promotes anonymity and deindividuation.

7.6 LEARNING ACTIVITY

Multiple-choice questions

1. A critical factor in deindividuation is
   - **A.** loss of self-esteem.
   - **B.** anonymity.
   - **C.** identity diffusion.
   - **D.** group cohesiveness.

2. Which of the following is the most likely contributory factor to the abuse of prisoners by guards in the Zimbardo Stanford Prison Experiment?
   A. deindividuation
   B. groupthink
   C. group polarisation
   D. unanimity
3. Voula is usually shy but joins in a Mexican wave along with all the other people waiting for a rock concert to start. Voula's behaviour has most likely been influenced by
   A. groupthink.
   B. group polarisation.
   C. social comparison.
   D. deindividuation.
4. Hamish and his friends, who are all keen football players and spectators, had a long discussion about a rule change being proposed by the Australian Football League. At the start of the discussion, Hamish was against the rule change and by the end of the discussion had become even more strongly opposed to the rule change, even though his friends had suggested good reasons for the rule change.
   The shift in Hamish's initial view on the rule change to a more extreme position is an example of
   A. groupthink.
   B. deindividuation.
   C. group polarisation.
   D. status and power.
5. Some psychologists have extended the concept of deindividuation beyond the group or crowd to explain online trolling in terms of the anonymity that is possible when online.

   Online trolling is best explained by
   A. group polarisation.
   B. status and power.
   C. social comparison.
   D. deindividuation.
6. Group experiences that _____ self-awareness are more likely to increase deindividuation.
   A. create
   B. increase
   C. decrease
   D. stabilise

To answer these and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

7.7 Obedience

There are many occasions in everyday life when we change our behaviour in some way to fit in with whatever is required in a particular situation. The pressure to do so often occurs in subtle, not so easily identifiable ways; for example, when it 'feels right' to be more or less noisy. We also change our behaviour in response to more obvious influences.

This can occur when we are required to do something because someone with authority asks or tells us to do or not do something. For example, our parents, teachers, sports coaches and employers are all authority figures who have the power to get us to behave in certain ways in particular aspects of our lives. When they ask us to do something that is clearly in their area of power, we usually obey and do as we are told. When we defy them, we usually do so knowing that there may be undesirable consequences.

From a very early age, we learn that we must be obedient when someone with legitimate authority over us commands us in some way or other to behave in a certain way. **Obedience** occurs when we follow the commands of someone with authority, or the rules or laws of our society. The term is sometimes used interchangeably with the term compliance. However, while *compliance* involves changing one's behaviour in response to a request to do so, it does not necessarily involve an authority figure. We may submit to the demands, wishes, or suggestions of someone without authority, such as a friend or sibling. Psychologists also distinguish between constructive and destructive obedience.

Constructive obedience occurs when there is compliance with the orders of an authority that results in a positive outcome. Examples of constructive obedience include accident victims obeying the commands of emergency personnel, and citizens adhering to laws within their communities, which reduces crime and makes neighbourhoods safer, thus instilling a sense of security and well-being for individuals living within those neighbourhoods.

Destructive obedience occurs when there is compliance with the orders of an authority that results in a negative outcome. Examples of destructive obedience include soldiers obeying orders to harm innocent civilians and nurses or other medical personnel following a doctor's orders even when they know the doctor is mistaken (APA, 2022).

Leaders in groups are often in the powerful position of being able to exert influence over other members of the group. Why do other group members usually obey the leader? This question becomes important when the leader attempts to exert their power and influence over other group members, pushing them to behave in a manner that is different from the way in which they want to behave or would normally behave.

Several disturbing historical events sparked interest in this question among psychologists. An example is the gassing, starving and shooting of millions of Jewish people in concentration camps during World War II by Nazi soldiers under Hitler's direction. This type of destructive obedience is sometimes described as involving 'blind obedience' to authority. Victims were usually unknown to their executioners and were, in the main, unseen. Did all those Nazi soldiers who carried out Hitler's instructions support this course of action, or were they 'just following orders' as they stated at the Nuremberg trials of war criminals following World War II?

Figure 7.18 Nazi soldiers killed millions of Jewish people in the Holocaust of World War II, and many stated that they did it because they were 'just following orders'.

7.7.1 Milgram's experiments on obedience

In a series of well-known and very controversial experiments, American psychologist Stanley Milgram (1963) investigated factors that can influence obedience to an authority figure. In all, there were 19 variations of the experimental procedures to identify specific influences.

For his first experiment, Milgram advertised for 40 male research participants between the ages of 20 and 50 years, offering to pay them US$4.00 (equivalent to about US$40 today) for one hour of their time to participate in an experiment at Yale University in the state of Connecticut. He wanted to find out whether individuals would obey an authority figure who was instructing them to inflict pain on another person. Participants were informed, however, that they were involved in a study on 'memory and learning' as described in the advertisement in Figure 7.24 on page 482.

Imagine yourself as one of the respondents to the advertisement and as one of Milgram's participants being treated in the following way. You arrive at the university to be met by one of Milgram's assistants, the experimenter, dressed in a white laboratory coat. You chat with the experimenter who seems quite friendly and the purpose of the research is explained. You and another participant (who, unknown to you, is a 'confederate' working for the experimenter and posing as a participant) draw slips of paper to determine who will be the 'teacher' and who will be the 'learner'. Again, unknown to you, the draw is rigged so that the participant (you) always becomes the teacher and the confederate (experimenter's assistant) is always the learner.

The learner is taken to an adjoining room, strapped into a chair wired through the wall to an electric shock machine and has electrodes placed on their wrists. You witness all this before being taken to your seat in the next room and receiving instructions about your task — to teach the learner to remember pairs of words.

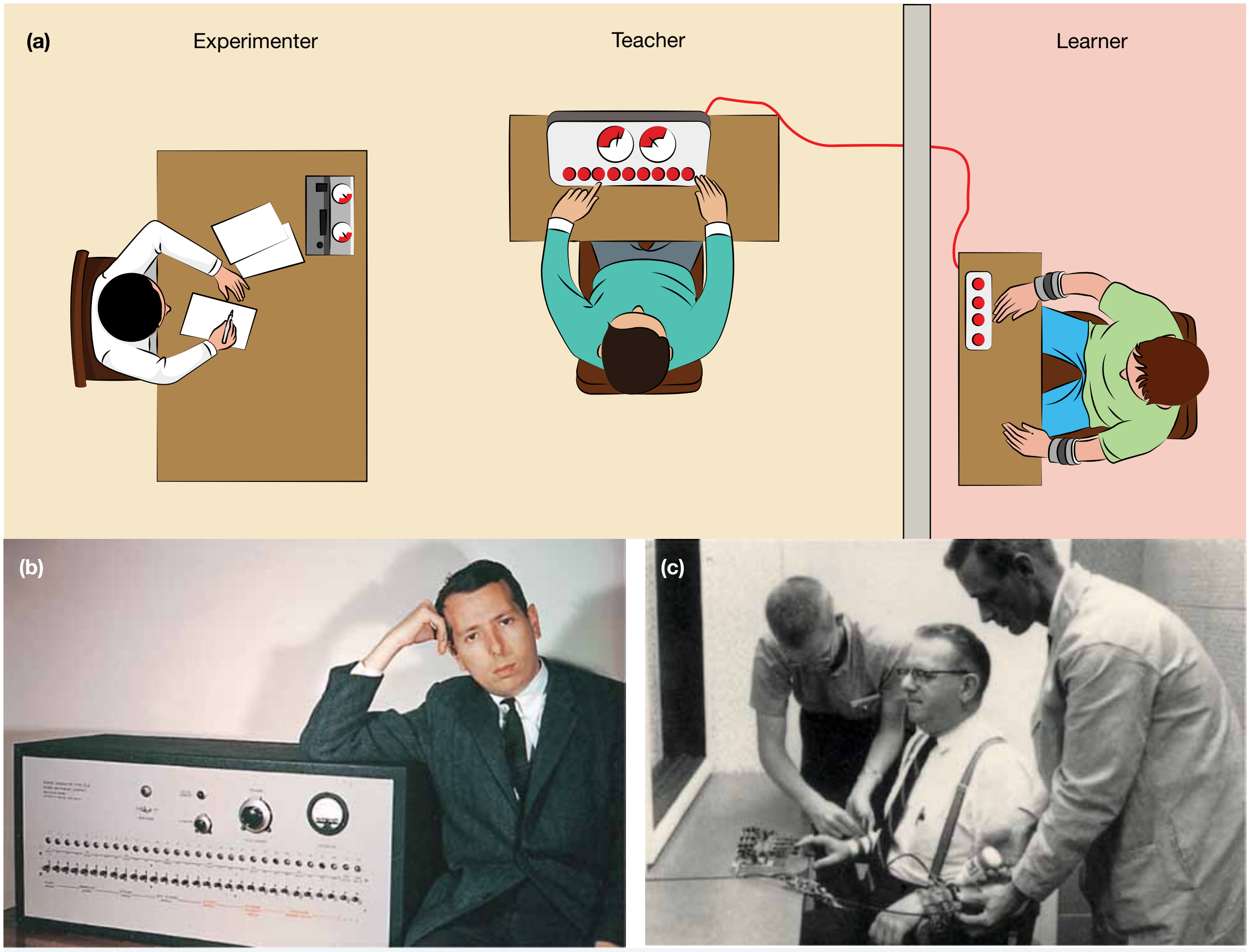


Figure 7.19 (a) Laboratory set-up in Milgram's classic experiment (b) Stanley Milgram (1933–1984) with the shock generator used to administer the shocks. (c) A learner (confederate) being strapped into the apparatus.

You are instructed that each time the learner makes a mistake you are to deliver a brief shock of increasing intensity through a shock generator with 30 levers marked at 15-volt intervals from 15 to 450 volts. The shock generator also has descriptions of the severity of the shock levels from 'slight shock' to 'danger' to 'severe shock'. On the first error, you are required to administer 15 volts and are to move up to the next higher voltage for each further error. With each flick of the switch, lights flash and an electric buzzing sound fills the room.

Deliberately, the learner (confederate) makes errors. By the fifth error (75 volts), you hear a grunt from the next room. If you question the experimenter as to whether to continue you receive a standard reply, 'The experiment requires that you must continue'. Then, if you show further reluctance to continue administering the shocks, you are told, 'It is absolutely essential that you continue' and finally, 'You have no other choice, you must go on'.

If you continue to administer the shocks, after the eighth error (120 volts), the learner cries out, at 150 volts the learner demands to be let out, at 180 volts the learner cries that they cannot stand the pain any longer and at 300 volts the learner refuses to continue and becomes silent. How would you feel as the teacher at this point? How far would you go in administering the shocks? How obedient would you be in this situation?

After the experiment, all participants (the 'teachers') were debriefed and informed that the learners did not actually receive the electric shocks and that they were confederates of the experimenter. The results were unexpected — of 40 participants, none stopped administering the shocks before 300 volts and 26 continued to administer the shocks at the 450-volt level. Five participants refused to go on with the experiment at 300 volts when the learner began kicking the walls.

Milgram's experiments attracted a great deal of interest among psychologists. Many variations of his standard experiment were subsequently conducted in other countries and cultures, including Australia, Austria, England, Germany, Italy, Jordan, Spain, the Netherlands and Poland. These studies produced a range of results, with the level of obedience found to be higher in some studies (and therefore cultures) and lower in other studies than that in Milgram's original experiment, but nonetheless still occurring at a significant level.

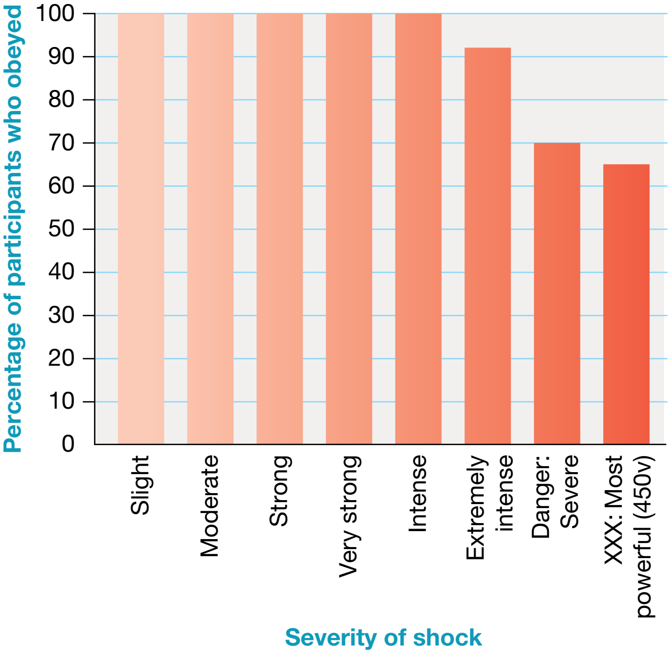


Figure 7.20 Results of the Milgram (1963) experiment. The data show that 65% of participants obeyed an authority figure to the extent that they potentially put someone else's life at risk by doing so.

Table 7.3 A learner's protests in the Milgram experiment

75 volts	Ugh!
90 volts	Ugh!
105 volts	Ugh! *(louder)*
120 volts	Ugh! Hey this really hurts.
135 volts	Ugh!!
150 volts	Ugh!!! Experimenter! That's all. Get me out of here. I told you I had heart trouble. My heart's starting to bother me now. Get me out of here, please. My heart's starting to bother me. I refuse to go on. Let me out.
165 volts	Ugh! Let me out! *(shouting)*
180 volts	Ugh! I can't stand the pain. Let me out of here! *(shouting)*
195 volts	Ugh! Let me out of here. Let me out of here. My heart's bothering me. Let me out of here! You have no right to keep me here! Let me out! Let me out of here! Let me out! Let me out of here! My heart's bothering me. Let me out! Let me out!
210 volts	Ugh!! Experimenter! Get me out of here. I've had enough. I won't be in the experiment any more.
225 volts	Ugh!
240 volts	Ugh!
255 volts	Ugh! Get me out of here.
270 volts	*(Agonised scream)* Let me out of here. Let me out of here. Let me out of here. Let me out. Do you hear? Let me out of here.
285 volts	*(Agonised scream)*
300 volts	*(Agonised scream)* I absolutely refuse to answer any more. Get me out of here. You can't hold me here. Get me out. Get me out of here.
315 volts	*(Intensely agonised scream)* I told you I refuse to answer. I'm no longer part of this experiment.
330 volts	*(Intense and prolonged agonised scream)* Let me out of here. Let me out of here. My heart's bothering me. Let me out, I tell you. *(Hysterically)* Let me out of here. Let me out of here. You have no right to hold me here. Let me out! Let me out! Let me out! Let me out of here! Let me out! Let me out!

Source: Milgram, S. (1974). *Obedience to authority: An experimental view.* New York: Harper Row.

on Resources

Teacher weblinks

Video - Documentary on Milgram's experiments featuring a commentary by Milgram 9 m 53 s
Video - Zimbardo outlines Milgram's experiment 4 m 39 s
Official trailer for the 2015 Milgram movie *Experimenter* 2 m 11 s

7.7.2 Factors affecting obedience

Milgram's original experiment on obedience to an authority figure used a sample made up entirely of adult male participants. In subsequent experiments, Milgram (1974) tested the effect of other variables on obedience. For example, in another study, 40 adult females showed the same level of obedience as did the males — 65% delivered an electric shock to the maximum intensity of 450 volts.

Similar results have also been obtained in different countries throughout the world using people from different socioeconomic and cultural backgrounds, including children and elderly people in the role of the teacher. Most participants expressed considerable distress over what they were asked to do, yet most also continued to obey.

In sum, obedience in a 'Milgram-type' experimental situation seems to occur regardless of gender, socioeconomic background, age or culture. Does this mean you would be likely to obey an authority figure to deliver 450 volts that could kill somebody? The answer is 'Not necessarily'.

It appears that several factors interact in influencing someone to obey an authority figure. These include the physical distance between the authority figure and the person who must obey, whether the authority figure is perceived as being legitimate and having power, and group pressure to obey.

Social proximity

Generally, the term *social proximity* refers to the closeness between two or more people. This may include the physical distance between the people as well as the closeness of their relationship. In Milgram's experiment, social proximity was operationalised as the physical distance between the teacher and learner, including whether or not the teacher is physically present in the same room as the learner.

Milgram found that, the closer the learner ('victim') was to the teacher (person administering the shock), the more likely that person was to refuse to administer the shock. For example, as shown in Figure 7.20, when the teacher was in the same room with the learner and standing only 45–50 cm away, the number of *fully* obedient teachers dropped from 65% to 40%. And when the teacher was required to force the learner's hand down into contact with a simulated 'shock plate', the number of fully obedient teachers dropped to 30%.

Milgram also found that when the teacher was out of the room and issued their orders by telephone, the number of fully obedient teachers dropped to about 20%. Furthermore, in this experimental condition, the experimenter's authority was frequently defied. For example, several of the teachers administered shocks of lower intensity than they were supposed to and never told the experimenter that they were doing this.

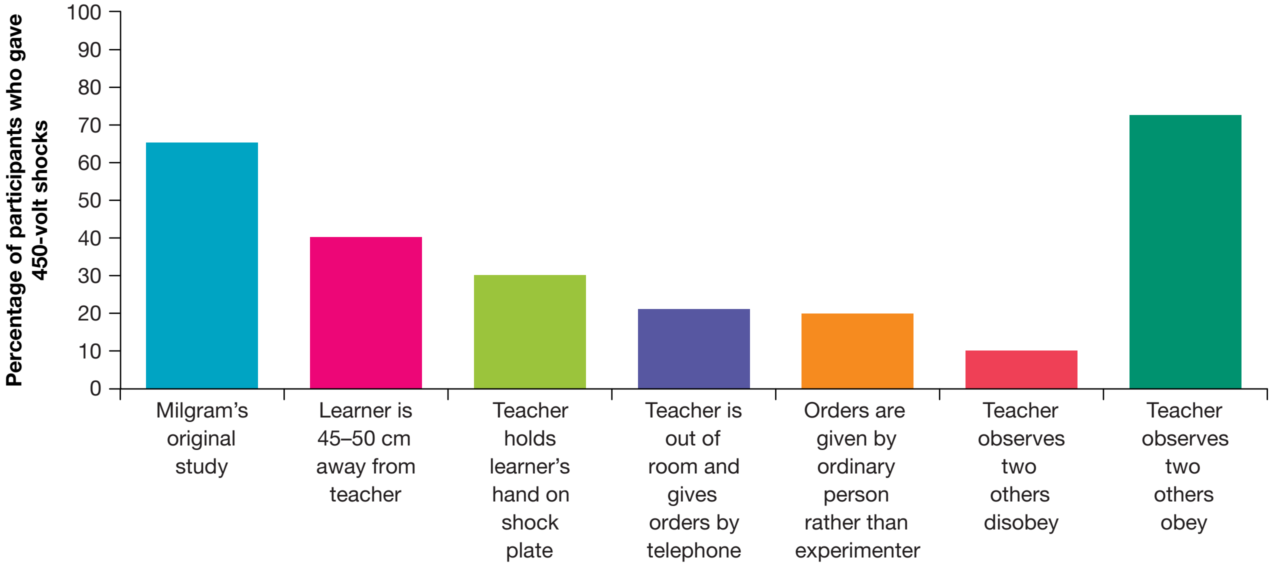


Figure 7.21 Factors that influenced obedience to authority

In situations outside the laboratory, it seems that it is also easier to obey an order to do something horrific when the victim is distant and not physically nearby or visible. For example, consider how much 'easier' it might be during a war to obey a military command to fire a missile from a drone or drop a bomb from high-flying aeroplane and kill thousands of helpless people, as compared with obeying a command to shoot and kill a helpless individual standing in front of you. It is also 'easier' to sign a document ordering someone's torture or death than to actually torture or kill them yourself.

Legitimacy of authority figures

An individual is also more likely to be obedient when the authority figure is perceived as being legitimate and having power. As shown in Figure 7.20, when an 'ordinary person' (someone with no particular authority) instead of the experimenter gave the orders, full obedience dropped from 65% to 20%.

In one variation of his experiment, Milgram (1974) set up a situation in which the experimenter received a fake telephone call that required him to leave the laboratory. After the experimenter left, another confederate who was posing as a participant entered the room and took charge. He 'decided' that the shock should be increased one level for each wrong answer and ordered the teacher to follow this command.

With the legitimate authority figure gone and someone with no apparent authority in charge, 80% of the teachers often ignored the confederate and refused to comply fully. When the confederate pretended to be disgusted by this defiance and sat down in front of the shock generator and tried to deliver the shock himself, most of the defiant participants protested vigorously. Some even tried to unplug the shock generator so it could not be used. In one instance, a physically big teacher actually picked up the confederate from his chair in front of the shock generator and threw him across the room. This 'rebellion' against an illegitimate authority figure contrasted sharply with the compliance usually shown to the 'authoritative' experimenter.

In Milgram's (1963) original experiment, the authority figures were easy to recognise because all the experimenters wore white lab coats. They looked like 'expert scientists from a prestigious university' and this helped reinforce the legitimacy of their authority in the experimental situation.

Figure 7.22 We are more likely to obey an authority figure when we perceive them as having legitimate authority. A uniform provides a readily visible sign of someone's authority in most places throughout the world.

In everyday life, individuals in authority also tend to have visible signs of their authority. Police officers, PSOs, paramedics, firefighters, parking officers and security guards all wear uniforms. Politicians wear suits. Doctors in hospitals wear stethoscopes around their necks. These symbols of their authority are often enough to bring about obedience. When confronted by these obvious signs and reminders of who is in charge, many people find it difficult to resist.

Group pressure

An individual is also more likely to be obedient where there is little or no group support for resisting the authority figure. As shown in Figure 7.21, when the 'teachers' were exposed to the actions of disobedient people who refused to obey the authority figure's commands, full obedience dropped from 65% to about 10%.

Milgram observed this effect of group pressure by placing the teacher with two confederate teachers. Initially, the two confederates pretended to collaborate by agreeing to follow the shock administration procedure. Then, they pretended to defy the experimenter and refused to administer shocks after the 150-volt to 210-volt range. After the participant observed this disobedience, the confederates turned to the participant and ordered them to administer the shock. Almost 90% refused to do so.

The results also indicate that an individual is more likely to be obedient where there is group support for the authority figure. As shown in Figure 7.21, when the teachers were exposed to the actions of two people who consistently obeyed the authority figure's commands to the end, full obedience increased from 65% to 72.5%.

In Milgram's study, participants were faced with the dilemma of whether to obey an authority figure or consider the health and safety of another human being. Obedience to authority was the more common response.

Milgram's study demonstrates how strong social influence is in affecting individuals' behaviours. Individuals will often rationalise, or justify, their behaviour by offering the excuse that they cannot be held responsible for their actions because they are acting under instructions.

Experiments such as those conducted by Milgram provide an interesting and important insight into human behaviour. We are often confronted with situations where we have to decide whether to do what others are expecting or demanding from us, or take a stand against their expectations or demands. However, you should keep in mind that the Milgram experiments provide an example of authority being abused. Without obedience to the laws of our democratic society, groups could not function and social life in the way we are accustomed to it would be extremely difficult, if not impossible.

Figure 7.23 Many civilian protests against government corruption and human rights abuses in other countries have been met by troops obeying orders to forcibly stop them. The power of obedience leads young soldiers to carry out these orders and injure or murder people. Observing other soldiers obeying the order is one factor that influences their compliance.

7.7.3 Ethical issues in Milgram's experiments

A common criticism of obedience studies, such as those conducted by Milgram, is that they are unethical. For example, according to current ethical standards for human research, a participant's full and informed consent must be obtained prior to the start of an experiment, the participant's health and wellbeing must be safeguarded and the participant must be informed about their rights and permitted to withdraw whenever they choose to do so. Milgram's experiment seems to have disregarded each of these standards.

Milgram did not actually obtain informed consent from his participants. To do so would have meant that participants had full knowledge of the real purpose and nature of his research. This would have undoubtedly influenced their natural responses in the experiment and, therefore, the results.

To avoid this, Milgram used deception. This means the participants were intentionally misinformed about what the experiment actually involved. Consequently, the participants did not truly give informed consent when they agreed to participate in the research study.

There were also other deceptions after the participants had agreed to take part in the experiment. For example, participants were introduced to someone whom they were led to believe was another participant, but who was in fact a confederate, and participants drew slips of paper to determine who was to be the teacher and who was to be the learner, but the draw was rigged to ensure that the confederate would always be the learner.

It is also clear that the mental health and wellbeing of participants were not adequately safeguarded. In fact, for one experiment, Milgram (1974) reports a participant as having been 'reduced to a twitching, stuttering wreck who was rapidly approaching a state of nervous collapse. He constantly pulled on his earlobes, and twisted his hands. At one point, he pushed his fist into his forehead and muttered: "Oh God, let's stop it." But Milgram did not intervene and 'stop' the experiment.

Public Announcement

WE WILL PAY YOU $4.00 FOR ONE HOUR OF YOUR TIME

Persons Needed for a Study of Memory

*We will pay five hundred New Haven men to help us complete a scientific study of memory and learning. The study is being done at Yale University.

*Each person who participates will be paid $4.00 (plus 50c carfare) for approximately 1 hour's time. We need you for only one hour: there are no further obligations. You may choose the time you would like to come (evenings, weekdays, or weekends).

***No special training, education, or experience is needed. We want:**

Factory workers	**Businessmen**	**Construction workers**
City employees	**Clerks**	**Salespeople**
Laborers	**Professional people**	**White-collar workers**
Barbers	**Telephone workers**	**Others**

All persons must be between the ages of 20 and 50. High school and college students cannot be used.

*If you meet these qualifications, fill out the coupon below and mail it now to Professor Stanley Milgram. Department of Psychology. Yale University. New Haven. You will be notified later of the specific time and place of the study. We reserve the right to decline any application.

*You will be paid $4.00 (plus 50c carfare) as soon as you arrive at the laboratory.

- -

TO:
PROF. STANLEY MILGRAM, DEPARTMENT OF PSYCHOLOGY, YALE UNIVERSITY, NEW HAVEN, CONN. I want to take part in this study of memory and learning. I am between the ages of 20 and 50. I will be paid $4.00 (plus 50c carfare) if I participate.

NAME (Please Print) ....

ADDRESS ....

TELEPHONE NO. ....Best time to call you.....................

AGE ....................OCCUPATION.................................SEX................
CAN YOU COME:

WEEKDAYS .... EVENINGS .... WEEKENDS ....

Figure 7.24 This advertisement was used by Milgram to recruit participants for his first experiment.

Nor did Milgram make it clear to the participants that they could withdraw from the experiment whenever they wanted to do so. While they were free to withdraw in the sense that they were not tied down or locked up in the experimental room, it was never made clear to them that they could withdraw. The fact that the participants were paid money to take part in the experiment may have also placed a certain obligation on them not to end their participation.

Ethical standards for research take account of the need for deception in some studies. When using deception, researchers are required to follow strict guidelines, including debriefing participants at the end of the experiment. Debriefing involves explaining the reasons for conducting the research and clearing up any misunderstandings or concerns on the part of the participant.

Debriefing may also involve ensuring the participant leaves the experimental setting in the same mental state as they were in before the experiment. Milgram (1974) reported that his debriefing procedure, involving a friendly reconciliation with the 'victim', was sufficiently thorough to ensure that each participant left the laboratory 'in a state of wellbeing'.

In a follow-up study, Milgram, assisted by a psychiatrist, discovered that very few participants felt they were harmed by their experiences. Only 1.3% of participants felt that they were 'sorry' or 'very sorry' to have taken part in the experiment, whereas 83.7% were glad to have taken part.

Despite this, some psychologists argue that Milgram's efforts to obtain naive participants were unethical because the participants were not fully informed and every opportunity was taken to persuade the participant to continue when some were clearly uncertain whether they wished to do so. On the other side of the debate, some psychologists have argued that the risks to participants were worth taking in order to investigate a very important aspect of behaviour that has significant benefits for society when properly understood (Wren, 1999).

learnon

learnMORE | Obedience in cults and sects

Access learnON to read about obedience in cults and sects.

7.7 LEARNING ACTIVITY 1

Review

1. Define what is meant by the term obedience.
2. a. In what way is compliance like obedience?
   b. In what way is compliance different from obedience?
3. Why was Milgram's (1963) experiment 'very controversial'?
4. How obedient do you believe you would be as a 'teacher' in Milgram's experiment? Explain your answer.
5. Is obedience to authority likely to be influenced by an individual's cultural background? Briefly explain with reference to research findings.
6. a. Describe the relationship between social proximity and how obedient someone is likely to be to an order to do something harmful to another person.
   b. Describe the relationship between the perceived legitimacy of an authority figure and how obedient someone is likely to be to an order to do something harmful to another person.
   c. In what way can group pressure influence obedience?
7. Comment on how far the teachers' responses in Milgram's experiment reflect what happens in real life. Explain your opinion with reference to an example.
8. Describe three ethical issues raised by Milgram's experiments on obedience.
9. Explain whether or not the amount of stress to which participants were subjected is justifiable in terms of the importance or benefits of the research itself and its outcomes.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

7.7 LEARNING ACTIVITY 2

Multiple-choice questions

1. Obedience is a
   A. thought.
   B. feeling.
   C. behaviour.
   D. All of the above are correct.
2. Obedience may be described as
   A. a shift in attention.
   B. moral correctness.
   C. compliance with a direct command.
   D. adoption of a more extreme view or behaviour than held beforehand.
3. The main difference between constructive and destructive obedience is
   A. whether or not a person is obedient.
   B. the extent to which a person is obedient.
   C. whether or not a person with authority makes the request.
   D. the type of outcome due to obedience.
4. Which of the following is an example of constructive obedience?
   A. Obeying a teacher's request for silence during a test so that noise is not a distractor.
   B. Obeying a friend's suggestion to bully another student who has been annoying everyone in class.
   C. Obeying a cult leader's suggestion to harm someone who is a poor role model for young people.
   D. Obeying a teacher's order to eat food at a camp despite the food being against one's religious beliefs.
5. In Milgram's experiment, a confederate is
   A. a participant.
   B. an experimenter.
   C. a respondent to the advertisement for participants.
   D. an aide of the experimenter who poses as a participant.

To answer theses and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

7.7 LEARNING ACTIVITY 3

Analysis and evaluation of research on obedience to authority

Prepare a flow chart summary of the main features of Milgram's experiment. Figure 2.23 in Topic 2 shows an example of a flow chart summary. The flow chart should include the following.

1. a possible aim of the experiment
2. a possible research hypothesis
3. who the participants were and how they were selected
4. the experimental conditions and key variables that were measured, stated in operational terms
5. the main results obtained
6. the conclusion that was drawn from these results
7. whether the experiment has external validity, with reference to a possible generalisation
8. two main limitations or criticisms
9. key ethical issues.

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7.8 Conformity

At various times in our lives, we all experience group pressure to conform. **Conformity** is the tendency to adjust one's thoughts, feelings or behaviour so that they become more consistent with those of other people, or with accepted standards about how a person should behave in certain situations (i.e. social norms).

When we conform, we adjust or even set aside our personal preferences to fall in line with those of others. For example, conformity would occur if we do something (e.g. swear or smoke) which we do not normally do, to 'go along' with the rest of the group (who all swear or smoke). Conformity also occurs when we wear a formal evening dress or a suit (rather than jeans) to a deb ball, stand (rather than sit) when the national anthem is played at a sports event, or use a fork (rather than our hands) to eat spaghetti when dining in a restaurant.

Figure 7.25 Conformity involves adjusting our behaviour so that it meets with accepted standards in a given situation.

on Resources

Teacher weblink Videos on Asch experiment 4 m 10 s, 3 m 40 s

When we are compliant, by submitting to the demands, wishes, or suggestions of another person, we would also be considered to be conforming, but only if we are complying temporarily. For example, we may not want to wear formal clothing to a wedding or funeral, but agree to do so for the occasion when asked by a parent.

Although conformity can sometimes result in our agreeing to do something we don't really want to do and even impair social diversity and change, it has positive as well as negative aspects. For example, conformity can enhance group cohesion and the positive feelings associated with belonging to and getting along with others in a group.

In addition, conformity to social norms makes the behaviour of others in everyday life more predictable and enables us to live in relative orderliness and get along with one another. We rely on customary ways of greeting friends, addressing strangers, connecting with others through social media, behaving in groups and crowds, eating when dining out, respecting private property and personal space, lining up in queues, getting to work on time, buying things, and so on. Widespread, ongoing non-conformity would lead to confusion and social chaos.

Psychologists have conducted many experiments to understand various conditions under which conformity occurs. One of the best-known series of experiments on conformity was conducted by Polish-born American psychologist Solomon Asch in the 1950s.

7.8.1 Asch's experiments on conformity

In several classic experiments, Asch investigated group pressure to conform. In different experiments, he studied factors that he believed influenced conformity, such as group size and whether or not the group is unanimous (in complete agreement) on what should be said or done.

In one of the experiments conducted by Asch (1951), the participant came into a room that contained six other people and an experimenter and sat at the end of a long table, in a chair that had been purposely left vacant. Each participant was told they were taking part in a 'psychological experiment on visual judgment'.

The experimenter then showed two cards to the group. On one card was a single vertical line. On the second card were three vertical lines as shown in Figure 7.26). The participant was asked to select the line from the second card that matched the length of the line on the first card. In total there were 18 trials, each using a different pair of cards. In some of the trials, the difference in the length of the lines was hardly noticeable so the matching line was difficult to identify. In other trials, the three lines were noticeably different.

The participant was not aware that the other people around the table were confederates. The confederates had been instructed to answer correctly for some of the trials and to answer incorrectly for the majority of trials. After hearing the confederates' answers, the participant had to decide between giving the same answer as the others in the group (i.e. conforming), even though on many trials their answer was obviously incorrect, or giving the answer they believed was correct.

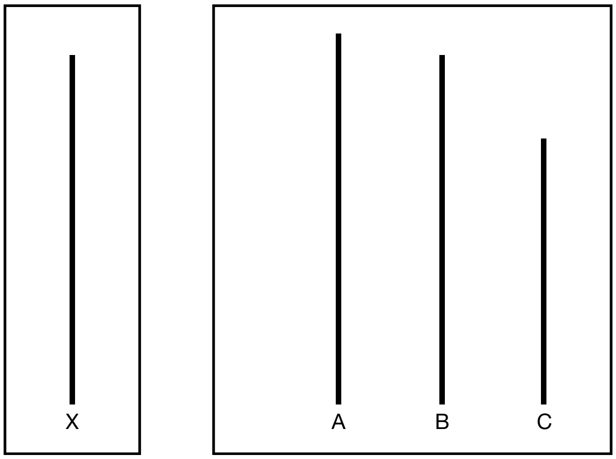

Figure 7.26 Asch's research participants were asked which of lines A, B or C was closest in length to line X.

About 75% of the participants agreed with the confederates' incorrect responses at least once during the trials. About 33% of the participants agreed with incorrect responses in half or more of the trials. However, 24% of the participants did not conform to the incorrect responses given by the confederates at all.

When the participants in Asch's experiment were questioned later, all reported experiencing some degree of self-doubt about their opinion as to which lines matched up. Those participants who had generally conformed and agreed with the answers the confederates gave, said that they were aware that their responses and the confederates' were wrong but they went along with the group because they did not want to spoil the experimenter's results and they did not want to generate disharmony or conflict. Some of the participants who gave the correct response went so far as to apologise for correctly responding. Those participants who did not conform said they felt 'conspicuous' and 'crazy', like a 'misfit' when they gave answers that disagreed with those of the rest of the group.

Figure 7.27 The unsuspecting participant (number 6) was asked to make judgments about the length of lines presented to the group, after the other group members had exerted group pressure on him by unanimously selecting the same wrong answer.

7.8 LEARNING ACTIVITY 1

Review

1. a. Define what is meant by the term conformity with reference to an example different from those used in the text.
   b. Explain whether wearing the required uniform when at school is an example of conformity or obedience.
2. Consider the Asch (1951) experiment.
   a. Briefly describe the procedure used by Asch to study conformity.
   b. Is it valid to conclude that participants gave incorrect answers because they experienced group pressure to conform? Explain with reference to the results obtained in the experiment.
   c. What explanation can you offer for the 24% of the participants in the experiment who did not conform and disagreed with the confederates' incorrect responses during any of the trials?
   d. Suggest a variation to the procedure that would use an experimental group as well as a control group for comparison purposes.
3. Which of the following factors do you believe would influence conformity in an experiment using Asch's (1951) procedures? Answer without referring to the text.
   - the size of the group
   - whether or not the group members are unanimous in their views
   - whether the group is viewed as being a valuable source of information
   - awareness of social norms
   - cultural background of participants
   - whether participants simply don't 'try hard' and just go along with the group
4. In your opinion, to what extent do the participants' responses in the Asch experiment reflect what happens in everyday life outside the laboratory?
5. Asch's experiment has been criticised by some psychologists as being unethical because of the use of deception. Is the criticism justifiable? Answer with reference to relevant ethical standards.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

7.8 LEARNING ACTIVITY 2

Analysis and evaluation of research on conformity

Prepare a flow chart summary of the main features of Asch's experiment. The flow chart should include the following. Figure 2.27 in Topic 2 shows an example of a flow chart summary.

1. a possible aim of the experiment
2. a possible research hypothesis
3. who the participants were and how they were selected
4. the experimental conditions and key variables that were tested, stated in operationalised terms
5. the main results obtained
6. the conclusion that was drawn from these results
7. whether the experiment has external validity, with reference to a possible generalisation beyond the sample
8. two main limitations or criticisms
9. key ethical issues.

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7.8.2 Factors affecting conformity

Prior to his experiments, Asch hypothesised that people would not conform in situations where they could clearly see what is correct and what is incorrect. Although most of the university students who were research participants in his experiments did not conform to group pressure that was exerted on them, many did. Asch made his views about this clear: 'That reasonably intelligent and well-meaning young people are willing to call white black is a cause of concern' (Asch, 1955).

Asch's findings also aroused interest among other psychologists and a great deal of research on conformity followed. On the basis of Asch's and other research findings, a number of key factors that influence conformity have been proposed. These include:

- the size of the group
- whether or not the group members are unanimous in their views
- whether the group is viewed as being a valuable source of information
- awareness of accepted standards about how one should behave (normative influence)
- cultural background
- social loafing.

Group size

Asch varied group size in his experiments by having 1, 2, 3, 4, 6, 7, 9 or 15 confederates unanimously and falsely state that a comparison line was the same length as the standard line. His results showed that conformity increased with group size, up to a size of four. Beyond a group size of four confederates, conformity did not continue to increase significantly. A group size of 15 actually produced a lower level of conformity than did a group size of three.

Other researchers who tested these findings have obtained similar results. A possible explanation is that as more and more people start to express the same opinion, an individual may suspect that they are behaving like 'mindless sheep' and therefore not want to 'follow in their footsteps'. However, when opinions are the same in a smaller group, an individual may think that each member of the group is behaving independently.

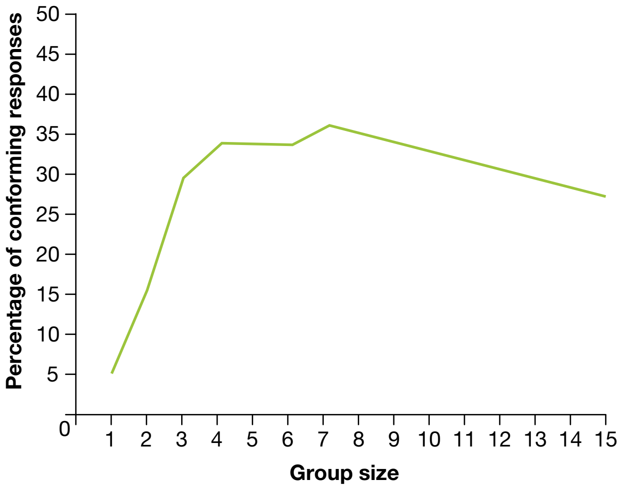

Figure 7.28 Conformity increases with group size up to about four, but beyond that, group size tends to have little influence on conformity.

This latter view may be more influential on whether a conforming response is made. Consequently, a belief that one, two or three independent thinkers have reached the same answer may have a more powerful effect than a belief that 14 people are mindlessly 'doing as the others do'. In sum, group size seems to be an important factor influencing conformity, but probably only up to a point.

Unanimity

Imagine yourself in Asch's experiment when everyone in the group gives the same answer, but an answer that is different from your answer; that is, there is **unanimity**, or complete agreement, among the other group members as to what the answer is. Would you be willing to disagree with everyone else if you believed that they were all incorrect? The results of Asch's experiment indicate that it is difficult to be a minority of one, to stand against the group, even when you think you are right and everyone else is wrong.

However, Asch also found that it takes only one person to disagree with the group's judgment to significantly affect conformity. When he allowed one confederate to answer in the same way as the research participant, the amount of conformity reduced by about 80%.

Experiments by other psychologists who subsequently investigated this 'ally effect' have found that when research participants are led to believe that their thoughts, feelings or behaviour are supported, shared or not disagreed with by someone else in their group, even when everyone else in the group agrees with a different view, the presence of the ally leads to a reduction in the level of conformity. The presence of an ally who shares one's view, or at least doesn't accept the views of the majority, can be seen as providing social support that strengthens resistance to conformity.

Figure 7.29 A group's unanimity creates pressure to conform, but it takes only one individual to disagree with the group's judgment to significantly affect conformity. This iconic photo shows a lone man standing directly in front of a line of tanks leaving Tiananmen Square in Beijing on June 5, 1989, the day after the Chinese government's violent crackdown on protestors who had gathered there to call for greater democracy. As the lead tank tried to go around the man, he repeatedly shifted his position in order to block its path once again. He was eventually pulled away by onlookers. To this day, who he is and what happened to him remains unknown. But the 'Tank Man' remains a powerful symbol of defiance and non-conformity to injustice.

on Resources

Weblink Video showing the Tiananmen Square tank man 2 m 55 s

Informational influence

In other experiments on conformity, psychologists have found that individuals are more likely to conform to the views of group members when they want to provide a correct response but they are unsure about what the correct response is.

For example, suppose that you want to buy a car and have narrowed your preferences down to two cars, a red car and a purple car. They are both about the same price but have some different features. You don't know much about cars so you seek advice from a friend who does. Your friend checks both cars and recommends that you buy the purple one because it has lower kilometres on the odometer, the tyres are less worn, the registration will take longer to expire and the engine runs more smoothly.

If you accepted your friend's recommendation, then you would be conforming because information they provided influenced you to make a specific choice. In this case, you were motivated to make the right choice, viewed your friend as a valuable source of information that you lacked, then were guided by the information your friend provided when deciding what to do. **Informational influence** occurs when conformity results from a need for direction and information on how to respond in a specific situation.

Informational influence leads people to accept other people's views when they are uncertain about what to do so they are guided by what others who are believed to know better say or do. In a group situation, we want to be correct, assume that when others agree on something they say must be right, so we are inclined to agree with them.

Research studies have found that informational influence is more likely to lead to conformity when participants feel incompetent, when the task is difficult, or when participants are very concerned about being right (Myers, 1990; Hewstone et al., 2008). In all these situations, we may be motivated by wanting to make good accurate judgments and to be 'right', so exposure to relevant information can influence us to conform.

Normative influence

When informational influence leads us to conform, we conform because we want to be right. When normative influence leads us to conform, we conform because we want to be liked and accepted by the group. We also to avoid any negative personal consequences, such as ridicule and ostracism (ignoring or excluding us).

Normative influence to conform occurs when our response in a group situation is guided by one or more social norms. When we are aware of social norms for a particular situation, awareness of these norms can be a powerful influence on both the likelihood that we will conform and the strength of conformity that occurs.

Research suggests that this may be partly explained by our desire to be liked and accepted by other people, as well as our concern with being rejected by others. We also like to receive praise and approval from others, particularly from those who are important in our lives, such as friends, parents, teachers and employers.

A useful way of meeting these needs for acceptance and approval is to be (or appear to be), as similar to others as possible (Hewstone et al., 2008). From a very young age, at home and at school in particular, we learn that agreeing with other people and behaving as they do when the situation demands it usually brings positive results. People are more likely to like and accept us, and may even give us praise or approval when we conform. They are also less likely to reject, ignore or exclude us, all of which are undesirable for most people.

Figure 7.30 Social norms influence conformity to unstated rules for queue behaviour that help maintain order. For example, even when you are in a hurry, you have to join the back of the queue.

Culture

Asch's experiment using the line-judgment task has been conducted by researchers in many different countries and cultures throughout the world. Sometimes it has been carried out under the same conditions (to test for *repeatability*) and at other times it has been carried out with variations under changed conditions (to test for *reproducibility*); for example, by using patterns rather than lines or participants of different social backgrounds, such as gender, age and educational qualifications

When British psychologists Rod Bond and Peter Smith (1996) examined the results of 133 of these 'Asch-type' experiments that had been conducted in 17 different countries, they found differences in levels of conformity. As shown in Table 7.4, conformity was found to occur less in North America and Western Europe (e.g. France and Portugal) than in other parts of the world such as Africa, Fiji and Asia (e.g. Hong Kong and Japan).

Table 7.4 Results of Asch-type conformity studies across different cultures associated with different countries or regions

Nation	Number of studies	Averaged effect size
Asch's USA studies	18	1.16
Other USA studies	79	0.90
Canada	1	1.37
UK	10	0.81
Belgium	4	0.94
France	2	0.56
Netherlands	1	0.74
Germany	1	0.92
Portugal	1	0.58
Japan	5	1.42
Brazil	3	1.60
Fiji	2	2.48
Hong Kong	1	1.93
Arab samples (Kuwait, Lebanon)	2	1.31
Africa (Zimbabwe, Republic of the Congo (Zaire), Ghana)	3	1.84

The averaged effect size in the right-hand column is the result of a statistical procedure to allow the results of Asch-type studies to be combined and averaged across different studies. The smaller the effect size, the lower the conformity, and the greater the effect size, the higher the conformity.

Source: Smith, P.B.,& Bond, M.H.(1998). *Social psychology across cultures* (2nd ed.). Boston, Massachusetts: Allyn & Bacon, p.16.

When Bond and Smith grouped according to cultural orientations, they found that the lowest level of conformity occurred in *individualist cultures* where achievement of personal goals tends to be placed ahead of achieving group goals. In addition, people who maintain independence and resist group pressure tend to be viewed as strong-minded and regarded more positively than those who conform. Consequently, conformity to incorrect answers

Figure 7.31 Conformity can be influenced by cultural norms. (a) The collectivist culture predominant in Japan and other Asian countries tends to be more conformist; whereas (b) the individualist culture predominant in Australia and other non-Asian countries tends to be less conformist. Autonomy and self-reliance tend to be highly valued in Australian society in general so it is considered to be a collectivist culture (though this is not true of all social groups in Australia).

given by the group in an Asch-type experiment would tend to be regarded as undesirable and weak.

The highest level of conformity occurred in *collectivist cultures* where individuals tend to be encouraged, and sometimes expected, to place group goals ahead of their personal goals. These cultures also encourage uniformity ('everyone being like everyone else') and values and beliefs that promote conformity and 'fitting in' for the good of the wider community, rather than individuality. Consequently, conformity to incorrect answers given by a group of confederates in an Asch-type experiment would tend to be regarded as appropriate (Bond & Smith, 1996; Smith & Bond, 1998).

Social loafing

Sometimes the presence of others in a group situation results in reduced performance, especially when the other people are co-workers or team mates. This reduction in the effort of an individual member of the group as a result of the presence of others is called social loafing.

Social loafing refers to the tendency of an individual to make less effort when involved in a group activity than when working alone. It was first systematically studied and observed in a tug-of-war experiment involving two teams of eight people. The results showed that the collective effort exerted by each team did not match the total of the individual efforts. For example, blindfolded participants who were assigned the first position in the tug-of-war machine shown below and told to 'pull as hard as you can' pulled 18% harder when they knew they were pulling alone than when they believed that others were also pulling (Ingham et al., 1974).

In the laboratory, social loafing has been observed for a range of other tasks in group situations, including, shouting and clapping, pumping water or air, writing poems or editorials, producing ideas and typing. However, most of these studies were conducted with American and European participants. Research on social loafing using Chinese participants has found that participants work harder in a group situation than when they work alone. This finding indicates

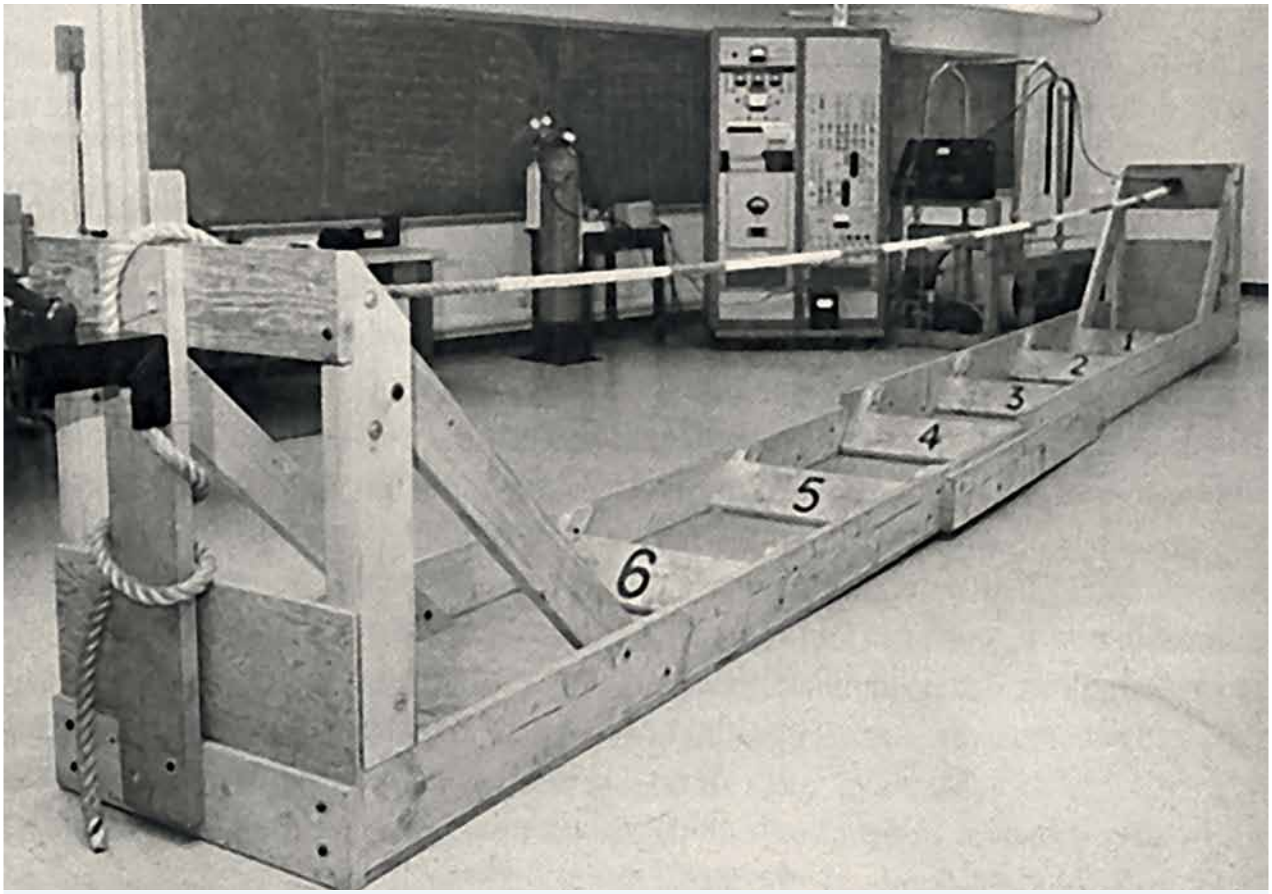

Figure 7.32 This tug-of-war apparatus was used in an experiment on social loafing. Participants in the first position did not pull as hard when they thought that people behind them were also pulling.

a cultural difference in social loafing that may be relevant to additional cultures, particularly collectivist cultures (Moghaddam et al., 1993).

Social loafing can also be observed in everyday life situations. For example, some workers who do not pay for membership of a union may be considered social loafers if they accept the improved benefits for workers achieved by the union.

Generally, social loafers conform to their group, but with less effort. This is based on their belief that conforming (or not conforming) will not make much of a difference in what the group decides (or does), so they just go along with whatever the group agrees to do (or does).

The influence of social loafing on conformity can depend on many different factors. Experimental research findings indicate that people are less likely to 'loaf' in groups when the group consists of friends rather than strangers, but this depends on the extent to which the group's decision or behaviour is of importance to the individual. For example, an individual is less likely to conform through social loafing when they view their group's outcome as important, challenging or appealing.

American psychologists Steven Karau & Kipling Williams (1993) analysed the results of 78 research studies on social loafing and found that social loafing is less likely to influence conformity, if at all, when:

- maximum effort from everyone in the group is essential for the group's goal to be attained
- the group is valued by its members (e.g., the group is made up of close friends)
- the task is important, challenging or appealing to those performing it
- the group is small
- members of a group believe that it is possible for their individual performance to be judged in some way
- other group members are not expected to perform well so social loafing might lead to failure on the task
- those working on the task are women rather than men.

Figure 7.33 Conformity by social loafing is eliminated entirely when maximum effort from every individual member of a group is essential for the group's goal to be attained.

7.8 LEARNING ACTIVITY 3

Review

1. Name and briefly describe three factors that influence conformity, with reference to relevant examples and research findings.
2. If you completed question 3 in 7.8 learning activity 1, check your answers. Which of the factors did you believe would influence conformity? Does this suggest 'common sense' is adequate in science? Briefly explain your answer.
3. Explain whether deindividuation can influence conformity in a group and, if so, how.
4. In what way are conformity and obedience similar and in what way are they different?

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

7.8 LEARNING ACTIVITY 4

Multiple-choice questions

1. Isabella doesn't know which of three outfits she could buy for the upcoming deb ball is the 'best one' so she accepts the advice of her older sister on which outfit to buy. Isabella's conformity to her sister's advice has most likely been swayed by
   A. social loafing.
   B. cultural influence.
   C. normative influence.
   D. informational influence.
2. Theo doesn't usually worry about 'good manners' when eating at home with his family but is well-mannered when eating out with his family in a restaurant. Theo's conformity when in a restaurant has most likely been swayed by
   A. social loafing.
   B. deindividuation.
   C. normative influence.
   D. informational influence.
3. Flynn doesn't actually enjoy alcohol but he still goes to the local hotel to drink alcohol with his workmates after work on Fridays because 'everyone else wants to go'. Flynn's conformity to his group of workmates has most likely been swayed by
   A. culture.
   B. social loafing.
   C. deindividuation.
   D. unanimity.
4. The reduction of effort that may occur when a group member believes their individual contribution cannot be identified is called
   A. unanimity.
   B. social loafing.
   C. deindividuation.
   D. normative influence.
5. Guards in Zimbardo's Stanford Prison Experiment may have been influenced by deindividuation and _____ when they abused prisoners.
   A. unanimity.
   B. group size.
   C. social loafing.
   D. the collectivist culture.

To answer these and additional questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

7.9 Influences of media on behaviour

We live in an age of mass communication in a media-saturated world. Most people now have access to traditional media such as television, and most also have access to the newer media technologies such as a smart phone, laptop, tablet and an internet connection. In the last 20 years or so, smart phones and internet-enabled electronic devices have transformed the world into a 'global village'. Lockdowns and isolation brought about by the COVID-19 pandemic increased dependence on the newer media technologies, especially the need for social media to connect with others, to study, or to do paid work from home.

An ever-increasing number of people have never known life without a computer or the internet. In time, many will have never handled a print newspaper or magazine. The traditional media has moved online. We are now watching TV shows and streaming video content and movies on our phones and iPads while on a stationary bike at the gym or on the bus to school or work. We can check messages, posts or the latest viral memes while waiting in a queue or walking the dog. We can check the weather forecast, book concert tickets or watch the news or a YouTube music video whilst drinking a smoothie at the local shopping mall.

Advertisements pop up on our screens, often promoting products linked to a previous online purchase. Subscription services for information and entertainment are a part of the family budget alongside food, power and other essential household expenses. According to a Deloitte's (2021) survey, every second Australian aged 18–75 years is now monitoring their health and fitness using a smart phone, smart watch or fitness band.

Digital media has not only changed how we socially connect and communicate with each other, but also how we gather and use information about the world and how we present ourselves to others. It influences how we perceive the world and therefore our conception of social reality. Social media is no longer in its infancy. It has come of age and given us access to a diverse range of opportunities for 24/7 information, entertainment and social interaction.

Our access to increasingly sophisticated digital media and a vast array of applications ('apps') has generated new questions and new research about

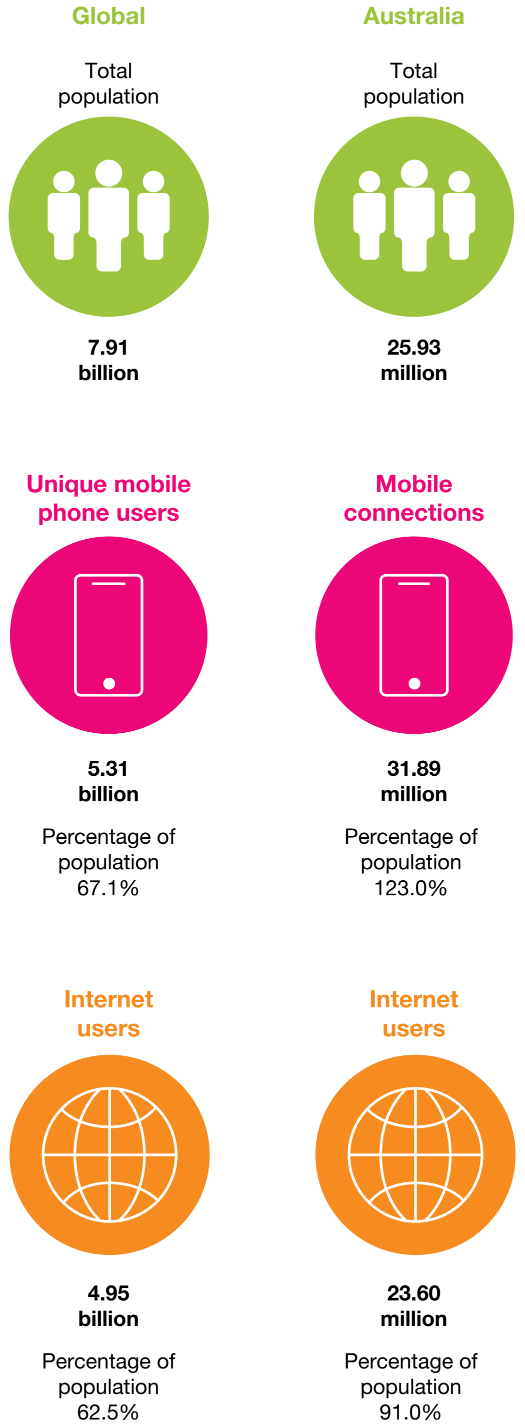

Figure 7.34 Estimated adoption and use of connected digital devices and services globally and in Australia as at January 2022.

Source: Hootsuite (2022). *Digital 2022: Global overview report*. https://hootsuite.widen.net/s/gqprmtzq6g/digital-2022-global-overview-report the positive and negative influences in our lives, particularly in children and adolescents as digital media use has become the most popular leisure time activity for them.

This research has been in three areas. First, there are studies that have examined how often and for how long people interact with different types of media. Second, there are studies investigating how the media is used. Third, there are studies that consider the effects of media on our lives. In this subtopic, we focus on the latter.

Positive and negative influences

Australians of all ages use traditional and new media technologies frequently and in a variety of ways. Generally, usage is for four main purposes — as a source of information (including education), for business and online transactions (including online purchases), for entertainment and for social interaction and communication. Figure 7.35 shows the media used in Australian homes, in order of popularity, during the COVID pandemic in 2020 and 2021.

As the new media technologies continue to become embedded within homes and schools, psychologists have become increasingly interested in the positive and negative influences on individual and group behaviour. Generally, the research shows that it is not the amount of screen time that should be of most concern. This tends to reveal little. Instead, the focus should be on what people are actually seeing and doing during their screen time and the potential effects of reduced time spent doing other activities such as physical activity, sleep or homework.

7.9.1 Television

TV viewing during free time has gradually been eroded in the past decade by social media and other online activities. However, it continues to be a relatively popular form of entertainment in all age groups despite changes in the way it is watched.

For example, growing numbers of all ages are also watching TV programs (including movies) through mobile devices, often while multitasking by playing digital games, doing homework or using social media. There is also an increasing preference for watching TV content through a streaming service such as Netflix and Stan, especially by younger people.

Among children, about 1 in 7 aged 3–7 years have a TV set in their own bedroom and many have other devices that can also be used to watch programs, especially tablets. Some watch many hours of TV each day, but the amount is influenced by parental control, time available, social factors such as the parents' occupations, income levels, educational backgrounds and cultural backgrounds.

As shown in Figure 7.36 on the next page, children aged 0–14 years watch around 90 minutes of TV screen content a day. Table 7.5 shows age-related TV viewing data for people aged 14–75+, as well as data for other screen content used for entertainment (ACMA, 2017; Mundy & Patton, 2020).

Most of the research on the influence of television (including DVD movies) has targeted young children, especially short- and long-term effects of observing violence in screen content.

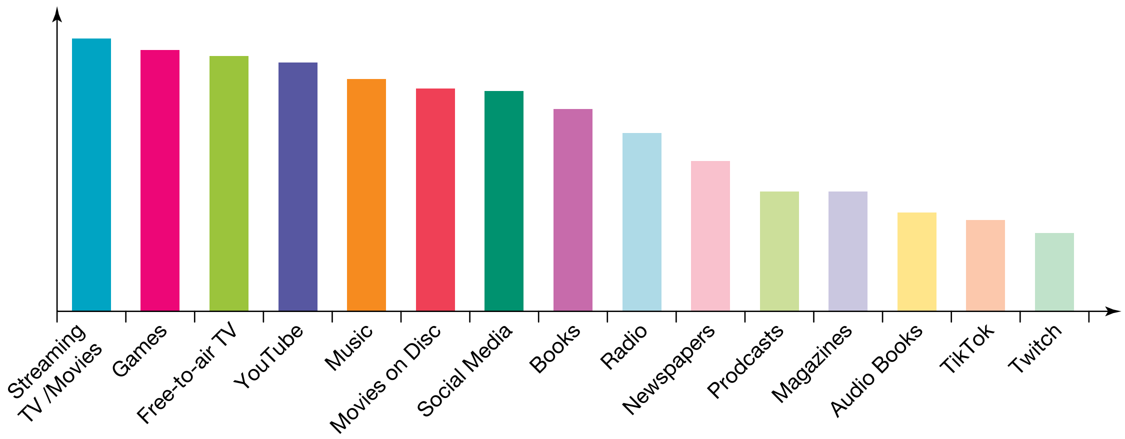

Figure 7.35 Popularity of different media in Australian homes in 2020–21

Source: Brand, J.E., & Jervis, J. (2021). *Digital Australia 2022*. Eveleigh, IGEA.

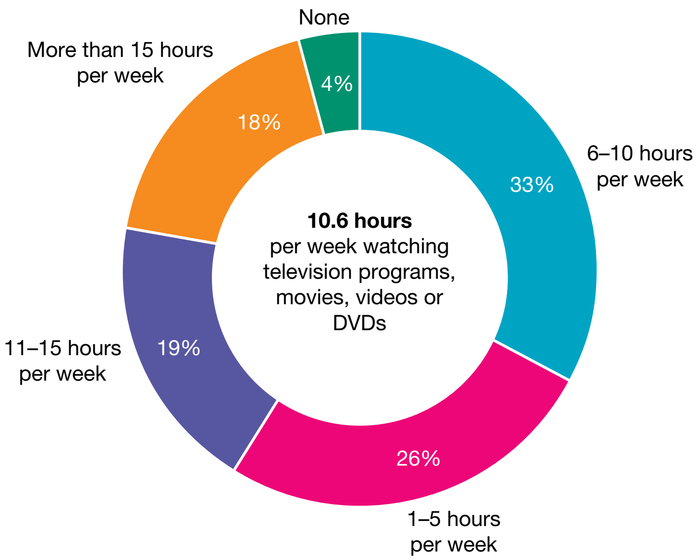

Figure 7.36 Amount of TV watched in a typical week by children aged 0–14 years

Source: Screen Australia (2017). Children's television viewing and multi-screen behaviour. Analysis of 2005–16 OzTAM audience

Table 7.5 A generational snapshot of TV viewing and streaming services for people aged 14–75+ years

Age group	Hours of live free-to-air TV watched each week	Hours of paid streaming TV/ movie services watched each week	Hours of free streaming video services (e.g. YouTube, TikTok, Facebook) watched each week
Gen Z (14–24 years)	7	11.22	14
Millennials (25–38 years)	9	11.6	9
Gen X (39–55 years)	13	8.76	6
Boomers (56–74 years)	18	6.86	4
Matures (75+years)	17.5	5.19	2
Mean for all ages	12.9	8.73	7

Source: Deloitte (2021), *Media consumer survey: Australian digital entertainment audience preferences (tenth edition).*

A number of Australian and international studies have found that watching TV has no significant benefit for children under 2 years of age, nor is it likely to have any other positive or negative influence. This is mainly because of their limited ability to attend to and cognitively process the onscreen information.

Although many parents believe that children under 2 years of age can develop their verbal language skills from watching TV, research shows that infants are more likely to learn far more new words from their adult caregivers than from the usual TV screen content (Anderson & Pempak, 2005; Krcmar et al, 2007; Smith et al., 2011).

Young children over the age of 2 years are more able to interact with what they see on the screen; for example, by clapping hands and imitating behaviours. By the age of 5, children can watch TV programs attentively, even when they are in an environment where they can be easily distracted. Consequently, the content of what is being watched can be influential.

As they get older, children tend to watch TV primarily for entertainment but research studies have found that they do not passively sit there and take in everything. They make a number of choices about what they will watch, when they will watch it and how much attention they will give it. They show a lot of interest in content they understand which is funny or fascinating. They like character movement, animation, sound effects, and children's or women's voices. Violence does not have to be present to keep them interested. The majority of children aged 0–14 years 'like best' TV programs that are specifically made for them (Screen Australia (2017).

TV programs can influence the behaviour and psychological development of children with the views of reality they depict and the messages they convey about how other people in the world act and react. As we get older we become increasingly able to distinguish between fact and fantasy in screen content and to recognise the subtle range of fact and fiction in many programs. But people can hang on to early beliefs while false stereotypes and other misconceptions about the world can persist through adulthood (Lemish, 2007).

Figure 7.37 Young children over the age of 2 years are more able to understand and interact with TV screen content.

Generally, many psychologists believe TV has a huge potential to positively influence the behavioural and psychological development of children and others of all ages. For example, various TV programs are educational and can increase our knowledge of the world beyond our everyday environments. We can learn about different cultures, the wonders of nature, human achievements and human failures. TV programs can also keep us informed of news and current affairs. They can expose us to issues that make us reflect on our ethics or morals. They can expose us to different sports and even motivate us to play. Similarly, watching a concert, a musical, a drama or a documentary about space travel, a scientific discovery, a famous artist or humanitarian work might inspire us to try something new.

Of particular concern to many psychologists (and parents) is the potential for early exposure to excessive violence. TV programs in general include a large number of violent interactions. In particular, aggressive incidents (physical and verbal) occur in all aspects of TV — in movies, dramas, comedies, cartoons, news, music videos, trailers and advertisements. This means that a child might see thousands of examples of aggressive behaviour each year. Furthermore, a significant amount of the televised violence to which children may be exposed is either glamorised (e.g. an action hero portrays it) or trivialised (e.g. it is shown as entertaining, or the consequences for the victim are ignored) (Rutherford et al., 2010).

The potential effects of observing violence provide the most controversial and widely researched topic in psychology with regard to television. Although there is conflicting evidence on the effects of observing violence, public opinion tends to blame TV programs for the increasing prevalence of violence in our society.

What does research indicate are the effects that observing televised violence has upon children? According to the Australian Psychological Society (2013):

- exposure to violent television can and does influence children's feelings, attitudes and behaviour
- it is generally agreed that prolonged exposure to television violence is one of a number of factors which lead to children being more likely to display aggressive behaviour in both the short term and the long term
- some children enjoy, and develop an appetite for, viewing violent material
- viewing violence on television leads to immediate distress and fear in many children
- many children retain longer-term recurrent disturbing memories from viewed violence
- exposure to media violence can contribute to beliefs that aggression is an acceptable and effective behaviour, can induce fear and anxiety and the belief that the world is 'a mean and scary place'

- continual exposure to media violence increases the likelihood that children will be desensitised to real violence
- age and gender are important influences on the nature of the effects, with younger children likely to be more susceptible to learning from TV
- the social context of viewing is important in determining the effects of exposure to violent television; for example, if an adult helps the child interpret and critique the viewed material, the negative effects are lessened.

Although various studies suggest that there is a significant link between TV violence and aggressive behaviour, a direct causal link has not been established. Factors that need to be considered when investigating the effects of TV violence include whether the violence appears to be realistic (as opposed to the unrealistic violence of cartoons), whether the violence seems to be defensible or justified, and the situation in which the violence occurs. The characteristics of the observer are also important; for example, some children may be more likely to become aggressive and may therefore be more easily influenced by observing violence.

Before TV was around, some people still behaved aggressively. Every behaviour has many determinants, and to say that one single factor such as TV viewing causes a certain behaviour would be simplifying the issue too much. Television is no longer the only media source of violent examples, and children can observe aggressive behaviours in other media, including when playing video games.

Figure 7.38 Every behaviour has many determinants, and to say that one single factor such as TV viewing of certain behaviour causes that behaviour would be simplifying the issue too much.

on Resources

Weblink	Disney stereotypes 3 m 40 s
Teacher weblink	TED talk on how TV affects the child's brain 16 m 11 s

7.9.2 Video games

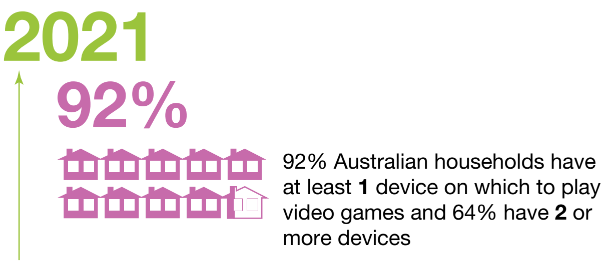

Figure 7.39

Source: Brand, J.E., & Jervis, J. (2021). *Digital Australia 2022*. Eveleigh, IGEA.

In 2021, around 9 out of 10 Australian homes had at least one device on which to play video games and more than 17 million (66%) of Australia's 25.8 million residents played at least 1 video game each day for about 1 hour on average.

Of the 9.5 million homes in which games were played, more than 6 million (64%) had 2 or more devices on which they could play games. Mobile phones are the preferred gaming device.

The largest proportion of players played casually between 1 and 3 times a day for 5–10 minutes at a time. This took place just about anytime and anywhere.

It was also found that the majority of all Australians who played video games in 2021 are working-age adults aged 18-64, with a mean age of 35 years (up from 24 years in 2005 when the research was first conducted). Males tended to play more than females across all age groups, but there was not a huge difference in playing time (Brand & Jervis, 2021; Hootsuite, 2022).

Most people choose to play video games simply to have fun, but reasons may vary in relation to age. For example, players aged 18–34 play primarily for fun and to pass the time or relieve boredom, whereas those aged 65 years and older report that 'keeping the mind active' is also an important motivator for play (Brand & Jervis, 2021). Games are also increasingly used by teachers at schools throughout the world as part of their school curriculum or for extra-curricular experiences. They may also be used for education and training in tertiary institutions and workplaces.

As with television, most of the research on video game playing has focused on children and adolescents. This has been influenced by widespread use of the games and community concerns.

For example, many parents worry about their child spending too much time playing video games instead of reading a book or playing outside and getting exercise. Similarly, many parents worry that playing video games might have a bad effect on the way their child behaves, especially if the game has lots of fighting in it and may therefore encourage their child to be violent (Orlando, 2017).

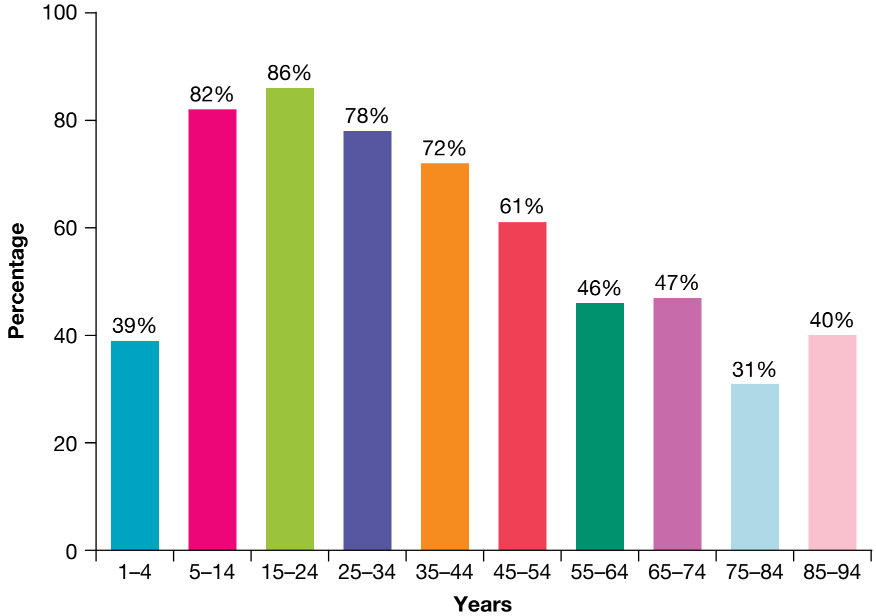

Figure 7.40 Age groups of video game players in Australian households in 2021

Source: Brand, J.E., & Jervis, J. (2021). *Digital Australia 2022*. Eveleigh, IGEA.

Video games can have both positive and negative influences. Researchers have found that the effects, whether good or bad, tend to vary according to five factors:

1. *amount of game play* e.g. length of time; whether played in lengthy sessions or spread across smaller chunks; whether played for prolonged periods over many days or weeks
2. *game content* e.g. whether educational, prosocial or violent; skill or knowledge requirements
3. *game structure* e.g. built-in features; driving game, shooter game etc.; 2D vs 3D; realistic vs unrealistic
4. *game mechanics* e.g. devices used to play the game, such as a mouse, keyboard or steering wheel for a driving game
5. *game context* e.g. situation in which the game places the player; single or multi-player; who with if multi-player; cooperation vs competition if multi-player.

Each factor can exert its own influence on a player and combine with other factors in multiple ways for an overall effect. Furthermore, some factors may have a positive effect and others a negative effect at the same time.

For example, spending a lot of time game playing (*amount*) can have negative effects, such as poorer school performance and increased risk of obesity, whereas the *structure* of a game may actually improve skills, such as visual attention and eye — hand coordination. And if it is also a violent game (*content*), this may increase aggressive thoughts and feelings which may worsened (or weakened) if played with friends competitively (or cooperatively) online (*context*) (Stone & Gentile, 2008; Gentile, 2022).

The advent of video games raised new questions about the potential impact of media violence, since the video game player is an active participant rather than merely a viewer. This means that a player is directly responsible for aggressive, sometimes extremely violent, actions.

In a meta-analysis of studies on violent video game playing in different cultures, American psychologist Craig Anderson and his colleagues (2010) concluded that exposure to violent video games is a 'causal risk factor' for increased aggressive behaviour, increased aggressive thoughts, increased aggressive emotions, decreased empathy and decreased prosocial behaviour. Another meta-analysis of 98 studies involving 36 965 participants in multiple countries obtained evidence supporting this conclusion. In addition, playing violent video games was found to have both short-term and long-term effects (Greitemeyer & Mügge, 2014).

These findings are similar to results from studies on television violence but exposure to game violence is viewed as more serious because of the interactive nature of video game violence. In particular, the player is encouraged to identify with an avatar, which then engages in violent actions at the command of the player (Rutherford et al., 2010).

Other researchers have found that violent video game playing does not necessarily translate into violent behaviour in the real world. In addition, researchers who have evaluated studies reporting a link between video game violence and real-life violence have found that many of these studies did not control for potential confounding variables such as the mental health condition and family environment of participants. Furthermore, children and adolescents who are already at risk for aggressive and violent behaviour may be more likely to choose to play violent video games (Ferguson, 2011; Jerabeck & Ferguson, 2013).

Overall, the results of research studies suggest that, as with viewing of television violence, there can be negative influences of video game violence but, for most children and adolescents, it may be only one of a number of factors contributing to violent behaviour.

There is no single factor that can drive someone toward violence or aggression, but violent video games could be one risk factor and not necessarily a causal factor.

Figure 7.41 The player is an active participant in violent video games rather than a passive viewer.

According to an American Psychological Association (2019) task force that reviewed 176 research studies on violent video game use, there is considerable evidence linking violent video game playing to violent behaviour (but insufficient evidence to link the games to actual criminal violence). The conclusions of this task force included:

- 'Research demonstrates a consistent association between violent video game use and increases in aggressive behaviour, aggressive cognitions and aggressive emotions and decreases in prosocial behaviour, empathy and sensitivity to aggression.
- The recent research demonstrates that the above effects may persist over some time spans.
- Higher amounts of video game use are associated with higher levels of aggression and other adverse outcomes.'

Another major concern about video games is that some people become addicted to game playing. For example, they may play for many hours throughout each day and become so preoccupied with playing that they think about a game when not playing, skip social activities, school and/or work, and even neglect meals, sleep and personal hygiene. They may know that they play too much and their play is maladaptive but are unable to stop or cut back on their game playing time.

The prevalence of video game addiction among people of different ages is unknown and much research remains to be done. The World Health Organization (2018) has reported that it is a mental health 'disorder' that 'affects only a small proportion of people who engage in digital- or video-gaming activities'.

A third major concern about video games is that game playing may result in social isolation and inhibit development of important social interaction skills. However, being a player does not mean being a loner, even if the player has a video gaming addiction.

Many games are now designed to promote cooperative play or competitive multiplayer activities. Time spent playing games often means time spent socially interacting. As many as three-quarters of video game players actually play these games socially, sometimes online, but mostly with family members and other people who are in the room with them.

According to an eSafety Commissioner (2021) survey, in September 2020, 77% of Australian teenagers aged 12–17 played games online with others. Furthermore, up to one third of players report having made new friends through video game play (Lenhart et al., 2008; Brand & Jervis, 2021). However, much research still needs to be conducted on whether online social interaction through gaming has the same potential benefits as the interpersonal interactions we have in real life.

Of course, numerous video games do not have any violence whatsoever and many of these games can have positive influences. Many video games provide valuable learning opportunities and assist development of literacy and numeracy skills.

There are also educational and community-oriented games in which people address issues and solve problems, either individually or collaboratively with others. Many of these games involve thinking about social, moral and ethical issues, and decision making about how a virtual community, city or nation

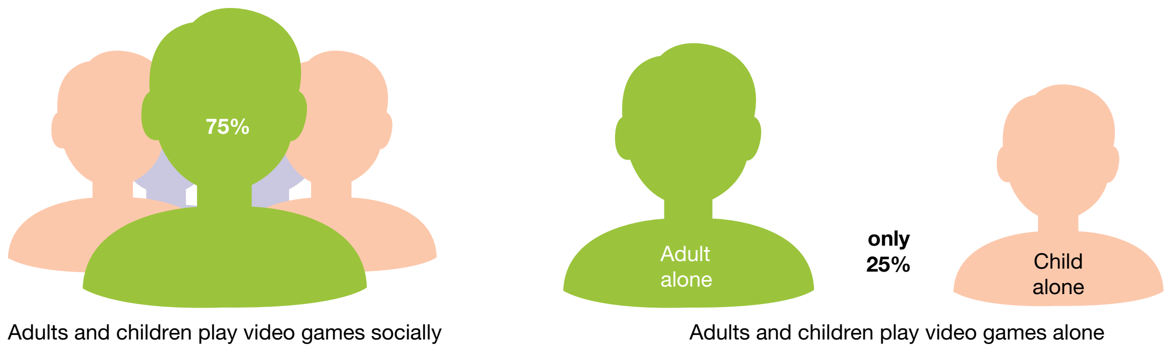

Figure 7.42 Video game playing tends to be a social experience in most Australian households.
Source: Brand, J. E., & Jervis, J. (2021). *Digital Australia 2022*. Eveleigh, IGEA.

should be run. Some of the less complex games played by young children can help the development of fine motor skills and coordination. They can also contribute to development of digital literacy and confidence about their use of the technology.

Many parents are concerned that time spent video game playing is less time getting exercise. However, research shows that low levels of game time do not necessarily lead to higher levels of physical activity.

Finally, that people of all ages primarily choose to play video games simply to have fun is no small thing. Video games give millions of people around the world an enormous amount of joy.

7.9.3 Social media

The most significant change in media use during the past decade has been the growth in the number of Australians of all ages using social media. It is now the second most popular media activity after watching television.

Social media are apps and websites, such as Facebook, YouTube, Instagram, TikTok, Snapchat, Wikis and online blogs, that enable users to create and share content or to participate in social interaction.

Various research reports indicate that over 80% of Australians actively use social media services through multiple apps. For many, social media is a regular part of everyday life. It accounts for about one-third of the time spent online.

On average, about 1 in 3 people aged 14 years and over check a social media app at least five times a day, mostly from their smart phones, to keep their 'finger on the pulse' and get a real-time perspective of what is happening around them, especially with friends and family.

Facebook is the most popular social media service by a significant majority. It is used by over 16 million (60%) of Australians who are eligible to have an account (> 13 years old). About 50% of the country logs onto Facebook at least once a day. Visitors spend an average of around 18 minutes per day on Facebook, with many younger people spending well over an hour in a single session checking updates, posting, commenting or liking. YouTube is also used by over half of Australians (54%). In addition, over 1 in 5 use Instagram, Twitter, LinkedIn, Pinterest, Snapchat or TikTok (Yellow, 2020; Glenroe, 2022; Hootsuite, 2022).

Table 7.6 The internet gives access to numerous social media services. A generational snapshot of social media use for people aged 14–75+ years

Age group	Check social media at least 5 times a day
Gen Z (14–24 years)	35%
Millennials (25–38 years)	28%
Gen X (39–55 years)	14%
Boomers (56–74 years)	6%
Matures (75+ years)	5%

Source: Deloitte (2021). *Media Consumer Survey 2021: Australian digital entertainment audience preferences (tenth edition)*.

Table 7.7 Reasons for using social media by Australians aged 18–65+ years

Reason	Social media users
Catching up with friends and family	83%
Share photos/videos	39%
Watching videos	32%
Finding or connecting with people who have similar interests	31%
Follow the accounts of influencers, celebrities, experts or bloggers	17%
Catching up on news and current affairs	10%

Source: Yellow (2020). *Yellow social media report 2020. Part 1 – Consumers*; Glenroe (2022). *Social media statistics for Australia (Updated January 2022).*

Social media is also an integral part of the lives of younger Australians aged 12–17 years. For example, according to eSafety Commissioner (2021) research, as at September 2020, teenagers spent an average of 14.4 hours a week online. Figure 7.43 shows what they did with that time when online. For example, 9 in 10 used the internet and various social media to research topics of interest, watch videos, chat with friends and listen to music.

It was also found the most popular social media services were YouTube (72%), Instagram (57%), Facebook (52%, down from 66% in 2017), Snapchat (45%) and TikTok (30%, up from 12% in 2017). As with older people, multiple social media services were used, with the average number increasing with age. Those aged 12 to 13 used an average of 3.1 services compared with 4.5 for those aged 16 to 17.

Facebook and other social media have changed how we connect and socially interact, not just by younger people. The data on social media usage shown in Figure 7.43 and Figure 7.44 suggest an important positive influence in fostering and supporting social networking and communication. Social media helps people stay connected with friends and family, regardless of geographical distance and other physical constraints.

Lockdowns and isolation during the COVID pandemic highlighted the value and benefits of social media for maintaining contact with others. Research has shown that, overall, those involved in social media 'bubbles' experienced lower loneliness and psychological distress during COVID.

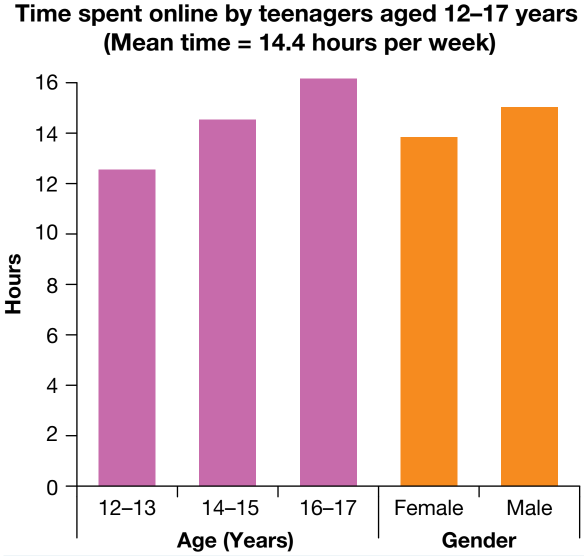

Figure 7.44 Time spent online by teenagers aged 12–17 years

Source: eSafety Commissioner (2021). *The digital lives of Aussie teens: February 2021*.

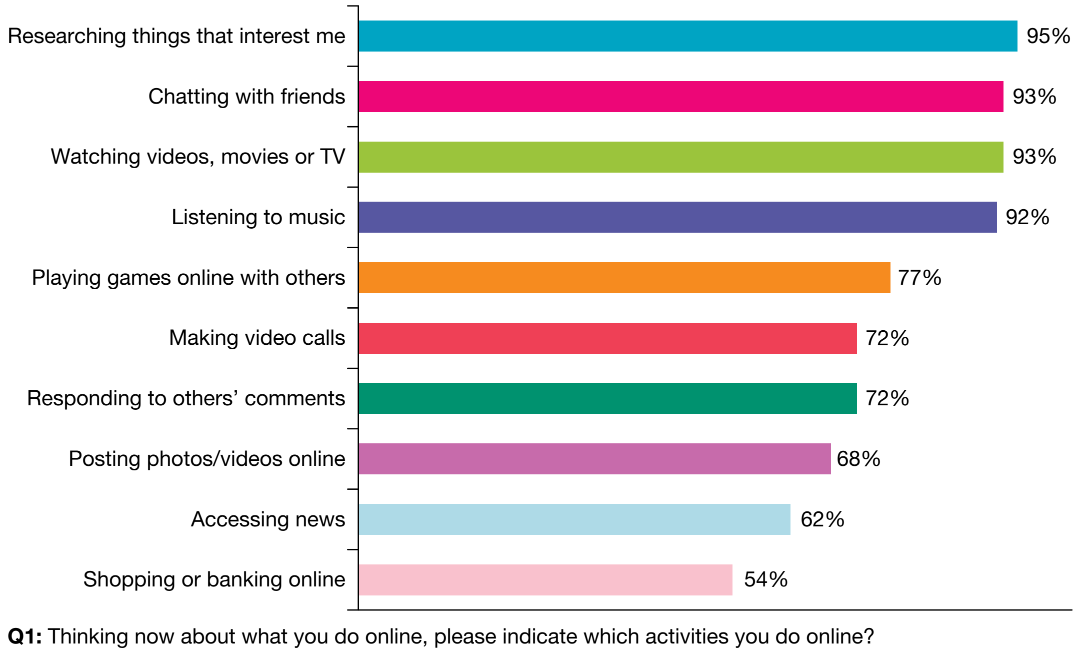

Figure 7.43 Social media and other online activities by teenagers aged 12–17 years

Source: eSafety Commissioner (2021). *The digital lives of Aussie teens: February 2021*.

Outside the pandemic period, more people report that social media has strengthened relationships with family and friends rather than weakened those relationships. For shy and introverted people, social media can help overcome barriers to connectivity with others as it enables friendships and communication behind the security or safety of a screen.

Another positive influence of social media is its educational benefits. For example, as well as promoting digital literacy, it provides a means of accessing and exchanging a diverse range of information through services such as YouTube, Wikis, online meeting platforms, discussion forums and blogs that can promote learning in engaging ways.

But social media can also negatively impact on learning, especially when it is a distractor or time waster at critical times. For example, researchers have found that middle school, senior school and university students who checked Facebook at least once during a 15-minute study period achieved lower grades than students who did not. Similarly, research shows that the more time students spend on Facebook, the more likely it is that their grades suffer, especially if they use Facebook for more than two hours a day and are lower achieving students. Of course, these problems may have more to do with the ability, self-regulation and focus of users than the social media service itself (Rosen, 2011; Junco, 2015; Wakefield & Frawley, 2020).

As with video gaming, concerns have been expressed about a negative influence of social media on development of our social skills and overall social wellbeing due to the absence of face-to-face contact in the 'real' world where we can touch and hug. It has also been suggested that social media sites can make it more difficult for us to distinguish between the meaningful relationships we foster in the real world, and the numerous casual relationships formed through social network sites. By focusing so much of our time on these less meaningful relationships, our most important connections with other people may weaken.

There is a lack of research evidence to support these concerns. However, research does show that our relationships and feelings of social wellbeing are likely to benefit more from increasing face-to-face communication in many situations outside the social media world (Hansen, 2019).

There is little doubt that social media can expose us to negative experiences which can be psychologically distressing. For example, Table 7.8 below shows the results of Australian research by the eSafety Commissioner (2016) on the downside of social media use, as reported by young people aged 8–17 years.

Follow-up research by the eSafety Commissioner (2021) has found that such experiences persist, along with other negative ones that hadn't been targeted in the original research. As shown in Figure 7.45, over 40% of teenagers continue to deal with negative online experiences, including unwanted contact, cyberbullying and harassment through their social media. Almost one third (30%) said that their negative online experience related to bullying that occurred at school. Furthermore, the likelihood of having a negative online experience increased with age and gender. One notable change since the previous survey is that an increasing number are taking some action against negative experiences.

Adults also have the same types of negative social media experiences. For example, 1 in 6 Australian adults report having been the victim of bullying or harassment on social media and one on four report that they've seen others bullied or harassed on social media. Among those aged 18–29, 38% reported that they've witnessed bullying and harassment, and 29% said they've been a victim. Furthermore, 18% of adults reported that they've posted something on social media they later regretted and 16% said they're concerned their social media footprint could have a negative impact on their future (eSafety Commissioner, 2022; Yellow, 2020).

Table 7.8 Downside of social media use reported by 8–17-year-olds

Nasty comments	45%
Inappropriate or hurtful content	36%
Feeling I have to keep checking it	23%
Fear of missing out on good times I see others having	18%

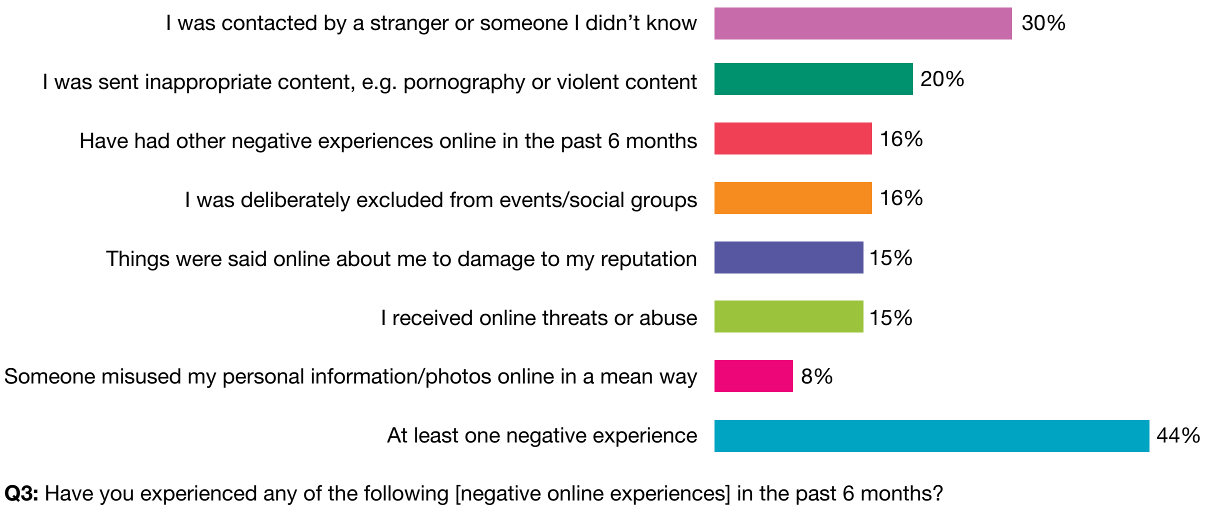

Figure 7.45 Negative experiences through social media and other online activities by teenagers aged 12–17 years
Source: eSafety Commissioner (2021). *The digital lives of Aussie teens: February 2021*.

Another influence of using social media is that it increases the likelihood of social comparison — our tendency to compare ourselves to others. Such comparisons help us evaluate our own abilities, achievements, physical attractiveness, personality, emotions, and virtually anything else about ourselves. This, in turn, influences how we see and feel about ourselves. Accessing content our friends, peers, celebrities and others have created about themselves and everyday life experiences for sharing on social media can trigger the social comparison process.

Figure 7.46 Social media can trigger a social comparison process. When we compare ourselves to others who appear to be better off, it can lower our self-esteem, increase anxiety levels and harm our mental wellbeing.

According to social comparison theory, comparing ourselves on social media to people who appear to be worse off than we are makes us feel better. Comparing ourselves to people who appear to be doing better than us, however, makes us feel inferior, dissatisfied or inadequate instead. If we do too much of the latter too often, research shows that it can lower our self-esteem, increase anxiety levels and harm our mental wellbeing (APA, 2022; Laplante, 2022).

Research also shows that the more time people spend using photo-based social media in particular, the more they engage in social comparison. In addition, our tendency to share content on social media whereby we always appear in our best light, may amplify unrealistic or idealised comparisons. For most adolescents, living in the real world is hard enough without the unrealistic pressures of the ideal worlds presented on social media (Paxton, 2019; Laplante, 2022).

Social media also provides a useful means of accessing news sources and keeping up to date with current news and events. The COVID restrictions highlighted the crucial role it plays in connecting people to information about the virus and vaccination during uncertain times.

News is frequently shared through social media. Anyone with a smart phone can be news reporter, live streaming news as it happens, at any time, from anywhere in the world with internet access. Anyone may also create written or visual content and share it as news. Many people now find it difficult to work out whether 'news' shared on social media is accurate, so they tend to distrust it and exclusively rely on traditional media such as TV news. For example, in a recent Australian survey, only 18% of respondents felt that information found on social media was trustworthy and 1 in 3 respondents just didn't know whether to trust news on social media (Deloitte, 2021).

Social media is also widely used as an agent to influence and change our thoughts, feelings or behaviour in targeted ways. Individuals, groups and organisations can create content and use social media to reach targeted or wider audiences virtually anywhere in the world. For example, people have used it for social and political meetings, to gain support and funds for a cause or election to a position of power, to protest, as a major organising or recruiting tool for a political or social movement, to spread conspiracy theories, to initiate change of government, and so on.

One outcome of such use has been an increased perception of disinformation and 'fake news' on social media that has been spread with the intent of influencing our beliefs, attitudes, political preferences or world views. There is also an increasing awareness that disinformation and fake news can be used to change our behaviour, possibly even inciting violence and anti-social behaviour. For example, most Australians are aware that fake news was created and deployed to manipulate public opinion that the result of the US elections in 2020 was 'rigged'. On January 6 2021, thousands of Donald Trump supporters stormed the Washington Capitol building where the official result was being declared, assaulted police and took control of the building, all in a bid to stop Joe Biden being formally appointed the next president. Numerous reports from authoritative sources that the election result was legitimate had been ignored.

It seems that even when told the truth about disinformation or fake news shared through social media, people can remain unconvinced. Without a shred of evidence, but with thinking influenced by cognitive biases, some social media users are more easily manipulated than others.

The social media profile and other personal information people post online can also have negative consequences. For example, it is now common practice for job recruiters, employers and human resources managers to check social media postings of job applicants before shortlisting. This is done

Figure 7.47 Disinformation and fake news can be used to incite violence and anti-social behaviour. Even when told the truth, people can remain unconvinced.

for casual and part-time jobs, as well as permanent ones. Many applicants have been overlooked for jobs because of unfavourable postings and other personal information in their profiles. Most people are becoming increasingly aware of the potential negative consequences of personal information they have posted and many now take steps to shape their reputation, manage their networks, and mask information they do not want others to know.

Other potential negative influences of social media include adverse consequences that may be associated with loss of privacy, identity theft and cyber safety issues. These potential consequences have also influenced many people to better manage their online identities. Many more, however, have not taken any of these actions (eSafety Commissioner, 2022).

As with video game playing, some people become addicted to social media, spending excessive time, often repeatedly and aimlessly, on social media. Although social media addiction has not been officially classified as a specific mental health condition in the current versions of the DSM and ICD, it is widely thought that it should be. When investigating social media addiction, researchers use criteria to distinguish between addictive and non-addictive behaviour. Criteria that are commonly used include:

- *salience* — being preoccupied by social media
- *mood modification* — using social media in order to reduce negative feelings or induce positive feelings
- *tolerance* — gradually using social media more and more over time in order to get the same pleasure from it
- *withdrawal* — experiencing distress if social media use is stopped or reduced
- *conflict with other activities* — prioritising social media use impacts on other activities and important life areas
- *loss of control/relapse* — inability to control social media usage.

All these criteria describe problematic behaviour that persists over a prolonged period of time.

Researchers have also constructed measures of social media addiction based on criteria such as those described above. The most popular ones are called the *Facebook Intrusion Questionnaire* and the *Bergen Social Media Addiction Scale (BSMAS)*. The first one assesses addiction specific to a single social media service, whereas the second one assesses addiction to social media in general (Cheng et al., 2022).

Item	Very rarely	Rarely	Sometimes	Often	Very often
1. How often do you think about TikTok when not using it?					
2. How often do you lose track of time when using TikTok?					
3. How often do you feel an urge to use TikTok when doing something else?					
4. How often do you feel connected to other people when using TikTok?					
5. How often have you tried to reduce your TikTok use?					

Figure 7.48 Examples of items for assessing TikTok addiction

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Weblink Bergen Social Media Addiction Scale

7.9.4 Advertising

Advertising can take many forms, including text, images, videos and games that advertise specific products, services or brands. The marketing landscape changed with the introduction of mobile phones and internet-connected devices. Advertising now comprises a wider range of marketing approaches. Sometimes it’s hard to distinguish between entertainment and advertising.

The average free-to-air TV viewer will probably see more than 25 000 advertisements a year. Those who are also active internet users will see many more in banners, pop-ups and unblocked emails. For example, Australian Facebook users are some of the most active ad clickers in the world, with an average of 22 ads clicked per month vs the global average of 12 (Radesky et al., 2020; Genroe, 2022).

The more we click an ad, check our social media, use an app, or merely browse, the more we are targeted for future ads. Advertisers use cookies to track our clicking. These are small files stored by internet browsers such as Chrome and Safari. Their purpose is to retain information between browsing sessions to save us time when searching. However, data from cookies can be compiled to determine our browsing habits and internet preferences. This can be complemented with user data mined from our social media and virtually everything else we do online. Our user data can be aggregated and stored and sold to third parties. The ultimate goal is to individually target us with highly specific ads.

Some online shoppers can find these personalised ads useful, especially those who regularly shop online, whereas others find them invasive, more so those who don’t do as much online shopping. Overall, whatever the media we use, it is virtually impossible to avoid exposure to ads wherever we are and whatever we are doing, whether online or not.

Many TV ads in particular are intended to have a positive influence by providing a public service or helping to protect us from harm. For example, some warn about the dangers of drink driving, speeding, cigarette smoking, exposure to the sun, coward punches, illegal drugs and not having an escape plan if living in a bushfire-prone area. Other ads advise us to watch out for possible signs of diseases, cancers or terrorist activity. Still others inform us about new or improved products, services, health benefits of this or that, ways to improve our lives, and so on, usually at an affordable cost or cheaper than their competitors.

A great deal of advertising, though often intrusive or annoying, is beneficial by being informative and educational. A lot of what we see and hear is true, but some is intentionally misleading or false.

As much as we are learning to recognise the persuasive intent of advertising and to mistrust information in certain ads, we can’t always separate fact from fiction. For example, in one study with nearly 8000 secondary school students, more than 80% of the middle school students believed that web ads they were shown were real news stories. Furthermore, recognition of persuasive intent does not necessarily lead to the ability to resist marketing, especially with highly appealing products (Gretter, 2019; Radesky et al., 2020).

Much advertising is directed at children because children represent a major market segment. Many of these products are unhealthy foods and drinks that are high in fat, salt and/or sugar content and can therefore have a major effect on children’s health. The growth in online access by children has meant that large sums of money spent targeting them through TV and newspaper advertising have been transferred to the internet and digital media such as game apps.

Psychologists have raised concerns about the negative influence of children’s ads because children under the age of 7 or 8 struggle to understand the persuasive intent of an ad — its ‘sales pitch’. They tend to believe that everything they see in ads is true. Due to their lack of experience, children under the age of 8 or so have less resistance to ads and lack the understanding to defend themselves against the persuasive intent.

Furthermore, newer forms of advertising found in mobile and interactive media and smart technologies,

Figure 7.49 Most advertising dollars are now dedicated to online sites.

often powered by personal data, are more difficult to identify. They do not necessarily occur in a predictable manner and are often integrated into the content. Advertising may also be linked to rewards or be embedded in trusted social media or personalised in apps, which can undermine children's abilities to identify or critically think about advertising messages (Lapierre et al., 2017 Radesky et al., 2020).

Psychologists have also expressed concerns about ads that target children because younger children have difficulty distinguishing fantasy from reality and make-believe from lying.

For example, many pre-schoolers cannot tell when a TV program ends and an ad begins, and many actually prefer certain ads. Many do not understand the difference between a program designed to entertain and an ad designed to sell. This is made especially difficult when celebrities and fictional characters are used to promote products. Research studies on internet advertising have found that that 6- to 8-year-old children also have difficulties distinguishing these types of ads from a core program and other onscreen content (Moondoore et al., 2009). Radesky et al., 2020).

When producing an ad that targets children, a key objective is to give the child a good eason to nag a parent for the product. Children's requests for products they have seen advertised are sometimes called 'pester power' and can lead to family arguments and conflict. Many parents believe that a child's desire for products can make them materialistic by suggesting that the means to a happier life lies in buying consumer goods. This is a particular concern in collectivist cultures where many people still emphasise communal values over individual possessions (Smith et al., 2011).

There has also been considerable concern about the idealised life images and stereotypes that are created and perpetuated by ads, especially TV ads and 'advice' from many of the more popular online celebrities and influencers. For example, these have tended to cultivate certain standards that define physical attractiveness and portray gender stereotypes in ways that can affect a healthy self-image and create feelings of inadequacy, especially in adolescent girls.

It is noteworthy that significant changes have occurred in this regard in recent years, with advertisers having become more sensitive to stereotyping population groups. In particular, the image of women in ads has changed significantly so that men and women tend to be portrayed equally. Such changes are not as common among online influencers as their content is not regulated.

Although there is some government regulation over advertising, as with products that cannot be advertised on TV during children's viewing times, advertising

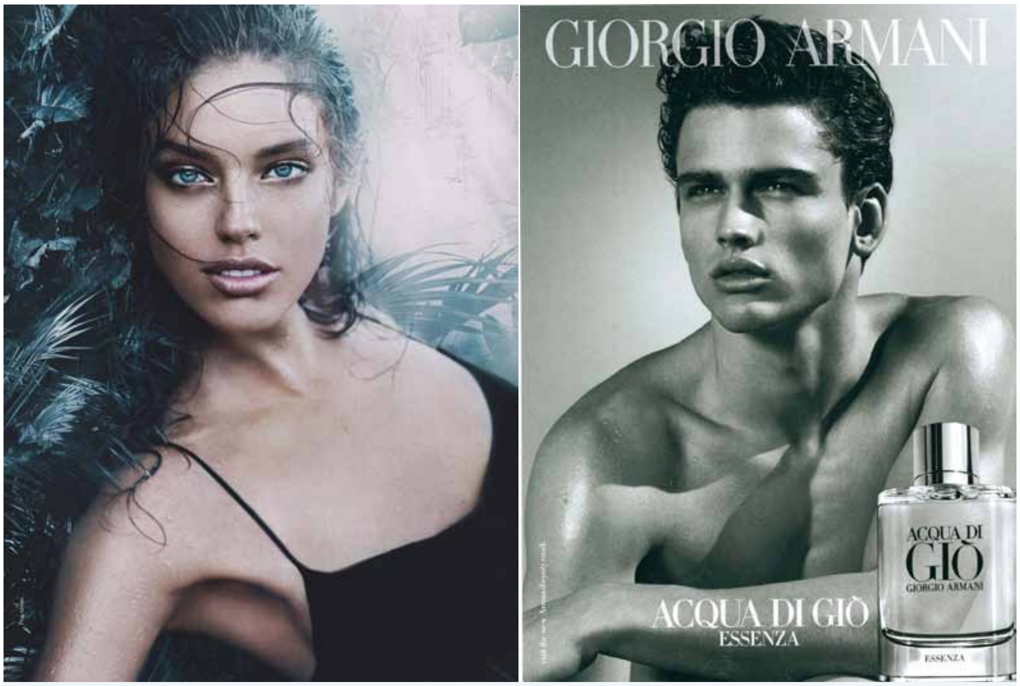


Figure 7.50 Advertisements, such as these ones for perfume brands, often present idealised images and stereotypes.

remains a very prominent occurrence in our lives. Most psychological research has focused on how ads try to influence us and how we cognitively process their content rather than specific behavioural effects.

In particular, researchers have analysed ads and other persuasive communication techniques and identified three main components they have in common: a source of the message (*who*), a message (*what*) and a target audience (to *whom*). Each of these components has been studied intensively and it has been found that their respective characteristics combine to determine the effectiveness of any type of persuasive communication strategy. In sum, the impact of an ad is determined by *who* says *what* to *whom* and the individual who is watching.

However, the rapid uptake of mobile devices and internet connectivity has raised new research questions about the influence of advertising, especially on children and adolescents. A problem challenging researchers is that newer forms of advertising using mobile and digital technologies, often driven by a user's data, are more difficult to monitor. For example, with TV ads, researchers can record a few hours of TV to get a sense of how marketers are selling to children, adolescents or whoever. Advertising on digital media, however, is often personalised or integrated into the content, does not necessarily occur in a predictable manner, and can change in a matter of hours (Radesky et al., 2020).

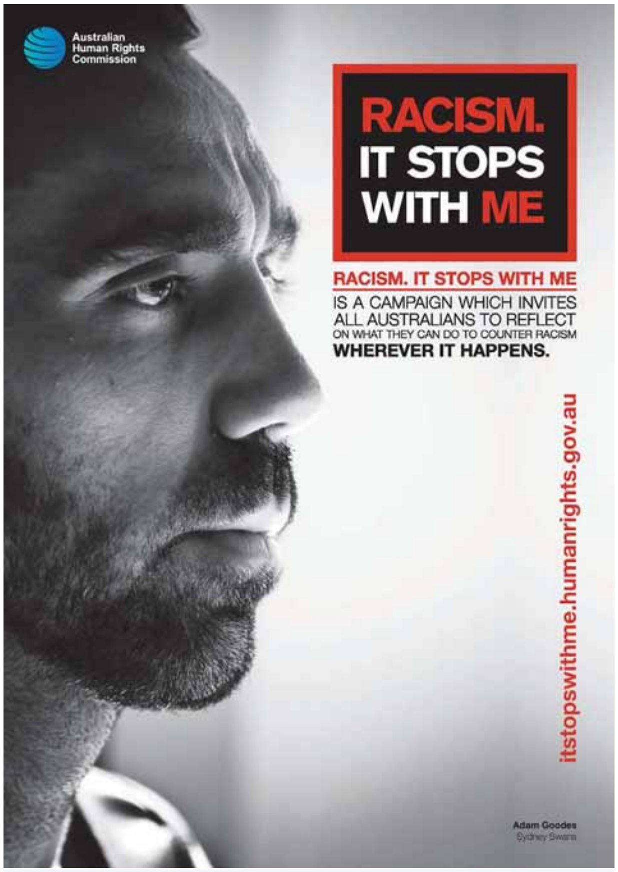


Figure 7.51 Advertising can have a positive influence. This slogan was a part of a campaign by the Australian Human Rights Commission to help ensure more Australians recognise that racism is unacceptable in our community.

7.9 LEARNING ACTIVITY

Review

Complete the table to summarise influences of different types of media. Include two examples of each type of influence.

Type of media	Positive influence	Negative influence
a. television		
b. video games		
c. social media		
d. advertising		

To answer questions online and receive **immediate feedback,** access learnON at www.jacplus.com.au.

7.10 Empowering individual decision-making when in groups

All of us can be influenced in some way or another by what others say or do when in a group. For example, in this topic we have examined how factors such as status and power, groupthink, polarisation, deindividuation, obedience and conformity can influence individual decision-making and other aspects of our behaviour when in a group. These are just some of the numerous influences that have been described by psychologists on the basis of research evidence.

As shown through the study of conformity, we often adjust our opinions, judgments or actions so that they fall in line with those of other people. This is not necessarily a bad thing because conformity can help ensure group members get along with one another whilst enhancing group cohesion and the positive feelings associated with belonging to the group. However, conformity can also have negative aspects. For example, when group members don't speak up or are willing to deny or withhold information in order to avoid 'rocking the boat', the group is at risk of polarisation to an extreme position or groupthink that results in a bad decision and unwanted consequences.

At a personal level, conforming when we think we shouldn't, can cause not only the psychological discomfort of cognitive dissonance, but loss of independence and self-esteem. At a wider societal level, conformity can hamper innovation or change that would benefit its members and ensure society keeps making progress as whole. Moreover, conformity can encourage individual and group apathy, and reduce social diversity because there are too many like-minded people. It can also be destructive. For example, Hitler's Nazi Germany thrived on conformity as well as obedience.

Numerous discoveries and breakthroughs throughout the history of the world have their roots in anti-conformity, by people who were willing to be different, often in the face of adversity. In some cases, governments have been overthrown, more often for the better than not. Anti-conformity by supporters of the women's liberation movement that emerged in the late 1960's brought about change that redressed some of the injustices experienced by females. Anti-conformity has also been influential in ending wars, as happened with the Vietnam War in the 1970s.

Generally, **anti-conformity** is the deliberate refusal to comply with accepted standards in a society. It is often accompanied by the expression of ideas, beliefs, or judgments that challenge those standards. According to research, anti-conformity is more likely to be motivated by rebelliousness or stubbornness rather than the need to 'speak up' or express oneself sincerely (APA, 2022). Anti-conformity in a group therefore means that you would have consciously made a decision to refuse to go along with the group and take a stand against whatever the group is thinking, planning or doing.

It can be difficult to assert ourselves in many decision-making situations when in a group. Faced with an unreasonable request or when sensing that the group's thinking is heading in the wrong direction or simply wrong, many people become anxious at the mere thought of disagreeing, let alone putting their foot down

Figure 7.52 Anti-conformity is the deliberate refusal to comply with accepted standards in a society, such as ignoring rules around smoking in public.

and speaking up. However, just as we can refuse to obey unreasonable or unlawful requests to do something we don't want to, we can maintain our independence in the face of conformity pressures. **Independence** is evident when we experience freedom from the influence or control of other individuals or groups.

In some cases, knowing that someone is trying to influence us in a group may prompt us to react in the opposite direction. Many people value their sense of freedom and like to protect it. Consequently, when social pressure to conform becomes so strong that it threatens our independence, we often rebel. This is evident among children who assert their independence by doing the opposite of what their parents ask. Psychologists use the term reactance to describe such behaviour.

Reactance theory was first proposed by American psychologist Jack Brehm in 1966. According to this theory, a person will experience **psychological reactance** (or, more simply, **reactance**) in response to a perceived threat to — or loss of —their freedom to think, feel or behave as they want to. It is a motivational state characterised by distress, anxiety, resistance, and the desire to restore that freedom. When people feel that they are being forced to agree with or do something, they will react against the coercion, and they may think, feel or behave opposite to that which is desired (APA, 2022).

Although we can feel uncomfortable when we appear too different to others, we can also experience psychological discomfort by appearing exactly like everyone else.

Research shows that people feel better when they see themselves as unique. When they do so, they also tend to act in ways that set them apart and maintains their sense of individuality. For example, in one experiment, participants were asked to complete a questionnaire and then given results that led them to believe that they were either distinct from or nearly identical to the attitudes of 10 000 other students. They were then asked to participate in a conformity experiment. The results showed that those who had been deprived of their feeling of uniqueness were most likely to assert their individuality by non-conformity (Myers, 1990).

7.10 LEARNING ACTIVITY

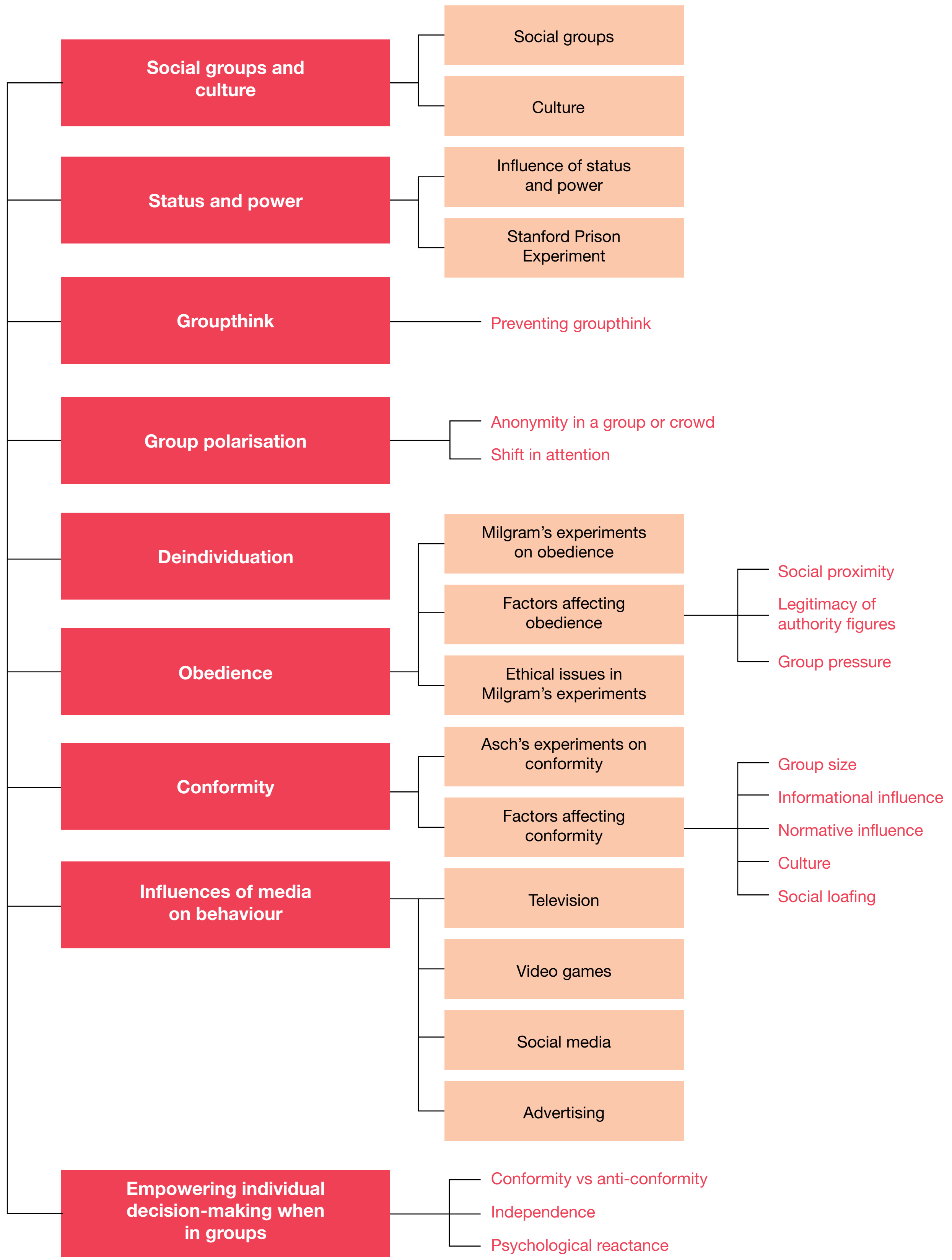
Review

1. List three influences on individual decision-making in groups.
2. Define the meaning of anti-conformity.
3. Give two potential benefits and consequences of conformity for an individual or society in general.
4. Explain how pressure to conform may promote psychological reactance.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

7.11 Review

Topic summary



Key terms

aggregation p. 451
anti-conformity p. 512
compliance p. 475
conformity p. 485
constructive obedience p. 475
culture p. 452
deindividuation p. 472
destructive obedience p. 475
independence p. 513
informational influence p. 489
group p. 451
group polarisation p. 469
groupthink p. 465
normative influence p. 490
obedience p. 475
power p. 456
psychological reactance p. 513
reactance p. 513
role p. 458
social comparison p. 470
social group p. 451
social influence p. 449
social loafing p. 492
social media p. 503
social power p. 456
status p. 455
unanimity p. 488

Note: The **References** for the entire title can be accessed in learnON and are also available as a downloadable PDF.

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Digital documents Key terms glossary — Topic 7 (doc-37927)
Topic summary — Topic 7 (doc-37928)
Key diagrams PowerPoint — Topic 7 (doc-37930)

7.11 Topic 7 test

Section A: 30 marks **Section B:** 30 marks **Total:** 60 marks

Access learnON to answer the following test questions online and receive immediate feedback.

Section A — Multiple-choice questions

Choose the response that is **correct** or **best answers** the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Question 1

The term social influence describes

A. someone's behaviour when they socially interact with others.
B. the way in which someone interacts with others in different social situations.
C. the influence of someone's personal thoughts and feelings on how they can best behave in a group.
D. how the presence or actions of others can affect someone's behaviour.

Question 2

An individual's ability to control or influence someone else's behaviour is best described as

A. power.
B. status.
C. conformity.
D. obedience.

Question 3

Which of the following is not a characteristic of a true social group?

A. there are only two people
B. there is interaction between members
C. there are no shared goals
D. different members can influence one another

Question 4

The importance of an individual's position or standing in a group, as viewed by members of the group, is best described as

A. power.
B. social power
C. status.
D. peer influence.

Question 5

Which of the following is a source of power in a social group?

A. low status
B. having information that group members need
C. having the ability to be punished by others in the group
D. being an independent observer

Question 6

Social loafing occurs when group members reduce their effort because they believe that

A. their individual contribution to the group product is not identifiable.
B. their individual contribution will have little impact on group performance.
C. there is a loss of group member's motivation to contribute to group task performance.
D. other group members have lowered their effort.

Question 7

Which of the following factors is least likely to affect conformity?

A. group size
B. group cohesiveness
C. awareness of social norms
D. group polarisation

Question 8

An aggregation of people is best defined with reference to the

A. number of people.
B. high level of cohesion.
C. lack of obedience to authority.
D. lack of interdependence or direct interaction.

Question 9

Which of the following is not considered to be a social media service?

A. a smart phone
B. Facebook
C. TikTok
D. Instagram

Question 10

A key finding of the Stanford Prison Experiment is that

A. power can be used to influence someone else's behaviour but status cannot.
B. status can be used to influence someone else's behaviour but power cannot.
C. role expectations can lead people to behave differently from the way in which they would normally behave.
D. all participants in the experiment did their best to behave as the experimenter wanted them to behave.

Question 11

Research studies have found that disobedience during warfare is rarer among those ordered to kill from a distance with a missile than close-up with a knife. This result suggests that _____ may influence obedience.

A. friendship
B. social proximity
C. legitimacy of the authority figure
D. group pressure

Question 12

If someone in a group has legitimate power, then they have the _____ to direct or influence the behaviour of other group members.

A. social skills
B. right
C. expertise
D. information

Question 13

Which of the following behaviours best describes conformity?

A. following the commands of someone in authority
B. giving an incorrect answer when all other group members give the correct answer
C. giving the correct answer when all other group members give an incorrect answer
D. adjusting one's actions so that they are consistent with those of group members

Question 14

As group size increases, conformity by an individual to the group's behaviour tends to

A. stay the same.
B. decrease.
C. increase.
D. increase, but only up to a group size of four.

Question 15

Arlo conforms because he wants to be liked and accepted by the group. This is an example of conforming that is primarily due to

A. normative influence.
B. unanimity.
C. informational influence.
D. culture.

Question 16

Lim is taking up surfing. She buys a surfboard with two fins rather than one fin on the advice of a surfer friend. This is an example of conformity that is primarily due to

A. normative influence.
B. unanimity.
C. informational influence.
D. culture.

Question 17

Overlooking serious problems in their relationship, a couple decides to marry because they believe they're very different from couples who divorce. Which groupthink symptom is likely to be reflected by this belief?

A. mind guarding
B. stereotyping outgroups
C. illusion of invulnerability
D. illusion of unanimity

Question 18

Deindividuation is more likely to occur when an individual is experiencing

A. loss of self-esteem.
B. group polarisation.
C. social comparison.
D. a sense of anonymity.

Question 19

Which of the following groupthink symptoms reflects tunnel vision?

A. mind guarding
B. collective rationalisation
C. illusion of invulnerability
D. direct pressure on dissenters

Question 20

A conscious decision to refuse to comply with the accepted standards of behaviour in a decision-making group would best explain

A. groupthink.
B. anti-conformity.
C. group polarisation.
D. power and status in a group.

Question 21

Obedience involves

A. following the command of someone in authority.
C. exerting power and influence over someone.
C. exerting power and status over someone.
D. choosing to do as the rest of the group does, even when not in agreement with the group.

Question 22

An analysis of the results of Asch-type experiments in many different countries found that

A. people in all cultures seldom conform to group pressure.
B. people in North America and Western Europe show the highest levels of conformity to group pressure.
C. people in collectivist cultures are less likely to conform to group pressure than people in individualistic cultures.
D. people in individualist cultures are less likely to conform to group pressure than people in collectivist cultures.

Question 23

The results of Milgram-type experiments that have been conducted in many different countries with participants from various kinds of backgrounds indicate that

A. most people refuse to be obedient when they become distressed.
B. there are significant sex differences in obedience.
C. there are significant age differences in obedience.
D. obedience in a Milgram-type experimental situation seems to occur regardless of sex or age.

Question 24

In one experiment on obedience, 22 hospital nurses were telephoned one at a time throughout the day by an unknown 'doctor' who ordered them to give a 'patient' an obvious overdose of a drug. All but one nurse complied without delay (until they were intercepted on their way to the patient).

Although not all nurses are so compliant, these nurses probably obeyed due to

A. ethical issues involved in disobeying a doctor.
B. the doctor's legitimate authority over them.
C. the social proximity of the doctor.
D. group pressure to obey.

Question 25

Samir is upset by an unfair request by a teacher to clean up the classroom, but obeys the teacher despite being upset. The teacher then makes the same request to Sara and Luke who refuse to obey. When Samir observes this, he also decides to disobey and stops cleaning.

Samir's change of mind about complying with the teacher's request is best explained by

A. ethical issues that are involved when teachers make unfair requests of students.
B. the realisation that the teacher is not a legitimate authority figure.
C. the social proximity of Sara and Luke.
D. the presence of group support.

Question 26

Social norms are best described as

A. laws.
B. known ways of behaving.
C. unknown ways of behaving.
D. instinctive ways of behaving.

Question 27

Collectivist cultures tend to

A. encourage a low level of conformity.
B. place achievement of personal goals ahead of achieving group goals.
C. encourage individuality for the wider good of the community.
D. place achievement of group goals ahead of personal goals.

Question 28

Group experiences that arouse its members and reduce their self-awareness increase the likelihood of

A. deindividuation.
B. polarisation.
C. groupthink.
D. referent power.

Question 29

Group polarisation during decision-making is evident when group members

A. act impulsively and conform to the majority view.
B. collectively adopt a more extreme view than held beforehand.
C. seek agreement to the extent that they overlook possible alternative, better options.
D. experience reduced self-consciousness and feelings of personal responsibility.

Question 30

Eliana tried cigarette smoking once when she was in year 7. She didn't enjoy the experience and quickly gave up after a couple of puffs. When Eliana attended a week-long school camp in year 11, her 'room-mates' all liked to sneak off every so often for a smoke. During the first couple of days Eliana refused their invitation, despite their teasing. On the third day, Eliana sneaked off with her 'roommates', lit a cigarette and kept smoking it. During the remaining days, Eliana always went for a smoke with her 'room-mates'. Eliana started to enjoy cigarette smoking and now smokes a packet a day.

Which of the following best explains why Eliana started cigarette smoking?

A. social loafing
B. social power
C. conformity
D. obedience

Section B — Short answer questions

Question 1 (1 mark)

The term _____ is used to describe the way of life of a particular society or community that sets it apart from other societies and communities.

Question 2 (2 marks)

When we obey an order from someone in a uniform we are most likely influenced by the _____ of this authority figure; whereas when we obey an order from someone because 'everyone else' is obeying, then we are most likely influenced by _____.

Question 3 (1 mark)

What did Asch target for study in his experiments?

Question 4 (4 marks)

Distinguish between each of the following pairs of concepts.

a. conformity and obedience 2 marks
b. constructive and destructive obedience 2 marks

Question 5 (2 marks)

Explain how being drunk in a large group or crowd can increase the likelihood of someone engaging in anti-social behaviour.

Question 6 (5 marks)

Explain what groupthink is and describe three conditions that make it more likely to occur.

Question 7 (3 marks)

Four drivers of other vehicles stop and help someone trapped in their car following a collision. They assumed different responsibilities and worked cooperatively in administering first aid and to safely remove the trapped person from the car before emergency services arrive.

Explain whether or not the four drivers are a group, with reference to three distinguishing characteristics of a group.

Question 8 (2 marks)

Explain how power and status affected the behaviour of the 'mock guards' and 'mock prisoners' in Zimbardo's Stanford Prison Experiment.

Question 9 (4 marks)

Describe a positive and a negative influence of two different types of digital media on behaviour, either for an individual or society in general. Ensure you name the media types.

Question 10 (6 marks)

Consider the data in the table below.

	Total	Gender		Age (years)	
		Male	Female	12 to 13	14 to 17
Researching things that interest me	95%	96%	94%	93%	95%
Watching videos, movies or TV	93%	94%	92%	90%	94%
Chatting with friends	93%	94%	93%	90%	95%
Listening to music	92%	91%	94%	89%	94%
Playing games online with others	77%	87%	66%	80%	75%
Responding to others' comments	72%	72%	72%	65%	75%
Making video calls	72%	70%	74%	67%	74%
Posting photos/videos online	68%	66%	69%	60%	71%
Accessing news	62%	67%	56%	48%	69%
Banking or shopping online	54%	51%	56%	30%	65%

Source: eSafety Commissioner (2021). *The digital lives of Aussie teens: February 2021*.

a. What is an appropriate header for the column at the left? 1 mark
b. Construct a relevant title for the table. 1 mark
c. Describe four key results with reference to the data in the table. 4 marks

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Go to learnON to access answers to the Topic 7 test. A customisable Word version of the test can also be downloaded from the **Digital documents** tab of the Resources panel.

learnMORE | Peer groups and cliques

One of the most important and influential groups you can belong to is a peer group consisting of your friends, sometimes called a clique.

A *peer group* is usually made up of people who have similar interests, do the same sorts of things and often associate or interact with one another. For example, the peer group of an adolescent will be made up of other adolescents.

A peer and a friend are not necessarily the same. The term *peer* refers to anyone who has one or more characteristics or roles in common with one or more other individuals, such as age, sex, occupation or social group membership. However, *friendship* involves a positive relationship between two (or more) people who usually regard or treat each other in similar ways. Adolescents attending a particular school or college have many peers (other adolescents), but they may or may not have many friends (Kaplan, 2004).

A distinguishing characteristic of adolescence is the amount of time young people spend with their peers. Some typical features of an adolescent peer group are:

- it often has its own norms or standards of acceptable behaviour and anyone who breaks these norms may be rejected by other members of the group
- it often has its own style of dress (including hairstyles), its own places for socialising, its own taste in music, dancing, sport and so on
- it usually has its own special attitudes to matters such as sex, smoking, alcohol, illegal drugs, bullying and so on
- it often has its own language or lists of expressions which may not make sense to anyone outside the peer group
- its members usually discuss their problems with one another but not with outsiders.

Australian psychologist John Cotterell (1996) has described the peer group to which most adolescents belong as a *clique* — a relatively small group of friends of similar age, and generally of the same sex. For example, when an adolescent speaks of 'my friends', 'my mates', 'the girls', 'the guys', or uses some other collective noun of this kind, they are usually referring to a *friendship clique*, an interaction-based grouping of peers who 'hang around together' and may be either close friends or 'just friends'.

According to Cotterell, clique members communicate easily with one another, and spend a great deal of their time together simply talking and enjoying each other's company. They vary in the extent of closeness or intimacy, ranging from individuals who are 'friends' only in a specific situation, such as a sports team or interest group, to clusters of close friends who are inseparable.

An adolescent may belong to several different cliques containing different friends; for example, team-mates at hockey practice after school, classmates in psychology lessons, 'the guys' at the party and the after-school 'mates' in the local neighbourhood. Some of these cliques meet only in a specific setting (e.g. the basketball stadium or the local shopping centre), and the relationship is one of companionship that is restricted to that particular setting. In contrast, close friendships are not restricted to a particular setting.

learnMORE | Social hierarchies

Status and power within a group are often based on an individual's position in the 'pecking order' or social hierarchy that may have developed. A *social hierarchy* shows the order of dominance of different members of a group, with the most dominant individual (the leader) at the top and the least dominant individual(s) at the bottom of the hierarchy.

Among animals, the hierarchy is often determined by age, physical strength and sex; for example, the oldest and strongest male often becomes the most dominant animal and holds the position at the top of the hierarchy.

In simple animal hierarchies, the general rules are male dominates female, bigger dominates smaller and older dominates younger individuals. There are, however, exceptions. For example, in breeding seasons, females may become more dominant, or at other times, a group of lower-ranking animals may band together to try to push out the highest-ranked animal in the hierarchy.

Within groups of people, a social hierarchy is often determined by the status, power and specific roles of the various individuals of the group. For example, in a work environment, the social hierarchy is relatively easy to identify and is determined by legitimate power that goes with certain positions. Most of the group members would accept that their manager, supervisor or team leader has the right to exert power over them in relation to their work tasks.

Hierarchies serve an important function in all groups as they can assist in reducing the amount of conflict within the group, thereby allowing for more harmonious functioning. Individuals who know where they stand in the group are less likely to create unrest than those whose position is unclear. The hierarchy also gives group members a better understanding of their role expectations — knowing what is expected of them in their various relationships with other group members.

In this troop of baboons, the most physically powerful male is at the top of the social hierarchy, followed by other males, then females and infants.

In this platoon of soldiers, the person at the top of the hierarchy is clearly evident.

learnMORE | Obedience in cults and sects

The terms cult and sect are often used interchangeably because they share some common features. They are, however, different types of social groups. A key distinction is in the separateness of the identity of the group.

A *cult* is a group that claims to have a great devotion to some person, idea or object. It usually has a religious or quasi-religious basis and there is often a living, charismatic and influential leader who is typically seen as the 'guiding spirit' behind the religious beliefs and practices of the group. Other common characteristics include unusual or atypical beliefs, seclusion from the outside world, and an authoritarian structure. Cults also tend to be highly cohesive, well organised, secretive, and hostile to non-members.

A *sect* is a group that follows a particular set of principles, beliefs and practices and has a separate identity within a larger group or organisation. A sect is generally a faction (breakaway group) within the larger religious, political or other social group and is often not formally recognised by the larger group.

There are many cults and sects in Australia and throughout the world. Most establish their own set of social norms that are often different and hidden from the rest of society.

Although most cults claim to have a religious basis, there are differences between religions and cults. For example, religions are more outward looking and more public in their affairs than cults, which tend to be more inward looking, committed to their own affairs and preoccupied with the activities of its members. In addition, recruitment is the primary reason for the existence of cults and they spend a great deal of time at this work (Wallace, 2000).

One well-known cult was established in the 1960s by the Reverend Jim Jones. Initially located in Indiana in the United States, Jones relocated his 'congregation' to Guyana in South America, where he set up his own community called Jonestown. Jones was extremely influential over his group of loyal followers.

On November 18, 1978, the mass media around the world were filled with horrific scenes (below) and stories from Guyana where 911 people committed mass suicide at Jonestown. Under the direction of the Reverend Jim Jones, the members of Jones's People's Temple gave a poison-laced drink to their children, and then drank it themselves. It is likely that Jones had told his followers that they were not committing suicide, instead, that they were performing an act of freeing themselves from the harsh world in which they lived.

Jonestown massacre, 1978

8 Perception

TOPIC CONTENT

8.1 Overview

KEY KNOWLEDGE

- the role of attention (sustained, divided, selective) in making sense of the world around us
- the role of perception in the processing and interpretation of sensory information, as demonstrated through top-down and bottom-up processing
- the influence of biological, psychological and social factors on visual perception and gustatory perception

Source: © VCAA, *VCE Psychology Study Design: 2023–2027*. p.30.

Imagine what it would be like to have no sensory or perceptual capabilities. Your life would be in complete darkness and silence. You would not be able to taste fruit or smell the fragrance of a flower. You would not be able to feel the warmth of heat or the coolness of ice. Never feeling pain means that you would always be vulnerable to physical harm. Standing or moving around would be a problem as you would never know whether you were upright, laying down, moving a leg or the direction in which you were facing. And you would never be aware of conditions inside your body.

We have a number of different senses, including vision, taste, hearing, smell, touch, pain and kinaesthesia (body position and movements). Each of these senses provides information in the form of a different kind of energy.

When we 'sense' something, we are actually detecting physical stimuli and sending it to the brain for interpretation — information which is in the form of a specific type of energy and has stimulated sensory receptor cells. It is not until we 'perceive' the information that we have become aware of and then interpreted and assigned meaning to it.

Most of the sensory information ('stimuli') comes from our external environment; for example, light (for vision), chemical molecules (for taste and smell), and air vibrations (for hearing). Other sensory information comes from sensory receptor sites within our body, such as from muscle tendons and joints (for kinaesthesia).

Perception does not entirely occur in the cortical areas where the sensory information is received. The visual, gustatory and other sensory cortices are connected

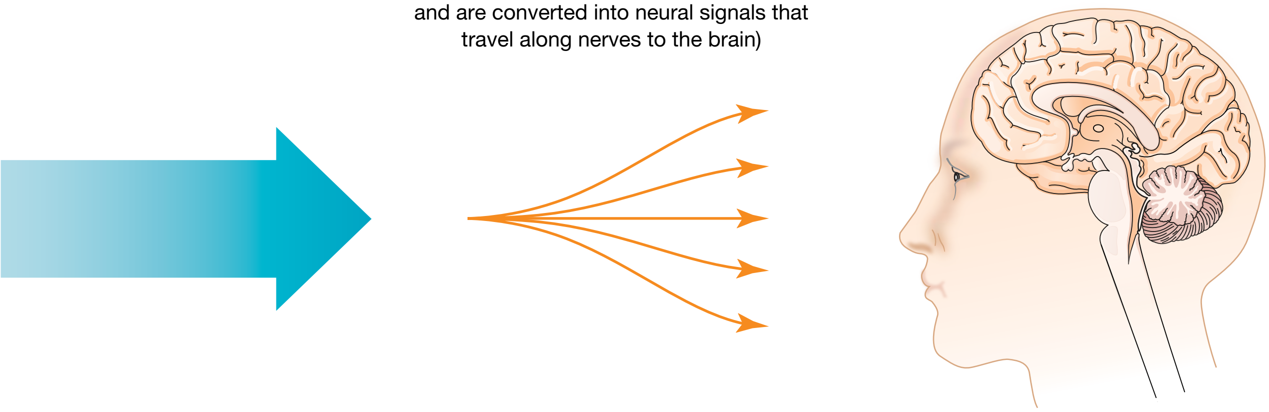

Figure 8.1 From sensation to perception. This example shows sensation and perception of external sensory stimuli. The process is generally the same for internal sensory stimuli. Sensation is considered a part of the perceptual process, rather than a separate process.

to other parts of the brain where incoming sensory information is redirected for additional processing that enables perception. For example, the primary gustatory cortex receives taste information then sends it to several other areas of the cerebral cortex. This includes a cortical area in the frontal lobe where neural connections for taste and smell are combined to enable interpretation of the taste information as either pleasant or unpleasant.

The perceptual process involves bringing together all incoming sensory information and using existing knowledge to make sense of the sensory input. This may include information we have learned and stored in memory, as well as such information as our current motivational and emotional states and the situation in which the perceptual experience is taking place. Multiple areas of the brain are involved. However, the processing of information from different brain areas is so rapid that we are rarely conscious of it occurring at all.

It is usually only when a stimulus is vague, confusing or ambiguous that we become aware of the interpretative process. For example, our experience with many visual illusions often requires us to test a number of possible interpretations to make a meaningful perception. In some cases, as with the objects in Figure 8.3 on the next page, we may struggle to make a meaningful interpretation, regardless of how often or how long we consider it.

In this topic, we examine vision and gustation (taste) as examples of human perception. Vision is the sense on which most people are most reliant and taste is the least crucial but the most multisensory of our perceptual experiences. We will consider how biological, psychological and social factors can influence our perception of visual and taste stimuli originating in our external environment. In the next topic, we explore circumstances where perceptual distortions, or 'mistakes', of vision and taste in healthy individuals may occur.

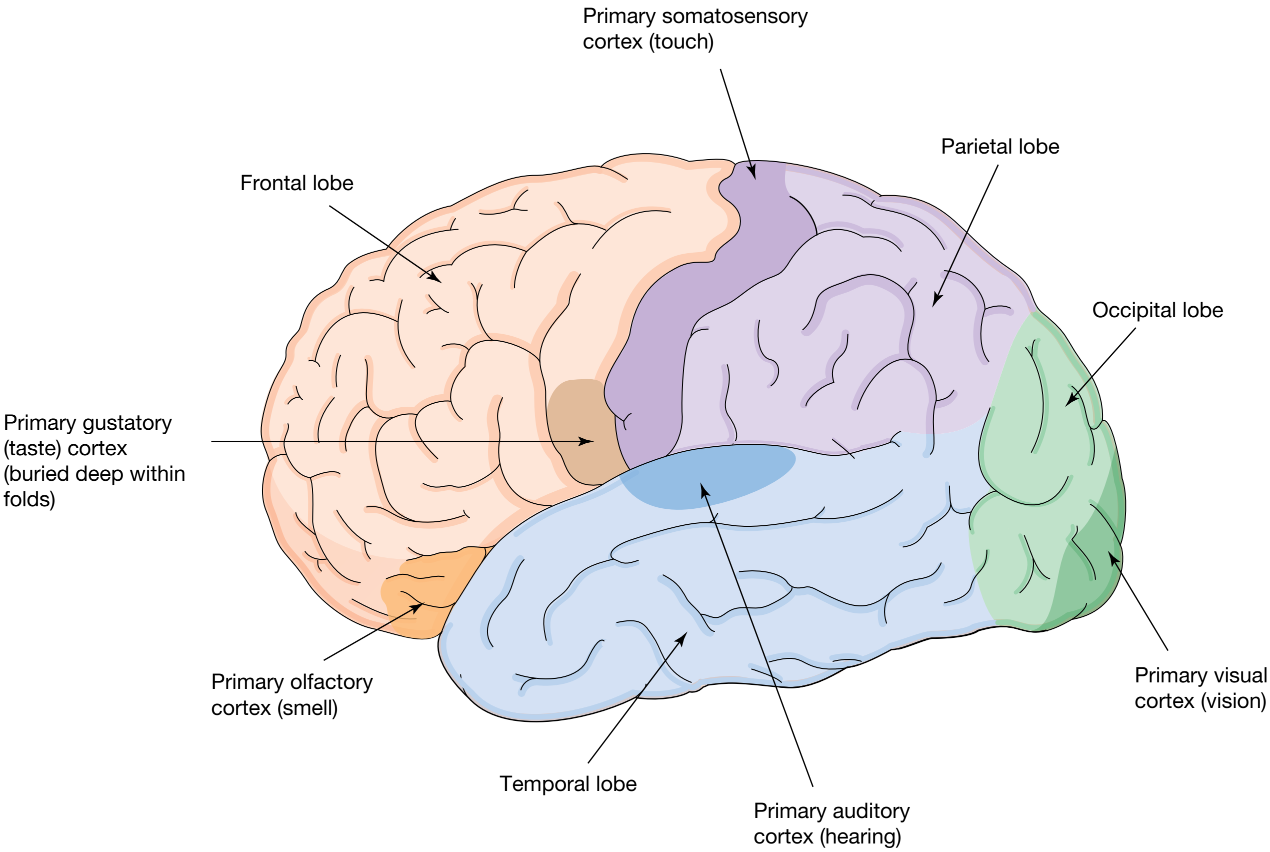

Figure 8.2 The primary areas in the cerebral cortex for receiving and processing different sensory information.

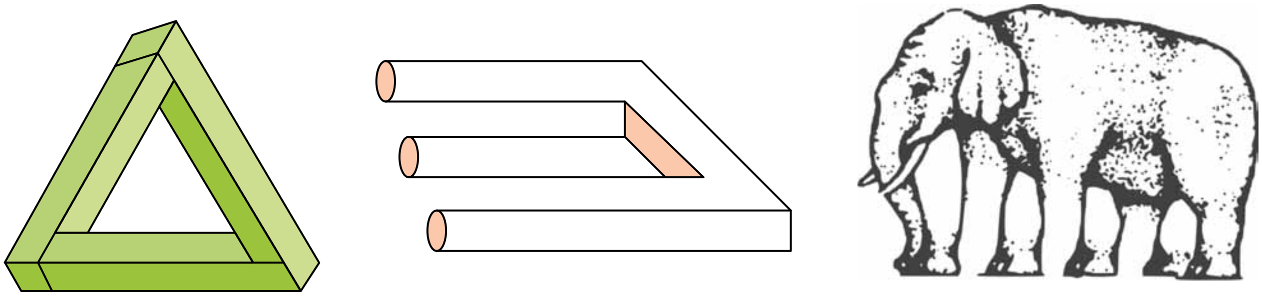

Figure 8.3 Visual illusions such as the 'impossible triangle', 'three-pronged widget' and the 'impossible elephant' illustrate that we can sometimes become confused by a stimulus and struggle to make a meaningful interpretation, regardless of how often or long we consider it.

8.1 LEARNING ACTIVITY

Multiple-choice questions

1. Each of the human senses provides perceptual information in the form of a different kind of
   A. energy.
   B. molecule.
   C. vibration.
   D. awareness.
2. Human perception involves interpretation of
   A. the senses.
   B. multiple cortical areas.
   C. external stimuli.
   D. internal and external stimuli.
3. Sensation involves _____; whereas perception involves _____.
   A. interpretation; detection
   B. stimuli; detection
   C. detection; interpretation
   D. interpretation; awareness
4. Human perception is best described as a/an _____ process, whereas sensation is best described as a/an _____ process.
   A. overt; covert
   B. active; passive
   C. passive; active
   D. real; incomplete
5. When we perceive something, we are actually
   A. assigning meaning to it.
   B. using all our senses to process it.
   C. sending it to the brain for interpretation.
   D. bringing together multiple senses to process it.

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8.2 Role of attention in making sense of the world around us

Every day, millions of stimuli reach our sensory receptors and never become part of our conscious perceptual experience. We simply cannot react to everything. Human beings do not have the capacity to do so.

One of the ways we cope with the relentless bombardment of stimuli is by not responding equally to all stimuli. We narrow our focus and 'pay attention' to only some of the stimuli in our sensory environment. **Attention** is the process of focusing on specific stimuli or aspects of the sensory environment whilst ignoring and therefore excluding others.

When we pay attention to a stimulus, we become consciously aware of it. In addition, when paying attention, whatever the type or level of attention, we are being perceptually selective. With attention, we can choose to focus our awareness on important things whilst ignoring a great deal of competing and less important stimuli. This puts us in a state of readiness to respond to a stimulus and enables it to become part of our conscious perceptual experience.

As basic a process as it may seem, attention underlies numerous aspects of how we think, feel and behave. Attention not only affects perceptual experience, it helps us to learn, form and retrieve memories, build relationships with others, stay safe, complete specific goal-directed tasks, and successfully perform most of our other everyday activities. The ability to pay attention is therefore a crucial means of successfully adapting to the environment.

Attention is like a mental spotlight that can be moved around and focused on specific sensory inputs. The focus may be either on an *internal* stimulus (e.g. our breathing) or on an *external* stimulus (e.g. something in our visual field).

A shift in the focus of our attention can be intentional, such as when you concentrate on listening to arrangements for meeting friends. A shift can also occur without our being aware of it. For example, when you are focused on a teacher's explanation and the person sitting next to you starts talking to you, the focus of your attention will usually shift to their comments, even if only for a second or two.

Many different types of attention have been described. These include sustained attention, selective attention and divided attention. Their use may overlap in the course of everyday life experience.

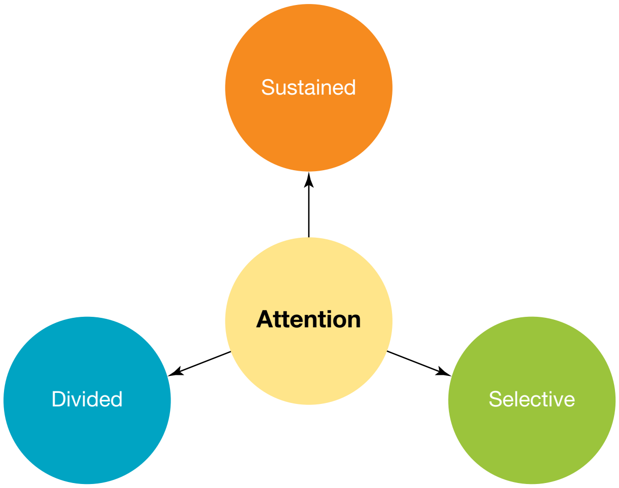

Figure 8.4 Three types of attention

8.2.1 Sustained attention

Instructions from a parent, teacher or coach to 'pay attention' or 'concentrate' are essentially an attempt to get a person to engage in sustained attention.

Sustained attention involves maintenance of attention on a specific stimulus or task for a continuous period of time without being distracted. It is an important cognitive ability that helps us efficiently and successfully carry out tasks and activities in our daily lives, especially those that take a long time to complete, are repetitive or not particularly interesting.

Most of our everyday activities require at least some level of sustained attention. For example, reading this passage of text, listening to a teacher give an explanation, studying for a test, holding a serious conversation with a friend, driving a car, watching a movie and playing a video game typically involve sustained attention for a period of time.

Figure 8.5 Sustained attention is an essential ability in some workplaces.

With sustained attention, people keep their focus on the task at hand and continue to engage in the activity until completed or a certain amount of time has elapsed, without letting other things distract them.

Research on sustained attention originated in the 1940s as a result of attentional problems among radar operators during World War 2. These operators were required to be vigilant and sustain attention, alertness and accuracy during the long and often boring task of monitoring radar screens for specific blips. After a certain time on duty, they tended to become less alert and this resulted in a decrease in their ability to detect the signals caused by incoming enemy planes (Mackworth, 1948).

The terms sustained attention and vigilance are sometimes used interchangeably. Although vigilance requires sustained attention and vigilance tasks are often used to measure sustained attention, *vigilance* refers more specifically to a state of alertness or extreme watchfulness. It is often directed toward potential threats (e.g. predators, intruders, enemies) and is characterised not only by an ability to sustain attention for uninterrupted periods, but also by a maximum readiness to react.

Sustained attention is essentially a type of time-based attention. It can be challenging to maintain this type of attention for a significant period of time. However, after a distraction arises, we can simply re-focus on the task at hand.

For how long can we concentrate on a task before distraction kicks in? Generally, it depends on the nature of the task and the personal characteristics of the individual. If the task is engaging and arousing to the person, then this will tend to lead to more mental effort and better performance on the task. Task complexity, reward, fatigue, expectations about the outcome, anxiety and emotional state are among other variables that can affect the duration of sustained attention (Johnson, 2016; Pudelko, 2020; Andrillon et al., 2021).

8.2.2 Divided attention

Most people have little difficulty in carrying out two or more activities concurrently. For example, most of us could read a text message, brush our hair and chew on a snack, all at the same time.

Divided attention refers to the ability to distribute our attention so that two or more activities may be performed simultaneously. It may involve the use of just one sense (e.g. vision) or two or more senses (e.g. vision, hearing and taste). Other examples of divided attention include eating dinner while watching the news, talking on the phone while getting dressed, and reading an email while listening to music and tapping to the beat. However, simultaneously reading an email while listening to a podcast and watching a movie would be more difficult.

It seems that our ability to divide our attention and 'multitask' depends on how much conscious effort is required for the various tasks in which we are engaged. In turn, this depends on the similarity of the tasks, their complexity and how accomplished, or 'experienced', we are at doing them.

Research findings indicate that our perceptual systems can more competently perform tasks requiring divided attention when the tasks are sufficiently similar, not complex, well known and therefore do not demand considerable mental effort. Often, especially for more complex tasks, we may think we are using divided attention but we are actually shifting attention from one task to another.

Understanding the limits of our attention has become important in the decision to pass laws against the use of mobile phones while driving. There is considerable research evidence that using a mobile phone while driving, whether handheld or not, distracts the driver's attention. If the driver's attention is divided between two tasks, one or both of which demand considerable attention (such as when manually dialling a phone number, texting or browsing the internet), there is a significant increase in the likelihood that the driver will fail to notice a potentially dangerous situation in time to respond and avoid an accident (VicRoads, 2021).

Figure 8.6 Some people are more confident in their ability to attend to more than one stimulus at the same time.

Figure 8.7 (a) Using a mobile phone while driving requires divided attention to simultaneously perform two relatively complex tasks and puts the driver and other road users at risk. (b) Researchers are now also increasingly raising concerns about pedestrian use of mobile phones and other handheld devices as they divide attention when navigating or crossing streets.

8.2.3 Selective attention

Selective attention involves choosing and attending to a specific stimulus whilst at the same time excluding other stimuli. Essentially, you 'select' what you want to pay attention to and ignore less important or irrelevant stimuli. For example, you may use selective attention when studying in a noisy room to filter out distracting sounds, or you may selectively attend to a book you are reading on the bus to school whilst ignoring the discomfort of the seat and the chatter of other passengers. When used successfully, selective attention enables you maintain the required level of performance in the presence of distracting stimuli.

Selective attention demonstrates that, at any given moment, the focus of our conscious awareness is on only a limited range of all that we are capable of experiencing. This occurs for an internally sourced event such as the perception of pain in the foot or an externally sourced event such as watching a car drive past.

What factors determine whether we will attend to a particular stimulus, possibly involuntarily? Generally, we are more likely to attend to a stimulus if it is important or meaningful to us, if it changes in some way or if it is novel.

If a stimulus is of *personal importance* we are more likely to notice and attend to it. For example, suppose you are at a party. Loud music is playing and you are surrounded by many conversations and a general babble of noise. Despite being totally involved in one conversation, your attention is likely to be automatically drawn to another one if you hear your name being mentioned. In effect, you will 'tune out' the rest of the party in order to selectively attend to the bits of incoming stimulation that are important to you. This commonly occurring experience is known as the 'cocktail party phenomenon'.

Our *physiological state* can also influence attention. For example, a hungry person is more likely to notice and pay attention to a fast-food outlet and a thirsty person's attention may be directed towards locating places where water is available.

Our *motives* can also be an influential force on attention. For example, the student who is highly motivated to learn a concept being explained by their teacher is more likely to pay much more attention in class than the students lacking motivation.

Past experience also has an important influence on attention. For example, we are more likely to notice and attend to things that are of personal interest or have meaning to us. An entomologist (person who studies insects) and a botanist (person who studies plants) will probably attend to different features of the environment as they walk through a forest.

Our attention is also attracted by any *changes* in stimulation or the introduction of a *novel* stimulus; that is, a stimulus that is new or unusual in some way. This may explain why many television and

Figure 8.8 The cocktail party phenomenon describes how a person's attention is attracted and becomes selective when they overhear their name mentioned in a nearby conversation.

radio advertisers pitch their commercials at a higher or lower volume than the programs they interrupt. Similarly, if a student wore an iridescent green jacket to a school that had a strict uniform policy, it would readily command attention from teachers and students alike.

Other changes in a stimulus that can attract our attention include:

- *movement*: A stimulus which moves is more likely to capture our attention than a stationary one. For example, a flickering light will attract our attention more readily than a non-flickering light, as will a moving vehicle compared with a stationary one.
- *contrast*: A stimulus which is noticeably different from its background or surroundings will attract attention more readily than one which is similar to the others. For example, a black ink stain on a white shirt is more likely to stand out and attract attention than a vanilla ice cream stain.
- *intensity*: A stimulus that is more intense than the others is more likely to capture our attention than one that is less intense. For example, a bright colour, loud noise, sharp pain or strong smell will attract our attention more readily than those of much lower intensity.
- *size*: A much bigger or a smaller stimulus draws attention more readily than one of an 'average' or 'normal' (due to salience).
- *duration or repetition*: A brief or momentary stimulus is less likely to capture our attention as easily as one that persists or is repeated. However, a constant stimulus or too much repetition can lead us to become accustomed to it through a process called *habituation*. We will then pay less and less attention to it and eventually ignore it.

If our attention is selective, does that mean we take in no other information presented to us when our attention is completely focused on one thing? For example, during the first class on Monday morning your attention may be selectively focused on hearing what happened at a weekend party. However, you may still process some of what the teacher is saying or doing with the rest of the class, which is selectively attending to what the teacher is saying. You may be aware that you need to have your book or screen open at a particular topic, or that you need to be copying some questions from the board even if you don't know what the questions actually ask.

Thus, even when your attention is focused on one thing, you are still capable of reacting to other stimuli. This suggests that we can process some information outside conscious awareness.

8.2 LEARNING ACTIVITY 1

Review

1. Distinguish between sustained, divided and selective attention.
2. An elite cricketer fielding on the boundary is running to catch a mis-hit ball against a complex background of noisy spectators wearing colourful clothing and moving about.

Explain the role of each type of attention in catching the ball.

3. What type of attention is predominantly used by the person in each of the following situations?

a.

b.

c.

d.

4. List three roles of attention in perception and making sense of the world.
5. Consider the potential influences on whether we attend to a stimulus. Classify each stimulus as either internal or external by placing a tick in the correct column.

Example	Internal	External
past experience		
change in stimulation		
movement		
novelty		
contrast		
personal importance		
intensity		
duration		
physiological state		
repetition		
size		
motives		

6. Taking account of the concept of attention, construct a definition for each of the following terms:
   a. distraction
   b. inattention
   c. attention span.

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8.2 LEARNING ACTIVITY 2

Analysis and evaluation of research on selective attention

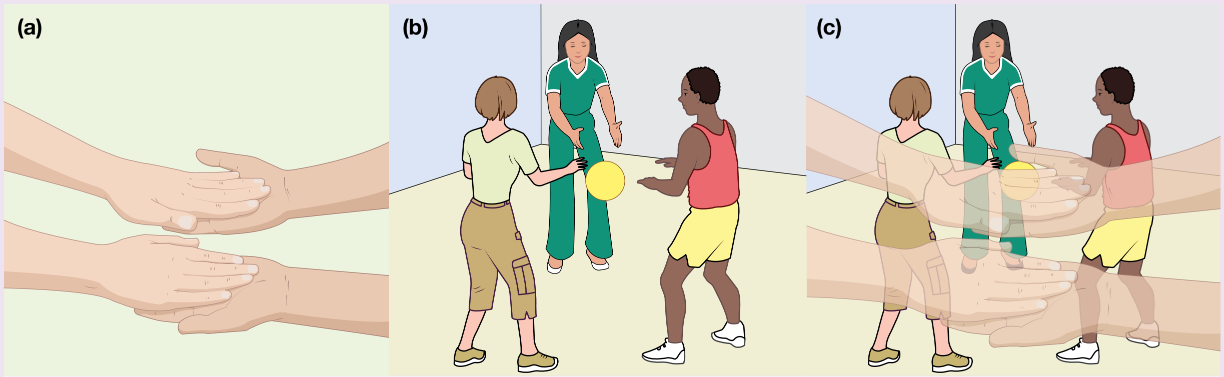
In order to investigate selective attention, American psychologists Ulric Neisser and Robert Becklen (1975) had participants view a video with two superimposed scenes showing overlapping events occurring at the same time (as in Figure c on next page). One scene showed two people playing a hand-slapping game (as in Figure a). The other scene showed three people passing a basketball to each other (as in Figure b).

Neisser and Becklen used a between subjects controlled experiment. Each participant was randomly allocated to one of two groups. Each group was asked to watch either the hand-slapping or basketball game.

The participants in the group that watched the hand-slapping game were required to press a response key whenever the people in the game slapped hands. Those watching the basketball game were required to respond in the same way whenever the basketball was passed.

The results showed that participants in both groups were able to selectively attend to the designated stimulus and effectively block the other stimuli that were present. Their 'attention filtering' processes were so successful that of the 24 participants who focused on the basketball game, only one noticed that the hand-slappers had finished their game and were shaking hands. When the experimenter replayed the videotape, the participants reported that they were surprised at what they had missed.

According to Neisser and Becklen, their results suggested that information may enter or be excluded from our consciousness through the process of selective attention.



Figures (a) and (b) are drawings from scenes in the two videos in the Neisser and Becklen (1975) experiment. Figure (c) shows the Figures (a) and (b) are drawings from scenes in the two videos in the Neisser and Becklen (1975) experiment. Figure (c) shows the two scenes superimposed, as seen by research participants.

a. Formulate a research hypothesis for the experiment.
b. Identify the operationalised independent and dependent variables in the experiment.
c. Suggest why a between subjects design is more appropriate for this particular experiment, rather than a within subjects design.
d. Briefly state the results that were obtained.
e. Briefly state the conclusion(s) drawn by the researchers on the basis of the results obtained.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

8.3 Role of perception in the processing and interpretation of sensory information

Perception is the process by which we interpret and give meaning to sensory information. This results in the conscious experience of ourselves and the world. For example, perception enables us to become aware of and understand our physiological state, what we are looking at or what we have tasted or heard, then think, feel or behave in response to that understanding.

Most of the time we process sensory information automatically, without realising that we are doing it. However, perception is not a passive process. It does not work like a camera or recorder, digitally capturing information.

Perception is an active process. What we see, taste, hear, smell and so on is the result of brain activity that constructs our personal understanding of reality from raw sensory information. This allows us to adapt to our environment and function in everyday life as we do.

Psychologists distinguish between two types of perceptual processes — top-down and bottom-up processing. These involve different ways of processing sensory information but they do not necessarily occur independently of each other.

8.3.1 Top-down processing

With **top-down processing**, the perceptual process starts 'at the top' with higher level 'processing' in the brain and then works 'down' from the whole to the details. Perception is guided and influenced by cognitive processes, such as drawing on your past experience, knowledge and expectations in order to interpret and assign meaning to raw sensory information.

The top-down process will also take account of the context in which the perception occurs. If there are gaps in sensory data, then these may be filled in when constructing the perception.

The top-down perceptual process does not rely entirely on the sensory data alone. For example, when going for a walk in your neighbourhood on a dark night, a small vaguely seen blob on the end of a leash is recognised as a dog. Despite the low quality of the raw sensory information and lack of finer details, you recognise it as a dog because you draw on your past experience and knowledge of the world. You have prior experience with dogs and know what they look like. You also know that they are often walked by people using leashes. The information is stored in your memory. In addition, you have walked through the neighbourhood on previous occasions and have come across people walking dogs. So, the stimulus is occurring in a context or situation where you would expect a dog to be.

It is also possible that you initially hypothesised that it was a dog because you couldn't quite make out enough features. However, as you got closer, you could distinguish several specific features known to be part of a dog and confirmed your hypothesis. Using top-down processing, you worked downward from an initial impression, through to lower level information in the form of particular details. Your hypothesis may have also influenced your choice and analysis of additional stimulus information as you got closer to the dog.

Yu can sitll raed tihs snetecne wouthit too mcuh dicffiutly depsite the sepillng mitsakes. Tihs is bcuseae it deosn't mttaer waht oredr the ltteers in a wrod are. The olny iprmoetnt detial is taht the frist and lsat ltteers of each wrod are in the rghit pclae.

FIGURE 8.9 Our use of top-down processing means that we can draw on our knowledge of words, past experience and expectations to quickly read words collectively as a whole rather than reading each letter individually. When the first and last letters of a word are in the right place, we can overlook the misspellings and correctly identify each word.

8.3.2 Bottom-up processing

With **bottom-up processing**, the perceptual process starts 'at the bottom' with raw sensory information that is sent 'up' to the brain for higher level mental 'processing'. Raw sensory data are progressively analysed at higher and higher levels until they reach the relevant cortical areas in the brain where they are processed and a perception is constructed based on this information. Unlike, top-down processing, the bottom-up perceptual process relies entirely on the sensory data.

Bottom-up processing is also known as 'data-driven processing', because incoming stimulus data initiate and determine the higher level processes involved in their interpretation when the sensory information reaches the brain. It is entirely data-driven. No previous knowledge or other higher level mental processes are required during the process.

Bottom-up processing takes place as it happens and perceptions are built from the sensory input. For example, if a visual stimulus is a dog, the image on the retina is converted into electrical impulses and sent to the visual cortex in the brain where it is initially processed. Along the path from the eye to the brain, specific features of the stimulus such as colour, dots, edges and lines are detected and sorted. When the sensory information reaches the visual cortex, the different features are combined and an image may be constructed from all the available information. It is then sent to other cortical areas for even higher level processing so that it may be recognised. Then, cognitive processes take over and perception occurs when the stimulus is matched against information in memory and it is recognised as a dog.

Although, top-down and bottom-up processes are different, human perception is not simply the result

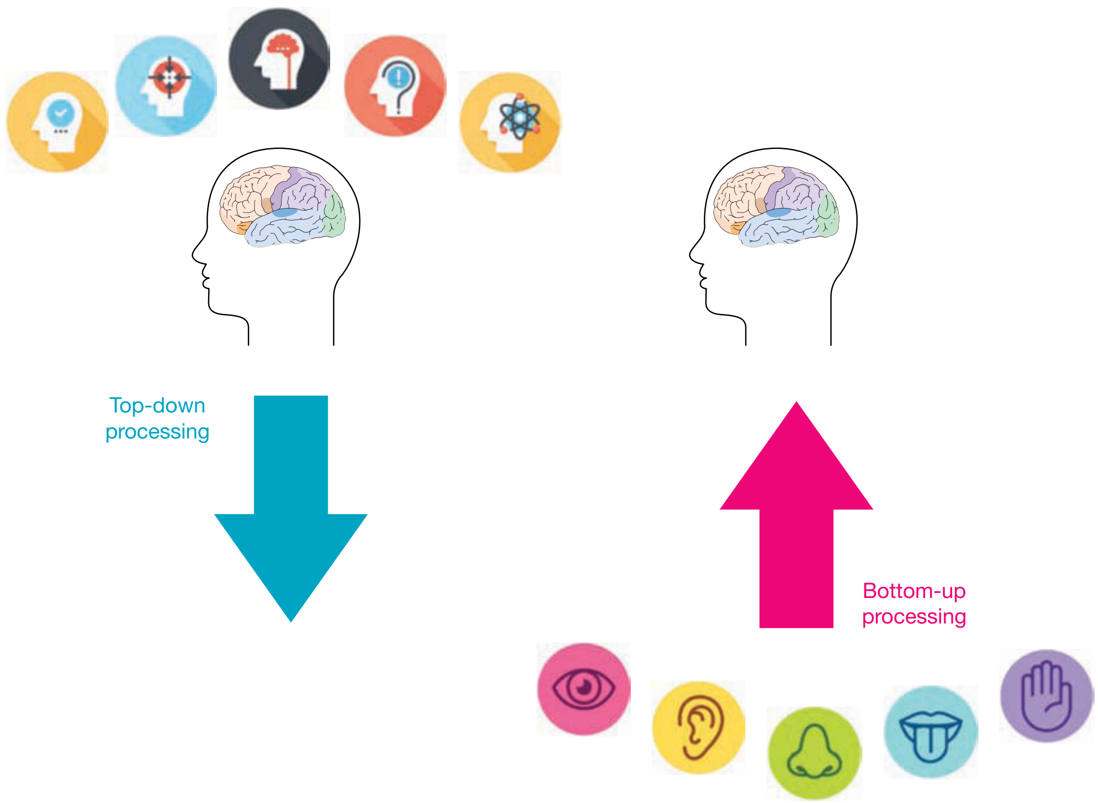


Figure 8.10 Top-down processing is driven by mental processes, such as the individual's knowledge, experiences and expectations, not just the sensory data. Bottom-up processing is stimulus driven processing that entirely relies on the sensory information.

Figure 8.11 Many visual illusions show how top-down and bottom-up processing influence perception. For example, most people first interpret this image as random scattering of black dots and splotches on a white background. However, when told that there is a dalmatian sniffing around on the ground and to look at the image as a whole, the dog can be recognised. In the first instance, bottom-up processing is influential and responsible for the inability to recognise the pattern formed by the dog. Then, when told that there is a dog in the image and to look at the whole image, most people expect to see a dog and draw on their knowledge of dogs to recognise it. This approach demonstrates the influence of top-down processing.

of a one-way flow of information, either downward or upward. Most of the time, our perceptions are the result of both types of influences, top-down and bottom-up. Top-down and bottom-up processing work together, complementing and reinforcing each other in the construction of our perceptions.

8.3 LEARNING ACTIVITY

Multiple-choice questions

1. We assign meaning to sensory information through a process called
   - **A.** attention.
   - **B.** awareness.
   - **C.** sensation.
   - **D.** perception.
2. The term top-down in relation to perceptual processing refers to
   - **A.** the speed of processing.
   - **B.** the direction of information flow.
   - **C.** the level of importance of the information.
   - **D.** the quality of the information being processed.
3. Bottom-up processing is also commonly described as
   - **A.** data-driven processing.
   - **B.** cognitive processing.
   - **C.** sensory processing.
   - **D.** two-way processing.

4. When learning to read, we initially learn that certain arrangements of lines and squiggles represent letters of the alphabet. Later on, when we have developed the ability to read, we know that these letters combine into chunks to form words that we commit to memory.
   For this example, ____ accounts for a chunk of letters initially being perceived as lines and squiggles rather than words; whereas ____ accounts for these letters being perceived as words when we have learnt to read.
   - A. top-down processing; bottom-up processing
   - B. divided attention; selective attention
   - C. bottom-up processing; top-down processing
   - D. selective attention; divided attention
5. The identification of an auditory stimulus using previous knowledge, context and expectations demonstrates the use of
   - A. top-down processing.
   - B. bottom-up processing.
   - C. hypothesis testing.
   - D. selective attention.

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8.4 Visual perception

Visual perception occurs through the interaction of numerous factors, many of which automatically influence assist our interpretation of what we are looking at. Although the diverse range of influences can be classified as biological, psychological and social, this does not mean that a neat line or boundary can be drawn between different types of factors. To do so would be like trying to draw a line between sensation and perception.

In the same way that sensation and perception are closely interrelated, so too are biological, psychological and social factors that influence any perception interrelated. The interaction between them is responsible for the unique personal realities we each construct of the world around us.

In this section, we examine examples of the different types of factors. These are shown in Figure 8.12.

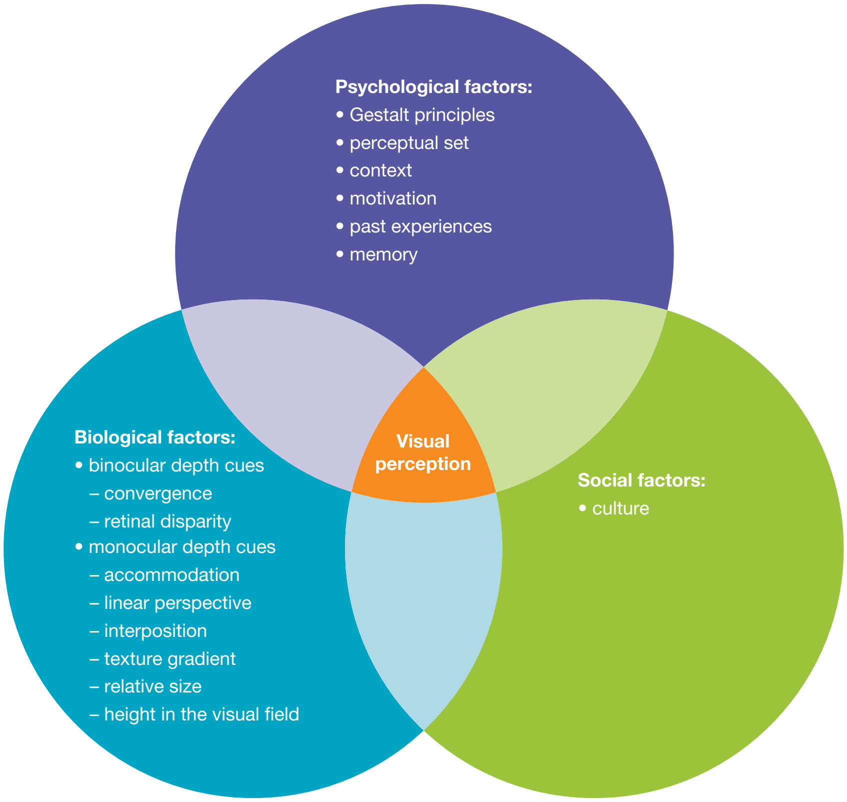

Figure 8.12 The biological, psychological and social factors that influence visual perception which are described in this topic. These are just some of the many influences.

8.4.1 Biological factors

Visual perception starts at the eye where light is received, converted into neural signals then sent to the brain for interpretation. All of the anatomical structures and processes of the eye and brain, neural pathways that connect them and the genetics that underlie and shape their maturation and development over time, are just some of the biological factors that can influence visual perception.

In this section, we consider the role of depth cues in how we perceive depth and distance, and how the use of one eye or two eyes can influence what we perceive.

Depth cues

One of the most important tasks of our visual perception system is to locate objects in space. Without this ability, we would find it difficult to navigate and interact with our world. In order to locate objects in space, we need to judge whether one object is above, below, or to the left or right of another. We also need to judge how far away objects are from each other and ourselves.

We need to make these judgments automatically and rapidly or our interaction with the world would be something like being in continual slow motion. Judgments about where objects are in space enable you to efficiently reach for a pen on your desk. They are also vital for your survival. For example, when crossing a street you need to judge where approaching vehicles are in relation to yourself and judge the distances between you and the vehicles so that you safely reach the other side. Locating objects in space involves depth perception.

Depth perception is the ability to accurately estimate the distance of objects and therefore perceive the world in three dimensions. Many psychologists describe our depth perception as a 'remarkable' ability because objects in our world are arranged in three dimensions — length, width and depth — but the retina at the rear of each of our eyes holds only a two-dimensional image of the world around us.

Depth cues provide the information that enables us to translate the two-dimensional images on the retinas into three-dimensional reality. **Depth cues** are sources of information from the environment (external cues) or from within our body (internal cues) that help us to perceive how far away objects are and therefore to perceive depth. Depth cues are often categorised into two groups — binocular or monocular.

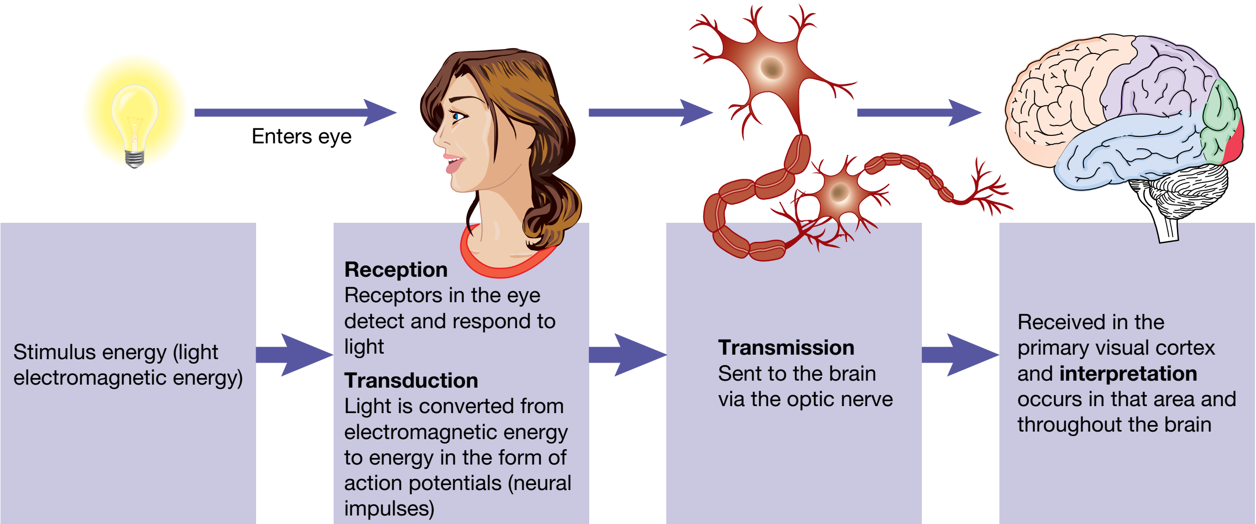

Figure 8.13 Reception, processing and interpretation of visual sensory information. Visual perception starts at the eye where light is received, transduced, then sent to the brain for interpretation.

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Binocular depth cues

Binocular depth cues require the use of both eyes working together in order to provide information to the brain about depth and distance. These cues are especially important in determining the distance of objects that are relatively close. Consequently, if for some reason our vision is limited to the use of only one eye, tasks requiring us to focus on detail over short distances can be difficult to accomplish.

Convergence

Imagine you are watching someone approach a small, round, shiny object on the footpath. If you could watch their eyes as they picked it up and brought it in close to their eyes to work out what it is, you would see their eyeballs turning in slightly towards their nose. If they held the object right up near the tip of their nose, their eyeballs would turn inwards ('converge') like the girl's eyeballs in Figure 8.14.

Convergence involves the brain detecting and interpreting depth or distance from changes in tension in the eye muscles that occur when the two eyes turn inwards to focus on objects that are close. The brain interprets greater tension in the eye muscles as an object gets closer and less tension as an object gets further away.

Figure 8.14 Convergence involves the two eyes turning inwards to focus on objects that are very close.

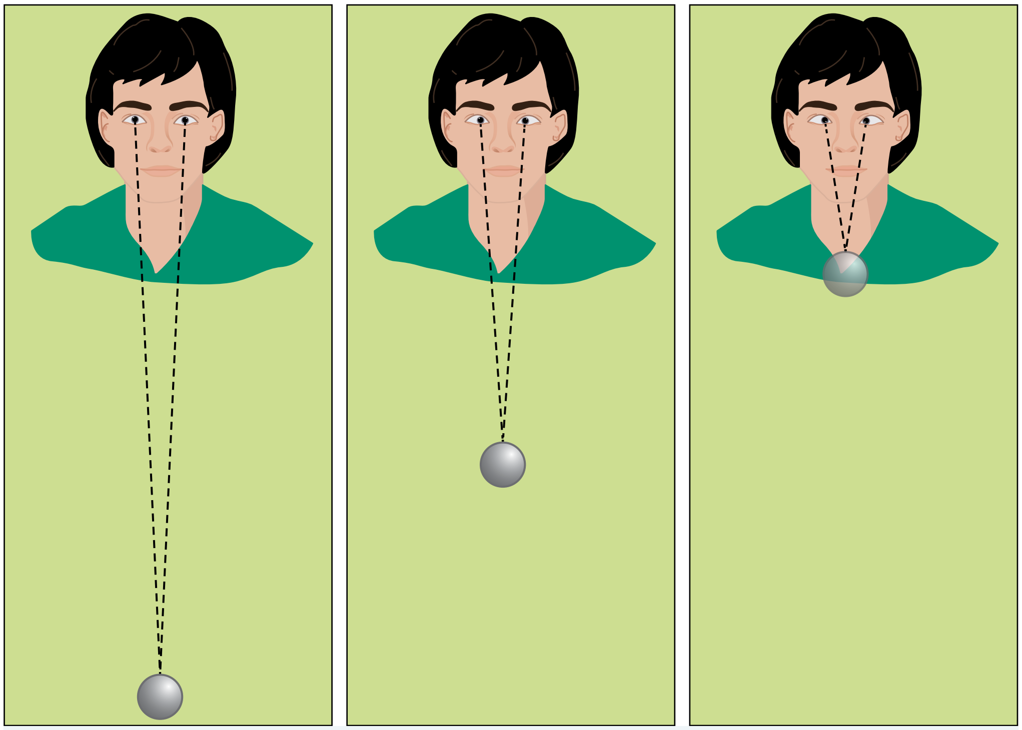

Figure 8.15 Our brain receives information from the muscles that turn each eye in towards the nose as an object in focus gets closer. The change in muscle tension is used by the brain to perceive depth and distance.

Convergence is particularly useful when the object we are looking at is within about 6 metres. Beyond this distance, the lines of sight from our eyes to the object are virtually parallel and there is no need for our eyes to converge to keep the object in focus. For example, fully extend one of your arms in front of you and point a finger upwards. Slowly move the finger towards your nose. You should be able to 'feel' the muscle tension associated with the convergence of your eyes, particularly as your finger gets very close to your nose. Your eye muscles relay this information to your brain, enabling you to make judgments about how far away your finger is as you focus on it.

Retinal disparity

Any visual image sourced in the external environment is focused onto the retina by the lens, which is located towards the front of the eye (behind the pupil, which is the black, circular part). The image cast on the retina is inverted (upside-down) and reversed (back-to-front). When received at the brain, it is rearranged so that we can perceive whatever we are looking at as it is in reality.

Because our eyes are about 6 or 7 centimetres apart, each retina receives a slightly different image due to the different angle of view from each eye. The difference in the image cast on each retina decreases

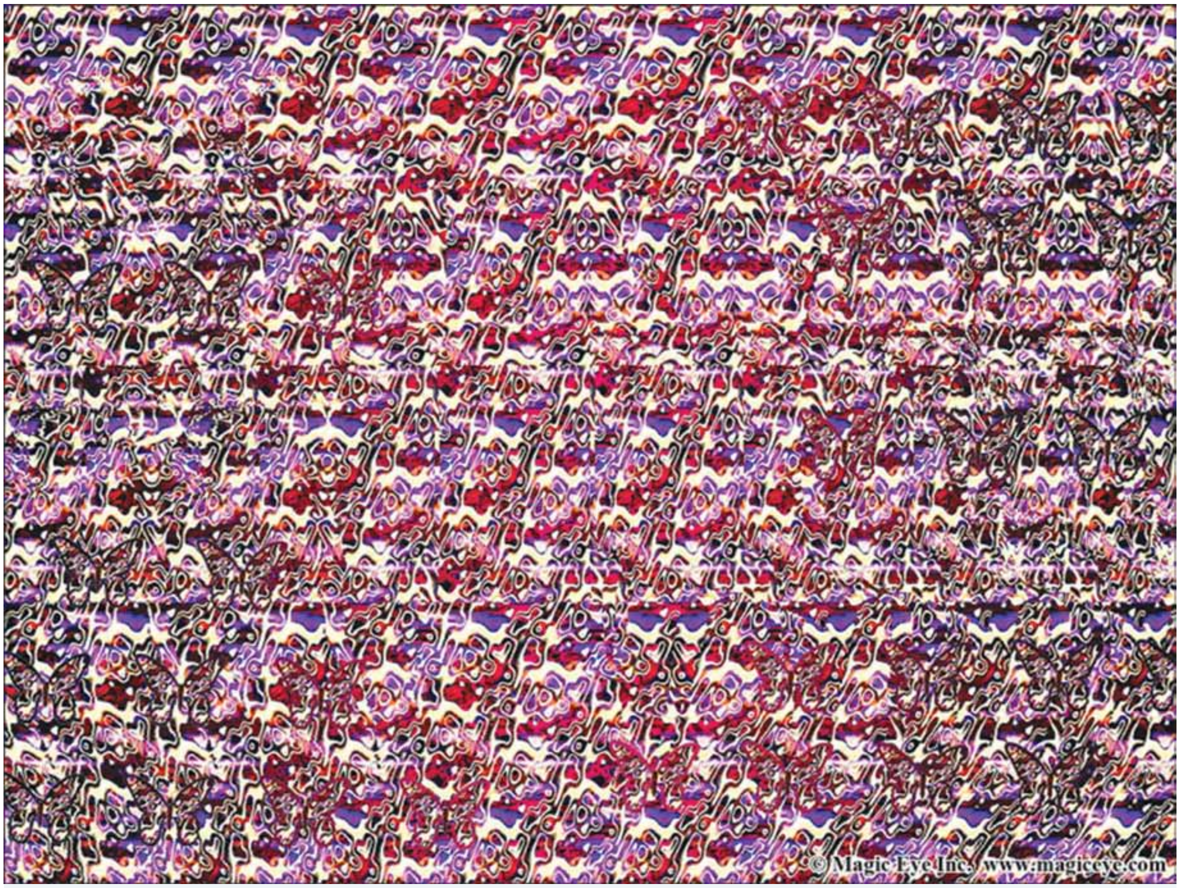

Figure 8.16 'Magic Eye' images take advantage of retinal disparity. Hold the centre of the image right up to your nose. It should be blurry. Stare as though you are looking through the image. Very slowly move the image away from your face until you begin to see depth. Now hold the image still and try not to blink. Most people eventually see the three-dimensional image within.

on Resources

Weblink Video on Magic Eye images and how to perceive 30 m 1 s as the object we are viewing moves further away from us. Beyond about 10 metres or so, there is hardly any difference in the image cast on each retina.

Retinal disparity refers to the very slight difference ('disparity') in the location of the images on the retinas (due to their slightly different angles of view), which enables us to make judgments about the depth or distance of an object.

When the two different retinal images are combined in the brain, the images received from each eye are compared. Any disparity or difference between the two images provides information about the depth of the object or its distance from the viewer.

To help you understand how retinal disparity changes with distance, hold a pencil vertically about 10 centimetres in front of you, then close one eye and notice where the pencil is in relation to the background. Next, open that eye, close the other one and notice how much the pencil 'shifts'.

These are the two different views of the pencil received by each eye. If you repeat this procedure while holding the pencil at arm's length, you will notice less disparity or 'shift' because there is less difference in the angles at which the two eyes view the pencil.

Monocular depth cues

Monocular depth cues require the use of only one eye to provide information to the brain about depth and distance, but they also operate with both eyes. Most depth cues are monocular, so we can still perform many of our daily activities without difficulty if we lose vision in one eye.

Many monocular cues are referred to as *pictorial cues* because artists use them to create depth and distance on two-dimensional surfaces such as paper and canvas. Monocular cues that are classified as pictorial cues include linear perspective, interposition, texture gradient, relative size and height in the visual field.

Accommodation

The size of the visual image of a large object viewed at close range would normally be too large to fit onto the retina. The lens in each eye plays a key role in enabling images of close, large objects to fit onto each retina. The flexibility of the lens enables it to bulge to fit ('accommodate') close objects on the retina and to elongate (flatten) when looking at objects that are further away. The closer (and therefore larger) the object, the more the lens needs to bulge to fit the object's image on the retina.

Accommodation involves the automatic adjustment of the shape of the lens to focus an object in response to changes in how far away the object is. The brain monitors the movement of the ciliary muscles that control the shape of the lens. These muscles contract to enable the bulging of the lens, and expand to allow it to elongate (flatten), as shown in Figure 8.17.

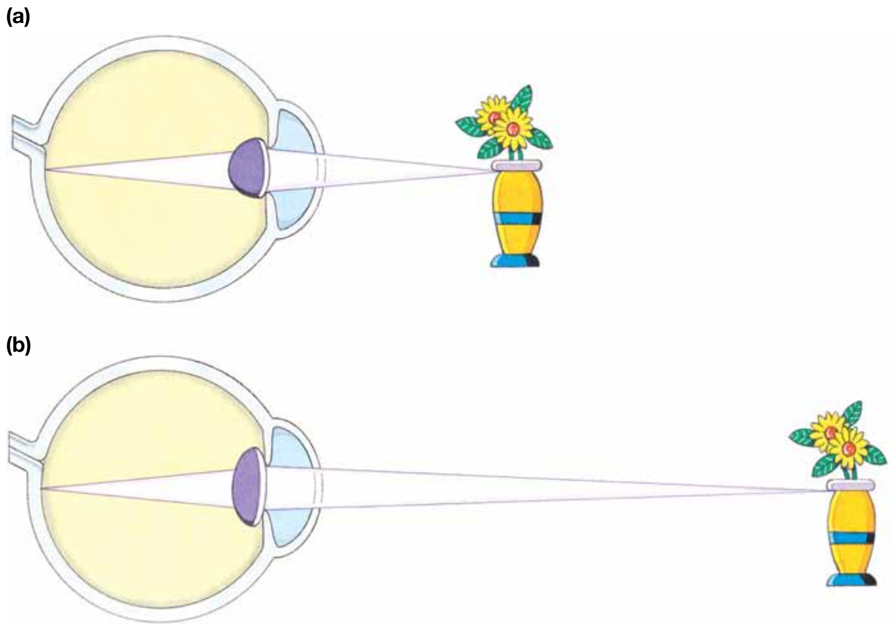

Figure 8.17 (a) The lens (shown in purple) bulges to focus the light rays reflected from a nearby object such as the flowers. (b) The lens elongates (flattens) to focus the light rays when the object is further away.

Information about how much the lens bulges or elongates is used by the brain to determine the depth and distance of the object in focus. For example, as you watch a golf ball leave the club head and travel 200 metres down the fairway, the lens quickly elongates. Alternatively, as you watch a basketball come towards you, the lens quickly bulges.

Linear perspective

When you are travelling in a car on a long, straight highway through the countryside and you look ahead, the view through the front windscreen is one of a road that appears to be narrowing. In fact, if you look all the way to the horizon, it will seem as if the two parallel edges of the road have come together to a single point. This illustrates the depth cue called linear perspective. **Linear perspective** is the apparent convergence of actual or imagined parallel lines as they recede ('go back') into the distance.

Interposition

When we see two footballers racing for the ball from a front-on perspective, it's sometimes difficult to tell which player is going to get there first. However, when one player starts to block our view of the other, we know that the partially 'covered' player is behind the other player and therefore further away. The image received on the retina of one footballer overlapping the other provides the brain with information about which player is closer and which player is further away. **Interposition**, also called *overlap*, occurs when one object partially blocks or covers another, and the partially blocked object is perceived as further away than the object that obscures it (and vice versa).

Figure 8.18 Linear perspective is evident in both of these scenes. Note the parallel lines formed by different features that appear to converge as they recede into the distance.

Figure 8.19 (a) The building on the left partially covers the Tower of Pisa on the right so we can use interposition as a depth cue to judge that the tower is further away than the building that covers it (and vice versa). (b) Non-availability of the interposition cue from another viewpoint makes it difficult to judge which of the two buildings is more distant.

Texture gradient

When we look down a long pathway made of pavers, the amount of detail that we can perceive in the pavers reduces more and more the further we look. For example, at our feet we can see individual pavers that make up the pathway, whereas if we look 30 or 40 metres further along the pathway, it looks like a single surface, with little detail.

Texture gradient refers to the gradual reduction of the detail that occurs in an object or surface as it recedes into the distance, compared with an object or surface that is close and perceived in fine detail. Thus, our judgment about depth and distance is influenced by the extent to which we can detect fine detail. We perceive objects for which fine detail is clear as being closer and those that lack detail, as being further away.

Figure 8.20 Use of texture gradient helps us to judge depth and distance. (a) Note that the flowers closest to us in this photo can be seen in detail and as these recede into the distance they become a blur and less detail is apparent. (b) Similarly, the pavers closest to us can be seen in more detail than those farther away. Linear perspective is also helpful, demonstrating that we use combinations of different depth cues.

Relative size

Imagine watching a cartoon about outer space. The cartoon shows a huge explosion of a planet and pieces flying through space in all directions. Some of the pieces appear to be hurtling towards you. How does the artist who draws each separate image that makes up this scene lead you to perceive how far away the pieces are?

The pieces that appear to be coming towards us are drawn as larger in each image than those going away or sideways from the exploding planet. The size of the pieces in relation to each other provides us with information about distance from us. As we move around in the real world, we use this information about the size of objects in relation to each other to judge depth and distance.

Relative size refers to the tendency to visually perceive the object that produces the largest image on the retina as being closer, and the object that produces the smallest image on the retina as being further away. However, the objects being perceived must be *expected* to be about the same size in real life. For example, we do not necessarily perceive that a car is further away than a truck because the car is smaller. We take into account what

Figure 8.21 Photo (a) shows a man leaning against a wall in the foreground and two men in the background. Our familiarity with the relative size of objects enables us to perceive the largest image on the retina (the man leaning against the wall) as closer than the smaller images on the retina (the other two men). Photo (b) has been manipulated. The retinal-sized image of the man in the white shirt has been placed next to the man leaning against the wall so that both the man leaning against the wall and the man in the white shirt are the same distance from the observer. If you measure the height of the image of the man in the white shirt you will realise that he is exactly the same size in both photos.

we *know* about their size, which is learned through past experience, and enables us to become familiar with the size of different objects in our environment.

Height in the visual field

When we draw a picture, objects that are in the sky, such as clouds, birds and planes, will be perceived as further away when they are drawn near the horizon. When we draw objects on the land, such as trees, animals and cars, they will also be perceived as further away when they are drawn near the horizon. **Height in the visual field** refers to the location of objects in our field of vision, whereby objects that are located closer to the horizon are perceived as being more distant than objects located further from the horizon.

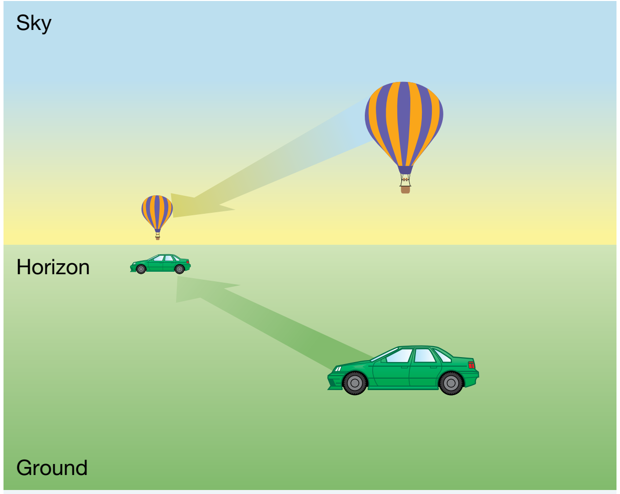

Figure 8.22 The hot-air balloon that is higher in the visual field is perceived as closer than the other balloon as it is further away from the horizon. The car lower in the visual field (but also below the horizon) is also perceived as closer, as it is further away from the horizon.

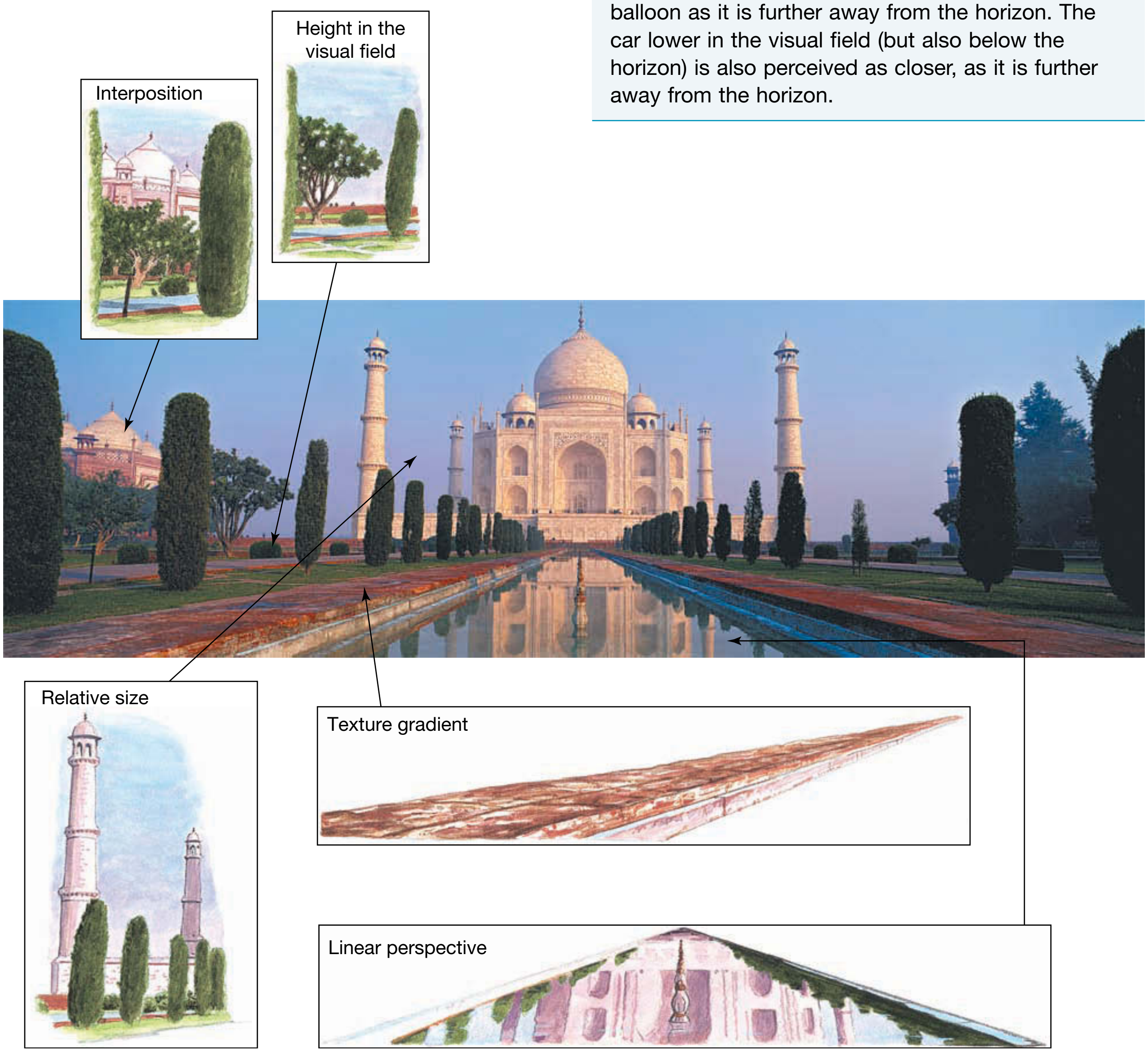

Figure 8.23 This photo of the Taj Mahal illustrates the use of all five pictorial depth cues.

8.4 LEARNING ACTIVITY 1

Review

1. Complete the table below to describe and classify each depth cue listed and give an example that illustrates each cue.

Depth cue	Description	Monocular (M) or Binocular (B)	Example
a. convergence			
b. retinal disparity			
c. accommodation			
d. linear perspective			
e. interposition			
f. texture gradient			
g. relative size			
h. height in the visual field			

2. a. Briefly describe a task that would be difficult for a person with sight in only one eye.
   b. Which depth cues would this person be unable to use?
   c. How would the inability to use both eyes affect the person's performance on this task?
3. Which of the monocular cues described in the text would not be classified as a pictorial cue?
4. The eye's lens can alter its shape for near or distant objects.
   a. Name the depth cue that uses information associated with change in lens shape.
   b. Explain how and why the lens would change shape as a jeweller looks on a shelf for a tiny part to repair a watch, then closely inspects the part.
5. The retina receives a two-dimensional image, yet we visually perceive a three-dimensional environment. Explain how this occurs, with reference to depth cues.
6. Examine the Renaissance painting shown in Figure (a) and the street scene in Figure (b). Identify three depth cues that are evident in the artwork and three in the photo.

The Annunciation by Crivelli, c.1430–95.
© The National Gallery London

7. Explain with reference to three examples of pictorial cues, why it is difficult to judge depth or distance in this scene.

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8.4.2 Psychological factors

Psychological factors involve the many and varied mental processes and influences on visual perception. These are sourced within the individual and therefore significantly influence top-down processing of incoming sensory information.

In this section, we consider the influence of some common Gestalt principles on how we organise visual stimuli to make them meaningful, the role of perceptual set and our expectations of what a stimulus may be, and the influence of the context in which perception occurs, our motivational state at the time of perception, and how past experiences and memory can influence perception.

Gestalt principles

In relation to visual perception, the term **Gestalt principles** refers to ways in which we organise the features of a visual stimulus by grouping them to perceive a whole, complete form. The 'principles' are like 'rules' that we apply to visual information to assist our perceptions.

For example, if part of what we are looking at is hidden or covered, then, in order to make sense of what is being observed, we simply construct a 'whole' or complete form by mentally filling in the part that we cannot see. In this way, Gestalt principles help us construct a meaningful whole object from an assortment of parts that, when considered as individual bits, lack any real meaning.

We tend to automatically use these Gestalt principles, without any conscious effort or awareness that we are doing so. And when we group 'parts' into 'wholes', we usually do so in the simplest way possible.

Psychologists have identified numerous Gestalt principles that are used in visual perception. These include figure–ground organisation, closure, similarity and proximity.

Figure 8.24 A food artist has used Gestalt principles to create these buffet displays. The individual 'parts' are various fruits and vegetables which are organised into the 'whole' forms of birds.

Figure–ground

Figure–ground is used when you read this sentence — the words printed in black (figure) stand out against the white paper (ground) on which they are printed. Similarly, a classroom teacher is perceived as the figure against the background of the rest of the classroom.

When we use **figure–ground**, we organise visual information by perceptually dividing a visual stimulus into a 'figure', which stands out from the 'ground', which is its surroundings. By making an object the centre of our focus it becomes the figure, while all other visual information becomes the (*back*)ground.

Figure–ground organisation is generally achieved when we separate the figure from the ground using a line or boundary between the figure and ground, which may or may not exist in the scene. This line of separation between the figure and ground is known as a *contour*. The contour is always perceived as belonging to the figure.

Signs are frequently designed so that the figure stands out clearly from the background. Road traffic signs in particular, are designed so that the figure stands out from the background. For example, the letters on the 'STOP' sign in Figure 8.26 are written in white to stand out as the figure against a contrasting red background. Similarly, signs indicating speed limits that need to be seen quickly make use of numbers that stand out against a contrasting background. The contours are attributed to the numbers, making them the figure against the background.

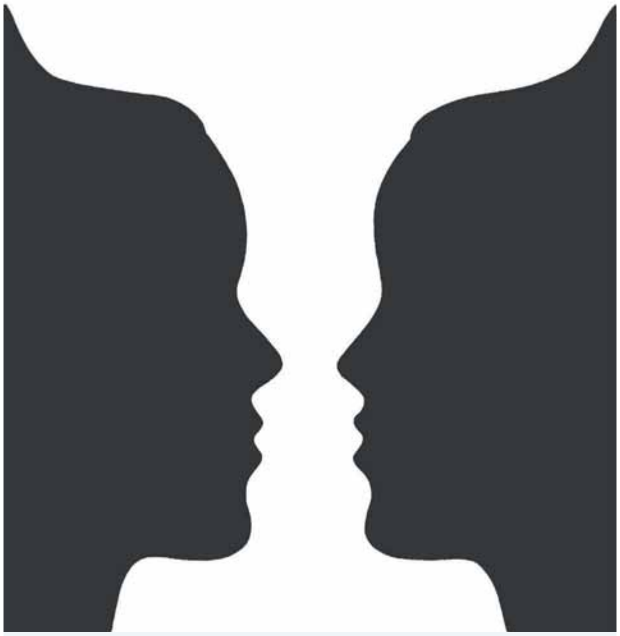

Figure 8.25 In 1915, the Danish psychologist Edgar Rubin produced an image like this one. It is commonly called an ambiguous or reversible figure. The term ambiguous figure refers to the fact it can be perceived as either two silhouetted faces in front of a white background or as a white vase against a black background. The term reversible figure refers to the fact that it can produce alternative perceptions based on whether we identify the faces or vase as the figure or ground. The differing interpretations of the image occur with shifts in attention and how we perceive the contour. When we focus our attention on the vase, the contour belongs to the vase and this separates it from the ground. When we focus on the two faces, they 'own' the contour and the vase becomes the ground.

Figure 8.26 Road signs use the figure–ground organisation principle to support quick perception of their messages.

The importance of being able to attribute a contour to part of the stimulus (the figure) in order to separate it from the background is highlighted when we have difficulty in doing this. When this happens, either by design or unintentionally, it creates camouflage.

Camouflage occurs when the figure and ground are not easily separated, but blend together. Camouflage restricts our ability to separate the figure from the background because the colour(s) and pattern (or design) of the figure are similar to the background. Uniforms for army personnel are designed to use the colours of the surrounding environment so that a soldier (the figure) is difficult to separate from the environment (the ground) in which they are located.

Closure

Closure is the perceptual tendency to mentally 'close up', fill in or ignore gaps in a visual image and to perceive incomplete objects as complete ('whole').

For example, in Figure 8.28 the standard sign for disabled people's facilities requires the use of closure to reach the interpretation of a person in a wheelchair. Similarly, we use closure to organise then interpret the shape in the Australian Made, and Owned logo as a kangaroo and the World Wildlife Fund logo is a panda.

Figure 8.27 Can you find all the soldiers in this photo? Camouflage makes them difficult to spot.

Figure 8.28 Organisational logos and signs often require the use of closure by the observer to mentally complete an incomplete figure.

Similarity

The principle of **similarity** involves the tendency to perceive parts of a visual stimulus that have similar features — such as size, shape, texture or colour — as belonging together in a unit, group or 'whole'. For example, this principle is used when we group people wearing the same clothing and identify them as belonging to the same team, school or workplace.

Similarity is applied by the designers of uniforms for school, sports teams, emergency services and defence forces personnel, as well as to uniforms worn by employees of commercial organisations such as fast-food chains, supermarkets and petrol stations so as to identify people as belonging to a particular group. Whether it is students from different schools at a bus stop, players in opposing sports teams, or even bikies dressed in particular clothes that are typical of their gang, we visually group those who are dressed similarly and perceive them as belonging to the whole group.

Tests for colour blindness examine whether we have normal colour vision by requiring us to use the principle of similarity to group sections of the images in the test items to visually perceive numbers. These numbers will remain hidden if we are unable to group the dots accurately on the basis of colour. An example of an image like one used in tests of colour blindness is shown in Figure 8.29(b). Can you perceive the number 12?

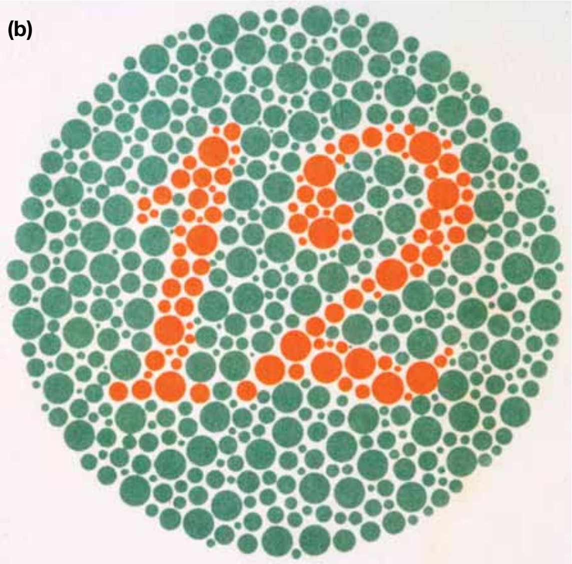

Figure 8.29 (a) Individuals in this photo can be perceived as belonging to different groups based on uniform colour when you apply the principle of similarity. (b) This image is like one used in the tests for colour blindness. Can you perceive the 12?

Proximity

The principle of **proximity** (also called *nearness*) is the tendency to perceive parts of a visual image which are positioned close together as belonging together in a group. We group the separate bits into a whole based on how close they are to each other. For example, a series of letters located physically close together might be grouped to be perceived as a word, as in Figure 8.30, or a series of musical notes grouped together on a score may become a melody, as in Figure 8.31.

Figure 8.32 shows two examples of the principle of proximity. In Figure 8.32(a) we perceive four horizontal rows of blocks, whereas in Figure 8.32(b) we perceive four vertical columns of blocks.

What's that on the road ahead?

What's that on the road a head?

Figure 8.30 The series of letters located physically close together might be grouped to be perceived as a word.

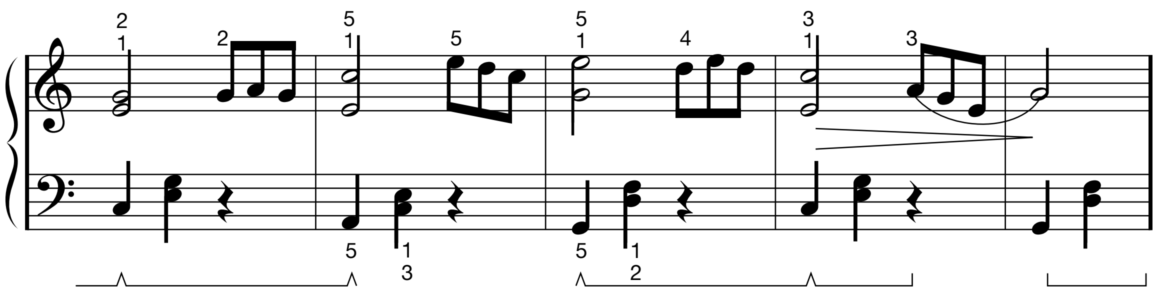

Figure 8.31 The musical notes that are closer together in this musical score will be perceptually grouped (by those who read music) to be interpreted as a melody.

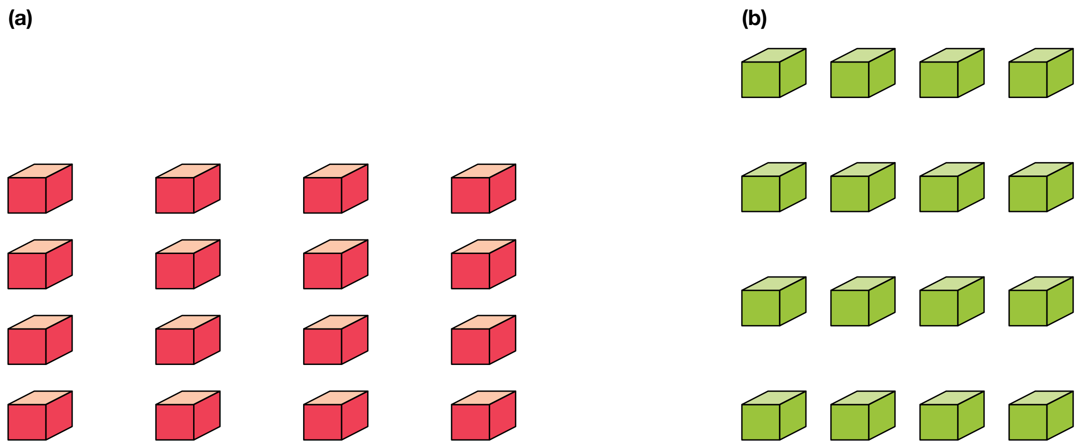

Figure 8.32 The proximity of the parts which comprise these two diagrams determines whether we perceive rows or columns.

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Weblink Video tutorial on Gestalt principles 4 m 35 s

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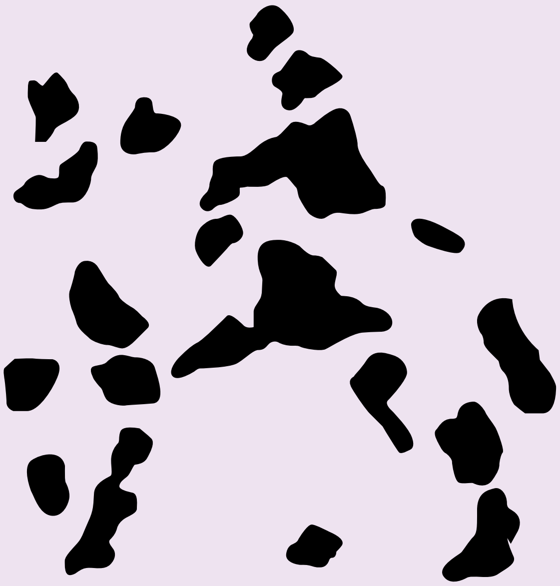
8.4 LEARNING ACTIVITY 2

Review

1. Explain the meaning of:
   a. visual perception principle
   b. Gestalt principle of visual perception.
2. Complete the table below to summarise four Gestalt principles described in the text and an additional principle you identify through your own research. Write a definition of each principle and give two examples of artworks, signs and/or symbols that illustrate the four principles in the text. For each principle, one of the examples should be your own. For the fifth principle you identify, include at least two examples in total.

Principle	Definition	Examples
figure–ground		
closure		
similarity		
proximity (nearness)		

3. Consider the image in Figure 8.29(b) which is like those used to diagnose colour blindness. When tested for colour blindness, people are required to visually perceive a number located within the stimulus figure. Explain, with reference to two Gestalt principles, how someone who is not colour blind (or colour weak) would visually perceive the number within the visual stimulus.
4. Identify two Gestalt principles used to organise and interpret the figure shown below.



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Perceptual set

Look closely at the illustration of a seal act for a circus in Figure 8.33. What do you see?

Figure 8.33

You may have identified a seal balancing a ball on its nose with its trainer on the right holding a fish in one hand and a stick in the other. However, if you had been told that this picture was of two people at a costume party, how would you then have described it? Would your perception of the same illustration have been different? Look again at Figure 8.33 until you can identify the woman on the left handing the man on the right an object. He has a sword in his right hand.

The ambiguous illustration demonstrates that an individual can arrive at entirely different perceptions from the same visual information. Why is it that our perceptions of the same visual scene can differ? Why is it that you could be led to perceive the same visual scene in two different ways? This can be explained by perceptual set, one of the most widely researched psychological factors that influences visual perception.

Perceptual set is a temporary readiness to perceive something in accordance with what we expect it to be. Our expectations of what an object or event may be also make us more likely to interpret the object or event in the predetermined way. It may also predispose us to perceive certain objects or events rather than others. For example, a person driving a car is likely to have a perceptual set to identify anything in the car or on the road that might affect their safety.

Perceptual set is often referred to as *expectancy* because various psychological and social factors create an 'expectation' to perceive something in a particular way or to perceive something to the exclusion of other stimuli. Experimenter effects in research are attributed to perceptual set and its expectancy influence.

Visual perception is usually assisted by perceptual set when we correctly anticipate what something is and therefore interpret it more quickly. For example, as your teacher writes on the board at the front of the classroom, a perceptual set may enable you to interpret a misspelt word such as 'rember' as a meaningful word (remember) in order to make sense of what is being written. Thus, you perceive the total message more quickly than if you had to try to work out what the word 'rember' meant before interpreting the whole message.

Sometimes, however, perceptual set can lead to perceptual distortions or mistakes. For example, look at the photo in Figure 8.34 and complete the activity. Our expectations of what something might be may cause us to notice only the information that is consistent with our expectations and ignore or overlook information that may be relevant. This can lead to a misinterpretation of an object or event.

Figure 8.34 Consider this photo of American singer-song writer Taylor Swift, who has sold over 200 million records worldwide, then turn to Figure 8.37 and complete the simple activity.

Consider the situation of waiting for a friend on a busy corner in the Melbourne CBD. The two of you have arranged to meet there and go to a movie. Your *past experience* with this person tells you that she walks faster than most people. You also know from past experience that she is always late, and today is no exception. Given the busy setting (i.e. *context*), you may be predisposed to look for the person walking fastest in the approaching crowd.

A perceptual set, such as one based on these factors, often enables you to visually perceive information quickly. You would eliminate all the people in your field of vision who are not walking quickly, because you expect your friend to be in a hurry. However, what if she has sprained her ankle, and is now hobbling slowly to meet you? Or, what if you rush to greet a fast-moving young woman who resembles your friend to find that you are totally mistaken?

There are several factors that may interact in influencing or bringing about perceptual set. Most of these involve personal characteristics of the perceiver, such as their past experience, motivation, emotional state, beliefs and cultural background. The context in which the perception occurs may also influence perceptual set.

Context

In visual perception, **context** refers to the setting or environment in which a perception is made. When interpreting visual information, we often take account of the setting and pay more attention to those aspects of the situation that are immediately relevant. In this way, context has a 'focusing' role in visual perception and usually assists us to make a quick and accurate interpretation of what we are looking at.

For example, consider the different interpretations that could be made of a fast-moving bright light in the sky that has a tail streaking behind it. How would you interpret this visual stimulus if you observed it in the sky over:

1. outback central Australia on a clear night?
2. a war zone?
3. a NASA launch site in the USA?
4. Melbourne's Yarra River on New Year's Eve?
5. a ship at sea?

As the context of the visual stimulus changed, your interpretation may also have changed from: (1) a meteorite, (2) a missile, (3) a rocket headed for outer space, (4) a skyrocket, (5) a distress flare.

Figure 8.35 Our perception of a bright light with a tail streaking across the night sky is likely to be influenced by the context in which it is observed.

Context can also lead us to make slower or inaccurate interpretations. For example, have you ever bumped into someone who seems familiar but found you cannot recall their name or where you know them from? The person may have been one of your primary school teachers, but because they were 'out of context' in a different situation from that in which you have known them, you were unable to readily identify them.

The importance of context in visual perception was first demonstrated in a well-known experiment by American psychologists Jerome Bruner and Leigh Minturn (1955).

In this experiment, one group of participants who were assigned the role of observers (Group A) was shown a visual stimulus like that in Figure 8.36 for 80 thousandths of a second *after* viewing the series of letters L, M, Y, A. Another group of observers (Group B) was shown the same visual stimulus for the

Figure 8.36 The ambiguous 'B or 13' stimulus figure used by Bruner and Minturn (1955)

same exposure time *after* viewing the series of numbers 16, 17, 10, 12. The task given to each group of observers was to identify what they saw and to draw it.

Results from Group A (who saw the letters first) indicated that 92% of the participants perceived the visual stimulus as a 'B'. For Group B (who saw the numbers first), 83% of the participants perceived the visual stimulus as a '13'.

Bruner and Minturn concluded that the context of either letters or numbers 'set' and therefore predisposed the observers to interpret the ambiguous symbol in accordance with the type of symbols that had preceded it. A perceptual set had been established by the time the ambiguous figure was shown. Observers expected the next symbol to be one that was consistent with the established context.

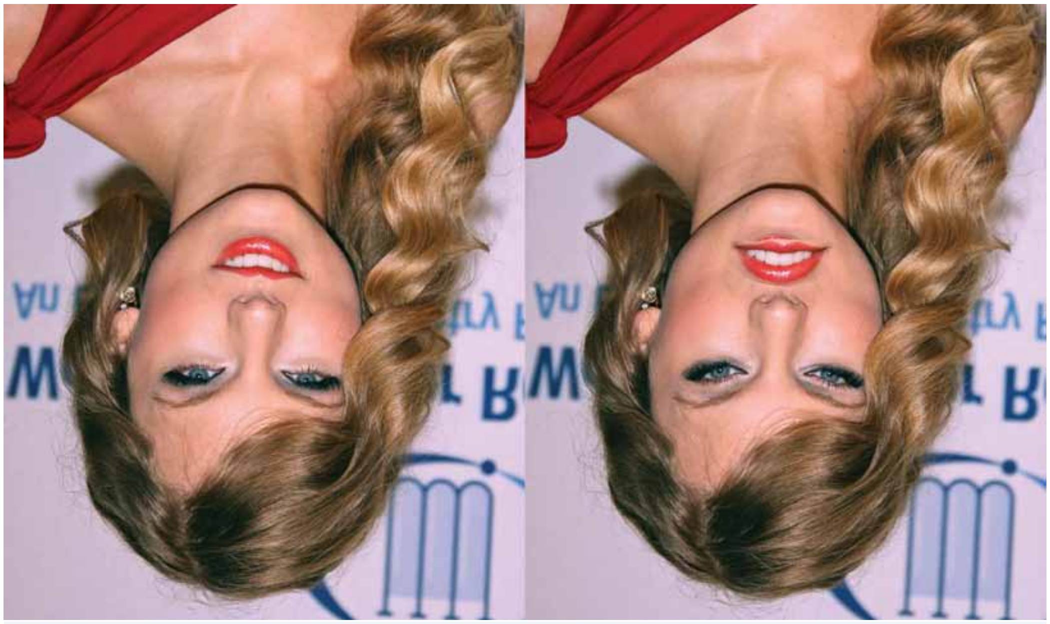

Figure 8.37 Consider the photos above and answer the following questions. Who is in the photo? Other than being of the same person, can you identify anything that clearly distinguishes the two photos? Now turn the photos upside down. Most people name Taylor Swift as the person in the photos when previously shown the photo in Figure 8.34. Most people also expect the photos to be of Taylor Swift smiling. Perceptual set has predisposed them to answer in these ways. Most people expect the photos to be 'normal' because of perceptual set.

8.4 LEARNING ACTIVITY 3

Analysis and evaluation of research on context in visual perception

Consider the experiment conducted by Bruner and Minturn (1955) on context in visual perception and answer the following questions.

a. Formulate a possible research hypothesis.
b. Identify the independent and dependent variables in the experiment.
c. Briefly state the results that were obtained.
d. Briefly state a conclusion for the experiment based on the results obtained.
e. Would a perceptual set have been established by showing one number/letter prior to showing the ambiguous figure? Explain your answer.

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Teacher digital document Practical activity — the effect of context on the interpretation of visual stimuli

Motivation

Motivation refers to processes which activate and sustain purposeful or goal directed behaviour. Motives can be influenced by psychological factors (such as interests, ambitions and desires), biological factors (such as bodily processes associated with hunger or thirst), or social factors (such as the influence of who we are with, how much money we have and our cultural background).

Motivation primarily influences perceptual set and therefore our expectations, visual perception can be influenced by our motives when we see what we *want* to see, rather than what is actually there. When supporters of opposing teams are sitting side by side at a football match, the difference in their perceptions of the same event may be considerable. Physically, the images cast upon their retinas are almost identical, but the influence of their respective motivational states to see their team win brings about perceptual differences which can be so great that they may appear (to the impartial observer) to be watching two different games.

Figure 8.38 Many AFL fans will arrive at a game with a perceptual set established by their motivation to see their team win.

Past experience

Past experience refers to our personal experiences throughout our lives. This includes everything we have learned both intentionally and unintentionally. Our visual perception relies to a very large extent on our past experience. For example, it is a crucial aspect of top-down processing, enabling to more efficiently form perceptions. In addition, our unique combination of past experiences can lead to many individual differences in perception. Such experiences can influence our expectations and predispose, or 'set', us to perceive incoming visual information in a particular way.

One of the pioneering experiments on the effect of past experience on visual perception and how it may influence perceptual set was conducted by American psychologists Hans Toch and Richard Schulte (1961). They hypothesised that past experience (operationalised as 'type and stage of training') influenced which illustration would be perceived more readily when two illustrations were briefly presented to participants.

The Toch and Schulte experiment involved the use of binocular rivalry. Binocular rivalry occurs when a different visual image is briefly and simultaneously presented to each eye. Usually one image or the other is seen, but participants rarely see both.

All participants were presented with nine pairs of illustrations. In each pair, one illustration was of a violent scene and the other was of a neutral (neither violent nor non-violent) scene. One of the pairs of illustrations used in this experiment is shown in Figure 8.39. The illustrations were deliberately drawn to be somewhat ambiguous in order to maximise the potential influence of the participants' training on their perceptions.

The participants were drawn from three different backgrounds: Group 1 had completed police-style training at the School of Police Administration and Public Safety at an American university, Group 2 had just begun their police-style training at the same school, and Group 3 were university students with no police-style training of any kind.

The results showed that Group 1 participants perceived the violent pictures on 52% of the trials, compared with Group 2 on 26% and Group 3 on 22%. Toch and Schulte concluded that the past experience of police training (which had involved considerable time discussing, recognising and managing potentially violent and dangerous situations) increased the probability of perceiving the violent pictures.

Figure 8.39 Figures such as this pair were presented to participants in the Toch and Schulte (1961) experiment.

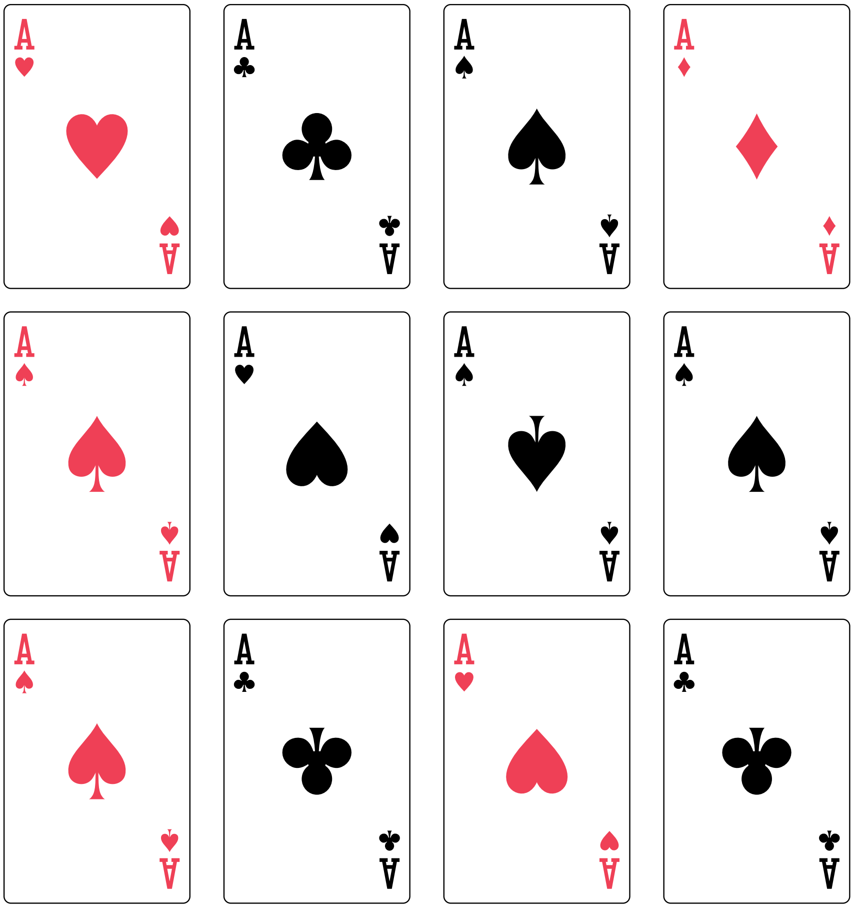

Figure 8.40 How many aces of spades do you see? Most participants shown the above display for a few seconds report seeing three aces of spades. However, there are actually five — two of them are coloured red instead of black. Because of past experience with playing cards, particularly with the ace of spade being coloured black, we are predisposed to look only at the black cards when given the task, which often results in an inaccurate perception. The above stimulus was used in a pioneering experiment conducted by American psychologists Jerome Bruner and Leo Postman (1949) who found that perceptual set based on past experience may cause perceptual error.

8.4 LEARNING ACTIVITY 4

Analysis and evaluation of research on the influence of past experience

Consider the experiment conducted by Toch and Schulte (1961) on past experience and answer the following questions.

a. Formulate a possible research hypothesis for the experiment.
b. Identify the independent and dependent variables in the experiment.
c. Identify the groups in the experimental and control conditions.
d. Briefly state the results that were obtained.
e. Briefly state the conclusion drawn by Toch and Schulte from their results.

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Teacher digital document Practical activity — the effect of past experience on the interpretation of an ambiguous stimulus

Memory

Visual perception is the process of interpreting what we see in a meaningful way. Memory is the process of storing and retrieving this perceived information for use when needed.

Knowledge and past experiences are stored in our long-term memory and can remain there relatively intact for a lifetime. This depends on such factors as the type of information, how deeply it is processed, how well it is stored, and how often it is retrieved for use.

What's stored in long-term memory is used to identify, interpret and understand the meaning of new visual information. For example, in the visual perception of objects and scenes through top-down processing, sensory information is initially compared with those stored in memory in the attempt to find a match. When a match is found, this enables us to recognise what we are looking at and incorporate it in the reality we mentally construct. If a match is not found, the top-down process may commence again.

Information stored in long-term memory also influences our expectations, motives, beliefs, emotions, understanding of the context and all other psychological factors which can in turn effect visual perception.

Without memory, we would be unable to store any new incoming information and have no knowledge or past experiences to draw upon for visual perception.

Figure 8.41 How well would you be able to read a text message or understand what you are reading without the words and their meanings stored in your memory?

Visual perception and memory are therefore closely interrelated. Perceiving incoming visual information would be meaningless without the ability to recall and link it to corresponding memories. Top-down processing would not be possible and bottom-up processing alone would provide inadequate information to visually perceive the world as we do.

8.4.3 Social factors

Social factors involve influences from the external social environment in which we interact with others. For example, experience with or in a particular culture can influence the way we process and interpret visual information.

Culture

One of the best-known studies that demonstrated the influence of culture on visual perception was conducted with Malawi people, a remote village community in Tanzania, Africa. A group of them were shown a black and white photograph of a dog. Despite the fact that many owned dogs or had experience with dogs, they were unable to identify the subject of the photograph as a dog. Even when the various features of the dog such as the head, ears and tail were pointed out to them, many of the Malawi people still had difficulty interpreting the photograph as a dog and, in some cases, the specific features of the dog, such as the paws and tail.

The researcher suggested that, being a remote tribal community, the Malawi people had little, if any, exposure to picture books. Consequently, they had little or no experience with photographs or two-dimensional drawings of dogs on paper. When they were shown a two-dimensional photograph, they may not have been able to use relevant visual perception principles to identify the features and the overall image of the dog (Deregowski, 1972).

For example, look at the picture of the hunting scene in Figure 8.42 on the next page. This was used to test the ability to respond to pictorial depth cues in one of the earliest studies on cultural influence. Which animal is closer to the hunter, the elephant or the antelope?

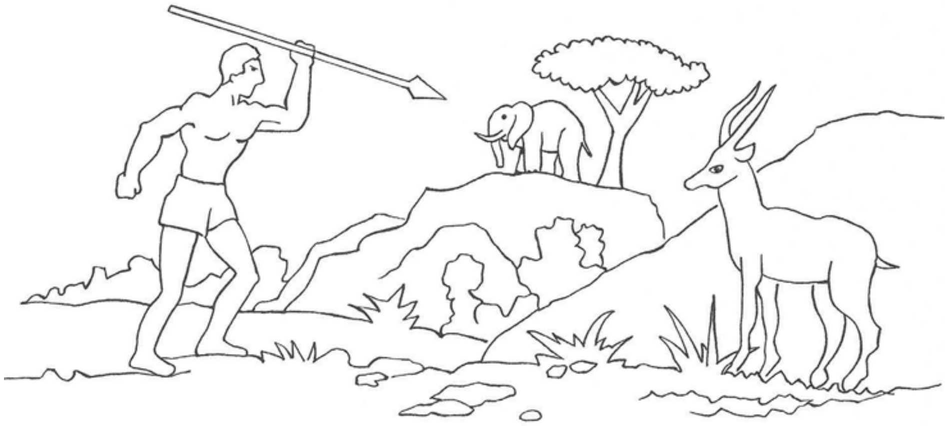

Figure 8.42 Which animal is closer to the hunter?

Using pictorial depth cues (monocular), you probably chose the antelope. The picture was shown to tribal Bantu indigenous people in Africa, who had little or no formal education and lived in isolated areas. Many of these participants selected the elephant, which is physically closer to the tip of the spear in the picture.

The researcher classified this answer as a two-dimensional response. The Bantu people had not used the interposition depth cue, nor had they taken into account what they know about the relative size of the animals; that is, that an elephant is bigger than an antelope (Hudson, 1962).

This cultural evidence also indicates the importance of past experience in visual perception. It is possible that the Bantu who made incorrect perceptual judgments did so because they had limited opportunities to see three-dimensional representations in two-dimensional forms. Therefore, they have difficulty judging distance from pictures (Deregowski, 1989).

Consider also the potential influence of cultural factors on the use of Gestalt principles. Prominent Russian psychologist Alexander Luria (1902–1977) was a pioneer of a specialist area in psychology now called cultural or sociocultural psychology. From this perspective, he queried Gestalt principles of perceptual organisation such as closure, proximity and similarity.

Many of the Gestalt principles had been developed from experimental research by German psychologists using participants who were university educated and lived in big cities such as Berlin and Munich. Luria was interested in finding out whether the Gestalt principles were also relevant to people from other sociocultural backgrounds. He was particularly interested in studying people who lived in rural areas and did not have any formal education.

In what is regarded by many psychologists as a pioneering study, Luria (1976) conducted experimental research using five groups of participants which he described as follows:

1. Ichkari women living in remote villages who were illiterate and not involved in any modern social activities
2. peasants in remote villages who were illiterate (and self-supporting)
3. women who attended short-term courses in the teaching of kindergarten children. As a rule, they still had no formal education and almost no literacy training.
4. active kolkhoz (collective farm) workers and young people who had taken short courses. They actively involved themselves in running the farms; had acquired a much broader outlook than had the isolated peasants; had attended school only briefly; and many were still barely literate.
5. women students admitted to a teachers' school after 2 or 3 years of study. Their educational qualifications, however, were still fairly low.

In sum, Groups 1 and 2 had no formal education and were illiterate, Groups 3 and 4 were semi-literate, and Group 5 had been formally educated and were literate.

Luria was concerned that an experiment in a laboratory setting would be entirely inappropriate. He believed that such a formal situation would be too far removed from the real-life experiences of many participants and may therefore influence the results in unwanted ways.

Instead, he conducted a field experiment during which he tested participants in what he described as their 'habitual' (or normal) environments. In his research report, he described a part of his procedure as follows:

> *As a rule our experimental sessions began with long conversations (sometimes repeated) with the subjects in the relaxed atmosphere of a tea house — where the villagers spent most of their free time — or in camps in the fields and mountain pastures around the evening campfire.*

Luria and his research assistants tested participants with the visual stimuli shown below in Figure 8.43. When asked to name the shape in each stimulus, the formally educated female students (Group 5) were the only ones who identified each item using the correct term.

For example, items 1–3 were all identified as a circle, regardless of whether it was made of a solid line (item 1), an incomplete line (item 2) or a solid colour (item 3). However, most of the participants in Groups 1–4 named the shapes according to the objects they resembled. For example, a circle was called a watch, plate or moon, and the square was called a mirror, house, or even an 'apricot-drying board'. When asked if items 12 and 13 were alike, one Group 1 participant answered, '*No, they're not alike. This one's not like a watch, but that one's a watch because there are dots*'.

Based on his research findings, Luria suggested that Gestalt principles may only be relevant to people who have studied geometrical concepts in a formal education system, such as in a school or university. Contemporary psychologists have suggested that experience with two-dimensional drawings on a sheet of paper may also be a factor that explains the results (Price & Crapo, 1999; Matsumoto, 2000).

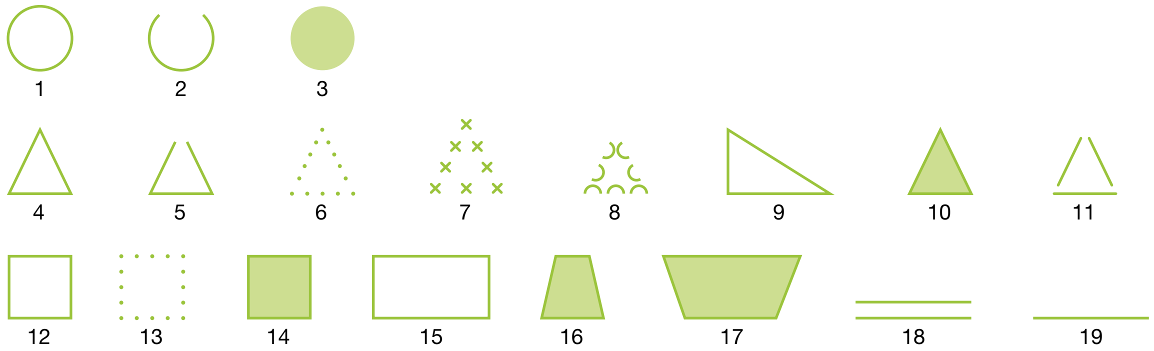

Figure 8.43 Luria's visual stimuli

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Teacher digital document Sociocultural research findings on the use of Gestalt principles — options and variations

8.4 LEARNING ACTIVITY 5

Review

1. a. Explain the meaning of perceptual set.
   b. Suggest why perceptual set is sometimes referred to as 'expectancy'.
2. a. What does context mean in relation to visual perception?
   b. Give an example of how context may lead to a perceptual interpretation of having 'seen' a UFO, a Tasmanian tiger, the Loch Ness monster or a similarly rarely sighted phenomenon.
   c. In what way is 'context' an explanation of the results obtained by Bruner and Minturn (1955) in their experiment?

3. Briefly explain, with reference to relevant examples, how each of the following can influence visual perception.
   a. motivation
   b. past experience
   c. memory
   d. culture.
4. Name the experimental research design used by Luria (1976).

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8.5 Gustatory perception

The pleasure we can derive from eating delicious food suggests that we can discriminate many tastes. However, we detect only five basic tastes — sweet, sour, salty, bitter and umami. Umami, also called savoury, is a rich, 'mouth-filling' taste in protein-based foods due to the presence of glutamate. Meat, aged cheese, ripe tomatoes, mushrooms, soy sauce and Vegemite are examples of foods that contain glutamate.

It was once believed that different parts of the tongue are more sensitive to certain tastes. It is now known that taste buds are spread relatively evenly throughout the tongue and mouth. Therefore, areas on the tongue do not differ too greatly in the taste sensations that they activate.

Taste seems to be the least critical of our senses but long ago it contributed more directly to our survival. It is believed that taste evolved to protect us from eating things that are poisonous and to ensure we have an appetite for the calories and nutrients we need.

For example, many toxic or spoilt foods and liquids are either bitter or sour. These are tastes we tend to avoid. In contrast, pleasure through sweet and salty-tasting foods helps ensure we meet nutritional requirements to keep us healthy. Identifying tastes is our brain's way of telling us about what's going into our mouth, and in some cases, keeping us safe.

Our perception of taste, or **gustatory perception** as it is formally called, is of renewed interest in psychology because it plays a significant role in overeating and in the rising incidence of obesity, diabetes and other eating or food-related disorders. Research studies have found, for example, that people who have a low sensitivity to the taste of sweetness in foods tend to eat more sweet foods and are more likely to be overweight. In addition, loss of taste sensitivity can lead people to eat too much sugar or salt to make their food taste better. This can be a problem for people with diabetes or high blood pressure. In some cases, loss of taste can even lead to mental health problems.

As with visual perception, taste perception occurs through both bottom-up and top-down processes. Most taste experiences are complex and result from the activation of different combinations of more or less of the five basic tastes.

Our appreciation of food, however, depends on more than taste alone. As you probably know from when your sense of smell is impaired by a stuffy nose, the perception of taste is dulled as well. Block your nose and an apple will taste the same as a raw potato. This occurs because taste perception relies very heavily on smell. Taste, smell, sight and other sensory inputs influence the perceptual experience we commonly call flavour.

We each have individual taste preferences. For example, some people hate oysters while others love them. Some people love sour lollies while others prefer only sweet ones. Some people prefer the taste of dim sims with soy sauce and others avoid the taste.

Our taste preferences are determined by perceptual processes that are shaped by the complex interaction of biological, psychological and social factors. Figure 8.44 on the next page shows some of the many specific influences on taste perception. In this section, we consider the influences of age and genetics and age (biological), memory and food packaging and appearance (psychological) and culture (social).

Figure 8.44 The biological, psychological and social factors that influence gustatory perception which are described in this topic. These are just some of the many influences.

8.5.1 Biological factors

Taste perception starts with the physical stimulation of taste receptor cells located within taste buds, most of which are in the mouth. The stimuli that produce taste sensations are chemical molecules in whatever you eat or drink. These molecules are dissolved by saliva, allowing the chemicals to stimulate taste receptors.

When taste receptors are stimulated, they convert the sensory input into neural signals that are sent along nerves to gustatory cortex in the brain, where the taste information is combined with other sensory inputs about the food or drink for interpretation.

All of the anatomical structures and processes involved in taste, and the genetics that underlie and shape their maturation and development over time, are just some of the biological factors that can influence taste perception. We focus on the role of genetics and age in what we taste.

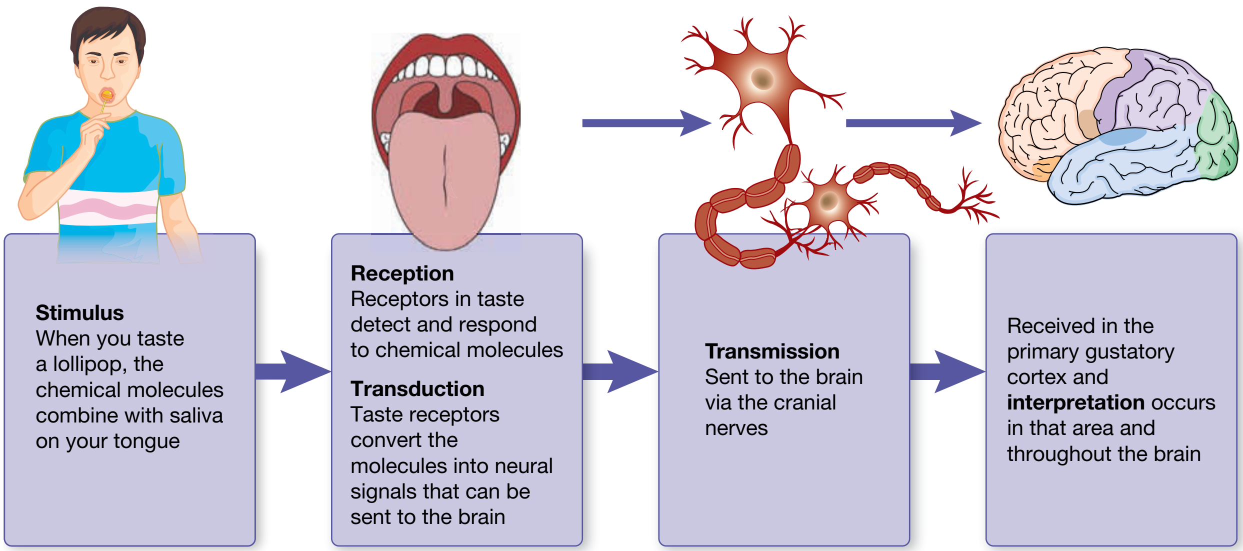

Figure 8.45 Reception, processing and interpretation of taste sensory information Gustatory perception starts at in the mouth, primarily on the tongue, where chemical molecules in food and drink are received, converted into neural signals then sent to the brain for interpretation.

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Genetics

People vary in their ability to taste. One reason is that genetic differences make us more or less sensitive to the chemical molecules in different foods. Our genes can therefore influence how sensitive we are to bitterness, sweetness, umami or any other tastes. For example, variants of one gene (called TAS2R38) have been found to influence how strongly an individual will be able to detect bitter tastes, which may explain why some people refuse to eat broccoli, Brussels sprouts and similar dark green, leafy vegetables throughout their lives.

If you enjoy these vegetables, this may seem a little strange. But some people actually experience the taste differently because of underlying genetic factors. Similarly, researchers have found that the likelihood of a person being a coffee drinker or a tea drinker is linked with the presence or absence of the gene variants that shape how bitter flavours taste (Ong et al., 2018). Our ability to perceive sweetness and the other basic tastes has also been found to be partly controlled by our genes.

American psychologist Linda Bartoshuk (2014), a prominent researcher in the study of taste, believes that 'bitter is hard-wired in the brain to hate' so 'we are born hating it', whereas 'we are born loving sweet'. Other psychologists argue that this view overstates genetic influence on taste because it suggests that our taste preferences may be fixed at birth and cannot be modified. We can learn to like or dislike bitter, sweet and other tastes. As you may have experienced, our taste and dietary behaviour can change over time as we get older and our social world expands.

Figure 8.46 Are we born loving sweet flavours?

Our individual taste sensitivities and preferences are also influenced by the different numbers of taste buds we have, and this is determined by genetics. Generally, the more taste buds we have, the more intensely we perceive tastes, especially bitter ones. The same food can actually taste different to different people because the sensation associated with that food differs in their mouths due to the number of taste buds they have, the number of receptors within the taste buds, and how sensitive these are to each of the basic tastes.

Therefore, whether you love or hate broccoli and whether you are predisposed to becoming a 'chocoholic' has an underlying genetic basis associated with how many taste buds or receptors you have (Rawal et al., 2013; Grison et al., 2014).

Some people who inherit an unusually high number of taste buds and experience taste differently have been called 'supertasters'. We consider their taste experiences in Topic 9.

Age

The ability to taste many substances is already well-developed at birth. Even premature infants show characteristic responses to basic tastes. For example, they suck more in response to a sweet substance used to coat a dummy and try to spit out the dummy when it is coated with a bitter substance.

Full-term infants start out with relatively few taste buds, but during childhood the number steadily increases until the final total is reached. The persistence of an aversion to bitterness may help protect children from eating poisonous foods during their early development, before they have learned what can be eaten and what must not be eaten.

Research also shows that children are much more responsive to taste than adults. One explanation is that they have more taste receptors than adults. We start to lose taste buds as we age, but exactly how many and when remain unclear. Some researchers have estimated loss of more than half our taste buds by the time we turn 20, whereas others report that loss of taste buds may not start until at least age 50.

Nonetheless, a greater number of taste buds in childhood may bring with it a greater range of taste sensations and partly explain why young children seem to be 'fussy eaters'. The explanation of fussiness in relation to the tastes of bitter and sour may have far more to do with genetics.

Among older adults, many report some loss of taste and research shows that it gradually deteriorates as they get older, especially over age 70. Loss of taste receptors does not, however, fully account for this change.

Many people may mistakenly believe they have a problem with taste, when they are actually experiencing a problem with smell. In older people, there is a normal age-related decline in the sense of smell which substantially contributes to loss of taste and the associated belief of having a taste problem. The decline in sensitivity of smell with age is due to several factors, including a reduction in the number of olfactory (smell) receptors in the nasal cavity which detect and respond to different odour molecules (Setarehnejad & Fairchild, 2019).

Another reason for impairment of taste perception associated with ageing is due to structural changes in the taste papillae. These bumpy structures host the taste buds. One type of papillae (called fungiform), which

Figure 8.47 Fussy eater or too many taste buds resulting in a sensory overload of taste?

Figure 8.48 A favourite treat might not taste the same when we are older.

contain high levels of taste buds, decreases in number as we age and also changes in shape, becoming more closed. The more open the papillae, the easier it is for chemicals in food to come into contact with the receptors to create taste. Closed papillae reduce the contact surface between food chemicals and receptors resulting in reduced responsiveness to food tastes.

Other than smell dysfunction, when a problem with taste exists among older people it is more likely to be caused by upper respiratory infection, medications, a dental, mouth or throat disease, a cancer treatment, or a history of middle ear infection (one taste nerve travels through the middle ear on its way to the brain).

Chewing problems associated with tooth loss and dentures can also interfere with taste sensations, along with the reduction in saliva production. For example, dentures, especially if not fitted well, can affect the quality of chewing and breaking down of food. This can then reduce the dissolution of the food chemicals in saliva and reduces the contact levels with taste receptors. In addition, the decline in saliva secretion means that there is less fluid to carry food ingredients to the taste receptors, and less liquid available to help food particles to dissolve, resulting in less taste information.

Of course, there are many older adults who do not experience noticeable deterioration in taste perception. Nor does everyone's taste perception decline in the same way. Changes among different people and genders are diverse, and not everyone shows the same types of taste preferences or level of impairment as they age (Bartoshuk, 1989; Boyce & Shone, 2006; Setarehnejad & Fairchild, 2019).

8.5.2 Psychological factors

Although we are genetically predisposed to like or dislike certain tastes, our taste perceptions and preferences are modifiable and can be influenced by psychological and other factors. For example, our initial visual inspection of food usually indicates if we would consider eating it on the basis of taste. We can often anticipate the taste of food simply by looking at it.

Underlying this reaction is a complex interaction of mental processes, most of which occur automatically with little conscious effort. These may include visual perception of the food's general appearance, colour and other distinctive features, drawing on past experience and memory to recognise the food its key ingredients, and decision making with reference to the context in which the food is presented and may be eaten, expectations about how it may taste, our mood and motivational state, how well we are feeling, our attitudes towards healthy eating, our beliefs about how healthy the food may be, and so on. We focus on how memory and food packaging and appearance can affect taste perception.

Figure 8.49 Our initial visual inspection of food usually indicates if we would consider eating it on the basis of taste.

Memory

From very early in life we acquire information about a diverse range of foods (and drinks). We gradually learn and remember what different foods look like, what they are called, what their main ingredients are, how they are made, what they taste like, how they are eaten, how they may affect us when eaten, and so on. This may occur through direct experience or by learning about foods from others. The knowledge and experience are stored in long-term memory for future reference.

What's stored in long-term memory is used to identify food and make judgments about how it may taste. Without memory, we would be unable to store any food and taste-related information and have no knowledge or past experiences to draw upon for taste perception. Information stored in memory also influences our expectations, mood, motives, beliefs and all other psychological factors which can in turn affect taste perception.

Taste perception and memory are therefore closely interrelated. Incoming taste information would be meaningless without the ability to recall and link it to corresponding memories. Top-down processing would not be possible and bottom-up processing alone would provide inadequate information to perceive taste as we do.

We also have specific food-related memories that directly influence taste perception when eating or planning to eat. For example, recalling a positive memory about a food influences our expectations of its taste in a positive way and thereby tends to make a present experience with the food pleasurable.

Similarly, we have memories of bad experiences with food, some of which may underlie a taste aversion. For example, if we get food poisoning after eating oysters or sick with the flu after eating dim sims, we may associate these foods with adverse reactions and form long-lasting memories that influence how we perceive them in the future. It is not uncommon to associate such foods with feelings of nausea and disgust which we experience every time we think about these foods, let alone try to eat them again.

In some cases, we may also generalise the experience of these foods and associate it with other foods which we also avoid or perceive with nausea and disgust. Creating these types of memories is believed to be essential from an evolutionary perspective because it is important for survival to have strong memories of anything that can potentially harm us.

Figure 8.50 Our memories of taste experiences influence taste perception. In some cases, we may associate a food with an adverse reaction and form a long-lasting memory that leads us to avoid it.

learnON

learnMORE | Taste aversions

Access learnON to read about why we have aversions to some foods.

Food packaging and appearance

We often taste what we expect to taste. A significant influence is our expectation of how a food 'should look'. Sometimes what we see can override what we think we taste. Although taste perception is significantly influenced by the various sensory properties of food, the process often begins with the eyes. This is why food producers, retailers and marketers pay so much attention to how they package and present food.

Changing the known colour of a food is usually all it takes to manipulate our expectations and change the taste. Researchers have found, for example, that orange juice tends to taste better when it is bright orange, cheddar cheese is tastier when yellow rather than white, and tomato sauce will often taste more like tomato sauce when it is red rather than brown or blue. When sweet tasting pink soft drink is changed to yellow with a neutral food dye, it is likely to be reported as losing its sweetness despite no real change in its original taste properties (Spence et al., 2010; Piqueras-Fiszman et al., 2013).

A review of five major studies conducted in different countries over a 30-year period found that people consistently associated particular colours with specific tastes. Taken together, the results showed that the colour black and purple/violet are widely associated with the taste of bitter, white and blue with salty, yellow and green with sour, and pink and red with sweet (Spence et al., 2015).

The colour of the plate has also been found to influence taste. For example, strawberry mousse presented on white plates compared to black plates tends to be reported as significantly sweeter, more intense in flavour, of much better quality and tasting much better. However salted popcorn eaten from a white bowl tasted less sweeter than popcorn eaten from a white bowl. In another study, the colour of the mug influenced the taste of coffee. Coffee served in a white mug tasted more intense and less sweet than one in a blue or transparent mug (Harrar et al., 2011; Piqueras-Fiszman et al., 2012; Van Doorn et al., 2014).

Even a more subtle feature of food such as shape can influence perception of its taste. For example, French fries tend to be reported as tasting better when thin than fat (but not if the fries are too thin). And square donuts contradict what we know about the essential features of donuts. When given the opportunity to taste a square donut, people are not as confident in predicting its taste because their perceptual set for its taste has been distorted by the unexpected, square appearance. When tasting, they tend to take longer to report on the experience than the time taken for a round donut.

We also use a food's appearance for clues on whether it is safe to eat. For example, appearance helps us judge whether a food is fresh or not fresh, ripe or unripe and rotten or not rotten. Each of these aspects of food is associated with taste. Colours associated with the ripening of fruits are particularly effective in influencing perceived sweetness, while foods and drinks with a green colour (which is associated with unripe fruits) are often judged to be sourer (Spence et al., 2010).

In addition, when we make an overall judgment that a particular food is safe to eat, our expectancy is that it will taste as it should and that it will not be harmful in any way. When we actually taste the food and it meets our taste expectation, the experience reinforces our perceptual set of its taste. Similarly, when we believe that food is unsafe to eat, we usually expect that it will have a bitter or sour taste, which are in themselves biologically determined signs to avoid such food.

Packaging, labelling and branding also influence our perception of taste. For example, research participants report that Coca-Cola™ and peanut butter taste worse when consumed from a plain, unlabelled container than from one marked with a familiar brand. Children tend to report that an apple tastes better if it comes from a bag with the McDonald's logo. Adults tend to report that red wine tastes more full-bodied and complex if it costs more. And plain, home brand bottled water will tend to taste just like expensive Perrier water when there is no label to give feedback about the source (Schrank, 2012).

Figure 8.51 When given the opportunity to taste a square donut, people tend to be less confident in predicting its taste because their perceptual set for its taste has been distorted by the unexpected, square appearance.

Researchers have also investigated the effect that the arrangement of food on a plate has on taste perception. Food presented in a neat arrangement is liked more than the same food presented in a messy manner. In addition, participants *expected* to like the food in the neat arrangements more than in the messy ones and would be willing to pay more for them. They also indicated that the food in the neat arrangements came from a higher quality restaurant and that more care was taken with its preparation than the food in the messy ones (Zellner et al., 2011).

We also have expectations about food sounds that influence taste perception. For example, food-eating sounds contribute to the perception of crispness and freshness in foods such as potato chips, biscuits, breakfast cereals and vegetables. When these types of foods have louder 'crisp-biting sounds', they tend to be rated by research participants as tasting significantly crisper (and fresher). Similarly, perceptions of the carbonation of a beverage served in a cup have been influenced by the intensity and frequency of the bubbly sounds they hear (Spence & Shankar, 2010).

Figure 8.52 Food plated in a neat arrangement tends to be more positively viewed than food plated in a messy arrangement.

8.5.3 Social factors

What's perceived as tasting delicious or disgusting varies across cultures. In some cultures, witchetty grubs, snails, fish eyes, parrots, scorpions, beetles, grasshoppers, dog meat, goat testicles, fried tarantula or chicken feet are tasty delights, whereas in other cultures the thought of eating these foods would trigger a negative reaction in most people. Our cultural background and experiences are considered to be the most persistent, consistent and significant of all social factors that influence taste perception.

Culture

Most cultures have food practices involving the use of basic ingredients, techniques and flavour principles when cooking. For example, diets in Asian cultures include many more sour, bitter and umami tastes than Western diets. We are exposed to these cultural differences from birth and they are reflected in our perceptual judgments of what tastes good and what tastes bad.

Generally, we like and prefer tastes we grow up with. Research studies have found that familiarity with a food influences how we perceive it and whether we ultimately eat it. For example, in a study on 10 foods — tortoise jelly, chili slices, beef jerky (dehydrated strips of meat), dried tofu (bean curd), Vegemite, durian (a sweet-tasting fruit with a strong odour) cake, octopus chips, chocolate, corn chips, and wasabi (spicy Japanese horseradish) coated peas, people from both Asian and Western cultures showed a much stronger preference for those foods with which they were more familiar through exposure in their own cultural domains (Jeong & Lee, 2021).

When we are familiar with a food and have eaten it before, we know how it is best eaten. For example, consider Vegemite, which many people in other countries describe as tasting too salty, too bitter or generally unpleasant. If you have grown up with it, you know that you're supposed to spread it thinly and only eat a little bit at a time. You are therefore more likely to think it tastes nice or not too bad (Archer, 2017).

Familiarity with foods also enables us to more readily perceive subtle differences between foods. For example, in one study, participants of Italian and Czech cultural backgrounds were required to discriminate between various foods made from goat milk.

The Italian participants, who more frequently eat goat milk products, distinguished between goat milk yogurts according to the degree of goat odour and flavour. In contrast, the Czech participants used degrees of sourness or sweetness to distinguish between the formulations. They more frequently consume fermented milk, which is characterised by a sour taste. In a similar study, Italian, Spanish, and French participants could more easily discriminate between cheeses from their own country than they could between cheeses from other countries (Jeong & Lee, 2021).

Our preferences for foods with which we are familiar tends to develop in infancy and persist throughout childhood. But most people will eventually try 'new tastes' when presented with the opportunity. We may also change taste preferences through learning as we get older. For example, children tend to reject the bitter taste of beer but many adults have learned to appreciate its taste.

From a sociocultural perspective, adult food preferences, especially in Western cultures, are associated with age, sex, health status, education, and income. In addition, the healthiness of food preferences increases with increasing age (Ventura & Worobey, 2013).

Direct experience with different foods in our cultural environment is an important influence on taste perception. As we grow up, most of this experience occurs within a family setting. The family setting also exposes us to the reactions of others when they taste food. Parents, siblings and relatives can act as role models who encourage tasting of new foods or influence taste preferences through positive or adverse reactions to foods. We may also be influenced in this way when watching people eating

Figure 8.53 What's delicious varies across cultures and this may be influenced by how the cook prepares the food.

in a movie, during lunchtime at school, when out with friends, and so on.

Other cultural influences on taste perception include being encouraged by a parent or caregiver to eat certain foods because of the health benefits. We may also be influenced by attitudes to health foods and junk foods by the various people around us, having increased or decreased access to certain foods through socioeconomic circumstances, and even school food policies or having access to a coin operated junk food dispenser in the workplace. In addition, some religions have rules regarding what may be eaten or drunk and whether or not a food or drink item can actually be enjoyed.

Cultural influences on taste appear to be determined early in life, perhaps even in the uterus. Research suggests, for example, that mothers can pass their food preferences on to their offspring during the months immediately before (via amniotic fluid) and after birth (via breast milk).

In one well-known study, pregnant women were randomly assigned to one of three groups. The women drank either carrot juice or water for 4 days per week for 3 consecutive weeks during the last 3 months before birth and then again during the first 2 months after birth.

Group 1 mothers drank carrot juice in the period before birth and water after birth. Group 2 mothers drank water before birth and carrot juice after birth. Group 3 mothers drank water in both periods before and after birth. All the mothers breastfed their infants, so the taste of what each mother consumed was in the breast milk which was the only source of food for the infant during the first 2 months after birth.

When the infants were about 3 months old, they were fed carrot juice, either alone or mixed in cereal. The infants were videotaped as they fed and immediately after the mothers rated their infants' enjoyment of the food on a 9-point scale. The researchers also monitored the infants' facial expressions for negative taste reactions.

The results showed that the infants whose mothers drank carrot juice during the 3 months before birth, the first 2 months after birth or during both periods showed a preference for carrot juice compared with the infants whose mothers drank only water during those same months.

For example, Group 1 infants previously exposed to carrot juice showed fewer negative facial expressions while being fed the carrot-flavoured cereal compared with the plain cereal, whereas Group 3 infants whose mothers drank water in both periods before and after birth did not show such a difference. In addition, Group 1 infants who were exposed to carrot juice prenatally were perceived by their mothers as enjoying the carrot-flavoured cereal more compared with the plain cereal.

The researchers concluded that the infants' taste preference for carrot juice was passed on by the mothers and that this early experience may provide the foundation for cultural and ethnic differences in taste preferences (Mennella et al., 2001).

Figure 8.54 Taste preferences may be acquired very early in life — during breast feeding and possibly in utero.

8.5 LEARNING ACTIVITY 1

Review

1. Explain the meaning of gustatory perception.
2. Complete the following table to summarise the biological, psychological and social influences on taste perception described in the topic. For each type of influence, include two key points or examples.

Type of influence	How it may influence taste perception
genetics	
age	
memory	
food packaging and appearance	
culture	

3. Give an example of a bottom-up process involved in taste perception.
4. a. Explain the meaning of perceptual set in relation to taste perception.
   b. Give an example of an influence on perceptual set for a particular taste.
5. Give an example of how the presence of others may influence taste perception.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

8.5 LEARNING ACTIVITY 2

Analysis and evaluation of research on infants' taste preferences

Consider the experiment on the development of infants' taste preferences described section 8.5.3 of this subtopic and answer the following questions.

a. Formulate a research hypothesis that would be relevant to the experiment.
b. Name the type of experimental design.
c. Identify the independent and dependent variables.
d. Use the following table to summarise the experimental conditions:

Group	Before birth	After birth
1		
2		
3		

e. Which one or more of the three groups is the control group(s)?
f. What results were obtained for the different groups?
g. What conclusion about infant taste preferences and culture was drawn by the researchers?
h. Identify two extraneous or potential confounding variables that required strict control in this experiment.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

8.6 Review

Topic summary

- **Role of attention in making sense of the world around us**
  - Sustained attention
  - Divided attention
  - Selective attention
- **Role of perception in the processing and interpretation of sensory information**
  - Top-down processing
  - Bottom-up processing
- **Visual perception**
  - Biological factors
    - Depth cues
  - Psychological factors
    - Gestalt principles
    - Perceptual set
    - Context
    - Motivation
    - Past experience
    - Memory
  - Social factors
    - Culture
- **Gustatory perception**
  - Biological factors
    - Genetics
    - Age
  - Psychological factors
    - Memory
    - Food packaging and appearance
  - Social factors
    - Culture

Key terms

accommodation p. 539
attention p. 525
binocular depth cue p. 537
bottom-up processing p. 533
closure p. 546
context p. 551
convergence p. 537
depth cue p. 536
depth perception p. 536
divided attention p. 526
figure–ground p. 545
Gestalt principle p. 544
gustation p. 523
gustatory cortex p. 523
gustatory perception p. 558
height in the visual field p. 542
interposition p. 540
linear perspective p. 540
memory (in perception) p. 532
monocular depth cue p. 539
motivation (in perception) p. 553
past experience p. 553
perception p. 532
perceptual set p. 550
pictorial cue p. 539
proximity p. 548
relative size p. 541
retinal disparity p. 538
selective attention p. 528
sensation p. 522
sensory information p. 522
similarity p. 547
sustained attention p. 525
texture gradient p. 541
top-down processing p. 532
visual cortex p. 523
visual perception p. 535

Note: The **References** for the entire title can be accessed in learnON and are also available as a downloadable PDF.

on Resources

Digital documents Key terms glossary — Topic 8 (doc-37655)
Key diagrams PowerPoint — Topic 8 (doc-37658)
Topic summary — Topic 8 (doc-37656)

8.6 Topic 8 test

Section A: 20 marks **Section B:** 30 marks **Total:** 50 marks

Access learnON to answer the following test questions online and receive **immediate feedback**.

Section A — Multiple–choice questions

Choose the response that is **correct** or **best answers** the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Question 1

An important role of attention in perception involves

A. detection of all stimuli in the sensory environment.
B. processing of all stimuli in the sensory environment.
C. ensuring conscious awareness of all stimuli in the sensory environment.
D. filtering all stimuli in the sensory environment.

Question 2

Sensory processes primarily involve _____; whereas the perceptual processes primarily involve _____.

A. stimuli; detection
B. detection; interpretation
C. interpretation; awareness
D. interpretation; detection

Question 3

Human perception is a/an _____ process, whereas sensation is a/an _____ process.

A. active; passive
B. physiological; psychological
C. passive; active
D. directly observable; indirectly observable

Question 4

James can sing along to music on the radio while driving his car and efficiently navigate to his friend's house at the same time. This illustrates a feature of perception involving

A. concentration.
B. selective attention.
C. divided attention.
D. sustained attention.

Question 5

Unlike other types of attention, sustained attention is more

A. selective.
B. time-based.
C. distributed.
D. focused.

Question 6

Which of the following sequences has perceptual processes for vision and taste in the correct order?

A. reception; interpretation; transmission
B. transmission; interpretation; transduction
C. reception; transduction; transmission
D. interpretation; transmission; reception

Question 7

The visual cortex is located in the ____ lobe.

A. occipital
B. parietal
C. frontal
D. temporal

Question 8

Most of the gustatory cortex is located deep within the folds of the ____ lobe.

A. occipital
B. parietal
C. frontal
D. temporal

Question 9

Which of the following is a depth cue for visual perception?

A. proximity
B. similarity
C. accommodation
D. closure

Question 10

The taste of umami is based on detection of ____ in a substance.

A. acidity
B. glutamate
C. sugar
D. salt

Question 11

When we have difficulty separating a figure from the background in a picture or in an everyday setting, it is most likely due to an inability to

A. use linear perspective.
B. use monocular cues.
C. use retinal disparity.
D. perceive the contour lines which belong to the figure.

Question 12

Sam is relaxing on the beach when something tiny lands on her nose. She tries to get a good look at it and feels the tension in the muscles controlling the movement of her eyeballs as she tries to see what it is.

This example illustrates the visual perception principle called

A. convergence.
B. accommodation.
C. retinal disparity.
D. linear perspective.

Question 13

An artist has painted a scene of an air and land battle. In the sky, she has portrayed the planes as smaller the lower they are in the sky to show distance. On the ground, her army tanks and soldiers have been portrayed as smaller the higher they are on the canvas to show distance.

The artist has used the depth cue called

A. height in the visual field.
B. accommodation.
C. linear perspective.
D. relative size.

Question 14

The number of taste buds ____ with age.

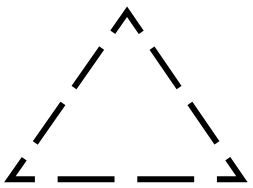
A. increases
B. decreases
C. stabilises
D. remains the same

Question 15

Taste is most dependent on

A. the sense of smell.
B. the sense of sound.
C. what is eaten in the period immediately before birth.
D. what is eaten in the period immediately after birth.

Question 16



If you perceive a triangle in the stimulus above, then you are using

A. similarity.
B. binocular cues.
C. bottom-down processing.
D. top-down processing.

Question 17

The difference in the placement of the same image on the retina of each eye when looking at something is called

A. retinal disparity.
B. retinal size.
C. texture gradient.
D. height in the visual field.

Question 18

When one object in a visual stimulus partially blocks another, the object at the back which is blocked from full view is perceived as being further away than the object in front of it. This is an example of

A. closure.
B. interposition.
C. constancy.
D. figure–ground organisation.

Question 19

Artists use their knowledge of decreasing detail to portray depth and distance in their paintings. In doing so, they are applying the depth cue called

A. texture gradient.
B. convergence.
C. height in the visual field.
D. linear perspective.

Question 20

When elements of a visual stimulus that have characteristics in common are perceptually grouped together to form a whole, the visual perception principle being used is called

A. retinal disparity.
B. convergence.
C. closure.
D. similarity.

Section B — Short answer questions

Question 1 (1 mark)

A robot has been designed to perceive without any prior experience. This machine would only be able to use ____ processing.

Question 2 (2 marks)

Without labels, the drawing above is a meaningless doodle due to ____ processing. However, if the drawing is identified as a person scrubbing the floor, then we can easily assign meaning to it due to ____ processing.

Question 3 (5 marks)

a. Explain the meaning of depth perception. 1 mark

b. Distinguish between binocular and monocular cues in depth perception with reference to an example of each type of cue. 4 marks

Question 4 (2 marks)

People may perceive the stimulus shown below as either a young woman with her head turned away, or an old woman with a large nose, in semi-profile. Explain the alternate perceptions of the image with reference to figure–ground.

Question 5 (2 marks)

Explain the meaning of perceptual set in relation to visual or taste perception and how it may influence that type of perception with reference to a relevant example.

Question 6 (4 marks)

Give two arguments in support of a genetic component of taste perception and two arguments in support of environmental influences on taste perception.

Question 7 (2 marks)

Describe an influence of two of the following types of factors on visual perception.

- biological
- psychological
- social

Question 8 (12 marks)

Israeli psychologist David Navon was intrigued by the Gestalt approach to visual perception. In particular, Navon was interested in whether we first perceive the elements (parts) of a visual scene and build them up to a whole, complete image, or whether we perceive the whole first and then perceive the elements through further visual processing.

In order to conduct an experiment on this question of research interest, Navon (1977) distinguished between ‘local’ and ‘global’ features of a visual stimulus. The 14 participants were required to briefly observe a large letter (global feature) that was made up of many small letters (local features) such as those shown below.

Each participant was required to make responses under two different experimental conditions. The conditions required their attention to be focused either globally (‘the whole’) or locally (‘the parts’). In the globally focused condition, the participant had to indicate whether the *global letter* was the letter H or the letter S. In the locally focused condition, the participant had to indicate whether the *local letter* was the letter H or the letter S. On half the trials the global and local letters were the same letter of the alphabet, and on the other half they were different, as shown below.

The participants were asked to identify the letters as quickly and accurately as possible. They were paid a monetary bonus for their responses. The amount paid depended slightly on speed, but more on accuracy. Navon recorded the speed and accuracy with which participants could recognise the same or different global/local letters.

The results showed that the type of local letters used (whether the same or different from the global letter) had no effect on the speed with which the global letter was recognised. However, identification of the small, local letters was less accurate when the global and local letters did not match.

From these results, Navon concluded that we mentally process the whole before we analyse the parts (or detail); that is, we perceive the entire global letter before we start to analyse its composition of local letters.

```
(a) H     H      (b)  HHH
    H     H          H   H
    H     H          H
    HHHHHHH           HHH
    H     H              H
    H     H          H   H
    H     H           HHH
```

Visual stimuli (a) Global and local letters that are the same (b) Global and local letters that are different

a. What is the aim of this experiment? 1 mark

b. Identify the independent and dependent variables in the experiment. 2 marks

c. Identify the two conditions of the experiment. 2 marks

d. Identify the experimental research design. 1 mark

e. Briefly state the results obtained by Navon. 1 mark

f. Briefly state the conclusion(s) that was drawn from these results. 1 mark

g. Suggest an extraneous or confounding variable that may not have been adequately controlled and explain why it may have affected the results. 2 marks

h. To what extent can the results be generalised to visual perception by people in everyday life? Explain your answer. 2 marks

on Resources

Go to learnON to access answers to the Topic 8 test. A customisable Word version of the test can also be downloaded from the **Digital documents** tab of the Resources panel.

learnMORE | How we see — from the eye to the brain

The eye is the sense organ for vision. An important function of the eye is to collect light that has been reflected or given out by objects in the environment. Light enables sight to occur.

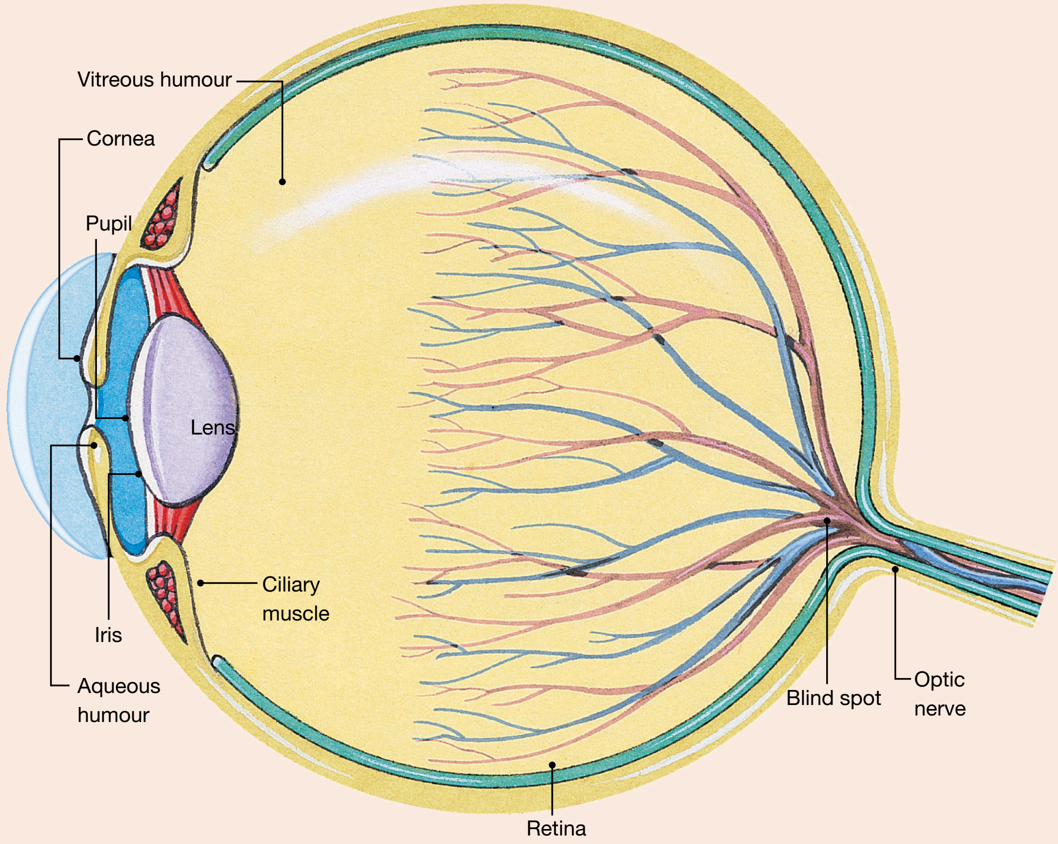
Light initially enters the eye through the *cornea*, a transparent, convex-shaped (curved outwards) covering which protects the eye and helps to focus light rays onto the retina at the back of the eye. After passing through the cornea, light then passes through the aqueous humour which fills the space between the cornea and the lens. The *aqueous humour* is a watery fluid that helps to maintain the shape of the eyeball and provides nutrients and oxygen to the eye, as well as carrying away waste products.

The passage of light continues through the *pupil*, which looks like a black circle in the centre of the eye. The pupil is not a structure in itself, but an opening in the iris that helps to control the amount of light entering the eye. In a place where there is dim light, such as a darkened movie theatre, the pupil dilates (expands) to allow more light into the eye. However, in a place where there is bright light, such as at the beach on a clear summer day, the pupil contracts and becomes smaller to restrict the amount of light entering the eye. In a place where it is extremely bright, the pupil may be no larger than a pinhead. When it is extremely dark, the pupil may become as big as the diameter of a pencil.

The *iris*, which surrounds the pupil, is the coloured part of the eye. The iris is a ring of muscles that expand or contract to change the size of the pupil and control the amount of light entering the eye.

Having passed through the pupil, light then enters the *lens*, which is a transparent, flexible, convex structure located immediately behind the pupil. The lens plays a major role in focusing light onto the retina for processing. In order to focus light onto the retina, the lens adjusts its shape according to the distance of the object being viewed. Its shape is changed by the *ciliary muscles* attached to each end of the lens. These muscles expand and contract, enabling the lens to automatically bulge to focus nearby objects onto the retina and flatten to focus distant objects onto the retina.

After incoming light passes through the lens, it continues through the vitreous humour. *Vitreous humour* is a jelly-like substance that helps to maintain the shape of the eyeball and also helps focus light. Finally, the light reaches the retina at the back of the eye.



The structure of the eye

The *retina* receives and absorbs light, and also processes images. The image focused onto the retina is an inverted (upside-down) and reversed (back-to-front) image of the object being viewed. When received in the brain, it is rearranged so that we can perceive whatever we are looking at as it is in reality.

The retina consists of several layers of nerve tissue made up of different types of neurons that include light-sensitive visual receptor cells called *photoreceptors.* There are two types of photoreceptors — rods and cones — that react to light in different ways.

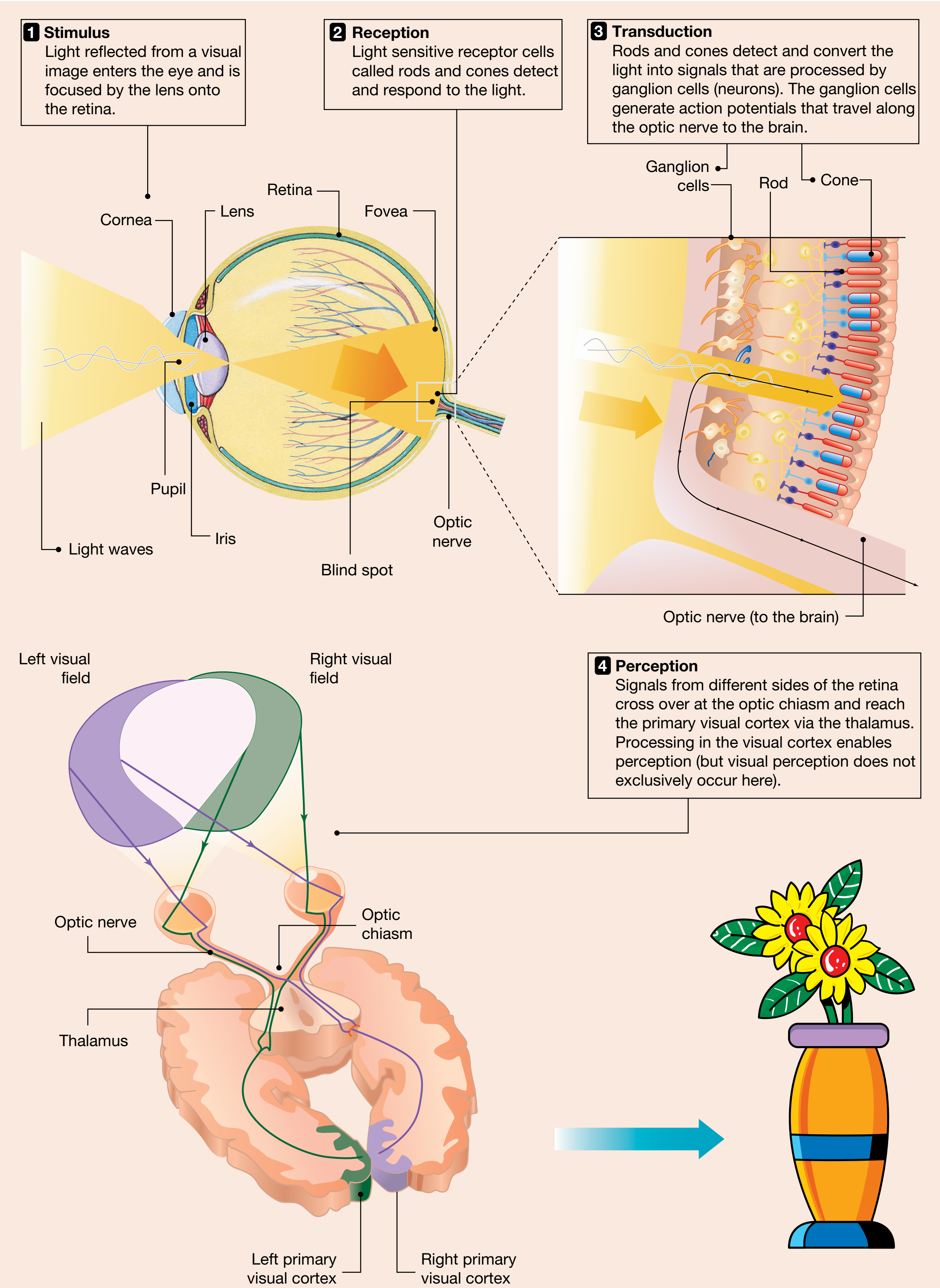
Rods respond to very low levels of light and are primarily responsible for night vision. They are very poor at detecting the fine details in an image and are not involved in colour vision. This is why everything on a dark, moonless night appears as shades of grey. In contrast to rods, *cones* respond to high levels of light (and do not respond well to dim light). They are primarily responsible for our vision in well-lit conditions, and for detecting fine detail and colour vision. When rods and cones detect light, they respond by changing the light energy into a form of energy that can be sent to the brain for further processing.

Photoreceptors do not transmit what the eye has sensed directly to the brain. They convert light into signals that can be processed by other types of neurons in the retina. These signals are sent to ganglion cells located elsewhere in the retina for processing (see the figure below). *Ganglion cells* then generate action potentials that enable transmission of the information to the brain via their axons.

The axons of the ganglion cells from all over the retina are gathered into a bundle that forms the optic nerve. The *optic nerve* carries the visual information from the retina to the primary visual cortex. The optic nerve exits the eye at the back of the retina, the same point where blood vessels enter and exit the eye. There are no rods or cones here, so it is known as the blind spot. The term *blind spot* refers to the fact that there are no photoreceptors on that small area of the retina so light cannot be detected there. This means that any part of a visual image that is focused on this 'spot' will not be visually processed and we will remain 'blind' to it.

We are seldom aware that we have a blind spot and that some visual information escapes us. If visual information entering one eye hits the blind spot, usually the other eye provides information that can compensate for any gaps in the overall image. This occurs because we receive slightly different images on each retina (as the eyes are set a small distance apart). Therefore, the gap in visual information from one retina can be filled in by the equivalent part of the image from the other retina.

The optic nerve provides the pathway for the transmission of action potentials carrying visual information to the primary visual cortex, via the thalamus. The axons of ganglion cells in the optic nerve that originate from the left side of each retina transmit visual information that reaches the left visual cortex. The axons that originate from the right side of each retina transmit visual information to the right visual cortex. This occurs because the transmission of visual information from each retina involves a partial cross-over of neural pathways. The point where the axons cross is called the **optic chiasm** (as shown below).



How we see — biological processes in visual sensation and perception

learnMORE | Perceptual constancies

As we move around, the images that are cast on each retina are constantly changing. Yet, we still perceive the world as a fairly stable place. Objects such as trees, houses and people are not perceived as changing in size, shape or brightness from one minute to the next. Despite the stable nature of the real world, visual information received in the retinas *is* constantly changing. For example, as you move away from an object, such as a tree, the size of the image it casts on the retina becomes smaller. But you do not perceive the tree to be shrinking. Similarly, a car is not perceived as changing in shape as we walk around it and view it from different angles, even though different shapes are produced on the retina. These are examples of what is known as perceptual constancy.

In vision, **perceptual constancy** refers to the tendency to perceive an object as remaining stable and unchanging ('constant') despite any changes that may occur to the image cast on the retina. Three of the perceptual constancies involve size, shape and brightness.

Size constancy

Size constancy involves recognising that an object's actual size remains the same, even though the size of the image it casts on each retina changes. For example, when you are on a railway station platform watching a train coming towards you, the image it casts on each retina gets progressively bigger. However, you do not perceive the train as actually increasing in size. Similarly, when you watch a train depart into the distance, the size of the retinal images becomes progressively smaller. Despite this, you still perceive the train's size as remaining constant. You know it hasn't shrunk. This indicates the role of learning in size constancy. Past experience with objects has enabled you to become familiar with objects of different sizes and you now know that they don't necessarily change size if they appear smaller.

Size constancy helps ensure we do not perceive an approaching train as actually increasing in size.

Shape constancy

As you move around a room that has a round clock on the wall, the angle from which you view the clock changes. Consequently, the image of the clock cast on the retina also changes. It might change from a circle when viewed face-on to an ellipse (oval shape) when viewed from side-on. Despite these changes to the retinal image, your perception is still of a circular clock.

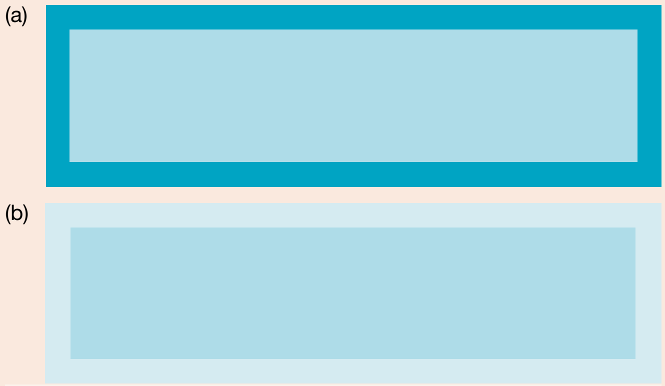
Shape constancy is the tendency to perceive an object as maintaining its shape despite any change in shape of the image of the object on the retina. As we move around in our daily lives, the angles at which we view objects change. Consequently, the image of the object that is cast on the retina also changes. If we interpreted the image in terms of how it actually occurs on the retina, the object would be perceived as constantly changing shape. However, by automatically using the principle of shape constancy we know that the object hasn't changed shape and we perceive it as remaining stable (i.e. constant).

We tend to perceive this clock as maintaining its shape despite the changes in the image it produces in the retina when we view it from different angles.

Brightness constancy

Suppose you are seated in a room at dusk with overhead lighting on. Suddenly, the electricity supply is cut off. Despite the changed lighting conditions, you still perceive the objects around you as remaining the same colour. You know, for example, that the cover on the lounge chair hasn't suddenly become dull even though there is a reduction in brightness ('light intensity') on the image produced on the retina and it 'looks' duller.

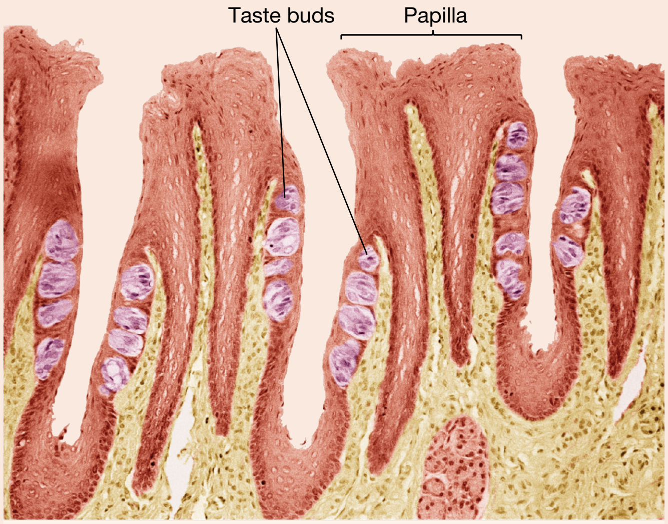
Because everything in your immediate environment has been reduced in light intensity by the same amount, the colours of all objects are perceived with the same brightness as they were before the lights went off. In this situation, your visual perception system has maintained brightness constancy. Brightness constancy is the tendency to perceive an object as maintaining its level of brightness in relation to its surroundings, despite changes in the amount of light being reflected from the object to the retina.



Look at the two inner rectangles. Most people perceive the inner rectangle in (a) to be lighter than the one in (b). If you cover the outer surroundings of each rectangle, you will see that they are of equal brightness. The brighter surrounds of (b) lead you to perceive the inner rectangle as relatively darker.

learnMORE | How we taste — from the mouth to the brain

Gustatory perception starts with the physical stimulation of taste receptor cells, which are mostly located in the mouth. The stimuli that produce taste sensations are chemical molecules in whatever you eat or drink. These molecules are dissolved by saliva, allowing the chemicals to stimulate taste receptors.



A cross-section of the tongue

Food, fluids or any substance that is soluble in saliva can stimulate the taste buds, which is why you can taste dirt and dust. Similarly, you may have noticed that after you have brushed your teeth in the morning, orange juice tastes bitter. The chemical residues from the toothpaste mix with those of the orange juice to produce a new taste sensation.

When taste receptors are stimulated, they convert the sensory input into signals that can be sent to the brain along neural pathways. The 'taste' pathways are cranial nerves that connect directly to the brain. Which one is used depends on where in the oral cavity the taste receptors that have been stimulated are located. Most taste messages travel to the brain along the facial cranial nerve.

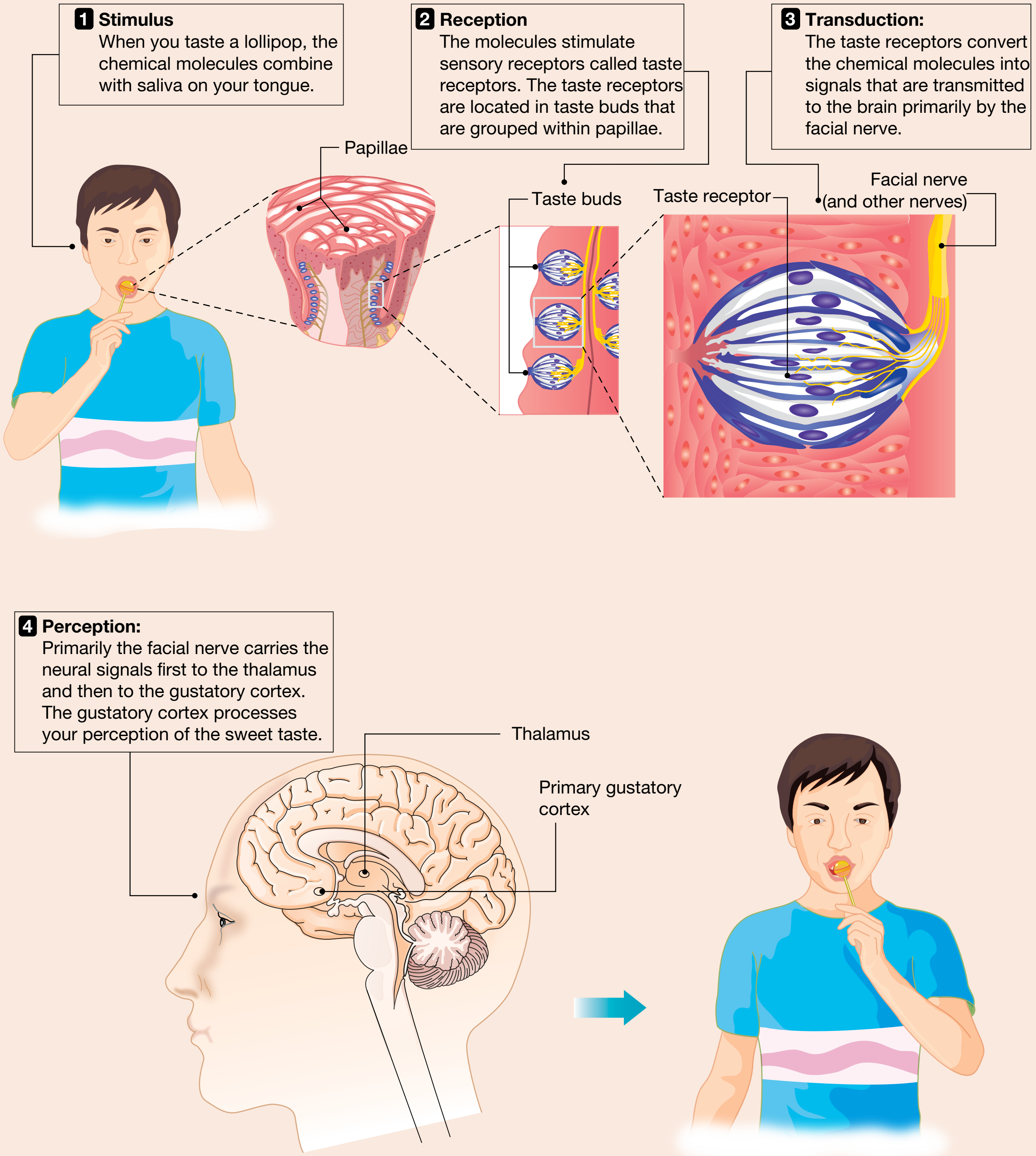
After initial processing by the thalamus, the sensory information is relayed to the gustatory cortex for interpretation. Taste alone does not affect how much you like a certain food or drink, so the information is combined with other sensory inputs about the food.

Taste receptors, sometimes called *gustatory cells*, are the sensory receptors that detect the chemical molecules that enable taste. The taste receptors are located within the *taste buds*. Most of the taste buds are on the tongue. But they are also found under the tongue, on the roof of the mouth, on the sides of the mouth, and at the back of the mouth on the upper part of the throat behind the nose. It is estimated that most people have about 8000 to 10 000 taste buds, but the number of taste buds peaks in early childhood and gradually declines during adulthood.

On the tongue, the taste buds are located within the thousands of small bumps called *papillae* that you can see and feel on the surface. An individual papilla may hold one or more taste buds. Each taste bud consists of a cluster of 50–150 taste receptors. Unlike sensory receptors in the eye, taste receptors have a limited lifespan of about 10 days, so they are constantly being replaced.

Taste pores on the surface of the tongue open into the taste bud, thereby connecting the surface of the tongue to the taste receptors within the taste buds. The connection is through fine *gustatory hairs* that extend from the taste receptors into the taste pores. These hairs come in contact with tastants. *Tastants* are the dissolved chemical molecules that can be tasted. The hairs stimulate their connected taste receptor cells to pass signals on to sensory neurons that transmit the messages to the brain.

Not all papillae contain taste buds and therefore taste receptors. Those found around the sides and at the front of the tongue contain taste buds, whereas those found predominantly in the centre of the tongue do not have taste buds. Some papillae have other functions. For example, some are pain receptors that respond to hot and spicy sensations (caused by the substance capsaicin found in chilli), others help break down fats and others are touch receptors that contribute to the perception of food texture. In addition, the tongue is sensitive to the temperature sensations of hot and cold.



How we taste — biological processes in taste sensation and perception

on Resources

Weblinks Videos on taste 1
Videos on taste 2

learnMORE | Taste aversions

Many of us have a dislike for certain foods. Sometimes there is a good reason for disliking the food, such as genuinely not liking the taste or smell of it. Sometimes the dislike is associated with the texture of the food (e.g. oysters or calamari) or the origin of the food (e.g. tripe or haggis). At other times there is simply an unwillingness to eat something perceived as disgusting (e.g. snails, witchetty grubs or frogs' legs), or possibly it is rejected on moral grounds (e.g. kangaroo, whale, bear paws or monkey brains).

All these reasons for the dislike of certain foods are personal and subjective. In a different circumstance, however, our dislike of a particular food occurs suddenly and decisively, yet with very little consideration or judgment. The term used for such a response is 'taste aversion'.

A *taste aversion* is a learned response that results from a person (or animal) establishing an association between a particular food and being or feeling ill after having tasted or consumed it at some time in the past. The association is usually the result of a single experience, and the particular food will be avoided in the future, hence the term 'aversion'.

A taste aversion may be learned for any food, not only for some of those foods exotic to us, but also for what we each consider plain, everyday foods.

9 Distortions of perception

TOPIC CONTENT

9.1 Overview

KEY KNOWLEDGE

- the fallibility of visual perceptual systems, for example visual illusions and agnosia
- the fallibility of gustatory perception, for example, supertasters, exposure to miraculin and the judgment of flavours
- distortions of perception of taste and vision in healthy individuals, such as synaesthesia and spatial neglect

Source: © VCAA, *VCE Psychology Study Design: 2023–2027.* p.30.

Perception occurs when sensory information reaching the brain is meaningfully interpreted. What we see, taste, hear, smell, and so on, is the result of brain activities that construct reliable representations of reality. This allows us to adapt to the environment and make sense of a constantly changing world.

Most of the time, our perception of the world closely matches the physical environment around us. However, this does not mean that perception is always error-free or perfect. We sometimes make mistakes and experience a perceptual distortion.

A **perceptual distortion** involves an inconsistency, or 'mismatch', between a perceptual experience and physical reality. Visual illusions demonstrate cases in which reality is misperceived for no immediately apparent reason. For example, the horizontal lines in Figure 9.1 below are parallel. You can confirm this with a ruler yet, whenever you look at the pattern, it is impossible to perceive the horizontal lines as parallel.

Similarly, consider the naturally occurring 'real life' moon illusion, whereby the moon appears larger when it is low in the sky near the horizon than when it is high in the sky. The moon does not actually change in size. Yet when the moon illusion is apparent, we cannot avoid perceiving the moon as bigger.

Perceptual distortions occur with all other senses too. For example, some people can perceive taste in something that has no chemical basis for what is tasted and some people can hear things that may not exist in reality.

Pain can also persist long after the injury that caused it has healed. For example, consider people with an amputated limb who continue to perceive painful sensations in the area of an arm or leg long after its loss. It is thought that the brain's cortical representation of the limb remains intact and continues to signal the presence of the amputated limb in the absence of normal bodily stimulation of the limb.

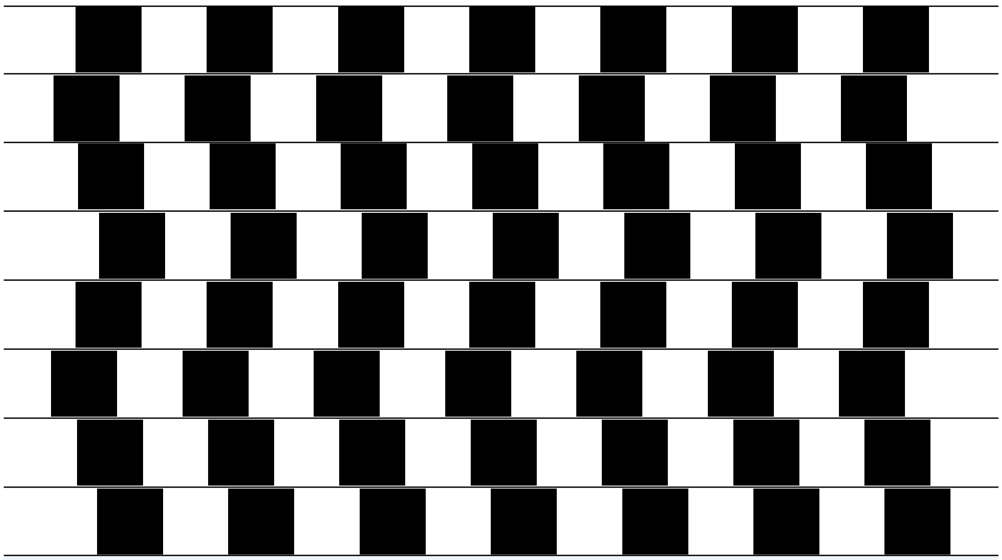


Figure 9.1 Are the horizontal lines parallel or do they slope?

Consider also examples of when you perceive movement that is not real. Have you ever noticed how the moon appears to be moving across the sky as clouds pass in front of it on a cloudy, windy night? A similar effect can occur when you are sitting in a car at a stoplight and the vehicle next to you starts to move forward. For a moment you may feel that you are moving backwards. This is despite the fact that your vehicle has not actually moved and the adjacent vehicle is the source of real movement.

Figure 9.2 Why does the moon look so much larger when on the horizon than when it is high in the sky?

learnON

learnMORE | The moon illusion

Access learnON to read an explanation of the moon illusion.

9.1 LEARNING ACTIVITY

Review

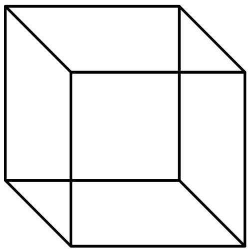
1. Explain the meaning of the phrase ‘distortion of perception’.
2. Give an example of a naturally occurring perceptual distortion and one that has been created to have an illusory effect.
3. What do visual illusions and other perceptual distortions suggest about the fallibility of perception?
4. a. Comment on whether the experience of a perceptual distortion has a genetic basis or is the result of experience.
   b. To what extent does your answer to part a. depend on the type of sense for which the distortion occurs?

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

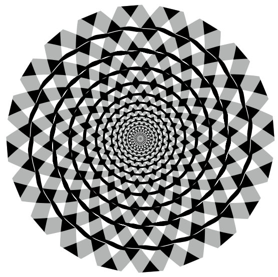
9.2 Visual illusions

Visual illusions are among the most common type of illusion. A **visual illusion** is a misperception of external visual stimuli that occurs as a result of a distortion or mistake when interpreting the stimuli. It is an experience in which there is a mismatch between our perception and what we understand as physical reality. Every time we view the same sensory information, we have the same illusory experience.

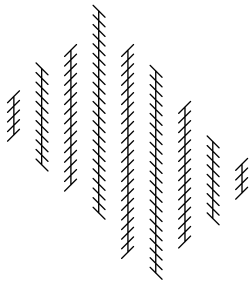
Psychologists have identified over 200 visual illusions, some of which are shown in Figure 9.3 below. Generally, the illusory effects are unavoidable. Even when we know that we are looking at an illusion and have an understanding of why the illusion occurs, we continue to see the illusion as powerfully as when we first saw it.



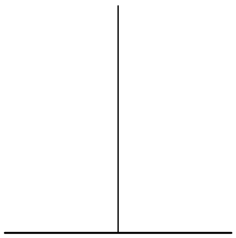
Necker cube: The cube can spontaneously flip to a different orientation when our attention shifts from one corner to another.



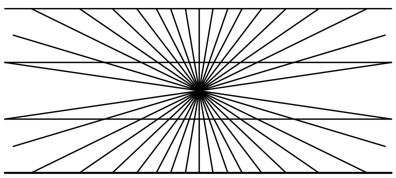
Fraser spiral: Although we perceive a spiral, this is actually a picture of a series of concentric rings.



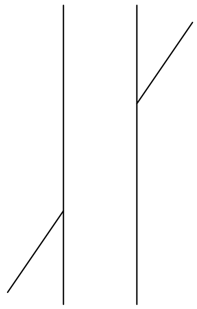
Zöllner illusion: The vertical lines are all parallel but do not look parallel because of the changing direction of the small diagonal lines crossing them.



Horizontal–vertical illusion: Although the two lines are equal in length, the vertical line appears to be longer.



Hering illusion: All four horizontal lines are parallel although the middle two appear to 'bow' around the central point where all the diagonal lines meet.



Poggendorff illusion: The diagonal line running from bottom left to top right appears to exit the vertical bar too high. A ruler placed on the line can confirm that the line is perfectly straight.

Figure 9.3 Some of the more widely studied visual illusions

on Resources

Weblink Visual illusions — explore an interactive selection of illusions

Teacher weblinks TED talk video on how eye tricks can reveal the way the brain processes visual information 14 m 20 s

A video on 10 amazing illusions 2 m 36 s

A video on 11 optical illusions that will trick your eyes 13 m 13 s

Psychologists have enhanced their understanding of visual perception by examining the conditions under which it fails. For instance, visual illusions demonstrate the important role our brain plays in constructing our view of the world. They also demonstrate the effect of perceptual principles and factors such as learning (past experience) and context on the formation of our perceptions.

Two of the most widely studied illusions in psychology are the Müller-Lyer and Ames room illusions. The spinning dancer illusion was created more recently by a Japanese artist and published on his website in 2003. We consider possible explanations of these illusions.

9.2.1 Müller-Lyer illusion

Are the vertical lines in Figure 9.4 (a) and (b) the same length? Since illusions are being examined in this section, you probably realise that they are the same length and therefore answered 'Yes'. But do they *appear* to be the same length?

The answer is 'No'. Measure the two vertical lines to confirm that they are identical in length. Look again at the two lines. Despite the fact that you know they are of equal length, they still do not look equal. Your distorted perception has been caused by the configuration of lines that make up the Müller-Lyer illusion — an illusion that has attracted a great deal of research by psychologists.

Named after Franz Müller-Lyer (1857–1916) who originally described it in 1889, the Müller-Lyer illusion is a visual illusion in which one of two lines of equal length, each of which has opposite shaped ends, is incorrectly perceived as being longer than the other. As shown in Figure 9.4, the line with the 'feather tail' at each end (b) is perceived as being longer than the line with the 'arrow head' at each end (a).

Psychologists have proposed a variety of explanations for the Müller-Lyer illusion, from biological, psychological and social perspectives. Some psychological explanations emphasise that the perceptual error we make with the illusion may be due to using inappropriate mental strategies when interpreting the incoming visual information. In particular, we may incorrectly use depth and distance cues when judging size in two-dimensional objects.

Other explanations emphasise the role of learning and past experience. For example, it has been proposed that we experience the illusion because it contradicts what we have learned throughout life about physical reality. Therefore, we cannot make sense of the illusion whenever we view it, even after the illusion is explained to us.

One learning-based explanation of the illusion that created a lot of interest is known as the *carpentered world hypothesis*. This explanation proposes that the illusion occurs because of its similarity to familiar architectural features in the real three-dimensional world we experience as part of everyday life as shown in Figure 9.5 on the next page.

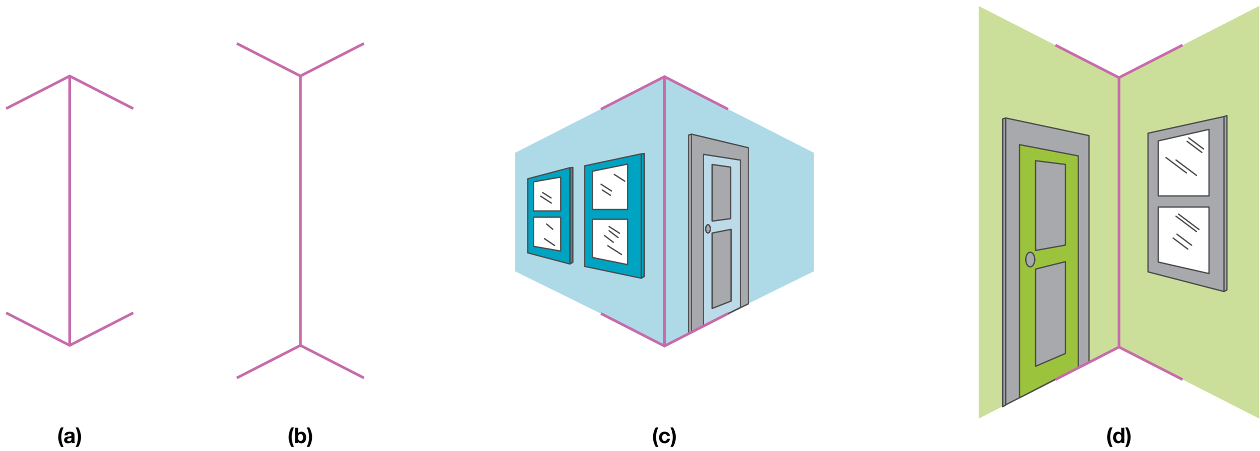


Figure 9.4 The standard Müller-Lyer illusion

Figure 9.5 (a) Carpentered and (b) non-carpentered worlds

In our three-dimensional world, we have grown accustomed to seeing corners everywhere and often use these and other angles and lines to judge depth and distance. As a consequence of this experience, the arrow headed line looks like the nearer, outside, vertical corner and roofline of a room or building, whereas the feather-tailed line looks like the farthest, inside corner (including ceiling and floor) of a room.

Consequently, the two vertical lines appear to be at different distances from the observer — the feather-tailed line appears further away. Our brain overrides information from the retinal images showing the two vertical lines as equal in length. Therefore, the line that appears further away (feather-tailed line) is perceived as longer.

Critics of these theories have questioned why the illusion works equally well when the two lines are horizontal rather than vertical, as shown in Figure 9.6. Furthermore, psychologists have produced other variations of the illusion which use different shapes on the ends, which are also shown in Figure 9.6. These variations of the illusion are equally effective in producing the illusion as the original figures.

Australian psychologist Ross Day (1989) has proposed that the Müller-Lyer illusion occurs because certain features of the figure provide visual cues that contradict each other and therefore give us conflicting information. We deal with this by making a perceptual compromise. We weigh up one piece of contradictory information against the other before settling on an interpretation that makes the 'best sense' on the basis of all the available information. This perceptual compromise explanation theory may explain not only the 'classic' or standard version of the illusion, but also variations of it, such as those shown in Figure 9.6 below.

In sum, psychologists have formulated and experimentally tested many hypotheses over many decades in order to understand and explain the Müller-Lyer illusion. It is generally agreed that there is not yet any single explanation of the illusion that is entirely satisfactory.

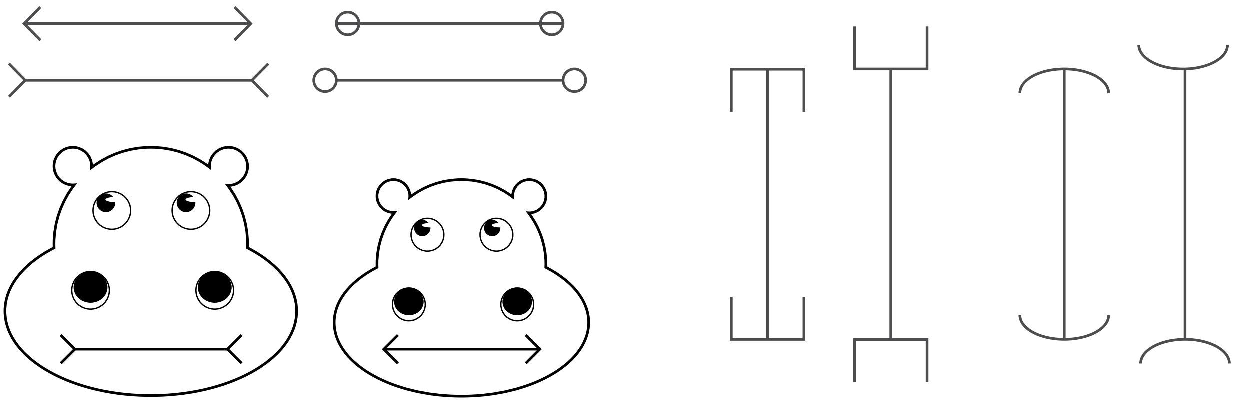


Figure 9.6 Variations of the Müller-Lyer illusion. These figures work just as well to produce the Müller-Lyer illusion without the depth cues said to cause the illusion in the original vertical figure.

on Resources

Teacher digital document Practical activity — measuring the Müller-Lyer illusion

9.2.2 Ames room illusion

Examine the photographs shown in Figure 9.7. The person on the right appears to be much bigger than the person on the left. However, both people are actually of normal size. This **Ames room illusion** involves people appearing smaller or larger, depending on where they are standing. It is based on the unusual construction of the room, particularly the shape of the back wall.

The Ames room illusion involves a trapezium-shaped room that is longer and higher on one side than the other. When viewed through a peephole at the front of the room using only one eye, the room appears rectangular. The room's unusual shape provides the basis for the illusion.

Although other items in the room such as windows, clocks and furniture may add to the impact of the illusion, these items are not essential for the illusion to occur.

The illusion is named after American psychologist Adelbert Ames (1880–1955) who intentionally designed the room to distort visual perception, particularly the size of objects in the room.

The Ames room appears to be a normal rectangular room when viewed through a peephole located in a central position on the front wall. The back wall looks parallel to the front wall and the two back corners therefore appear to be exactly the same distance from the observer.

Figure 9.7 There is a distortion of the size of objects within the Ames room.

on Resources

Teacher weblinks Video on Ames room illusion 2 m 54 s
Video of a teacher explaining the Müller-Lyer and Ames illusions 9 m 39 s

A crucial aspect of the illusion is that the back wall is actually slanted away from the observer (from right to left). This results in the far-left corner being double the distance of the right corner from the peephole.

When observing a person standing in the right corner at the back of the room, the image of that person which is cast on the retina is larger because the person is twice as close to the observer (compared to a person standing in the back left corner). In addition, the ceiling slopes upwards from the right upper corner to the left upper corner of the room. This increases the height of the ceiling from right to left, which also helps ensure the illusion occurs.

As a result of these deliberately constructed 'deceptions', Ames was able to make people appear small or large, depending on where they stood in the room.

When we view the inside of the room through the peephole, our past experience with rectangular rooms leads us to expect that the people in the room are all the same distance away from us. However, in this situation, one person casts a smaller or larger retinal image than the other, so their sizes are perceived as different.

According to *apparent distance theory*, when two retinal images are the same size, but one image appears to be at a greater distance, then the one that appears further away will be interpreted as bigger or larger.

In the Ames room, the perceived rectangular shape of the room is consistent with the retinal image, but not consistent with the room's real shape. The back corners on either side of the room actually produce equal-sized retinal images because the vertical length of the further left corner is double the length (but twice the distance from the observer) of the nearer right corner. Therefore, the visual angle is the same for both corners from the observer's view. Because the observer does not have the depth cues available to 'work out' the real difference in distance between the two corners, the equal-sized retinal images of the corners are interpreted as equal in size. This produces an illusion of a rectangular room.

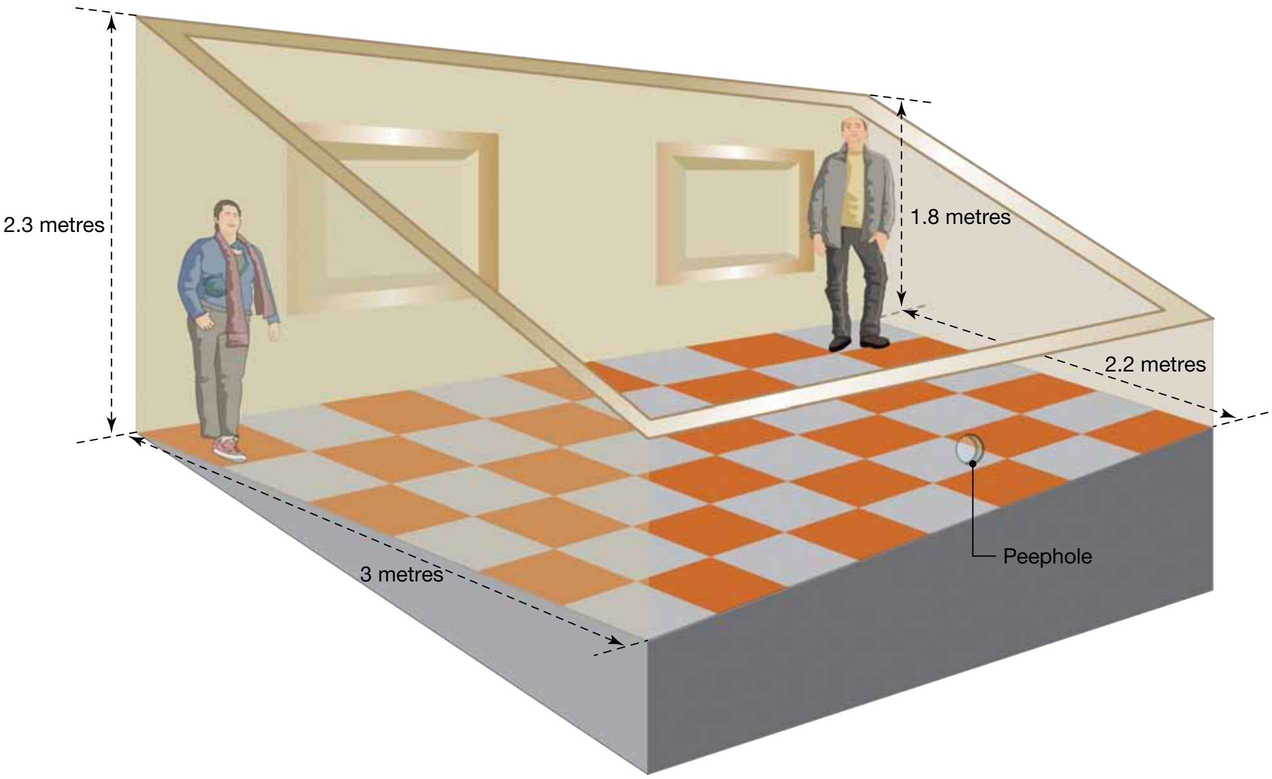


Figure 9.8 A crucial feature of the Ames room that creates the illusory effect is the back wall, which is actually slanting away from the observer, but appears to be a normal rear wall of a rectangular room. The measurements in the drawing show variations that contribute to the illusion. However, an Ames room can be built in virtually any size.

9.2.3 Spinning dancer illusion

The **Spinning dancer illusion** in Figure 9.9 was created by Japanese artist Nobuyuki Kayahara and published online on his website in 2003. Also known as the *silhouette illusion*, the animation shows the silhouette of a static female dancer pirouetting about a vertical axis.

Like the Necker cube in Figure 9.3 and other reversible or ambiguous figures (such as Figure 8.25), the dancer can be interpreted as spinning either clockwise or counter-clockwise. Even though both spinning directions can be seen, the dancer is more often perceived to rotate clockwise than counter-clockwise. Observers who initially perceive a clockwise rotation tend to have more difficulty experiencing the alternative (Troje & McAdam, 2010).

If you cannot see the illusion, try looking at the dancer and then blink. She may appear to change directions immediately after you blink. Alternatively, try blinking rapidly, narrowing your focus on a specific part of the dancer or even tilting your head. If you still can't see the illusion, access the Spinning dancer weblink in your online Resources.

Since it was first published, the Spinning dancer illusion has appeared in the context of all sorts of misleading theories and applications. One of the more popular applications was as a 'test' to distinguish 'right-brainers' from 'left-brainers'. Generally, people were incorrectly led to believe that if they view the dancer as standing on her left leg and spinning clockwise, then they are right brain dominant with a 'creative type of personality', or, if they see the dancer standing on her right leg and spinning counter-clockwise, then they are left brain dominant with a 'logical type of personality'.

The illusion has been explained in terms of the lack of depth cues to distinguish between the front and back of the silhouette. The dancer is presented as a silhouette, thereby minimising visual cues that could be used for depth perception. Without these, there is no clear distinction between which side of the body is closer to the observer when watching the dancer spinning in either direction. The two-dimensional, single-image figure can therefore be perceived from either of two perspectives.

Figure 9.9 The Spinning dancer illusion. The dancer can be interpreted as spinning either clockwise or counter-clockwise.

Resources

Weblink Spinning dancer — see a moving version of the spinning dancer

9.2 LEARNING ACTIVITY

Review

1. Explain the meaning of the term visual illusion.
2. Why are visual illusions often referred to as 'distortions of visual perception'?
3. In what way can the study of visual illusions enhance understanding of visual perception?
4. a. Briefly describe the Ames room illusion.
   b. If you watch a person walk from the back right-hand corner of the Ames room to the back left-hand corner of the Ames room, they are likely to appear to shrink. Explain why you would perceive the person to be shrinking.
   c. Why is the observer's view restricted to using monocular cues?
   d. What is a possible explanation of the Ames room illusion?
5. a. Why is the Spinning dancer illusion described as involving a reversible or ambiguous figure?
   b. What is a possible explanation of the Spinning dancer illusion?
6. The viewing service shown below enables tourists to perceive a three-dimensional colour image of fully reconstructed buildings and monuments on the Acropolis in Athens, Greece. Explain whether their 'augmented reality' view is a visual illusion.

7. Find an example of a visual illusion not described in the text that you find intriguing.
   a. Make a copy of the illusion (or provide information on where to find it).
   b. Outline the illusory effect.
   c. What is a possible explanation of the illusory effect?

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

9.3 Agnosia

After a car accident Mr A. had difficulty recognising familiar faces and objects. He could recognise his family and friends by their voices but not by sight. If separated from his wife when shopping, he was unable to find her again.

When getting ready to shave he had difficulty choosing between his razor and toothbrush. When getting dressed he had difficulty identifying the right items of clothing. A shirt looked the same as a jumper.

At meal times he had difficulty choosing between a knife or a fork. Nor could he identify a cup by sight, but he could tell its colour and identify it by touch by feeling its shape and texture.

Overall, Mr A. was able to tell where something was and what it was doing, but never what it was that he saw. Detailed examinations by various health professionals found that there was nothing wrong with his sight so his difficulties were not related to a problem with his eyes or sight itself. Nor did he have any problems with cognitive abilities in other areas.

However, brain areas involved in visual perception, particularly object recognition, were found to be damaged. Mr A. was diagnosed with a type of visual agnosia.

Agnosia is characterised by loss or impairment of the ability to recognise and identify objects, persons, sounds or other sensory stimuli using one or more of the senses despite otherwise normally functioning senses. The deficit cannot be explained by a problem with the sense organ itself, attention, memory, language problems, or unfamiliarity with the stimuli. As with other disorders, there is considerable variation in its experience between individuals.

Agnosia is usually limited to one sense, mostly vision, hearing or touch. For example, a person may have difficulty in recognising an object as a watch, in identifying a sound as a cough or in recognising the difference between sand and grass if touched unless looking at them.

It is also possible to have agnosia that affects the ability to recognise taste (gustatory agnosia) or smells (olfactory agnosia). Visual agnosia is the most common and better understood agnosia (Kumar & Wroten, 2021; NINDS, 2022f).

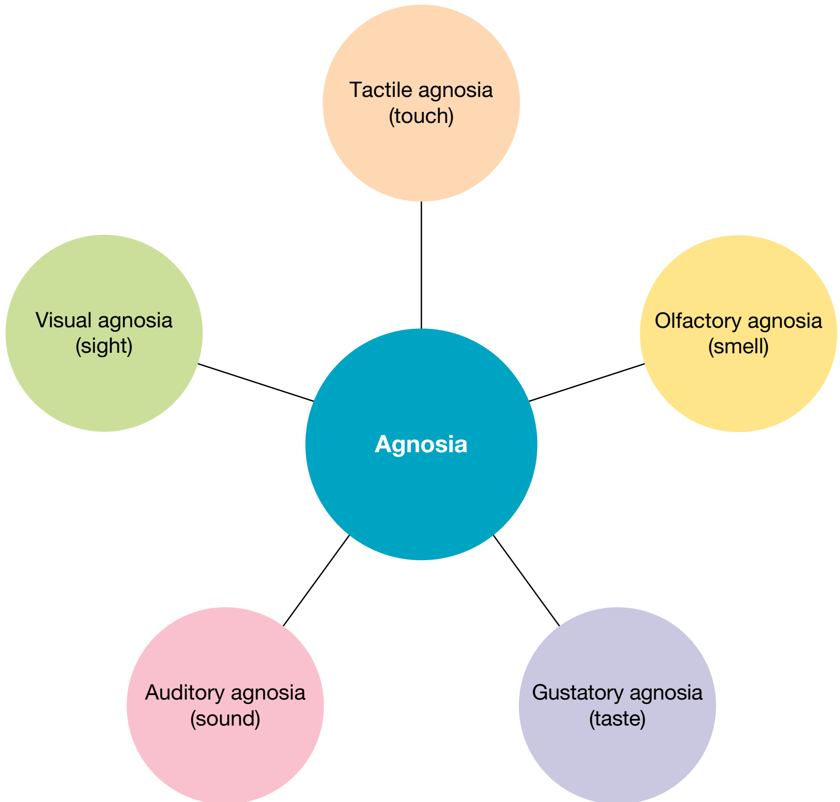


Figure 9.10 Agnosia involves partial or complete inability to recognise sensory stimuli using one or more of the senses. The term is derived from the Greek word meaning 'not knowing'.

9.3.1 Visual agnosia

Visual agnosia is loss or impairment of the ability to recognise visual stimuli. In particular, people with visual agnosia have difficulty recognising familiar objects and possibly faces. These difficulties are not related to sight, loss of memory or language.

For example, people with the disorder have normal sensitivity to light and visual acuity ('clarity'). Their problems result from damage to brain areas involved in visual perception. People with visual agnosia may still be able to recognise and identify objects and people, but only through other sensory information.

Types of visual agnosia

Various types and subtypes of visual agnosia have been described on the basis of the type of visual stimulus the person has difficulty recognising. We consider some of the more common.

Apperceptive visual agnosia

An inability to accurately perceive visually presented stimuli. What is seen cannot be recognised.

People with this disorder cannot perceive the individual parts of a stimulus as a meaningful, unified whole. For example, they cannot identify a dog that was shown to them, but could identify a dog by touch. They are also unlikely to be able to properly draw, copy or match a picture of a simple object with which they are familiar, even if they are told what it is.

People with this disorder are sometimes described by their relatives as being blind, since they have difficulty recognising and naming even simple objects and have to rely on non-visual cues to locate objects or get around.

Associative visual agnosia

An inability to associate a visual stimulus with stored information about objects in memory despite having otherwise normal perceptual abilities.

People with this disorder can describe an object or even draw it or copy a picture of it, thereby indicating that they can correctly perceive the physical characteristics of an object. However, they do not know what they have drawn or even explain what it does or is used for. When tested with verbal or tactile information, they can recognise what an object is. But they cannot identify or assign meaning to it through vision alone.

Figure 9.11 Visual agnosia involves loss or impairment of the ability to recognise visual stimuli using sight alone. This includes everyday familiar objects. When shopping for fruit, there would be a reliance on touch and feel.

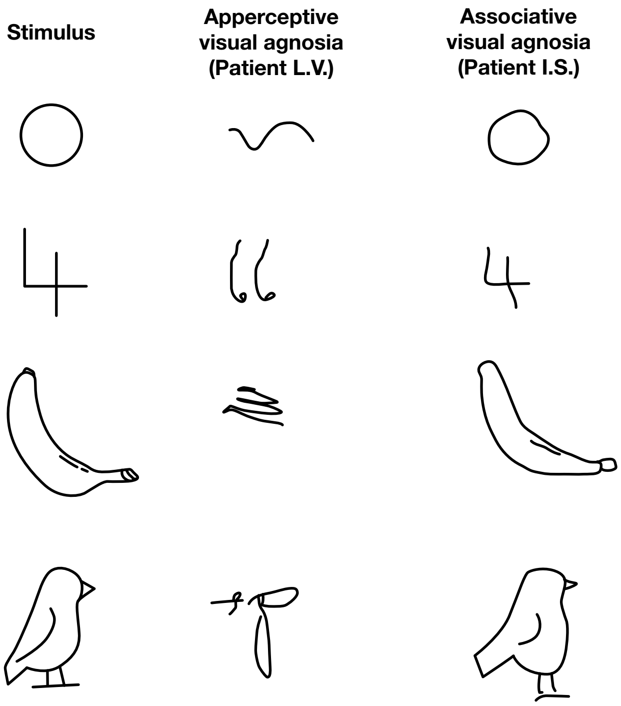


Figure 9.12 Drawings of the same shapes and objects made by patients with apperceptive and associative visual agnosia when asked to copy them from pictures.

Prosopagnosia

An inability to recognise a familiar face, including their own when seen in a mirror or photograph. The person can, however, use other visible characteristics to recognise people, such as gender, age, the way they walk (gait), a tattoo, a characteristic hairdo or even face information such as a moustache or expression. The ability to recognise other types of visual stimuli tends to be relatively unaffected.

When a person with prosopagnosia looks in the mirror they are likely to see the reflection of a stranger. However, they know they are the strange looking person since they are the only person standing in front of the mirror. If they speak, they may recognise their own voice. They may even recognise a characteristic gesture in front of the mirror, but the face is completely new to them.

Figure 9.13 Someone with prosopagnosia cannot recognise themself or other familiar faces in the way most people usually do.

on Resources

Weblink Video demonstrating psychological assessment of an adult female with prosopagnosia 3 m 30 s

Simultanagnosia

An inability to recognise more than one object at a time in a scene that contains more than object. For example, if a banana and an orange are presented together, only one of the two is perceived. If they recognise the banana and their attention is redirected to the orange, then they will report that they see the orange but no longer see the banana. Scenes are perceived in a piecemeal manner, bit by bit.

Some patients only ever see parts of objects. Many act as if they are blind because they find seeing the world one object at a time overwhelming. They typically fail to comprehend the overall meaning of the scene as they are unable to perceive the individual elements that form the whole.

Topographical agnosia

An inability to find one's way around familiar environments. The person typically has a good memory of the layout and specifics of the places well known to them, such as their own neighbourhood, but they are unable to navigate their way around without getting lost.

In particular, they are unable to use visual cues to guide them in the right direction. For example, they are unable to recognise landmarks that would indicate the appropriate direction of travel.

Colour agnosia

An inability to identify and distinguish between different colours, despite normal basic colour vision and colour discrimination mechanisms.

People with this disorder will typically be unable to name the colour of an object when seen, provide a list of objects of a specific colour, or to sort objects into colours. For example, they could not tell you that cherries are red when shown some cherries, write a list of a objects that are red, or tell the difference between opposing teams that are wearing different coloured uniforms.

Agnosic alexia

An inability to recognise or comprehend written or printed words. Also called *word blindness* and *pure alexia*, people with this disorder have severe reading difficulties while other language skills associated with writing, talking and listening tend to remain unaffected. For example, they remain capable of spelling and writing words and sentences but are unable to read and comprehend what was written by themselves.

Cause and treatment

Agnosia is a rare disorder caused by brain damage. Less than 1% of people diagnosed with brain damage have agnosia. The disorder can occur suddenly due to a stroke or traumatic brain injury, or gradually due to a brain tumour, overexposure to an environmental toxin (e.g. carbon monoxide poisoning), a developmental disorder, dementia, or another neurological condition.

Agnosia is specifically associated with damage along neural pathways that connect areas that process perceptual information. With visual agnosia, damage is likely to be found in a pathway extending from the primary visual cortex in the occipital lobe to the temporal lobe. This pathway is called the ventral stream.

The *ventral stream* (also known as the 'what pathway') is involved with visual object identification and recognition. In contrast, the *dorsal stream* (or, 'where pathway') which leads from the primary visual cortex to the parietal lobe, is involved with processing an object's spatial location.

The type(s) of visual agnosia acquired by the individual and the symptoms primarily depend on the specific location of the damage, its extent and severity.

There is no direct cure for visual agnosia (or any other type of agnosia). Instead, the underlying cause is treated if found and when possible. For example, if caused by a tumour, surgery and/or radiation may be an option.

Rehabilitation plays an important role in the treatment of agnosia. It is individualised, tailored to the specific problems and focuses on helping individuals cope with and adapt to their condition. In particular, compensatory strategies involving the use of other senses are taught. For example, someone with apperceptive or associative visual agnosia may be learn how to identify different types of objects by touch, whereas someone with prosopagnosia may learn how to identify and use physical features and voice characteristics to assist recognition of others. (Kumar & Wroten, 2021).

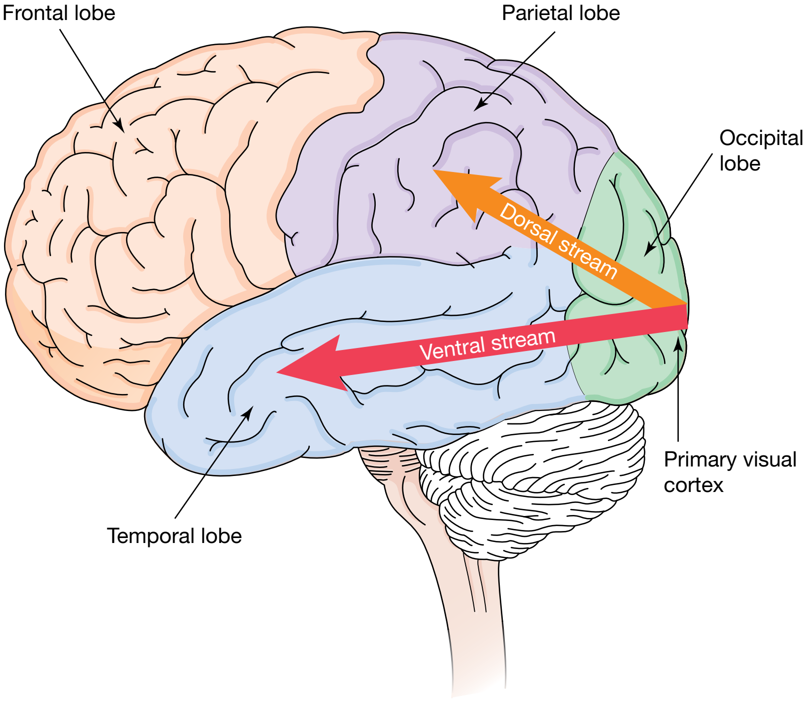


Figure 9.14 Visual agnosia is primarily associated with damage to the ventral stream ('what pathway') extending from the primary visual cortex to the temporal lobe. This pathway is involved with visual object identification and recognition.

9.3 LEARNING ACTIVITY 1

Review

1. Define the meaning of visual agnosia.
2. Summarise each different type of visual agnosia using a brief description.
   a. Apperceptive visual agnosia
   b. Associative visual agnosia
   c. Prosopagnosia
   d. Simultanagnosia
   e. Topographical agnosia
   f. Colour agnosia
   g. Agnosic alexia

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

9.3 LEARNING ACTIVITY 2

Multiple-choice questions

1. Visual agnosia is caused by
   - A. brain injury.
   - B. impaired sight.
   - C. loss of sight.
   - D. loss of cognitive abilities.
2. When shown a photograph of a cup, someone with ____ visual agnosia will probably be able to describe physical features such as Its size and the presence of a handle, but will be unable to recognise and identify it as a cup unless they use non-visual sensory information.
   - A. agnosic
   - B. topographical
   - C. apperceptive
   - D. associative
3. Ms A. is unable to recognise either of her two sisters by sight. It is likely that Ms A. has the agnosic disorder called
   - A. agnosic alexia.
   - B. prosopagnosia.
   - C. simultanagnosia.
   - D. associative visual agnosia.
4. People with ____ agnosia may be described as having a 'perceptual' problem rather than a 'sensory' problem because they can identify the individual parts that form a whole, complete object.
   - A. perceptual
   - B. topographical visual
   - C. apperceptive visual
   - D. associative visual
5. Mr S. had become agnosic following a very severe stroke. He can no longer find his way around his own home or backyard. Mr S. most likely has
   - A. prosopagnosia.
   - B. topographical visual agnosia.
   - C. agnosic visual agnosia.
   - D. associative visual agnosia.
6. Agnosic alexia is characterised by loss or impairment of ability to
   - A. recognise or comprehend written or printed words.
   - B. identify and distinguish between different colours.
   - C. recognise a familiar face.
   - D. recognise more than one object at a time.
7. Simultanagnosia is characterised by loss or impairment of ability to
   - A. recognise or comprehend written or printed words.
   - B. identify and distinguish between different colours.
   - C. recognise a familiar face.
   - D. recognise more than one object at a time.
8. Neuroimaging of the brain of someone with visual agnosia is most likely to find damage somewhere along the ____ stream.
   - A. dorsal
   - B. visual
   - C. ventral
   - D. ventricle

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

9.4 Supertasters

Do you find vegetables such as broccoli, Brussels sprouts, spinach and kale to be too bitter? Do you hate the bitterness of coffee or tea without milk or sugar? Have you ever tasted beer and found it to be too bitter to drink? Is grapefruit far too bitter for your liking? Are you a lot pickier about the food you eat than other people are? Do you shy away from spicy foods? Do you find very fatty foods to be unpalatable? Do sweet foods taste much sweeter than they do for other people? If you answered yes to some of these questions, you may be a supertaster.

A **supertaster** is a person who is more sensitive to certain tastes than most others. They experience taste with far greater intensity than the 'average' person, especially bitter. This often leads them to have very strong likes and dislikes for different foods (and drinks).

The term supertaster was devised by Linda Bartoshuk in 1990 when conducting research on people's sensitivity to bitterness. After additional taste experiments with the same participants over several years she found that those who were most sensitive to bitterness were also the most sensitive to sweetness, sourness and the other basic tastes.

Figure 9.15 Supertasters experience taste with far greater intensity than the 'average' person, especially bitter.

According to Bartoshuk (2010), supertasters do not actually have 'super' tasting abilities. They are ordinary, healthy individuals whose taste experience is simply different. 'These are people who live in a different taste world. If our tastes are painted in pastel colors, theirs are painted in neon.'

The difference is tied to their having a denser covering of the small, mushroom-shaped bumps on their tongue that contain taste buds. These fungiform papillae are scattered over the top and sides of the tongue, mostly towards the tip. The number of taste receptor cells within the taste buds is important, too. Supertasters have far more taste buds and taste receptors.

Overall, more of these papillae, taste buds and receptors is associated with the stronger taste perception experienced by supertasters. Of course, this can all depend on genes that influence the number of taste buds we have and our sensitivity to chemical molecules in different foods (and drinks).

The number of fungiform papillae on the tongue are quite easy to count. You can see fungiform papillae by just taking ordinary supermarket blue food colouring, swabbing it on your tongue, and looking at your tongue in the mirror. You'll see that certain areas don't stain — little pink circles. Those are the fungiform papillae. They contain taste buds, about six each on average. A non-supertaster's tongue looks polka dotted, whereas a supertaster's tongue looks tiled (Bartoshuk, 1997).

Figure 9.16 Supertasters have far more fungiform papillae, bumps on the tongue that contain taste buds.

It is estimated that 25% of the population are supertasters. About 25% of people are 'non-supertasters' with an unusually low number of taste buds. This group is often described more simply as 'non-tasters'. The other 50% of people are 'medium' tasters who fall in between these extremes. These proportions vary according to sex and race. Females are more likely to be supertasters and so are people from Asia, Africa and South America (Duffy et al., 2010; Robino et al., 2014; Bartoshuk, 2015).

Although it might seem enjoyable to experience intense tastes, many supertasters are especially fussy eaters because particular tastes can overwhelm them. When it comes to taste sensation, more is not necessarily better.

As you would expect, supertasters tend to avoid bitter-tasting foods, which they find extremely distasteful. They also tend to get more 'burn' from chilli and more 'creaminess' from fatty foods and thickeners in foods. Sweets, particularly sugars, are much sweeter to supertasters, by at least a factor of 2. This means that when sugar is tasted from a sugar bowl, supertasters perceive at least twice the sweetness than do others. Supertasters also experience pain in the mouth more intensely than non-supertasters. For example, they perceive considerably more pain from 'oral irritants' such as chilli peppers, black pepper and carbonation in carbonated water.

Non-supertasters are less affected by oral irritants and tend to find the five basic tastes less intense. They are also often easier to please in food choices.

Avoidance of vegetables and fruits with tastes that are experienced as extremely bitter may place supertasters at an increased risk for colon cancers that bitter foods may protect against. However, their dislike of fatty, creamy foods means that they tend to be thinner and therefore have an overall decreased risk of cardiovascular disease. They are also less likely to smoke because of the bitter taste of nicotine and avoid the bitter taste in coffee and tea or blunt it with milk and/or sugar (Bartoshuk, 1997; Bartoshuk, 2000).

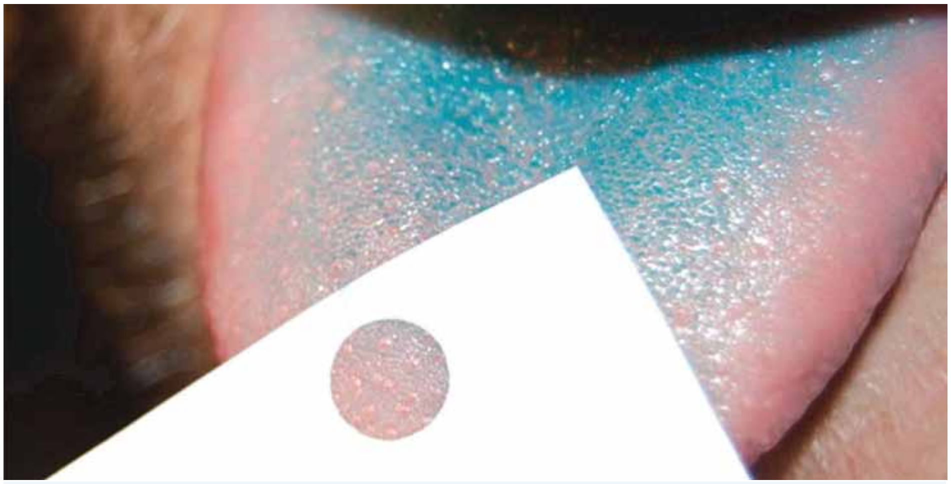


Figure 9.17 You can test if you are supertaster by swabbing blue food dye on your tongue then counting the number of papillae in an area the size of a hole punch (about 6 millimetres). The dye makes distinguishing between your tongue and the papillae easier. Place the paper on the tip of your tongue so that the circle touches the midline of your tongue and one edge. Count the number of visible papillae. A magnifying glass may help. Papillae are the lighter or pink dots which do not take up the dye. Each one contains 3–5 taste buds. Less than 5 papillae indicates a 'non-supertaster', between 6–10 means you fall in the 'medium' range, whereas 11+ means that you may be a 'supertaster' (Bartoshuk, 2012).

on Resources

Weblink	Supertaster test 2 m 23 s
Teacher weblinks	Practical activities on identifying supertasters Inside the psychologist's studio series: Interview with Linda Bartoshuk 43 m 02 s BBC Classroom resources on supertaster testing

Figure 9.18 A supertaster would tend to avoid this spicy meal as they could actually feel pain when eating it.

9.4 LEARNING ACTIVITY

Multiple-choice questions

1. A supertaster
   - **A.** is more sensitive to bitterness than most others.
   - **B.** likes foods more than most others.
   - **C.** can taste most foods better than most others.
   - **D.** dislikes foods more than most others.
2. Supertaster ability is primarily influenced by
   - **A.** gender.
   - **B.** culture.
   - **C.** genetics.
   - **D.** past experience.
3. It is estimated that about _____ people are supertasters.
   - **A.** 1 in 2
   - **B.** 1 in 4
   - **C.** 1 in 5
   - **D.** 1 in 10
4. A distinguishing characteristic of all supertasters when compared with non-tasters is that they have
   - **A.** fungiform papillae on their tongues.
   - **B.** an unusually low number of taste buds.
   - **C.** far more taste buds that contain fungiform papillae.
   - **D.** an unusually high number of fungiform papillae.
5. When compared with non-tasters, supertasters are more likely to
   - **A.** avoid foods that may be too tasty.
   - **B.** have super tasting abilities.
   - **C.** avoid foods that may cause health problems.
   - **D.** have different tasting experiences.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

9.5 Exposure to miraculin

If you pop a small, squishy *miracle berry* into your mouth, then chew and swoosh it around for a little bit, the juice will coat your tongue and for up to an hour or so you will experience a perceptual taste distortion. Previously sour foods like lemon, lime, grapefruit and vinegar will taste deliciously sweet. Anything else eaten within the following hour that's a bit sour or acidic will also be perceived as tasting sweet.

The miracle berry, also called *miracle fruit* or *sweet berry*, is a tiny fruit from a plant that is native to West Africa. Formally called *Richadella dulcifica*, the plant grows as a bush up to 4 or 5 metres tall in its native habitat, with small, white flowers that can sprout several hundred fruits. The fruit is a red berry, the size and shape of a small olive. Each fruit contains a seed, surrounded by a fleshy, opaque pulp. Within the fruit lies the 'miraculous' source of the perceptual taste distortion — miraculin.

Miraculin is a protein found in the fleshy part of a miracle berry. The berry itself does not taste sweet. It has a low sugar content and is commonly reported as being flat or nearly tasteless, but its taste changing effect led to the term 'miracle' being associated with it.

Miraculin attaches to taste receptors for sweet and upon interaction with acids from sour foods, changes shape to activate the sweet receptors that are normally set off by sugars. These sweet receptors essentially identify acids as sugars instead. The result is a sweet taste perception that drowns out the sour taste. This effect lasts until the protein is washed away by saliva (Koizumi et al., 2011).

Miraculin is different from other 'sweeteners'. For example, aspartame is an artificial sweetener with trade names such as NutraSweet and Equal. It is more than 200 times sweeter than sugar and commonly used as a sugar substitute in foods and beverages, including yoghurt, confectionary and carbonated soft drinks. Unlike, miraculin, aspartame always activates sweet taste receptors, no matter how acidic or neutral the environment is. Miraculin only activates sweet taste receptors in a sour environment (Brouwers, 2011).

As well as creating a perceptual distortion, miraculin's effect of turning sour into a palatable sweet taste demonstrates the role of top-down psychological processes in perception.

Figure 9.19 Miracle berries

Researchers are investigating applications of miracle berries. For example, the berries may eventually replace artificial sweeteners and be a safe, natural, low-calorie sweetener for people with diabetes or those trying to lose weight.

The miraculin in the berries may also help people with dysgeusia — a condition that distorts taste and is a common side effect of chemotherapy. Chemotherapy can cause food to taste metallic, thereby affecting appetite. When they eat too little food, chemotherapy patients can lose strength. Miraculin berries may eventually be able help chemotherapy patients, who have lost their sense of taste, to enjoy eating food once again.

Figure 9.20 Miracle berries create a perceptual taste distortion — sour foods are perceived as tasting sweet.

on Resources

- **Weblink** SciSvideo: Miracle fruit - how to trick your taste buds 2 m 58 s
- **Teacher weblink** Practical activity: The miracle fruit: An undergraduate laboratory exercise in taste sensation and perception

9.5 LEARNING ACTIVITY

Multiple-choice questions

1. Miraculin is a/an
   A. protein.
   B. miracle berry.
   C. natural sweetener.
   D. artificial sweetener.
2. Miraculin is found in
   A. sweet products.
   B. sour products.
   C. miracle berries.
   D. taste receptors.
3. Miraculin activates
   A. sweet taste receptors.
   B. sour taste receptors.
   C. sweet and sour taste receptors.
   D. all types of taste receptors.
4. Miraculin attaches to _____ when interacting with _____ from sour foods.
   A. proteins; acids
   B. sour taste receptors; acids
   C. sweet taste receptors; acids
   D. sweet taste receptors; proteins
5. The main effect of miraculin when compared with other foods is
   A. activation of bottom-up processing.
   B. activation of top-down processing.
   C. attachment of sweet taste receptors to sour foods so sweetness is perceived.
   D. interpretation of a sweet taste when actually consuming sour tasting food.

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9.6 Judgment of flavours

When we taste, what we actually perceive is the combined input from different senses, not just taste and other oral sensations. This overall experience results in flavour. Flavour is not in the food (or drink) — it is created from the food by the brain. Flavour tells us whether a food is delicious, good, unpleasant or even disgusting.

Flavour is a perceptual experience produced by a combination of taste and other sensations. A crucial component is smell. In addition, there is sensory information from receptors in your mouth that can detect temperature (e.g. hot or cold porridge), pain (e.g. too much chilli or spiciness) and the tactile sensation of texture (e.g. chunky or smooth peanut butter). The sensation of a food as 'hot' or 'spicy' is often described as a taste but is not actually a taste. For example, the substance capsaicin in foods seasoned with chilli causes a sensation of pain or heat, not taste.

Some psychologists have broadened the concept of flavour to include auditory sensations, such as the sounds heard when food is bitten or chewed, especially noisy foods such as carrots, celery and potato crisps, and visual sensations involving what a food or drink looks like and how it is presented (Spence, 2010, 2015).

The pleasure of food and beverages is critically dependent on all the sensory components being 'right'. The ideal lasagne, salad, sandwich, milkshake or mocktail is a perfect mix of all the sensory inputs. This also means that the taste of food can, for example, be ruined simply if it has an inappropriate colour or is not crunchy enough. In such cases, the influence of one type of sensory input may dominate or override other sensory input.

Given the multi-sensory nature of flavour, its perception is influenced by numerous factors. These include perceptual set, colour intensity and texture. Food producers and retailers recognise these influences when manufacturing and marketing their foods and beverages. Millions are spent on packaging and appearance to influence our choices, in our homes as well as in supermarkets, restaurants, school canteens and wherever else we may purchase food.

Perceptual set

The flavour we experience is influenced by expectations based on preconceived ideas about how foods (and drinks) should taste. These form through past experience. It is not even essential to have actually tasted something to have an expectation of flavour. For example, the mere thought of eating an uncooked cockroach is likely to disgust you without knowing what it actually tastes like. Your expectation is enough to produce disgust.

One of the most significant influences on flavour judgment is our expectation of how food should look. Colour tends to be the single most important visual cue when it comes to our expectation about the likely taste and flavour of food (Spence, 2015).

We start to associate specific colours with various types of foods and drinks during childhood and link them to certain tastes and flavours throughout life. For example, we expect yellow pudding to have a banana or lemon flavour and brown pudding to have a chocolate flavour. We also use colour to determine the ripeness and/or freshness of fruits, vegetables, meats, fish, dairy products and even lollies. If colour does not match our expectations, we may perceive the flavour of any one of these foods differently.

Figure 9.21 Your expectation of what an uncooked cockroach tastes like can influence your judgment of the flavour if you actually tasted it.

on Resources

Teacher weblink Australian psychologist explains flavour perception 3 m 56 s

Figure 9.22 We use colour to determine the ripeness and/or freshness of all types of food. If colour does not match our expectations then our flavour perception may change.

When the colour of a food or drink is different to what we expect, our brain can interpret that it tastes different too. Researchers have used colour to manipulate expectations and distort flavour judgments of participants in numerous studies.

One of the best-known demonstrations of this effect was reported by the American food researcher John Wheatley (1973). A group of people were served a meal of steak, French fries and peas under lighting conditions that masked the true colour of each food. All thought the meal was fine until the lighting was changed. Halfway through the meal, normal lighting was restored and it became apparent to the diners that they were eating blue steak, green fries and red peas. Upon realising this, many lost their appetite and some became ill.

According to Wheatley, the mere sight of the unnaturally coloured food was sufficient to induce nausea. In particular, the colour blue is often associated with spoiled, mouldy meat, creating an expectation that food of this colour won't taste very good and/or is likely to be off and cause some kind of food poisoning (Zampini & Spence, 2012).

Figure 9.23 We have expectations of how food should look and this perceptual set can influence our flavour judgment of the food. When exposed to this plate of food halfway through eating it in darkness, many participants lost their appetite and some became ill.

Researchers have also investigated the effect of perceptual set on our judgment of drink flavours. In one of the best-known studies, the colour of a cherry-flavoured drink was manipulated. The addition of an odourless orange or green food-colouring solution that was actually neutral in flavour led participants to incorrectly identify the flavour. For example, when the red, cherry-flavoured drink was changed to an orange colour, 41% of the participants reported that the drink tasted of orange compared to 0% when the drink's colour had not been changed. Colouring the same drink green led to 37% lime-flavoured responses (DuBose et al., 1980).

Even expert flavour tasters can be misled when their flavour expectations are manipulated. For example, some professional wine tasters and wine makers have been found to describe a white wine that had been artificially coloured red as having key characteristics of red wine. One explanation of wine experts being deceived in this way is that their expectations of the taste, aroma and flavour characteristics are much more strongly associated with a particular wine colour than in the non-expert (Spence, 2010).

Figure 9.24 There tends to be an expectation that more intensely coloured foods are likely to be more intensely flavoured.

Colour intensity

Colour tends to dominate over other sensory information when it comes to influencing our expectations about taste and flavour of food and beverages. In addition, changing the intensity of a colour can exert a sometimes dramatic impact on our expectations, and hence on the taste and flavour experiences. For example, a brighter or richer coloured food item can seem to taste different to a blander coloured one, even when there is no change in the ingredients that make up the flavour (Spence, 2015).

Regardless of our age or culture, there tends to be an expectation that more intensely coloured foods and drinks are likely to be more intensely flavoured. Research studies have found that simply adding more colouring to a food can lead participants to rate the taste and/or flavour as more intense. Most studies have been conducted with beverages. This is mainly because it is easier to manipulate the level of colour in solutions (Delwiche, 2012; Watson, 2013).

In one study, researchers investigated the influence of varying the intensity of colour on ratings of sweetness intensity. The participants were given two glasses of orange juice to compare and to rate in terms of their sweetness. The juices were lighter and darker shades of orange. The tasters rated the orange juice with the more intense, darker shade as being much sweeter. When later given two glasses of orange juice that had the same colour intensity but differing degrees of sweetness, most tasters did not report a difference in taste. Then, when asked to taste orange juice in which a flavourless green colour tinge was added, a significant number of participants reported the presence of sourness.

In a similar study, participants who drank strawberry- and cherry-flavoured juices reported that drinks with more red colour tasted stronger and had 'more' and 'truer' strawberry and cherry flavours. The effect was stronger among older than younger tasters (Fernández-Vázquez et al., 2014).

Studies that have manipulated the colour intensity of food have also reported distorted perceptions of flavour. As with drink studies, the colour is intensified using a food dye but there is no actual change in flavour. The results of food studies also show that overall flavour intensity is influenced by the amount of colouring that is added — the more intense the colour the more intense the flavour that tends to be reported and vice versa.

For example, chocolate pudding that is a richer shade of brown has a stronger flavour, as does chicken bouillon that has twice the level of normal colouring added. Egg yolks taste better when a rich orange colour, butter when pale yellow, margarine when it looks more like butter and brighter red salsas are perceived as spicier. When bright white colouring is added to skim milk it is perceived to be smoother, better tasting, and higher in fat than the uncoloured milk.

This type of colour intensity effect has been found with everything from noodles to vegetables, and from cheese through to yoghurt, as well as cake, jams, jellies, chocolates and sherbets (Chan & Kane-Martinelli, 1997; Shermer & Levitan, 2014).

Texture

We often describe ice cream, yoghurt or custard as having a creamy taste. That 'creaminess' is more about how the food feels in the mouth than about actual cream content.

Texture is the property of food or beverage that is felt in the mouth and contributes to flavour along with taste, vision and other sensations. Crispy, crunchy, crackly, gritty, grainy, chewy, sticky, soft, hard, smooth, rough, runny, lumpy, slimy, oily, greasy, dry, bubbly, fizzy, moist, rich, juicy and succulent are some of the other words that refer to texture when eating or drinking.

Texture stimulates tactile sensations and is therefore perceived in response to touch, primarily in the mouth. It can affect flavour in at least two important ways.

First, the texture of the food or drink we consume helps to determine how much of its surface area can come in contact with our taste receptors. For example, consider the difference in flavour intensity between carrot chunks, grated carrot and carrot juice. When you put a big chunk of carrot in your mouth, you do not taste much until you crunch down on it and break it into smaller pieces. Taste a forkful of grated carrot, and its flavour is much more noticeable. Sip on a glass of carrot juice, and you are likely to get a blast of carrot flavour immediately (Zimmerman, 2004).

Figure 9.25 Texture is the property of food that contributes to flavour along with the sensory input.

Second, the length of time a food or drink spends in the mouth also affects how strong its flavour seems. Thicker liquids and rich foods coat the mouth. Consequently, their chemical molecules that produce taste sensations (called tastants) spend more time exposed to taste receptors than thinner liquids and leaner foods, so they often seem more flavourful.

Dense foods, likewise, come into contact with more receptors than do aerated, lighter foods. Chewy foods take longer to break down enough to swallow than do softer foods, so we get more flavour from them. Studies show that people, for example, tend to judge the flavour of yoghurt or custard as creamier and more flavoursome and filling when it is thick, provides more mouth coating and is slow to melt (Zimmerman, 2004; McCrickerd et al., 2012).

In many cases, what we like and dislike about the texture of our food is a direct result of what we expect from a particular food. 'Chewy', for example, is a textural feature that we like when we are talking about a muesli bar or liquorice, but not when we are talking about steak or biscuits. Similarly, crispy or crunchy is what we expect and want from Twisties or pretzels but not from custard or scrambled eggs.

Texture contributes to the overall acceptability of a food or beverage, as well as to its appearance and flavour. Our expectation of how a food or drink should feel in the mouth is manipulated by food producers and marketers to influence our choices.

For example, potato chips and crackers are advertised as crispy, butter and margarine as smooth, oranges as juicy, meat and chicken as succulent, ice cream as creamy, gravy as rich and carbonated drinks as fizzy or bubbly. This occurs whether or not it is true. Chefs and food manufacturers use starches, thickeners and emulsifiers to help create the 'creamy' taste they promote. However, a sauce's flavour can be judged as being 'creamy' without actually containing cream.

Figure 9.26 The sight of the plated food may influence its preference over the handheld food. However, if blindfolded when tasting either of these foods, their texture will influence overall acceptability of one over the other.

Resources

Teacher weblink Practical activities on colour and flavour perception, and other aspects of taste

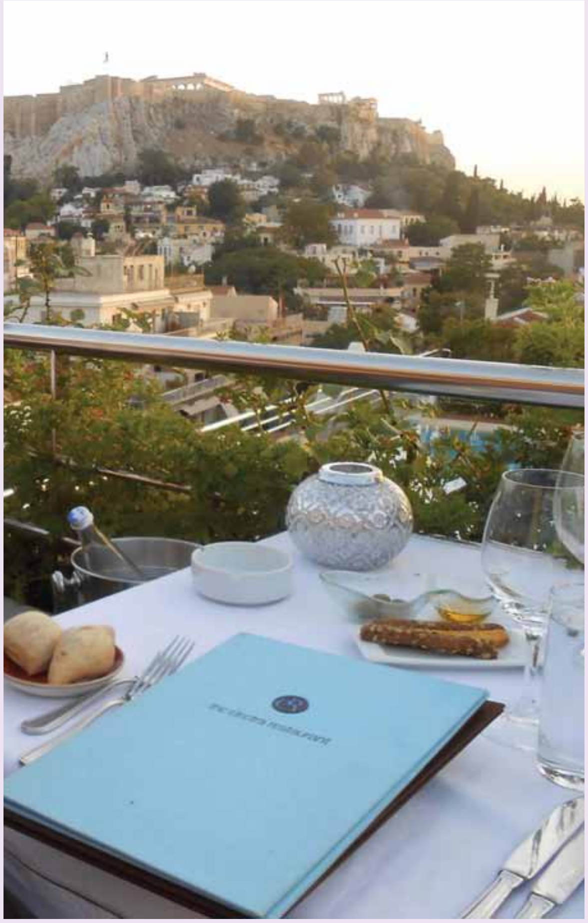
9.6 LEARNING ACTIVITY

Review

1. Explain the meaning of flavour.
2. How is flavour distinguished from taste?
3. Complete the following table to summarise how flavour is judged and can be influenced.

Factor	Description	Influence on flavour judgment	Example of manipulation by a food producer or marketer to influence purchase	Example of manipulation by a chef/restaurant to influence flavour judgment
Perceptual set				
Colour intensity				
Texture				

4. To what extent might the setting or ambiance ('atmosphere') of the eating place influence flavour judgment in a positive and/or negative way. Explain with reference to an example.



To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

9.7 Synaesthesia

When Matthew Blakeslee shapes hamburger patties with his hands, he experiences a vivid bitter taste in his mouth. To Sean Day, the taste of beef is dark blue and the smell of almonds is pale orange. Esmeralda Jones sees blue when she listens to the note C sharp played on the piano; other notes produce different colours — so much so that the piano keys are actually colour coded, making it easier for her to remember and play musical scales. And when Jeff Coleman looks at printed black numbers, he sees them in colour, each a different colour.

Blakeslee, Day, Jones and Coleman experience the ordinary world in extraordinary ways. For them, the senses get intertwined instead of remaining separate. They are among a few otherwise normal people who have synaesthesia (Ramachandran & Hubbard, 2003; Day, 2005).

Synaesthesia (pronounced 'sin-ess-THEE-zhah') is a perceptual experience in which stimulation of one sense produces additional sensations in another. The experience associated with the additional sensations 'adds' to the overall perceptual experience without replacing the initial sense.

Synaesthesia is not a disease. Nor does it interfere with normal daily functioning or cause significant difficulties in most cases.

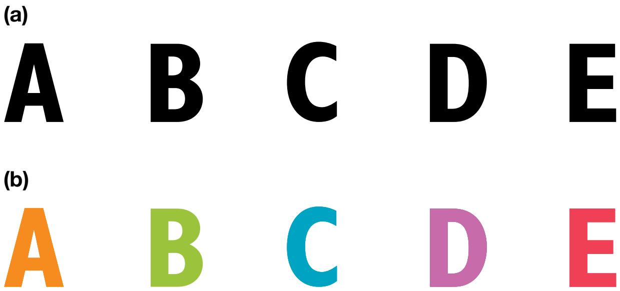


Figure 9.27 When synaesthesia occurs, stimulation of one sense triggers an unusual experience in another sense. Figure (a) shows how letters usually appear to a non-synaesthete and (b) how letters might appear to a synaesthete.

on Resources

Weblink Video of researcher describing synaesthesia 2 m 7 s

9.7.1 Types of synaesthesia

More than 50 different types of synaesthesia. One of the most common and widely studied is called *grapheme-colour synaesthesia* have been described, in which a person sees colours when viewing letters, numbers or words (i.e. graphemes).

Synaesthetes who have this experience report that looking at a specific letter of the alphabet will evoke a specific colour or a 'coloured overlay'. Others report that they do not actually see the colours but instead just 'know' that a particular letter is a particular colour. Still others report experiencing specific colours but say that the colour is experienced somewhere within their 'mind's eye' (Ramachandran & Hubbard, 2003; Carmichael et al., 2015).

Other types of synaesthesia include:

- *mirror–touch synaesthesia* — a person watching another individual being touched feels a tactile sensation on their own body
- *auditory–tactile synaesthesia* — certain sounds trigger sensations in parts of the body
- *word–gustatory synaesthesia* — experiencing tastes when hearing certain words
- *pain synaesthesia* — experiencing pain when observing or imagining another person in pain
- *chromesthesia* — perception of nonvisual stimuli (e.g. sounds, tastes, odours) is accompanied by colour sensations
- *chromatic audition* — colour sensations are experienced when sounds are heard
- *time–space synaesthesia* — individuals experience months, days, hours, and other units of time as occupying specific spatial locations around them (e.g. January is 30° to the left of my body).

Synaesthesia is relatively rare and there are substantial individual differences among people in how they experience it. Estimates of its prevalence vary from as much as 1 in 20 people to as few as 1 in 25 000 people. An estimate of about 1 in 2000 people seems to be widely accepted within psychology. Some people experience multiple types of synaesthesia (Day, 2005; APA, 2022).

9.7.2 Characteristics of synaesthesia

Researchers have found that synaesthesia is a real experience (rather than imagined) and can be distinguished by a number of characteristics.

Synaesthesia is involuntary and occurs automatically in response to the relevant sensory stimulation. It is extremely difficult to suppress. The experience is also vivid, highly memorable and consistent across time. For example, the synaesthete always associates the same colour with the same number, letter of the alphabet or sound. Blue will always be experienced with the number three, or T's are always red to the individual synaesthete. However, these specific cross-sensory experiences vary among individual synaesthetes. For example, one synaesthete may always experience blue with the number three, whereas another may always experience yellow with the number three. Finally, synaesthesia also tends to be one-way rather than bidirectional. If a sound produces a taste, the taste will not necessarily produce the sound (Hubbard & Ramachandran, 2003; Ward & Mattingly, 2006; Carmichael et al., 2015).

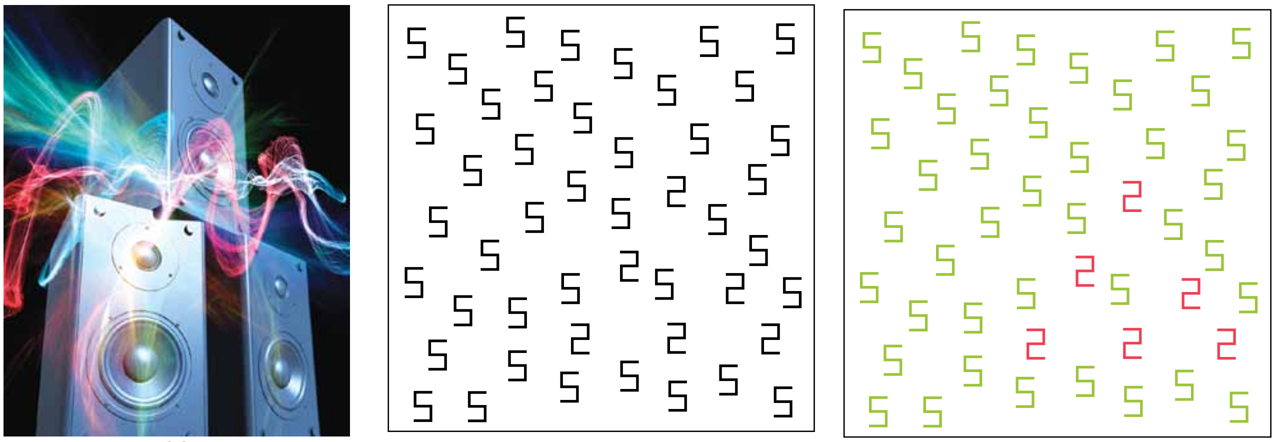
A number of studies have reported that synaesthesia occurs more commonly in women, with up to 6 times more female synaesthetes than males. Other studies have reported that such results are due to a confounding variable — female synaesthetes are more likely to volunteer for research on the condition. (Hubbard & Ramachandran, 2003; Simner & Carmichael, 2015).

9.7.3 Cause of synaesthesia

Although synaesthesia was first scientifically investigated around 1880, it was brushed aside as fakery or a mere curiosity for many years. More recently, psychologists have developed renewed interest in synaesthesia and have conducted various scientific investigations on the phenomenon.

However, researchers still know relatively little about synaesthesia and why it is experienced. Some describe it as a neurological condition, others as an inherited condition, others as a familial condition, and still others as a combination of two or more of these.

Many explanations have been proposed for its occurrence. Some researchers have suggested that synaesthetes are unusually sensitive to external stimuli and may have 'hyperexcitable' sensory



(a) (b) (c)

Figure 9.28 (a) It is estimated that about 18.5% of people with synaesthesia see visual images like colour or shapes when they listen to music. This form of 'coloured hearing' is called Chromesthesia or Sound-to-colour synaesthesia (Day, 2005). (b) Someone with grapheme-colour synaesthesia will tend to find it difficult to pick out the black twos from the black fives in this test item. (c) However, if the numbers are coloured, someone with grapheme-colour synaesthesia will tend to see the triangle of twos almost instantly.

learnMORE | Assessing synaesthesia

Access learnON to read about the Synesthesia Battery that has been developed to assess synaesthesia.

processing areas in the brain. Others have proposed that synaesthesia may result from a breakdown in sensory and perceptual processes.

It has also been suggested that synaesthesia can be linked to the excess of neural connections formed during early development that are normally pruned and refined as the brain matures over time. Therefore, synaesthetes maybe people who retain rather than lose these neural connections.

It is likely that the brains of synaesthetes possess unique structural and/or functional properties. Consequently, explanations often refer to the possibility of differences in the architecture of the synaesthete's brain. For example, the brains of synaesthetes may have abnormal neural pathways or be 'wired' differently, so that neighbouring sensory areas in the brain cross-activate one another, thereby triggering additional sensations — the experience of seeing colour when looking at shapes might be due to cross-activation of the colour and shape recognition (Carmichael et al., 2015; Simner & Carmichael, 2015).

Neuroimaging technology in particular has been useful for studying brain areas that are active during synaesthesia, but the images are not yet detailed enough to allow researchers to see whether the individual connections in the brain are cross-wired. Generally, these studies show that cortical areas involved in processing the relevant sensory information are activated as occurs in non-synaesthetes.

When enough known synaesthetes die and donate their brains for research, post-mortem examinations may provide valuable information on what is actually different about their brains and what may therefore account for their extraordinary perceptual experiences.

It is likely that something is 'going on' in the sensory areas of the brain, but precisely what still remains unclear. It is, however, clear that synaesthesia is not associated with any serious brain abnormality or problems with cognitive functioning. Nor is it some kind of 'sixth sense'.

Researchers usually study synaesthesia not only because it is a perceptual distortion involving an unusual perceptual experience, but also because it may shed new light on how the brain is organised and how we sense and perceive the world. It may offer new insights on brain areas and cognitive processes involved in perception. For example, it raises questions on how the different senses interact in the brain; how we 'bind' all perceptions together into one complete whole; how different types of information are represented in the brain; and on the overlap between cognitive processes such as perception, imagery, language, memory and conscious awareness.

on Resources

Weblinks Video on synaesthesia 3 m 57 s
I see words as colours — an article about a woman with grapheme-colour synesthesia
What is synesthesia and what's it like to have it? 8 m 50 s

Teacher weblink Documentary on synaesthesia 44 m 32 s

9.7 LEARNING ACTIVITY

Review

1. Explain what synaesthesia is.
2. List the key distinguishing characteristics of synaesthesia.
3. Suppose that you had synaesthesia. Write a one paragraph primary data description that reports a perceptual experience at a single point in time, ensuring you name the type of synaesthesia. You may refer to a type other than one described in the text.
4. Give a possible explanation of synaesthesia that is based on
   a. brain dysfunction
   b. healthy brain function.

To answer questions online and receive **immediate feedback**, access learnON at www.jacplus.com.au.

9.8 Spatial neglect

Mr V. is a patient in a rehabilitation facility. Soon after waking in the morning, he proceeds to shave his face. When he puts the shaver down to go to breakfast, it is apparent that he shaved only the right side of his face.

While eating breakfast, he starts to look for his coffee cup until someone points out that it is just slightly to the left of his dish. At lunch or dinner, he may leave the food on the left half of his plate untouched while asking for more, only to be reminded that there is still food on the plate.

If asked to read compound words such as football or birthday, he will read ball and day, overlooking the first half of the word. If questioned, he states that he read the words correctly. If asked to draw a clock, he will draw a circle correctly but then crowd all the numbers into the right half. If asked to draw a person, he will draw only the right side of the body, leaving out the left arm and leg. If questioned, he states that the drawings look alright to him (Springer & Deutsch, 1998).

This unusual behaviour by Mr V. is associated with brain injury resulting in a disorder called spatial neglect which causes problems with attention. Generally, **spatial neglect**, also called *visual neglect*, *unilateral neglect* and *hemispatial neglect*, is a neurological disorder whereby individuals are unable to notice anything either on their left or right side even though there may be no sensory loss. They tend to behave as if that one side of their world does not exist.

Pen-and-paper tasks are commonly used as part of the behavioural assessment of spatial neglect. These may include cancellation tasks (as shown in Figure 9.29) and copying drawings (as shown in Figure 9.30 on the next page). Cancellation tasks tend to be the most sensitive of the behavioural tests. These require patients to find and circle targets (sometimes embedded amongst distractors) on a centrally placed sheet of paper.

Spatial neglect is most commonly observed in stroke or accident victims who have fairly extensive injury to the cerebral cortex in the rear area of the parietal lobe of the right hemisphere. Consequently, these patients mostly neglect the left side of their world. Spatial neglect of the right side sometimes occurs after similar damage to the left hemisphere (or in subcortical areas), but much less frequently and in a milder form. In either case, the side of the world opposite to the damaged hemisphere tends to be neglected, rather than the same side (Parton et al., 2004; Li & Malhotra, 2015; Kolb & Whishaw, 2021).

Figure 9.29 A star cancellation task from a behavioural test for spatial neglect. The stimulus is positioned centrally and the patient is asked to find and mark all the small stars without marking the large stars or letters. This patient was only able to locate the small stars at the far right of the stimulus despite having unlimited time to complete the task.

Spatial neglect is a complex disorder with many different types and subtypes. Although neglect is mostly experienced with the visual sense, it may occur for other senses, such as hearing or touch, or with movement. Furthermore, it may be isolated to one or a combination of these senses.

When tested, some patients acknowledge the presence of something on the neglected side and mistakenly report its presence as if it appeared on the non-neglected side. Thus, for example, a patient may be given an auditory stimulation on their left neglected side and claim that the sound came from the right. Or, in the case of neglect involving movement, the patient may be asked to raise their left hand and, if they respond at all, they may raise their right hand.

The extent of neglect among different individuals varies and depends on the severity and specific location of their brain injury. It may range from indifference towards objects on one side to denial of the very existence of that side of the body. For example, one patient called a nurse in the middle of the night to ask her to help him throw his own left leg out of bed, thinking that 'the alien leg' had been put there as a cruel joke by other patients. Less severely affected individuals may simply ignore things in their left or right visual field and not necessarily all parts of their body on that side (Stirling, 2002; Parton et al., 2004; Li & Malhotra, 2015).

The higher incidence of spatial neglect when there is injury to the right rather than left parietal lobe demonstrates the importance of the cerebral cortex in the right parietal lobe in attention and in conscious awareness of objects and the self. Like many other mental processes, however, other brain areas are also involved in attention and consciousness. Interestingly, many individuals with spatial neglect insist that there is nothing wrong with how they perceive and act in the world.

Some people with spatial neglect make a gradual recovery from the disorder. Most make some degree of spontaneous recovery but tend to have significant cognitive impairments, particularly relating to attention, treatments tend to be unlikely to be successful unless they are tailored to the underlying cognitive impairments in individual patients (Li & Malhotra, 2015).

Psychologists are unclear about why spatial neglect occurs following damage to the parietal lobe. Nor is there any widely accepted explanation of the disorder. The two main theories on why neglect arises propose that it is caused by either (1) defective sensory or perceptual processes, particularly integration of sensations into perceptions or (2) defective attention (Kolb & Whishaw, 2021).

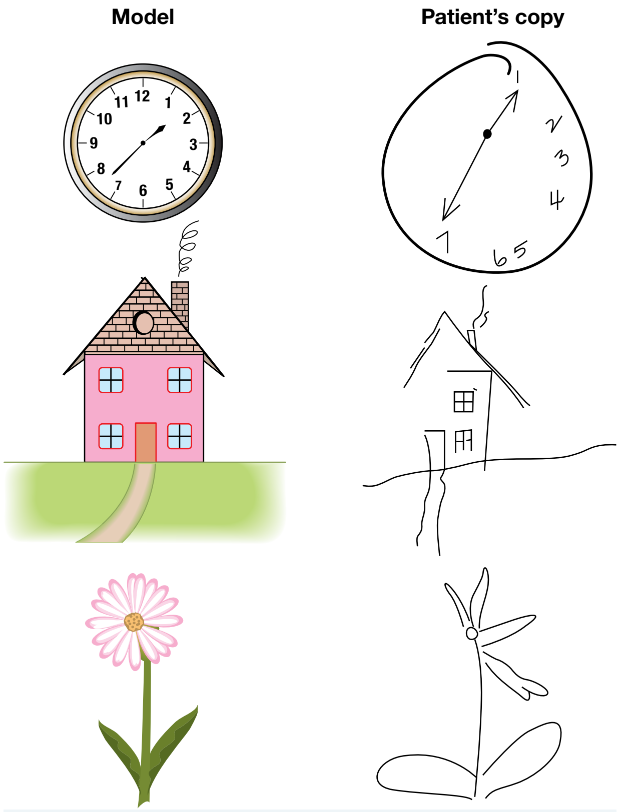


Figure 9.30 Drawings of common symmetrical objects by an individual with spatial neglect. Note that the left side of each object has been ignored.

Resources

Weblinks Video on spatial neglect featuring a neurologist and two patients 5 m 48 s
Video on a therapy session for spatial neglect 4 m 31 s

9.8 LEARNING ACTIVITY 1

Review

1. Spatial neglect is most commonly associated with damage in the _____ lobe.
   A. frontal
   B. occipital
   C. temporal
   D. parietal
2. The most common symptom of spatial neglect is loss of
   A. attention.
   B. visual perception.
   C. conscious perception of stimuli on one side of the body.
   D. conscious perception of stimuli on both sides of the body.
3. Individuals diagnosed with spatial neglect are also likely to experience loss of
   A. sensory abilities.
   B. cognitive abilities.
   C. awareness of stimuli on the same side of the body as the brain injury.
   D. awareness of stimuli on the opposite side of the body as the brain injury.
4. Difficulties experienced by someone with spatial neglect will primarily depend on
   A. the location and severity of their brain injury.
   B. abilities before their brain injury.
   C. early diagnosis of their brain injury.
   D. patient awareness of their brain injury.
5. Spatial neglect is best described as a/an _____ disorder.
   A. neurological
   B. sensory
   C. mental
   D. behaviour

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9.8 LEARNING ACTIVITY 2

Data analysis on recovery from spatial neglect

Spatial neglect is quite common among patients with a brain injury caused by a stroke. One of the earliest studies on recovery from right or left neglect induced by a stroke was conducted by British neurologist Derick Wade and his colleagues (1988).

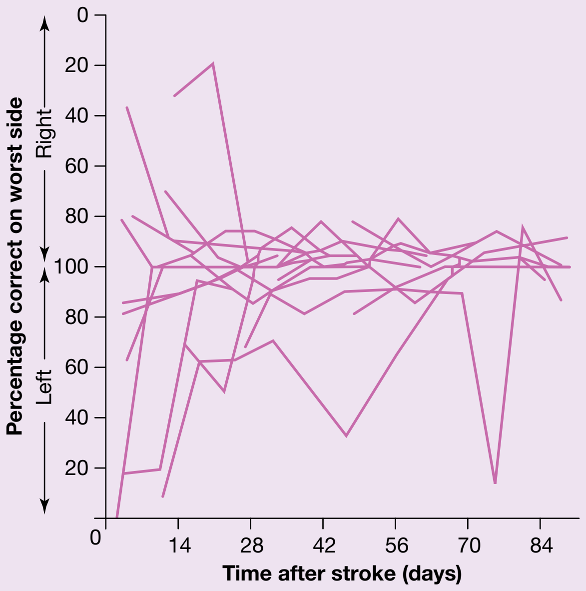
Patients admitted to hospital and surviving for 6 months were regularly tested on three cognitive tasks to measure their recovery.

One of the tasks required each patient to cross out all ‘1s’ and ‘4s’ presented in different strings of numbers (called a cancellation task). Examples of strings of numbers used in the study are:

983$_4$7$_1$0356350$_{41}$	758$_4$390238756$_{41}$
3829$_1$7$_4$65960758	537260$_1$987$_4$8285
$_4$7382059385837$_1$	38$_4$958$_1$9$_4$62$_1$578

The results for 15 patients are plotted in the graph below. Of the 15 patients, 9 had left visual neglect and 6 had right neglect.

a. What do the *X* and *Y* axes of the graph describe?
b. How many patients showed recovery from spatial neglect?
c. Explain, with reference to the data, whether there was a difference in the rate of recovery by each patient.
d. **i.** After how many days did one of the patients experience a sudden and dramatic relapse from recovery?
ii. Suggest a possible reason for the relapse.
e. Write a conclusion about recovery from spatial neglect based on the data.



Source: Wade, D.T., Wood, V.A., & Hewer, R.L. (1988). Recovery of cognitive function soon after stroke: a study of visual neglect, attention span and verbal recall. *Journal of Neurology, Neurosurgery, and Psychiatry, 51*(1), 10–13.

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9.9 Review

Topic summary

- Visual illusions
  - Müller-Lyer illusion
  - Ames room illusion
  - Spinning dancer illusion
- Agnosia
  - Visual agnosia
- Supertasters
- Exposure to miraculin
- Judgment of flavours
  - Perceptual set
  - Colour intensity
  - Texture
- Synaesthesia
  - Types of synaesthesia
  - Characteristics of synaesthesia
  - Cause of synaesthesia
- Spatial neglect

Key terms

agnosia p. 585
Ames room illusion p. 581
flavour p. 595
miraculin p. 593
Müller-Lyer illusion p. 579
perceptual distortion p. 576
perceptual set p. 595
spatial neglect p. 604
Spinning dancer illusion p. 583
supertaster p. 590
synaesthesia p. 601
texture p. 598
visual agnosia p. 586
visual illusion p. 578

Note: The **References** for the entire title can be accessed in learnON and are also available as a downloadable PDF.

on Resources

Digital documents Key terms glossary — Topic 9 (doc-37660)
Topic summary — Topic 9 (doc-37661)
Key diagrams PowerPoint — Topic 9 (doc-37663)

9.9 Topic 9 test

Section A: 15 marks **Section B:** 35 marks **Total:** 50 marks

Access learnON to answer the following test questions online and receive **immediate feedback**.

Section A — Multiple-choice questions

Choose the response that is **correct** or **best answers** the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Question 1

A visual illusion is best described as

A. consistent misinterpretation of real sensory stimuli.
B. a trick involving the visual perception system.
C. a false belief despite obvious proof that what is being looked at is incorrect.
D. a perception that occurs without external stimulation of the eye.

Question 2

An explanation of a visual illusion in terms of 'misfiring neural impulses' is likely to be based on a _____ perspective.

A. biological
B. psychological
C. social
D. biopsychosocial

Question 3

The Ames room illusion demonstrates that

A. viewing objects over a stretch of visible terrain can distort perception.
B. perception is more accurate when we use monocular cues as well as binocular cues.
C. past experience with rooms can create a perceptual set that leads to perceptual errors.
D. people can make perceptual errors on the judgment of size even when they know there is an illusory effect.

Question 4

In relation to taste perception, which of the following is a characteristic of texture?

A. colour
B. mouthfeel
C. labelling
D. packaging

Question 5

The Müller-Lyer illusion involves

A. straight lines and corners that can only be found in a carpentered world.
B. two lines of unequal length that are incorrectly perceived as being of equal length.
C. two lines of equal length that are incorrectly perceived as being of unequal length.
D. a line with an 'arrow head' at each end being perceived as longer than a line with a 'feather tail' at each end.

Question 6

Miraculin is a _____ that occurs in _____.

A. berry; West Africa
B. protein; miracle berry
C. taste receptor; fungiform papillae
D. perceptual interpretation; the brain

Question 7

Which of the following points is correct about synaesthesia?

A. an imagined experience
B. involves perceptual distortions
C. causes brain injury
D. caused by brain injury

Question 8

The flavour of food is determined by

A. taste.
B. tastants.
C. the brain.
D. the food properties.

Question 9

The visual cue that tends to be predominant in the judgment of flavour is

A. colour.
B. labelling.
C. packaging.
D. light.

Question 10

Research findings show that more intensely coloured foods or drinks are likely to be perceived as

A. sweeter.
B. unhealthy.
C. lacking in flavour.
D. more intensely flavoured.

Question 11

The Spinning dancer illusion has been explained with reference to the

A. silhouetted dancer moving in one direction only.
B. observer's failure to blink during the animation.
C. lack of depth cues in the animation to distinguish between the front and back of the dancer.
D. inability of the observer to differentiate between clockwise and anti-clockwise directions.

Question 12

Most students reading a handout prepared by their teacher failed to notice the word *the* written twice in succession. Which of the following factors best explains the perceptual error made by the students?

A. distortion of perception
B. proximity
C. visual agnosia
D. context

Question 13

Soldier B.L. sustained a brain injury during combat duty in Afghanistan. Despite making a reasonable recovery through an individualised rehabilitation program, B.L. was still unable recognise familiar faces.

B.L. most likely has the agnosic disorder called

A. agnosic alexia.
B. prosopagnosia.
C. simultanagnosia.
D. associative visual agnosia.

Question 14

Patient P.D. can easily identify a rose by smell but not by sight, even though he can see every feature and describe most of them in considerable detail. P.D. is most likely experiencing

A. synaesthesia.
B. topographical agnosia.
C. apperceptive visual agnosia.
D. associative visual agnosia.

Question 15

Patient T.L. has been diagnosed with agnosic alexia and is therefore experiencing significant difficulties

A. reading.
B. recognising landmarks.
C. recognising familiar faces.
D. recognising more than one object at a time.

Section B — Short answer questions

Question 1 (2 marks)

Explain the meaning of the phrase 'distortion of perception'.

Question 2 (4 marks)

a. Visual agnosia is caused by brain _____ and results loss or impairment of ability to recognise _____.
b. Distinguish between agnosic alexia and topographical agnosia.

Question 3 (2 marks)

a. A supertaster tends to have a more dense covering of fungiform _____ on their tongue than does a non-taster. 1 mark
b. To which basic taste are supertasters most sensitive? 1 mark

Question 4 (2 marks)

Distinguish between taste perception and flavour perception.

Question 5 (3 marks)

Explain how perceptual set can influence flavour perception with reference to an example.

Question 6 (2 marks)

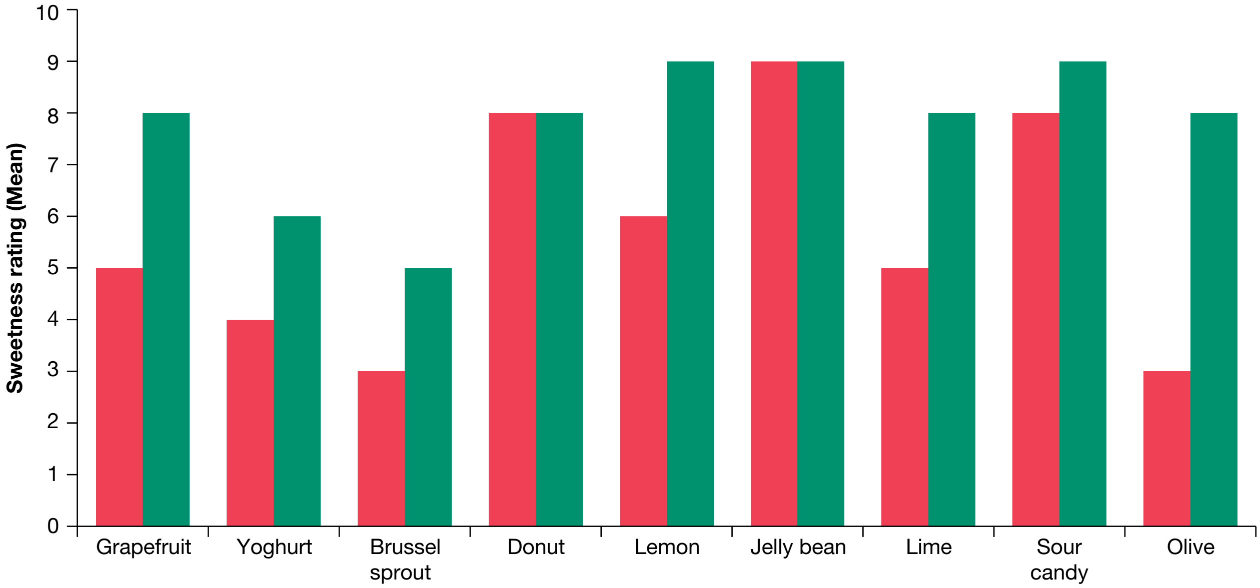
a. What is the key distinguishing behavioural characteristic of visual spatial neglect? 1 mark
b. What is the most common cause of spatial neglect? 1 mark

Question 7 (5 marks)

a. List three distinguishing characteristics of synaesthesia. 3 marks
b. Explain whether synaesthesia can be considered to be a perceptual distortion. 2 marks

Question 8 (5 marks)

The following graph shows the results of a taste perception experiment on the effects of consuming miracle berries. Sweetness ratings were reported by participants before and after consuming the berries.



a. What type of experiment was used to test the effects of consuming miracle berries? 1 mark
b. Which bar colour, red or green, represents the results of participants after consuming miracle berries? 1 mark
c. What was the effect of consuming miracle berries? 1 mark
d. About how long does the effect last? 1 mark
e. Why is this ingredient said to cause a 'perceptual distortion'? 1 mark

Question 9 (10 marks)

Researchers conducted an experiment to find out if consumers' perceptions of a café latte would be influenced by the colour (white, transparent or blue) of the mug from which it was drunk.

Nine male and nine female volunteer participants aged between 18 and 62 years with a mean age of 31.5 years were randomly allocated to either of three groups, with three males and three females in each group. Participants were told that the purpose of the study was to assess certain characteristics of coffee.

All drank ~200 mL of café latte (~135 mL of full-cream milk and ~65 mL of coffee). Group 1 were given their coffee in a white, porcelain mug, Group 2 in a transparent, glass mug and Group 3 in a blue, porcelain mug.

Once the participants had drunk their coffee, they rated the coffee on five characteristics using a 100-point scale. For example, for flavour intensity, a score of 0 = not intense at all and a score of 100 = very intense. Results are shown in the table on the next page.

The researchers concluded that the colour of the mug influenced participants' ratings of the coffee taste/flavour. On the basis of this finding, they recommended that 'café owners, baristas, as well as crockery manufacturers should carefully consider the colour of the mug and the potential effects that its colour may exert over the multisensory coffee drinking experience'.

The mean subjective ratings of the perceived intensity, aroma, bitterness, quality and acceptability of the coffee as a function of mug type

Mug	Flavour intensity	Aroma	Bitterness	Quality	Acceptability (likeability)
White	35.46	38.18	36.00	50.57	40.38
Glass	29.97	24.08	24.86	33.85	43.80
Blue	31.16	29.71	27.34	49.48	55.58

Source: Van Doorn, G. H., Wuillemin, D., & Spence, C. (2014). Does the colour of the mug influence the taste of the coffee? *Flavour, 3*(10).

a. Formulate a relevant research hypothesis. 1 mark
b. Identify the experimental research design. 1 mark
c. Identify the independent and dependent variables. 2 marks
d. Identify the experimental and control groups. 2 marks
e. Describe the results obtained. 2 marks
f. Suggest two potential extraneous or confounding variables relating to the coffee and/or mugs that needed to be strictly controlled. 2 marks

on Resources

Go to learnON to access answers to the Topic 9 test. A customisable Word version of the test can also be downloaded from the **Digital documents** tab of the Resources panel.

learnMORE | The moon illusion

Unlike many other visual illusions which are artificially created, the moon illusion is naturally occurring. The illusion occurs when the moon appears considerably larger when near the horizon than when it is high up in the sky, even though the retinal image is equal in both situations, and the moon does not actually change its size as it moves across the sky. The illusion is more obvious with a full moon. It has intrigued people for many centuries and various theories have been proposed to explain it.

One widely described explanation is in terms of apparent distance theory. This theory is based on the results of research conducted by American psychologists Lloyd Kaufman and Irvin Rock.

Kaufman and Rock (1962) proposed that viewing the moon over a visible stretch of terrain (or landscape) makes it appear further away. They found that when research participants viewed the moon at the horizon over a visible surface (e.g. trees and buildings), it appeared on average 1.3 times larger than the moon seen at its highest point in the sky (its zenith). However, when the terrain was kept out of vision by observing the moon through a hole in a sheet of cardboard, no difference in size between the horizon and zenith moons was reported.

Kaufman and Rock concluded that the terrain offers many depth and distance cues that provide 'evidence' to allow us to perceive the moon as more distant, whereas there are no depth and distance cues when the moon is high in the sky, so we misperceive distance and underestimate the moon's size.

Why does the moon look so much larger when on the horizon than when it is high in the sky?.

Not all psychologists agree with this explanation. For example, Coren and Aks (1990) have found that people sometimes perceive the horizon moon as closer, not more distant; Reed and Krupinski (1992) have found that the illusory effect cannot be created when the visual stimulus is a star rather than the moon; and Suzuki (1991) found that the illusion can still occur even when the moon is projected at different points in the sky without the presence of depth and distance cues, as in the total darkness of an indoor planetarium. In sum, a completely satisfactory explanation of the moon illusion has yet to be proposed.

learnMORE | Assessing synaesthesia

The Synesthesia Battery was developed by researchers to assess synaesthesia in a 10-minute online session. Synesthetes log on to the testing site (www.synesthete.org) and specify which form(s) of synesthesia they experience. The testing platform then presents their triggering stimuli (e.g. the 26 letters of the alphabet) one by one in randomised order, and participants are required to select their synesthetic colour for each trigger.

Each stimulus (e.g. letter) is presented three times, and a score is generated to quantify the consistency of participants' responses (e.g. did the participant choose the same/similar colours each of the three times she saw a particular letter?)

This score represents the geometric distance in RGB (red, green, blue) colour space, where R, G, and B values are all normalised to lie between 0 and 1.

If the mean overall score of colour distance is less than 1, the participant is classified as a synesthete; if the score is 1 or higher, the degree of inconsistency classifies the participant as a non-synesthete. However, it remains an open question whether this limited retest interval is sufficient to truly distinguish synesthetes from non-synesthetes.

Source: Carmichael, D. A., Down, M. P., Shillcock, R. C., Eagleman, D. M., & Simner, J. (2015). Validating a standardised test battery for synesthesia: Does the Synesthesia Battery reliably detect synesthesia? *Consciousness and Cognition, 33*, 375–385.

GLOSSARY

ablation see *brain ablation*

abnormality any deviation from what is considered normal, typical, usual or healthy

abstract thinking in Piaget's theory, a way of thinking that does not rely on being able to see, visualise, experience or manipulate in order to understand something

accommodation in Piaget's theory, changing a pre-existing mental idea to fit new information

accommodation in visual perception, a monocular depth cue involving the automatic focusing of the lens in the eye to adjust shape in response to changes in the distance of view from an object

accuracy how close a measurement relates to the 'true' value of the quantity being measured

acquired brain injury any type of brain damage or injury that occurs after birth

actor–observer bias the tendency to attribute one's own behaviour to external or situational factors, while attributing others' behaviour to internal or personal factors

adaptation in Piaget's theory, taking in, processing, organising and using new information in ways to adjust to change

adaptive behaviour any behaviour that enables the individual to adjust to the environment appropriately and effectively; compare with *maladaptive behaviour*

affect heuristic making a judgment that is influenced by the emotion being experienced at the time

affective component of an attitude in the tricomponent model, the emotional reaction or feeling an individual has towards an object, person, group, event or issue

aggregation a collection of people in one location who have no obvious social structure or organisation, and who have minimal shared purpose

agnosia loss or impairment of the ability to recognise and identify objects, persons, sounds or other sensory stimuli using one or more of the senses due to brain injury

aim a statement outlining the purpose of a research investigation

Ames room illusion a perceptual misinterpretation involving a trapezium-shaped room which appears rectangular when viewed through a peephole using only one eye and people appear small or large, depending on where they stand in the room

anchoring bias cognitive bias influencing the tendency to rely heavily on the very first piece of information received (called the anchor) when making a decision and to not modify this anchor sufficiently in light of later information

anecdote an informal verbal report of an event that has been casually observed

animism in Piaget's theory, the belief that everything which exists has some kind of consciousness

anti-conformity the deliberate refusal to comply with accepted standards in a society, it is often accompanied by the expression of ideas, beliefs, or judgments that challenge those standards

aphasia a language disorder due to an acquired brain injury to an area responsible for language production or processing

assessment assessment in general, a judgment of the quality, worth, importance or value of something or someone; in research, a systematic process of obtaining information from participants; in mental health, collecting and interpreting information about how a person thinks, feels and behaves in order to make a diagnosis

assimilation in Piaget's theory, taking in new information and fitting it into a pre-existing mental idea

association area surround sensory and motor areas in the brain's cerebral cortex and deal with more complex functions that require integration of inputs of information from different areas

attachment the emotional bond which forms between an infant and another person

attention deficit hyperactivity disorder (ADHD) a neurodevelopmental disorder involving a persistent pattern of inattention, and/or hyperactive-impulsive behaviour that adversely affects development or everyday functioning

attentional bias cognitive bias influencing the tendency to prioritise attention to certain information (or other stimuli) over other information

attention the process of focusing on specific stimuli or aspects of the sensory environment whilst ignoring and therefore excluding others

attitude an evaluation a person makes about an object, person, group, event or issue

attribution the process by which we explain the cause of our own or another person's behaviour; also used to refer to the explanation we come up with

atypical behaviour behaviour that differs markedly in some way from what is expected in a given situation; compare with *typical behaviour*

atypical development development that differs in a significant way from what is usual or appropriate; compare with *typical development*

autism a neurodevelopmental disorder that affects the way people communicate and interact with others and the world; more formally called *Autism spectrum disorder*

availability heuristic making a judgment based on how easy or difficult it is to bring specific examples to mind

behaviour any action made by a living person (or animal) that can be observed or measured

behavioural component of an attitude in the tri-component model of attitudes, the way in which an attitude is expressed through our actions (or how we might behave should the opportunity arise)

beneficence in relation to research ethics, the commitment to maximising benefits and minimising the risks and harms involved in taking a particular position or course of action

between subjects an experimental design in which each participant is assigned to only one group or condition and provides only one score for data analysis; also called *independent groups* and *between groups*

between groups see *between subjects*

biased sample a sample that does not adequately represent the key characteristics of its population

binocular depth cue the use of both eyes working together in order to provide information to the brain about depth and distance

biological factor in the biopsychosocial model, a physiologically based or determined influence, often not under our control, such as the genes we inherit

biopsychosocial model an approach to describing and explaining how biological, psychological and social factors combine and interact to influence an individual's behaviour and mental processes, including mental wellbeing, sometimes called the *biopsychosocial approach* or *theory*

blood-brain barrier a layer of cells which limits the entry to the brain of potentially harmful substances that may be present in the blood

body language non-verbal communication involving expression of feelings and thoughts through facial expressions, eye gaze, posture, gestures or other movements

bottom-up processing the perceptual process starts 'at the bottom' with raw sensory information that is sent 'up' to the brain for higher level mental 'processing'

brain ablation the destruction or removal of part of the brain

brain injury any brain damage or disorder that impairs normal functioning of the brain, either temporarily or permanently

brain lesioning disrupting or damaging the normal structure or function of part of the brain

brain plasticity the ability of the brain to change in response to experience; also called *neuroplasticity*

brain verses heart debate the issue of whether the brain or the heart was the source of human thoughts, feelings and behaviour

Broca's aphasia a language disorder involving difficulty with speech production

Broca's area area in the brain's left frontal lobe with a crucial role in clear and fluent speech production

carryover effect an order effect that arises from experiencing a task and thereby affects current performance

case study an intensive, in-depth investigation of some behaviour, event or problem of interest in a single individual, group, organisation or situation

centration in Piaget's theory, the cognitive ability to focus on only one quality or feature of an object or event at a time

cerebellum the cauliflower-shaped structure located at the base of the brain that coordinates fine muscle movements and regulates posture and balance; also involved in learning and memory

cerebral cortex outer layer of the brain involved in complex mental abilities, sensory processing and voluntary movements; roles in a diverse range of activities

cerebral hemisphere one of two almost symmetrical brain areas (comprising cerebral cortex) running from the front to the back of the brain and referred to as the right and left hemispheres

cerebrum largest part of the brain with the cerebral cortex as its outer layer

chronic traumatic encephalopathy (CTE) a progressive brain degeneration and fatal condition thought to be caused by repeated blows to the head and repeated episodes of concussion

classification in Piaget's theory, the ability to organise objects or events into categories based on common features that set them apart from other categories

closure a Gestalt principle of visual perception that involves a perceptual tendency to mentally 'close up', fill in or ignore gaps in a visual image and to perceive objects as complete

cognitive bias a mistaken way of thinking that leads to systematic errors of judgment and faulty decision-making

cognitive component of an attitude in the tricomponent model, the beliefs an individual has about an object, person, group, event or issue

cognitive development developmental changes in mental abilities

cognitive dissonance an unpleasant psychological state that occurs when people become aware that there is inconsistency among their various beliefs, attitudes or other 'cognitions', or that their behaviour conflicts with their cognitions

cognitive intervention in relation to reducing prejudice, changing the way someone thinks about prejudice

compliance changing one's behaviour in response to a request to do so, even if not made by an authority figure

computerised tomography (CT) a neuroimaging technique that uses x-ray equipment to scan the brain at different angles and build up a picture of the brain

conclusion a decision about what the results obtained from a research investigation mean

concussion a type of traumatic brain injury caused by a blow to the head or by a hit to the body that causes the head and brain to move rapidly back and forth

confidentiality ethical guideline for research involving the privacy, protection and security of a participant's personal information, including results

confirmation bias cognitive bias influencing the tendency to seek, recall or interpret information in a way that confirms existing beliefs or expectations, while dismissing or failing to seek contradictory evidence

conformity the tendency to adjust one's thoughts, feelings or behaviour so that they become more consistent with those of others or with accepted standards about how a person should behave in certain situations (social norms)

confounding variable a variable other than the independent variable that has an effect on the dependent variable which cannot be separated from that of the independent variable

conservation in Piaget's theory, understanding that certain properties of an object can remain the same even when its appearance changes

constructive obedience when there is compliance with the orders of an authority that results in a positive outcome

contact hypothesis in relation to reducing prejudice, proposes that certain types of contact between members of different groups can reduce prejudice between them

context the setting, situation or environment in which an event occurs

control group the group in an experiment who is not exposed to the independent variable

controlled experiment an experimental investigation of the relationship between independent and dependent variables, whilst controlling all other variables

controlled variable a variable that is considered to have an effect on the dependent variable in an experiment so it needs to be held constant to remove its potential effects

convenience sampling selecting participants who are readily or most easily available

convergence a visual perception binocular depth cue involving the inward turning of the eyes to focus on nearby objects

correlation coefficient a statistic used to describe the relationship between two variables

correlation the degree of a relationship between two variables

correlational study used to investigate the relationship that exists between variables without any control over the setting in which the relationship occurs or any manipulation by the researcher

cortex the outer layer of the cerebrum

cortical lobe one of four areas of the cerebral cortex associated with different functions

counterbalancing systematically changing the order of treatments or tasks for participants in a 'balanced' way to 'counter' the unwanted effects on performance of any one order

critical period a specific period during development when an organism is most vulnerable to the deprivation or absence of certain environmental stimuli or experiences; compare with *sensitive period*

CT see *computerised tomography*

culture the way of life of a particular community or group that sets it apart from other communities and groups

data information collected through research

debriefing ethical guideline requiring that at the end of the experiment, the participant leaves understanding the experimental aim, results and conclusions including wellbeing checks where appropriate

deception (in research) when a researcher deliberately conceals the true purpose of the experiment from participants by misleading or misinforming them

deindividuation reduced self-awareness, inhibition, feelings of personal responsibility and inner restraint that can occur when in a group or crowd

demand characteristic a cue in an experiment that may influence or bias a participant's response

dependent variable the variable that the researcher uses to observe and measure the effects of the independent variable

depth cue a source of information from the environment (external cue) or from within the body (internal cue) that aids perception of how far away objects are and therefore depth perception

depth perception the ability to accurately estimate the distance of objects and therefore perceive the world in three dimensions

destructive obedience when there is compliance with the orders of an authority that results in a negative outcome

development psychological or physical change in an organism that occurs over time

developmental coordination disorder the most common type of dyspraxia which is a neurodevelopment disorder that impacts motor skills

developmental norm a data set showing the typical skills and expected levels of achievement associated with a particular age or stage of development

diagnosis the process of identifying the type of disorder affecting an individual on the basis of its signs and symptoms

diagnostic criteria the signs and symptoms used for the diagnosis of a specific type of disorder

direct discrimination when someone treats another person unfavourably because of a personal characteristic protected by the law; compare with *indirect discrimination*

disability any impairment that makes it significantly more difficult for a person to undertake an everyday activity

discrimination when a person or a social group is treated differently than others

disorganised attachment a type of insecure attachment characterised by inconsistent or odd and contradictory behaviours by an infant when separated from or reunited with a caregiver

divided attention the ability to distribute attention so that two or more activities may be performed simultaneously

double blind a procedure in which both the participants and the experimenter(s) interacting with them are unaware of the conditions to which the participants have been allocated

DSM the *Diagnostic and Statistical Manual of Mental Disorders*, now in its 5th edition

Dunning-Kruger effect cognitive bias whereby people overestimate their knowledge or ability, particularly in areas with which they have little to no knowledge or experience

dyscalculia a learning disability that affects acquisition of mathematical concepts and skills

dyslexia a learning disability characterised by significant difficulties with accurate and fluent word reading, spelling and writing words

dyspraxia a learning disability that affects coordination of physical movements, which may include the muscles for speaking, it is a specific learning disability that impairs acquisition and/or execution of skills required for motor coordination and possibly speech

egocentrism in Piaget's theory, the tendency to perceive the world solely from one's own point of view

electrical stimulation of the brain (ESB) using an electrode to stimulate a specific area of the brain to assess what function that area controls or is involved in

emotion a complex reaction pattern to a personally significant event or matter that involves a mixture of physiological responses, subjective feelings and expressive behaviour

emotional development developmental changes in how an individual experiences different feelings and how these feelings are expressed, interpreted and dealt with

empirical evidence data collected through systematic observations and/or carefully controlled experiments

environment generally, the physical context or situation in which an event occurs; in relation to the nature–nurture debate, all the experiences, objects and events to which we are exposed throughout our entire lifetime; also referred to as *nurture*

epilepsy a neurological disorder involving recurrent, spontaneous seizures brought on by interference in normal brain activity

ethics standards that guide individuals to identify good, desirable or acceptable conduct

experience dependent plasticity brain change that modifies some part of its neuronal structure that is already present

experience-expectant plasticity brain change in response to environmental experience that is ordinarily expected

experimental group the group in an experiment exposed to the independent variable

experimenter bias see *experimenter effect*
experimenter effect any influence on the results produced by the person carrying out the research; also called *experimenter bias*
explicit prejudice consciously held and usually deliberately thought about
expressive behaviour in relation to emotion, an overt expression of behaviour which communicates an emotion
external attribution an explanation of behaviour due to factors associated with the situation the person is in
external prejudice prejudice that is consciously held and usually deliberately thought about
external validity the extent to which the results obtained for a study can be applied beyond the sample that generated them, specifically to individuals in a different setting and over time
extraneous variable variable other than the independent variable that may cause a change in the independent variable and therefore affect the results
false-consensus bias cognitive bias influencing the tendency to overestimate the extent to which other people are like them in terms of sharing beliefs, personal characteristics or behaviours
field experiment a psychological experiment that is conducted outside the laboratory in a field setting
figure–ground a Gestalt principle of visual perception, that involves organising visual information by perceptually dividing a visual scene into a 'figure', which stands out from the 'ground', which is its surroundings
fixed alternative question see *fixed-response question*
fixed-choice question see *fixed-response question*
fixed-response question a question that presents a number of fixed alternative answers from which participants are required to choose; also called *fixed alternative* or *fixed-choice question*
flavour perceptual experience produced by a combination of taste and other sensations, especially smell
fMRI see *functional magnetic resonance imaging*
focus group in psychological research, a small set of people who share characteristics and are selected to discuss a topic of which they have personal experience
forebrain a collection of upper level brain structures that include the hypothalamus, thalamus and cerebrum; involved in complex cognitive processes, emotion and personality
free-response question question which allows participants to answer entirely as they want to; also called *open ended question*
frontal lobe one of four critical lobes located in the upper forward half of a cerebral hemisphere
functional magnetic resonance imaging (fMRI) a neuroimaging technique that detects and produces images of brain activity by measuring oxygen consumption across the brain
functional neuroimaging a brain scanning technique, such as *PET* and *fMRI*, that produces an image showing some aspect of brain structure, activity and function; compare with *structural neuroimaging*
fundamental attribution error when explaining someone's behaviour, the tendency to overestimate the influence of personal factors and underestimate the impact of situational factors; behaviour is attributed to internal rather than external factors
generalisation in research, a decision about how widely the findings of an investigation can be applied, particularly to other members of the population from which the sample was drawn
Gestalt principle in visual perception, a way in which we organise the features of a visual stimulus by grouping them to perceive a whole, complete form
goal-directed behaviour in Piaget's theory, to perform and successfully complete a sequence of actions with a particular purpose in mind
grey matter neural tissue largely composed of nerve cell bodies and their local connections to each other
group any collection of two or more people who interact with and influence one another and who share a common purpose; also called *social group*
group polarisation the tendency of an individual group member, following group discussion, to shift their initially held views to a more extreme position (in the same general direction)
groupthink a way of thinking by individual members of a group characterised by a strong tendency to seek agreement when decision-making or problem-solving
gustation the sense of taste
gustatory cortex the region of the cerebral cortex responsible for the perception of taste
gustatory perception taste perception
halo effect the tendency to allow an overall positive impression of a person or a specific quality to influence beliefs and expectations about the person in other qualities

height in the visual field a visual perception monocular depth cue involving a perceptual tendency to visually perceive objects located closer to the horizon as being more distant than objects located further from the horizon

hemispheric dominance see *hemispheric specialisation*

hemispheric laterisation see *hemispheric specialisation*

hemispheric specialisation the concept that one hemisphere has specialised functions or exerts greater control over a particular function; also called *hemispheric dominance* or *hemispheric lateralisation*

heredity transmission of characteristics from biological parents to their offspring via genes at the time of conception; also referred to as *nature*

heuristic a strategy for solving a problem or making a decision that is based on experience with similar types of problems but cannot guarantee a correct outcome

hindbrain a collection of structures at the base of the brain that include the cerebellum, medulla and pons

hindsight bias cognitive bias influencing the tendency, only after an event has occurred, to overestimate the extent to which the outcome could have been foreseen

hyperactivity in relation to ADHD, excessive motor activity and difficulties remaining still, especially in structured situations

hypothalamus vital role in maintaining the body's internal environment by regulating release of hormones and influences various other behaviours

ICD *International Classification of Diseases,* now in its 11th edition

idealistic thinking in Piaget's theory, comparing oneself and others to a perfect standard and striving towards being like that ideal

implicit prejudice prejudice that is unconsciously held so the individual is usually unaware of it; compare with *explicit prejudice*

imprinting a simple type of learning in which a very young animal fixes its attention on or attaches to the first object with which it has visual, auditory or tactile experience and thereafter follows that object and seems to form an attachment to that object

impulsivity in relation to ADHD, the tendency to act in the spur of the moment in response to immediate stimuli, without a plan or consideration of the consequences

independent variable the variable that is manipulated in order to measure its effect on the dependent variable

indirect discrimination unreasonable requirement, condition or practice that disadvantages a person, or a group of people, because of a personal characteristic; compare with *direct discrimination*

informational influence when conformity results from a need for direction and information on how to respond in a specific situation

informed consent ethical guideline requiring that participants understand the nature and purpose of the experiment, including potential risks, before agreeing to participate

ingroup any group to which an individual belongs or with which an individual identifies; compare with *outgroup*

insecure avoidant attachment a type of attachment proposed by Ainsworth where there is a negative relationship and the infant does not seek closeness or contact with the caregiver and treats them much like a stranger

insecure resistant attachment a type of attachment proposed by Ainsworth where there is a negative relationship and the infant constantly checks the caregiver's whereabouts, calling, pleading, tries to re-establish contact, clings, then resists contact

integrity in relation to research ethics, the commitment to searching for knowledge and understanding, the honest reporting of all sources of information and results, whether favourable or unfavourable, in ways that permit scrutiny and contribute to public knowledge and understanding

internal attribution an explanation of behaviour due to the characteristics of the person involved, such as their personality, ability, attitude, motivation, mood or effort

internal validity the extent to which an investigation actually investigated what it set out to investigate and/or claims to have investigated

interposition a visual perception monocular depth cue based on the principle that an object which partially covers another is closer than the object it covers and the covered object is further away; also called *overlap*

interview asking questions to obtain self-report data

just-world belief the belief that the world is a just place in which people generally get what they deserve and deserve what they get; also called *just-world fallacy* or *just-world hypothesis*

justice in relation to research ethics, moral obligation to ensure that there is fair consideration of competing claims; that there is no unfair burden on a particular group from an action; and that there is fair distribution and access to the benefits of an action

labelling in mental health, the process of classifying an individual as having a specific mental disorder following a diagnosis

laboratory experiment a psychological experiment that is conducted within a laboratory setting

learning disability any disorder that impairs learning and results in the person learning with greater difficulty than a person without the disorder

lesioning see *brain lesioning*

linear perspective a visual perception monocular depth cue based on the apparent convergence of actual or imagined parallel lines as they recede into the distance

magnetic resonance imaging (MRI) a neuroimaging technique that uses harmless magnetic fields to vibrate atoms in the brain's neurons and generate a computer image of the brain

maladaptive behaviour any behaviour that interferes with a person's ability to successfully adjust to the environment and fulfil their typical roles in society; compare with *adaptive behaviour*

mean the arithmetical average of all the individual scores (or values) in a set of scores

measure of central tendency a score that indicates the central or average value of a set of scores

measure of variability a statistic that indicates how widely scores are distributed or scattered around the central point (or values)

median the middle score (or mid-point) of a set of scores (or values)

medulla a hindbrain structure that is a continuation of the spinal cord, connecting it to the brain; controls vital bodily functions required for survival

meninges one of three membranes covering the brain

mental process any process that takes place in the mind

midbrain connects upper and lower brain areas and houses structure involved with movement, processing of visual, auditory and tactile sensory information, sleep and arousal

mind–body problem the question of whether our mind and body are distinct, separate entities or whether they are one and the same thing

mind-brain problem questions about the relationship between brain activity and conscious experience

miraculin a protein found in the fleshy part of a miracle berry that has a taste changing effect whereby a sweet taste is perceived

misinformation effect cognitive bias influencing the tendency for information acquired after an event to influence the accuracy of the memory of the original event

mixed design an experimental design that combines the features of the within subjects and between subjects designs.

mode the most frequently occurring score (or value) in a set of scores

model a body of interrelated concepts ('ideas') that attempt to explain interrelated observations and make predictions about future events; also called *theory*

modern prejudice a form of prejudice which tends to be subtle, hidden and expressed in ways more likely to be accepted within the majority group; compare with *old-fashioned prejudice*

monocular depth cue the use of only one eye to provide information to the brain about depth and distance

motivation processes within an organism which activate behaviour that is directed towards achieving a particular goal

motor area area of the brain's cerebral cortex that initiates voluntary movements

MRI see *magnetic resonance imaging*

Müller-lyer illusion a visual illusion in which one of two lines of equal length, each of which has opposite shaped ends, is incorrectly perceived as being longer than the other

naturalistic observation when the researcher views behaviour of interest in the natural, 'real life' environment where it would ordinarily occur

nature hereditary factors that may impact on development

negative correlation when two variables change in opposite directions

neocortex the largest and most recently evolved part of the cerebral cortex

neurodiversity describes people whose neurological development and cognitive functioning are atypical and therefore deviate from what is considered typical or normal in the general population

neurogenesis production of new neurons

neuroimaging a technique that captures a picture of the brain

neurological disorder any disease or disorder of any part of the nervous system

neuroplasticity the ability of the brain and other parts of the nervous system to change in response to experience

neurotypicality describes people whose neurological development and cognitive functioning are typical, conforming to what most people would consider to be normal in the general population

non-maleficence in relation to research ethics, avoiding the causations of harm

non-participant observation when the researcher tries to conceal their presence so that their observations are made in entirely inconspicuous manner, avoiding a conspicuous role that would change what occurs in the group and bias the data

normative influence occurs when a response is guided by one or more social norms for a particular situation

nurture environmental factors that may impact on development

obedience following the commands of someone with authority, or the rules or laws of our society

object permanence in Piaget's theory, understanding that an object still exists even if it cannot be seen, heard or touched

objective data information that is observable, measurable, verifiable and free from the personal bias of the researcher

observational study collection of data by carefully watching and recording behaviour as it occurs without any intervention or manipulation of the behaviour being observed

occipital lobe one of the four critical lobes located in the rearmost area of each cerebral hemisphere

old-fashioned prejudice a form of prejudice in which members of the majority group openly reject minority group members and their views towards the minority group are obvious and recognisable to others; compare with *modern prejudice*

open-ended question see *free-response question*

operationalise define how variables will be manipulated as measured in a research investigation

opinion a point of view that is not necessarily based on verifiable evidence and can be disputed

optimism bias cognitive bias influencing the tendency to overestimate the likelihood of experiencing positive events and underestimate the likelihood of experiencing negative events in the future

order effect when performance on the dependent variable is influenced by the specific order in which an experimental task is presented rather than the independent variable

outgroup any group to which an individual does not belong or identify; compare with *ingroup*

outlier an extreme measurement, one that significantly differs from all others in a data set

parietal lobe one of four critical lobes located in the upper back area of the brain between the frontal and occipital lobes

participant observation when a trained investigator studies a pre-existing group by joining it as a member, while avoiding a conspicuous role that would change what occurs in the group and bias the data

participant variable a personal characteristic of a research participant that could influence their responses

past experience personal experiences throughout an individual's life, including everything that is learned intentionally and unintentionally through experience

perception process by which meaning is given to incoming sensory information

perceptual distortion an inconsistency, or 'mismatch', between a perceptual experience and physical reality; also called *illusion*

perceptual set a temporary readiness to perceive something in accordance with expectations of what it is

person perception the mental processes used to think about and evaluate other people

personal error a fault or mistake by the researcher; called *human error*

PET see *positron emission tomography*

phrenology a theory linking specific abilities or personality traits to specific areas of the brain, especially bumps and hollows in the skull surface

physical cue in person perception, information gained from the way people look and act

physical development developmental changes in the body and its various systems, such as development of the brain and its nervous system

physiological response in relation to an emotion, bodily change that occurs during its experience

placebo a fake treatment that is like the independent variable treatment but which is actually neutral or has no known effect

placebo effect when there is a change in a participant's behaviour due to their belief that they are receiving some kind of experimental treatment and they respond in accordance with that belief, rather than to the effect of the independent variable

plasticity in relation to the brain, the ability of the brain to change in response to experience; also called *neuroplasticity*

pons hindbrain structure involved in sleep, dreaming, arousal from sleep and control of breathing and coordination of some muscle movements

population (in research) the entire group of research interest from which a sample is drawn

positive correlation when two variables change in the same direction

positron emission tomography (PET) a neuroimaging technique that produces 2D or 3D colour images showing brain structure, activity and function

power an individual's (or group's) ability to control or influence the thoughts, feelings or behaviour of another person (or group)

precision how closely a set of measurement values agree with each other

prejudice a negative attitude towards another person or social group, formed in advance of any experience with that person or group

primary auditory cortex receives and processes sounds from both ears

primary data information collected directly from the source by the researcher (or through others) for their own purpose

primary motor cortex a strip of cortex at the back of each frontal lobe that initiates and controls voluntary movements

primary somatosensory cortex a strip of cortex located at the front of each parietal lobe that receives and processes sensory information from the skin and body parts

primary visual cortex receives and processes visual information from the eyes

proactive effect an order effect that arises from repeating and/or prior experience with a task

proximity a Gestalt principle of visual perception, that involves a tendency to perceive parts of a visual image which are positioned close together as belonging together in a group; also called *nearness*

pseudoscience fake or false science

psychiatrist a medical doctor who has obtained additional qualifications to specialise in the diagnosis and treatment of mental illnesses

psychological development the emotional, cognitive and social development of an individual

psychological factor in the biopsychosocial model, an internal, mental process and influence such as the effects of our prior experiences, memories and ways of thinking

psychologist a professional trained in the science of how people think, feel and behave; can only work as a psychologist or use that title if formally registered by the relevant Board

psychology the scientific study of human behaviour and mental processes

psychosocial crisis in Erikson's theory, a personal conflict an individual faces in adjusting to society

psychosocial development in Erikson's theory, change involving both psychological processes taking place within the individual ('psycho') and their experiences with other people ('social')

qualitative data non-numerical information involving the 'qualities' or characteristics of a participant's experience of what is being studied

quantitative data numerical information about the 'quantity' or amount of what is being studied

questionnaire a written set of questions or other prompts designed to collect self-report data

random allocation procedure used to assign participants to experimental and control groups (or conditions) so that they are as likely to be in one group as the other; also called *random assignment*

random error an error due to some chance factor or chance variation in a measurement

random sample a sample that has been selected using a random sampling technique

random sampling sampling technique that ensures every member of the population of research interest has an equal chance of being selected to be part of the sample

rating scale uses fixed-response questions or statements for which participants rank each item on a numerical scale by selecting from a number of choices

reactance a response to a perceived threat to freedom that may cause an individual to rebel

relative size a visual perception monocular depth cue involving perceptual tendency to visually perceive the object that produces the largest image on the retina as being closer and the object that produces the smallest image as being further away (when objects are expected to be the same size)

reliability the extent to which a measure produces results that are consistent, dependable and stable

repeatability the degree to which a specific research investigation obtains similar results when it is conducted again under the same conditions on all occasions

representative heuristic categorising a person, object, event or anything else by judging how closely it matches our idea of a typical member of the category

representativeness heuristic a strategy for solving a problem or making a decision that is based on experience with similar types of problems

representative sample a sample that closely resembles the population from which it is drawn in key characteristics

reproducibility how close the results are to each other when an investigation is replicated under changed conditions

research hypothesis a testable prediction of the relationship between two or more variables

research method a particular way of conducting a research study or investigation to collect accurate and reliable data on a question or problem of interest

respect in relation to research ethics, consideration of, and due regard to, the extent to which living things have an intrinsic value and/or instrumental value

reticular formation brain area that helps screen incoming information, alerts higher brain centres to important information, helps maintain consciousness, and regulates arousal and muscle tone

retinal disparity a visual perception binocular depth cue based on the difference (disparity) of the two retinal images

reversibility in Piaget's theory, the ability to mentally follow a sequence of events or line of reasoning back to its starting point

role the behaviour adopted by an individual or assigned to them that influences the way in which they function or act in different situations and life in general

salience in relation to person perception, any personal characteristic that is distinctive, prominent, conspicuous or noticeable and therefore attracts attention

sample the subset or part of the population that is selected for a research investigation

sampling process of selecting participants from a population of research interest

schema in Piaget's theory, a mental idea of what something is and how to act on it

secondary data information that was not collected directly by the current researcher but was collected at an earlier time by someone else

secure attachment a type of attachment proposed by Ainsworth where there is a positive relationship and the infant feels safe and secure

seizure uncontrolled, excessive electrical activity of neurons in the brain

selective attention choosing and attending to a specific stimulus whilst at the same time excluding other stimuli

self-report a participant's responses to questions presented by the researcher

self-serving bias when judging ourselves, the tendency to take the credit for our successes (internal factors) and attribute failures to external situational factors

self-stigma when an individual accepts the negative views and reactions of others, internalises them, and applies them to themself; see also *social stigma*

sensitive period a period of time during development when an individual is more responsive to certain types of environmental experiences or learning; compare with *critical period*

sensory area areas of the brain's cerebral cortex which receive and processes sensory information

separation anxiety the distress and uneasiness experienced by a child when away (or facing the prospect of being away) from the person or people to whom they are attached

similarity a Gestalt principle of visual perception that involves a tendency to perceive parts of a visual image that have similar features, such as size, shape, texture or colour, as belonging together in a unit, group or 'whole'

simulation study reproducing situations of research interest in a realistic way to investigate the behaviour and/or mental processes of individuals in that environment

single blind a procedure in which participants are unaware of ('blind' to) the experimental condition they are in

situational variable an external factor associated with the experimental setting that may influence participant responses and therefore the results

social behaviour any action that is influenced, directly or indirectly, by the actual, imagined, expected, or implied presence of others

social categorisation the process of classifying people into different groups on the basis of common characteristics

social cognition how individuals perceive, think about and use information to understand and make judgments about themselves and others in different social situations

social comparison the process of evaluating our attitudes and abilities by comparing ourselves to others

social development developmental changes in an individual's relationships with other people and their skills in interacting with others

social factor in the biopsychosocial model, an influence from the external social environment in which we interact with others, such as the range and quality of our interpersonal relationships with family, and our cultural background

social group see *group*

social influence the effects of the presence or actions of others, either real or imagined, on the way people think, feel and behave
social loafing the tendency of an individual to make less effort when involved in a group activity than when working alone
social media apps and websites, such as Facebook, YouTube, Instagram, TikTok, Snapchat, Wikis and online blogs, that enable users to create and share content or to participate in social interaction
social norm a widely held standard that governs what people should and should not do in different situations, especially in relation to others
social power use of power in a social interaction to control or influence another person (or group)
social stigma the negative attitudes and beliefs held in the wider community that lead people to fear, exclude, avoid or unfairly discriminate against people with a disorder
spatial neglect a neurological disorder whereby individuals are unable to notice anything either on their left or right side even though there may be no sensory loss; also called *visual neglect*
Spinning dancer illusion a visual illusion in which the silhouette of a female dancer can be interpreted as spinning either clockwise or anti-clockwise
split-brain surgery severing the corpus callosum to either partially or fully disconnect the cerebral hemispheres
standard deviation a statistic that summarises how far scores within a set of scores spread out, or 'deviate', from the mean for those scores
status the importance of an individual's position in the group, as perceived by members of the group
stereotype a generalisation about the personal characteristics of the members of a social group, regardless of individual differences among members of that group
Strange Situation a test to measure the attachment relationships a child has with their parent
stranger anxiety the distress and uneasiness experienced by young children when they are around people who are unfamiliar to them
stratified sampling a sampling technique involving sampling from different subgroups in the same proportions as they occur in the population of interest
stroke when blood supply to part of the brain is interrupted
structural neuroimaging a brain scanning technique, such as *CT* and *MRI*, that produces an image showing structure and anatomy (but not function); compare with *functional neuroimaging*
subjective data information that is based on personal opinion, interpretation, point of view or judgment
subjective feeling in relation to an emotion, its inner personal experience by an individual
superordinate goal a goal that cannot be achieved by any one group alone and overrides other existing goals which each group might have
supertaster a person who is more sensitive to certain tastes than most others; taste is experienced with far greater intensity, especially bitter
surrogate a person or object that takes on the role of another
sustained attention maintenance of attention on a specific stimulus or task for a continuous period of time without being distracted
symbolic thinking in Piaget's theory, the ability to use symbols such as words and pictures to represent objects that are not physically present
synaesthesia perceptual experience in which stimulation of one sense involuntarily produces additional sensations in another
synapse the site where adjacent neurons communicate by transmitting neural signals to one another
systematic error a measurement error produced by some factor that consistently favours one condition rather than another
temporal lobe one of four critical lobes, located in the lower, central area of the brain, above and around the top of each ear
texture gradient a visual perception monocular depth cue based on the extent to which fine detail can be perceived in a surface
texture a property of food or beverage that is felt in the mouth and contributes to flavour along with taste
thalamus relay station in the brain for incoming sensory information (except smells) and for information from the cerebral cortex to lower brain structures; numerous other roles
theory a body of interrelated concepts ('ideas') that attempt to explain interrelated observations and make predictions about future events; also called *model*
top-down processing a perceptual process that starts 'at the top' with higher level 'cognitive processing' in the brain and then works 'down' from the whole to the details
transformation in Piaget's theory, understanding that something can change from one state to another

traumatic brain injury a type of acquired brain injury caused by an external force, such as a blow to the head

tri-component model of attitudes an explanation of attitudes, in terms of three related components — affective, behavioural and cognitive — that comprise any attitude

triple blind a procedure in which the participants, experimenters, and research assistants only doing data analysis are all unaware of the particular experimental conditions

typical behaviour behaviour that would usually occur and is appropriate and expected in a given situation; compare with *atypical behaviour*

unanimity complete agreement among group members

uncertainty when something (e.g. a particular outcome) is not accurately or precisely known

validity the extent to which a measure accurately measures what it is supposed to be measuring; see also *internal validity* and *external validity*

variability the degree to which measures or values differ from one another

variable something that can change in amount or type and is measurable

verbal dyspraxia difficulties coordinating the movements necessary for speaking

visual agnosia loss or impairment of the ability to recognise visual stimuli due to brain injury

visual cortex located at the back of each occipital lobe and is the major destination of visual information from the two eyes

visual illusion a misperception of external visual stimuli that occurs as a result of a distortion or mistake when interpreting the stimuli

visual perception occurs through the interaction of numerous factors, many of which automatically influence or assist our interpretation of what we are looking at

voluntary participation ethical guideline requiring that no coercion or pressure is put on the participant to partake in an experiment, and they freely choose to be involved

Wernicke's aphasia a language disorder involving difficulties understanding spoken or written language and speaking in a meaningful way

Wernicke's area area of the brain's left temporal lobe involved in speech production and comprehension

white matter neural tissue largely composed of nerve fibres (enclosed in myelin sheath) that connect distant areas to one another

withdrawal right ethical guideline requiring a participant being able to discontinue their involvement in an experiment at any time during or after the conclusion of an experiment

within-groups see *within subjects*

within subjects an experimental design in which each participant is in both the experimental and control groups or all the treatment conditions (if there is no control group)

zero correlation when there is no relationship between two variables

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