Edrolo

VCE PSYCHOLOGY

Units 1 & 2

Edrolo

VCE PSYCHOLOGY

Units 1 & 2

Merav Chait, Stephanie White, Christy Thomas, Natasha Vranes,
Gabriella Velardo, Emily Condon, Jessie Rozario, Julia Ellul,
Dominic Marshall, Bridie Goold, Leonardo Curtis

Edrolo

At Edrolo, we're transforming the way the students learn and teachers teach.

Our mission is simple: to improve education.

This book has been printed on paper manufactured in Australia and certified by the Programme for the Endorsement of Forest Certification (PEFC). PEFC is committed to sustainable forest management through third party forest certification of responsibly managed forests. For more info: www.pefc.org.au

Proudly Printed In Australia

CONTENTS

UNIT 2 – How do internal and external factors influence behaviour and mental processes?

FEATURES OF THIS BOOK

Edrolo's VCE Psychology Units 1 & 2 textbook has the following features.

Theory

Study design dot points provide explicit links between the content covered in each lesson and the VCAA curriculum.

Hooks introduce the content of the lesson in an approachable way.

Explore boxes include useful tips, lesson links, want to know more, and psychology exploration boxes.

Key knowledge units break down the theory into smaller chunks that correspond with the relevant theory lesson videos on the Edrolo online platform.

Activities are provided on the Edrolo online platform and allow engagement and further understanding of the content covered in each lesson.

Questions

Theory review questions test if students can remember the foundational concepts and overcome common misconceptions.

Exam-style questions reflect the style of questions presented in the end-of-year exam in Year 12.

Assessment skills questions develop the skills students need for SACs and other assessments.

Answers

Exemplar responses are provided for every exam-style question to demonstrate what a full mark response could look like.

Online video solutions provide immediate feedback and extra guidance on how to answer questions.

Checklists break down exam-style questions to highlight what is required to earn full marks.

Hints are provided for each theory review question to help students understand the answer in greater detail.

Other acceptable responses are included when there are multiple answers that could achieve full marks.

Reviews

Chapter summaries are an outline of the knowledge from the entire chapter.

Chapter review activities help to revise and develop students' understanding of content throughout the whole chapter.

Chapter tests include exam-style questions from content throughout the chapter to help students revise and reinforce content.

Area of study reviews are written based on the assessment types provided by VCAA and act as a practice SAC, with each SAC worth 40 marks.

CHAPTER 1

Key science skills

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

Image: GoodStudio/Shutterstock.com

KEY SCIENCE SKILLS

- Construct evidence-based arguments and draw conclusions
- Analyse, evaluate and communicate scientific ideas
- Develop aims and questions, formulate hypotheses and make predictions

1A	1B	1C	1D	1E	1F	1G

0.0.1.1
Scientific and non-scientific ideas

0.0.1.2
Models and theories

0.0.1.3
Aims and hypotheses
- **0.0.1.3.1** Aims
- **0.0.1.3.2** Hypotheses

0.0.1.4
Variables
- **0.0.1.4.1** Independent and dependent variables
- **0.0.1.4.2** Controlled variables
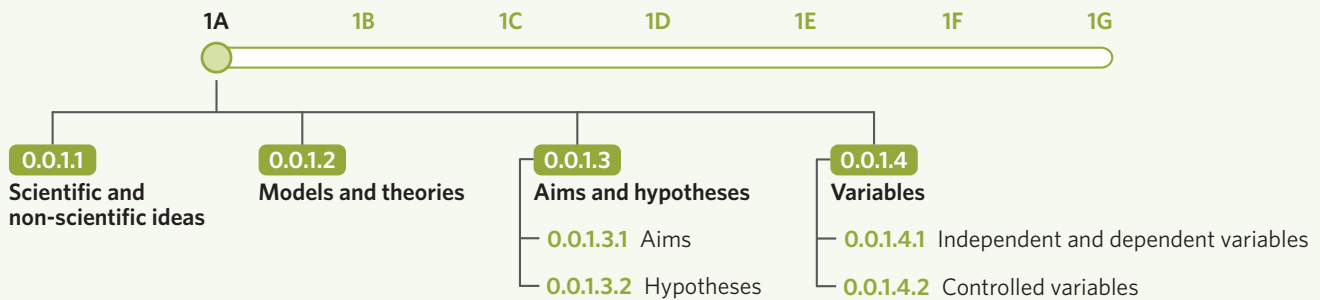
Astrology, phrenology, and palm reading: what do these three things have in common? They are all non-scientific approaches to understanding or making predictions about human behaviour and the mind. Psychology, on the other hand, is the scientific study of human behaviour and mental states. This means that it uses the knowledge and methods of science to understand and make predictions, as well as form theories and make models about human behaviour and mental states. Throughout this chapter, you will learn all about how the field of psychology conducts this kind of scientific research. In this lesson, you will learn about why psychology is considered a science, as well as some of the very fundamentals of psychological research.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

Scientific and non-scientific ideas 0.0.1.1

We can categorise all ideas in the world into two buckets: scientific and non-scientific ideas. In this section of the lesson, we will look at what classifies something as science versus non-science.

KEY SCIENCE SKILLS

In the study design, this theory relates to the following dot point:

- Construct evidence-based arguments and draw conclusions
    - distinguish between opinion, anecdote and evidence, and scientific and non-scientific ideas

Theory details

KEY TERMS

Psychology the scientific study of human mental states and behaviour

Science a field and practice that obtains knowledge and generates theories through observation and experiment

Psychology is defined as the scientific study of human mental states and behaviour. **Science** is a field and practice that obtains knowledge and generates theories through observation and experiment. But what makes psychology a science and how can we be sure it is one? Defining what science is can be a very tricky thing to do: scientists, philosophers, historians — pretty much all experts that attempt to answer this question — still debate what truly defines 'science'.

WANT TO KNOW MORE?

In the philosophy of science, the major and ongoing question of defining 'science' versus 'non-science' is referred to as the 'demarcation problem'. 'Demarcate' means to distinguish or decide on the clear boundaries of something.

To understand what scientific ideas are for our purposes, we can consider some hallmark features of science. Such features include that science relies on and produces **empirical evidence** (information obtained through direct and systematic observation or experimentation). Furthermore, science aims to be an objective, self-correcting field that produces explanatory claims that are provisional (updatable at a later time), testable, and reliable. Science also employs systematic methodologies, such as experimentation, observation, and hypothesis-testing. Finally, the findings of scientific research tend to contribute to 'public knowledge' and are often open to processes of 'peer review' (in which claims are reviewed by other individuals in the scientific field, such as researchers).

So if these are features of 'science', what makes something 'non-science'? **Non-science** refers to ideas formed without empirical evidence or the use of scientific methods or principles. It includes **pseudoscience** (beliefs, theories, and practices that are mistakenly regarded as, or claim to be scientific, but are not because they do not use the methods of science) and may also be understood through a set of features. Non-science makes claims that cannot be verified through observation or evidence. In other words, it can't be proven wrong. For example, astrology might claim that 'today is a good day to believe in yourself'; how do you disprove this with evidence? It also tends not to engage with criticism, nor contribute to a body of public, verifiable knowledge. Non-science often commits logical fallacies ('wrong' or invalid steps of reasoning), such as asserting conclusions with weak or false premises. For example, it may start with conclusions and then 'cherry-pick' evidence that support them, while ignoring non-supporting, empirical evidence.

Empirical evidence information obtained through direct and systematic observation or experimentation

Non-science ideas formed without empirical evidence or the use of scientific methods or principles

Pseudoscience beliefs, theories, and practices that are mistakenly regarded as, or claim to be scientific, but are not because they do not use the methods of science

Table 1 Summary of the distinguishing features of scientific versus non-scientific ideas

	Features
Scientific ideas	Scientific ideas generally: • aim to be objective • utilise and produce empirical evidence • are formed using the methods of science • use predictions, models, and theories that are provisional and verifiable to explain reality.
Non-scientific ideas	Non-scientific ideas may be: • non-objective • unempirical • imprecise or vague • dogmatic (not open to questioning) • unverifiable. Non-scientific ideas may be formed on the basis of: • anecdote (stories based on personal experience) • opinion (the view or perspective of someone not necessarily based on evidence) • intuition (something that one feels instinctively as opposed to arrives at through considered reasoning • hearsay (rumour or information from others which cannot be supported with evidence).

WANT TO KNOW MORE?

The following are some common examples of pseudoscientific approaches to explaining human mental processes and behaviours:

- astrology
- numerology
- phrenology.

Because they are non-scientific, even though they make claims about the human mind or behaviour, they are not considered to be a part of the field of psychology.
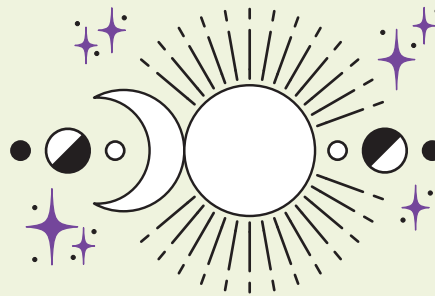
Figure 1 Astrology is pseudoscience because it makes vague, unverifiable, and imprecise claims

The scientific method

As we have just learnt, a major component of what characterises 'science' is the methods used to obtain knowledge. Psychology and other sciences often use a specific procedure for gaining knowledge known as the scientific method. While it is not the only method used to obtain scientific knowledge in psychology or other sciences, it is a commonly used approach that underlies rigorous research across the sciences, especially experimentation.

So what is the scientific method? **The scientific method** is a procedure used to obtain knowledge that involves hypothesis formulation, testing, and re-testing through processes of experimentation, observation, measurement, and recording. Importantly, it is centred around generating an informed hypothesis (a prediction) and then testing it to generate evidence that either supports or refutes it. You will soon see that understanding the scientific method and the idea of hypothesis-testing is very important to your studies in VCE Psychology.

The scientific method
a procedure used to obtain knowledge that involves hypothesis formulation, testing, and retesting through processes of experimentation, observation, measurement, and recording
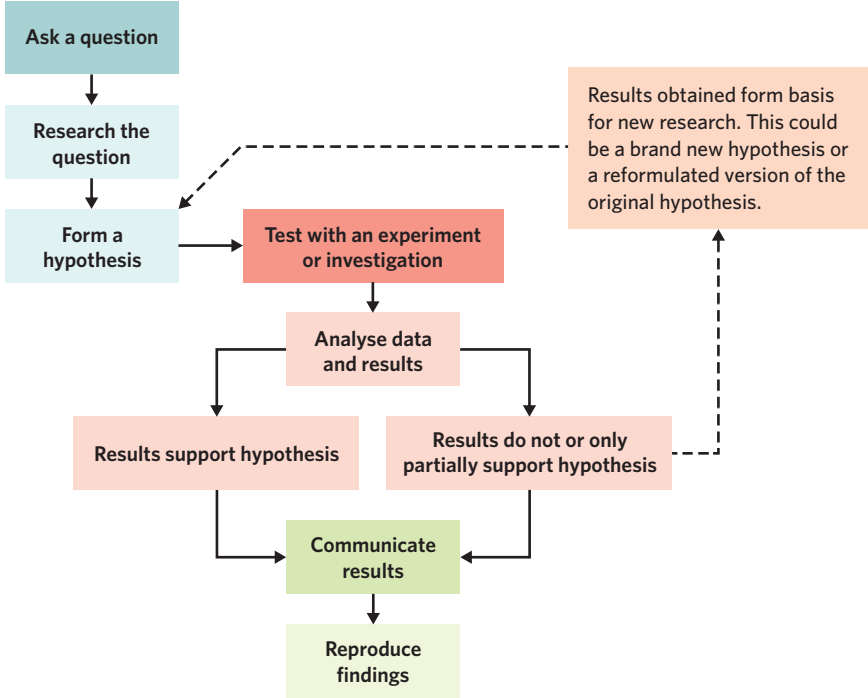
Figure 2 The scientific method

USEFUL TIP

The scientific method is often thought of as a cyclical process due to it being ongoing and evolving in response to emerging research. For example, an individual may create a research hypothesis in response to examining a psychological theory. After conducting research to see if this hypothesis has previously been tested, they may conduct an experiment and observe the findings. These findings may challenge or support the theory that inspired their research. This process goes on and on over time, as the whole process may repeat when another individual becomes aware of the findings of the study just conducted. This process is outlined in figure 3.

Figure 3 The cyclical nature of the scientific method

Models and theories 0.0.1.2

How do we organise all of the scientific knowledge that has accumulated over time? Models and theories are one way in which we can organise and understand observations and concepts related to psychology.

Theory details

As a result of scientific research, we are able to generate models and theories that explain the world around us. Both of these things equip us, as scientific thinkers, with a common language that we can use to communicate with each other about the world and also to devise informed solutions to our problems.

Table 2 The difference between scientific models and scientific theories

	Theory	Model
Definition	A **theory** is a proposition or set of principles that is used to explain something or make predictions about relationships between concepts.	A **model** is a representation of a concept, process, or behaviour, often made to simplify or make something easier to understand.
Main function	Explain and predict	Simplify and represent
Informed by	Scientific research or logic	Scientific theories and ideas
Example in psychology	Behaviourism; i.e. the theory that behaviour is learnt through interaction with the environment.	The multi-store model of memory posits that we have a sensory, short-term, and a long-term memory 'store'.

Model a representation of a concept, process, or behaviour, often made to simplify or make something easier to understand

Theory a proposition or set of principles that is used to explain something or make predictions about relationships between concepts

Psychological models and theories explain psychological phenomena. For example, the idea of having short-term memory and long-term memory 'stores' is a psychological model that helps to simplify our description of processes of the human mind. Having this conceptual model provides us with a useful way to talk about memory and address problems of memory, but it is only one way of representing this idea. It is important to note that there may be alternative scientific models and theories that are also valid.

Aims and hypotheses 0.0.1.3

Whenever researchers want to conduct an investigation in psychology, they first create an aim and at least one hypothesis. This is what allows researchers to ensure that their study follows the scientific method.

Theory details

Imagine you are a researcher wanting to conduct a study on the role of sleep on mental health. That's a big topic, and one investigation can only cover so much. Think about it: how much sleep are we talking about? What aspects of sleep do you want to know about? And what exactly about mental health? Do you want to know sleep's effect on a specific mental health problem, or for a certain age group's mental health? There are so many possibilities.

Before beginning any psychological study, researchers must narrow the scope of what is to be investigated. To do this, researchers form a research question or problem. This helps them to have a clear objective for their investigation and also informs what kinds of methods and procedures they will use. Before beginning any research, on the basis of their research question, a researcher must also outline a study's:

• aim
• hypothesis or hypotheses (a study may have more than one).

Aims 0.0.1.3.1

In psychological research, an **aim** is a statement outlining the purpose of the investigation.

It should be written as a succinct and straightforward sentence that clearly helps to narrow the parameters of the investigation. For example, a study on the role of sleep in mental health might have the following aims:

• The aim of this investigation is to explore the relationship between partial sleep deprivation and low mood.
• The aim of this study is to investigate the role of high quality sleep on concentration.

Hypotheses 0.0.1.3.2

In line with an investigation's aim and on the basis of scientific knowledge or experience, researchers must also form a hypothesis or hypotheses. A **hypothesis** is a testable prediction about the outcome of an investigation. Through psychological studies, researchers are trying to see if their hypothesis is supported or rejected. Remember also that this is a core function of the scientific method. This is why it is important that hypotheses are written in a way that makes them testable.

In experiments, a specific type of psychological investigation, a hypothesis often includes:

• the **variables**, which are the conditions or components of an experiment that can be measured or manipulated, such as 'test scores' or 'mood levels'. Two specific types of variables must be in an experimental hypothesis: the independent variable and the dependent variable, which we will learn about later in this lesson.
• the **population**, which is the group of people who are the focus of the research and from which the sample is drawn. Having a specific target population helps to narrow the scope of research and also improves the quality of research because certain methods and measures in research can be more suited to certain groups of people.
• a prediction about the 'direction' of results; for example, that some outcome was 'more likely' or 'less likely', or that some condition would increase or decrease.

Again, considering the example of sleep and mental health, some hypotheses could be:

• It was hypothesised that Australian females aged 12–16 who experienced partial sleep deprivation would be more likely to also experience low mood than those who did not experience partial sleep deprivation.
• It was hypothesised that high school students who had high quality sleep would perform better on tests of concentration than those who did not have high quality sleep.

Aim a statement outlining the purpose of an investigation

Hypothesis a testable prediction about the outcome of an investigation

Variable a condition or component of an experiment that can be measured or manipulated

Population (also known as research population) the group of people who are the focus of the research and from which the sample is drawn

---

USEFUL TIP

The acronym 'IPAD' can help you remember all the components which must be included in an experimental hypothesis:

• **I**ndependent variable and dependent variables
• **P**opulation
and
• **D**irection

LESSON LINK

In lesson **1B Scientific research methodologies**, you will learn about other types of psychological investigations beyond experiments.

WANT TO KNOW MORE?

In the world of psychological research, there is another type of hypothesis called the 'null hypothesis'. This is often a version of an experiment's main hypothesis, but stated as if there is no relationship (i.e. 'null') between the independent and dependent variables. If the findings of an experiment are statistically significant (i.e. not due to chance), the null hypothesis is rejected. Having a null hypothesis allows researchers to communicate a clear conclusion, regardless of whether the primary hypothesis is supported or rejected.

Variables 0.0.1.4

In psychological experiments, researchers are investigating the relationship between variables. There are a few different types of variables with which you should be familiar.

> **KEY SCIENCE SKILLS**
>
> In the study design, this theory relates to the following dot point:
>
> - Develop aims and questions, formulate hypotheses and make predictions
>   - identify independent, dependent and controlled variables in controlled experiments

Theory details

Independent and dependent variables 0.0.1.4.1

As mentioned, psychological experiments investigate the relationship between two variables. **Controlled experiments** are a type of investigation in which the causal relationship between two variables is tested in a controlled environment; more specifically, the effect of the independent variable on the dependent variable is tested while aiming to control all other variables.

In an experiment, the **independent variable (IV)** is the variable for which quantities are manipulated (controlled, selected, or changed) by the researcher, and the variable that is assumed to have a direct effect on the dependent variable. In contrast, the **dependent variable (DV)** is the variable the researcher measures in an experiment for changes it may experience due to the effect of the independent variable.

Controlled experiment
a type of investigation in which the causal relationship between two variables is tested in a controlled environment; more specifically, the effect of the independent variable on the dependent variable is tested while aiming to control all other variables

Independent variable (IV)
the variable for which quantities are manipulated (controlled, selected, or changed) by the researcher, and the variable that is assumed to have a direct effect on the dependent variable

Dependent variable (DV)
the variable the researcher measures in an experiment for changes it may experience due to the effect of the independent variable

Table 3 Examples of independent and dependent variables in experimental hypotheses

Example hypothesis	Independent and dependent variables
It was hypothesised that Australian females aged 12–16 who experienced partial sleep deprivation were more likely to experience low mood than those who did not experience partial sleep deprivation.	• Independent variable: partial sleep deprivation or no partial sleep deprivation. This is because it is something that is manipulated by a researcher (e.g. total hours of sleep deprivation) to see its effect. • Dependent variable: mood levels. This is because it is what is being impacted by the IV (sleep deprivation) and is measured (e.g. through scores on a self-rated mood scale).
It was hypothesised that high school students who had high quality sleep would perform better on tests of concentration than those who did not have high quality sleep.	• Independent variable: quality of sleep. This is because it is something that is manipulated by a researcher (e.g. total hours of uninterrupted deep sleep) to see its effect. • Dependent variable: performance on tests of concentration. This is because it is what is being impacted by the IV (high quality sleep) and is measured (e.g. through test scores).

> **USEFUL TIP**
>
> It is always the case that we want to see the effect of the independent variable on the dependent variable. This is also how you can remember the difference between the two: the independent variable is manipulated so we can understand its effect on the dependent variable, which is then measured.
>
> **affects the**
>
> **Independent variable (IV)**
> The variable that is **manipulated**. We want to know its effect of on the DV.
>
> **Dependent variable (DV)**
> The variable that is **measured**. We want to understand how it is affected by the IV.
>
> **Figure 4** You can remember the difference between the independent and dependent variable through the words 'manipulation' and 'measurement'
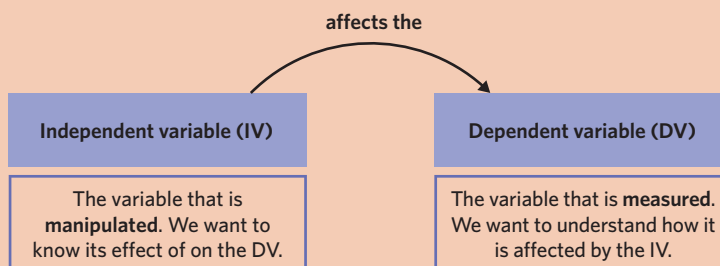
After data is collected during research, it will often be displayed visually. When graphs are used to plot the relationship between variables, the independent variable is presented on the horizontal axis (x-axis) and the dependent variable is presented on the vertical axis (y-axis).

Graph title
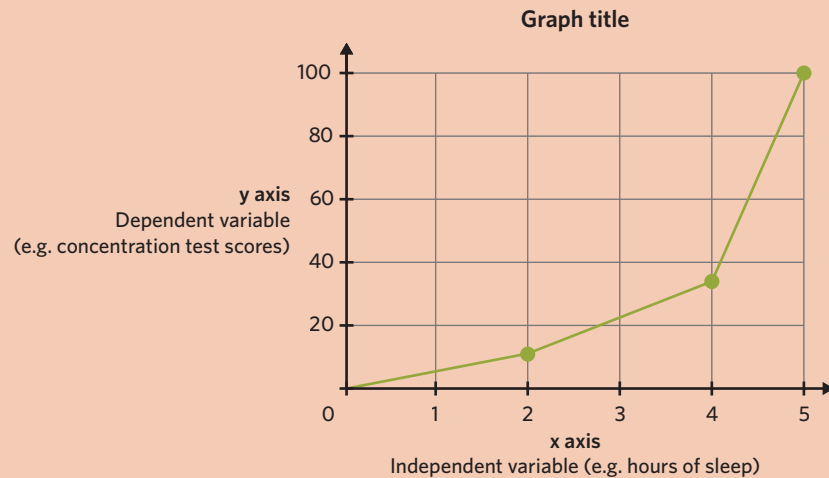
Figure 5 Sample graph showing where the independent and dependent variables would be plotted

Operationalising variables

Operationalising variables refers to specifying exactly how the variables will be manipulated or measured in a particular controlled experiment. For example, if a dependent variable is 'concentration', then this same variable operationalised might be 'concentration as shown by the number of minutes spent on an assigned task without stopping'. Similarly, if the independent variable that is manipulated to influence concentration is 'quality of sleep', this may be operationalised as 'the hours of REM, NREM, and total sleep as measured by EEG recordings'.

In psychological research, it does not matter if a hypothesis is rejected — a rejection is a valuable finding in itself. However, when designing an experiment, it is important that variables are specific enough so that a hypothesis can be clearly supported or refuted. 'Concentration' is broad and can be measured and spoken about in many different ways. So, to have a clear finding about concentration, the exact form or measurement of concentration needs to be specified. Having a clear outcome from an experiment, supported by the correct operationalisation of variables, is what best allows researchers to contribute to the current state of psychological research, and indeed, the world's understanding of psychology.

Controlled variables 0.0.1.4.2

How many different things can you think of that may affect 'concentration'? Unfortunately for researchers, there are often things that can affect the dependent variable in an experiment besides the independent variable. For example, in an experiment studying the effect of sleep deprivation on concentration, a participant's concentration may also be affected by what noise they can hear during a concentration test, whether they've consumed caffeine, and so on. When unwanted variables may have affected the dependent variable, researchers cannot always conclusively say changes in the dependent variable were due to just the independent variable. This is where controlled variables come in handy.

Controlled variables are variables other than the IV that a researcher holds constant (controls) in an investigation, to ensure that changes in the DV are solely due to changes in the IV. They are not part of the investigation because a controlled variable is not an experimental variable (IV or DV) (VCAA). For example, in that same study on concentration, researchers may ensure that participants all complete their test of concentration in a silent room, thereby holding the variable of 'noise levels' constant (controlled). This allows researchers to ensure that the dependent variable (concentration) was more likely affected by the independent variable (sleep deprivation) than a non-controlled, unwanted variable (noise levels). Table 4 outlines some potential variables experimenters might want to keep constant (controlled) in two example studies.

Controlled variables
variables other than the IV that a researcher holds constant (controls) in an investigation, to ensure that changes in the DV are solely due to changes in the IV

Table 4 Examples of potential controlled variables for two different experiments

Experimental hypothesis	Potential variables experimenters might want to hold constant (i.e. make a controlled variable)
It was hypothesised that Australian females aged 12–16 who experienced partial sleep deprivation were more likely to also experience low mood than those who did not experience partial sleep deprivation.	• Exercise done by participants on day of mood measurement • Light levels on day of mood measurement • Food eaten by participants on day of mood measurement
It was hypothesised that high school students who had high quality sleep would perform better on tests of concentration than those who did not have a high quality sleep.	• Food eaten by participants on day of concentration test • Caffeine consumed by participants on day of concentration test • Noise levels participants complete concentration test in

Theory summary

In this lesson, you have learnt about the difference between scientific and non-scientific ideas and some examples of each. You then went on to learn about some of the very first things researchers must define when designing a research study: a clear aim and hypothesis, and if it's an experiment, the independent and dependent variables. You also learnt about controlled variables and operationalising variables.
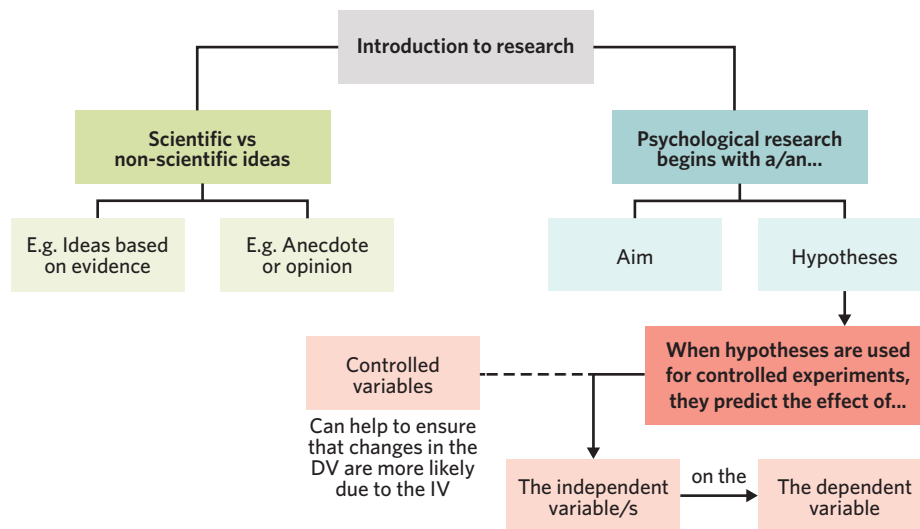
Figure 6 A summary of the concepts learnt in this lesson

1A Questions

Theory review

Question 1

Psychology is considered non-scientific because it is a relatively new field and we don't know much about what goes on in the human brain.

A. True.

B. False.

Question 2

Ideas informed purely by anecdotes and personal opinions are non-scientific.

A. True.

B. False.

Question 3

Before beginning any kind of psychological investigation, a researcher should have a clear aim and at least one hypothesis. Which of the following are true with regard to hypotheses? **(Select all that apply)**

I. You can have only one hypothesis.

II. It sets out the overall goal of the research.

III. It is a testable prediction.

IV. In an experiment, it includes the predicted effect of one variable on another.

Question 4

In an experiment, researchers want to know the effect of the _____ variable on the _____ variable.

Which of the following best fills in the blanks?

A. dependent; independent

B. independent; dependent

Question 5

A controlled variable is

A. a version of the independent variable with an exact and unchanging quantity or amount.

B. a variable other than the independent or dependent variable that is kept constant in order to avoid it affecting the dependent variable.

Assessment skills

Perfect your phrasing

Question 6

Which of the following sentences is most correct?

A. A hypothesis is a **testable, tentative prediction about** the relationship between variables.

B. A hypothesis is a **good guess of** the relationship between two variables.

Question 7

Which of the following sentences is most correct?

A. The independent variable is what the researcher **actively manipulates** to see its effect on the dependent variable.

B. The independent variable is what the researcher **records** to see its effect on the dependent variable.

Text analysis

The following assessment skills type reflects the study design assessment type:

- media analysis of one or more contemporary media texts.

Use the following information to answer questions 8–10.

> **Personality tests with deep-sounding questions provide shallow answers about the 'true' you**
>
> *Authors: Randy Stein (Assistant Professor of Marketing, California State Polytechnic University, Pomona) and Alexander Swan (Assistant Professor of Psychology, Eureka College)*
>
> Have you ever clicked on a link like "What does your favorite animal say about you?" wondering what your love of hedgehogs reveals about your psyche? Or filled out a personality assessment to gain new understanding into whether you're an introverted or extroverted "type"? People love turning to these kinds of personality quizzes and tests on the hunt for deep insights into themselves. People tend to believe they have a "true" and revealing self hidden somewhere deep within, so it's natural that assessments claiming to unveil it will be appealing.
>

> **Personality tests with deep-sounding questions provide shallow answers about the 'true' you – Continued**
>
> As psychologists, we noticed something striking about assessments that claim to uncover people's "true type." Many of the questions are poorly constructed – their wording can be ambiguous and they often contain forced choices between options that are not opposites. This can be true of BuzzFeed-type quizzes as well as more seemingly sober assessments.
>
> On the other hand, assessments created by trained personality psychologists use questions that are more straightforward to interpret. The most notable example is probably the well-respected Big Five Inventory. Rather than sorting people into "types," it scores people on the established psychological dimensions of openness to new experience, conscientiousness, extroversion, agreeableness and neuroticism. This simplicity is by design; psychology researchers know that the more respondents struggle to understand the question, the worse the question is.
>
> But the lack of rigor in "type" assessments turns out to be a feature, not a bug, for the general public. What makes tests less valid can ironically make them more interesting. Since most people aren't trained to think about psychology in a scientifically rigorous way, it stands to reason they also won't be great at evaluating those assessments.
>
> Read the full article on The Conversation: https://theconversation.com/personality-tests-with-deep-sounding-questions-provide-shallow-answers-about-the-true-you-95735
>
> (Stein & Swan, 2018)

Question 8

According to the article, all personality tests are pseudoscientific.

A. True.

B. False.

Question 9

The article says 'Many of the questions are poorly constructed – their wording can be ambiguous and they often contain forced choices between options that are not opposites'. Which feature of pseudoscience is this most clearly an example of?

A. Being non-objective.

B. Being imprecise or vague.

Question 10

Based on the information provided by the article, does the 'Big Five Inventory' sound scientific?

A. Yes, because it is based on empirical evidence.

B. No, because it is vague.

Exam-style

Remember and understand

Question 11   (1 MARK)

Which of the following is an example of a scientific idea?

A. An idea based on anecdotal evidence.

B. An idea based on opinion.

C. An idea based on empirical evidence.

D. A claim which cannot be tested.

Question 12   (1 MARK)

In an experiment, the independent variable is

A. a method of research that is used to test a hypothesis.

B. the variable that is manipulated by the experimenter.

C. the variable that is measured by the experimenter.

D. the variable that is held constant by the experimenter to avoid its effect on the dependent variable.

Question 13 (1 MARK)

A hypothesis

A. is a question the research study sets out to answer.

B. predicts how the dependent variable will affect the independent variable.

C. is generated based on scientific knowledge or experience in order to understand and test ideas.

D. is a method of research in which an experimenter manipulates the independent variable to observe the effect on the dependent variable.

Adapted from VCAA Psychology exam 2021 Q17

Question 14 (1 MARK)

Scientific ideas are not

A. testable and verifiable.

B. provisional.

C. empirically backed.

D. unchanging.

Apply and analyse

Use the following information to answer questions 15 and 16.

Charbel wants to investigate the effect of learning in the same environment on the ability to recall information from a specific text. Charbel did not allow participants to read the text in any room in their house other than in their living room.

Question 15 (1 MARK)

The independent and dependent variables for Charbel's investigation are respectively

A. the environment while recalling and the ability to recall information.

B. the ability to recall information and the environment.

C. the environment while reading and not allowing participants to read the text in any room except their living room.

D. not allowing participants to read the text in any room except their living room.

Question 16 (1 MARK)

A controlled variable in Charbel's investigation is

A. the use of a highlighter.

B. the ability to recall information.

C. the ability to recall information as measured by scores on a test.

D. what participants are allowed to do while reading.

Question 17 (1 MARK)

Priyal wants to conduct an experiment on the effect of florally-fragranced hair on levels of attraction. Write an aim for this experiment.

Question 18 (3 MARKS)

Gabriella wants to investigate whether consuming alcohol before sleep leads to poorer sleep quality. To test this, she conducted a study with some participants who drank alcohol and some who did not, before measuring their sleep quality and quantity.

Write a research hypothesis for this experiment.

Question 19 (3 MARKS)

Doctor Hamza wants to test the effect of caffeine on feelings of anxiety among individuals with hyperthyroidism.

a. Identify the independent and dependent variables for Doctor Hamza's study. (2 MARKS)

Independent variable: _____.

Dependent variable: _____.

b. Suggest a potential controlled variable for this study. (1 MARK)

Question 20 (3 MARKS)

Delilah wants to understand how mood might be affected by the number of minutes per day spent doing yoga. Construct a hypothesis for an investigation that could test this.

1B Scientific research methodologies
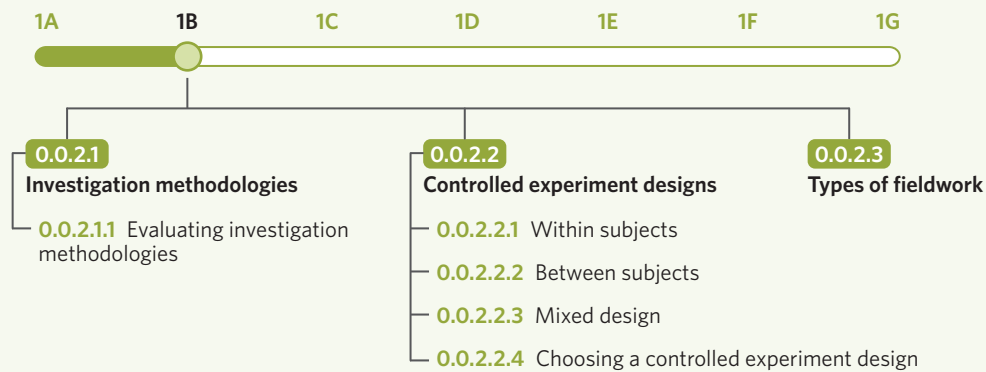
So, you want to study psychology. Maybe you want to know how the brain conceptualises time: why is it that sometimes time feels so fast, and then at others, so slow? Or, maybe you're interested in why some people think it's wrong to steal, whereas others don't. Maybe you're interested in the psychological processes behind why humans find it acceptable to yell aggressively at umpires when in a crowd at a sports match. Whatever the psychological phenomenon you are most interested in, there will be ways to study and investigate it.

In this lesson, you will learn about the different scientific investigation methodologies researchers can use to learn about psychological phenomena. Knowing which methodology to use for a given topic is an important research skill, so you will also learn how to evaluate them.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

Investigation methodologies 0.0.2.1

KEY SCIENCE SKILLS

In the study design, this theory relates to the following dot point:

- Plan and conduct investigations
  - determine appropriate investigation methodology: case study; classification and identification; controlled experiment (within subjects, between subjects, mixed design); correlational study; fieldwork; literature review; modelling; product, process or system development; simulation
  - design and conduct investigations; select and use methods appropriate to the investigation, including consideration of sampling technique (random and stratified) and size to achieve representativeness, and consideration of equipment and procedures, taking into account potential sources of error and uncertainty; determine the type and amount of qualitative and/or quantitative data to be generated or collated

- Analyse and evaluate data and investigation methods
  - evaluate investigation methods and possible sources of error or uncertainty, and suggest improvements to increase validity and to reduce uncertainty

There are many ways researchers investigate psychological phenomena. In this section of the lesson, you will learn about these different methods, which are referred to as 'investigation methodologies'. You will also come to understand some circumstances under which each methodology might be used.

Theory details

In lesson 1A, you learnt about how researchers formulate a research question or topic and then create an aim before conducting research. Once researchers know their goals, they must decide the type of research and investigation methods that are best to help meet them. Psychological investigations can be conducted in a variety of ways depending on the question under investigation, the aim of the investigation, and the nature of the evidence required to answer the research question. **Investigation methodologies** refer broadly to any of the different processes, techniques and/or types of studies researchers use to obtain information about psychological phenomena. You may already be familiar with some investigation methodologies from your own life: surveys, for example, are an investigation methodology used in psychology. Each methodology has its own advantages and disadvantages, so it is important to carefully consider which methodologies best serve a particular research topic.
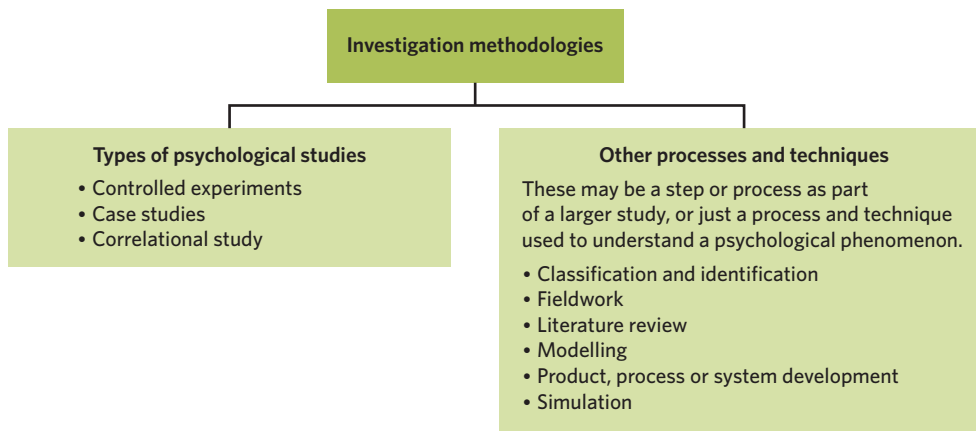
Figure 1 The types of investigation methodologies that you will learn about in this lesson

USEFUL TIP

In this lesson, 'investigation methodologies' and 'research methodologies' are used interchangeably and mean the same thing.

Types of psychological studies

Controlled experiments

A **controlled experiment** is a type of investigation in which the causal relationship between two variables is tested in a controlled environment; more specifically, the effect of the independent variable on the dependent variable is tested while aiming to control all other variables. For example, a researcher may want to test the effect of alcohol consumption (the independent variable) on driving ability (the dependent variable). To do this, they may ask participants to consume a specified amount of alcohol (e.g. two standard drinks) and then perform a 15-minute driving circuit. They would then record the participants' performance in some way and interpret these results to establish if there may be a relationship between these two variables.

Controlled experiments are one of the most scientifically rigorous and strict research methodologies used in psychology. As you learnt in the previous lesson, researchers aim to control the influence of variables outside the independent variable so that only the independent variable is able to influence the dependent variable.

Controlled experiment a type of investigation in which the causal relationship between two variables is tested in a controlled environment; more specifically, the effect of the independent variable on the dependent variable is tested while aiming to control all other variables

Figure 2 Controlled experiments involve testing a hypothesis about the causal relationship between variables

Case studies

Case study an in-depth investigation of an individual, group, or particular phenomenon (activity, behaviour, event, or problem) that contains a real or hypothetical situation and includes the complexities that would be encountered in the real world

A **case study** is an in-depth investigation of an individual, group, or particular phenomenon (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 may be:

- historical, analysing causes and effects, and examining what was learnt.
- a real situation or a role-play of a hypothetical situation, upon which suggestions are made.
- problem-solving, where developing a new design or procedure is required (VCAA).

Case studies are useful for gathering highly detailed, in-depth information about an individual or small group of people. Many different forms of data are collected during case studies, including:

- participants' biographical history
- psychological and biological data (e.g. medical history)
- environmental information
- quantitative and qualitative data (e.g. data from self-reporting rating scales or in-depth interviews).

Case studies are often utilised when information is needed about a specific phenomenon that is rare or hard to study repeatedly with a larger group of people. For example, a case study is a useful methodology for studying people with brain injuries: it is extremely valuable to know the effects and implications of brain damage; however, it is highly unlikely that many people at one time would be experiencing the same brain injury and able to participate in an experiment or other ongoing, large-scale research methodology.

Correlational studies

Correlational study a type of non-experimental study in which researchers observe and measure the relationship between two or more variables without any active control or manipulation of them

A **correlational study** is a type of non-experimental study in which researchers observe and measure the relationship between two or more variables without any active control or manipulation of them. A distinguishing feature of correlational research is that the variables under investigation are only measured and not manipulated, unlike in experiments, where at least one variable is manipulated by the researcher and one is measured.

Correlational studies are conducted to identify which factors may be of greater importance to some phenomena, enabling predictions to be made and theories to be created and tested. As shown in figure 3, correlational research aims to find relationships between variables, describe them, and make predictions on the basis of them.
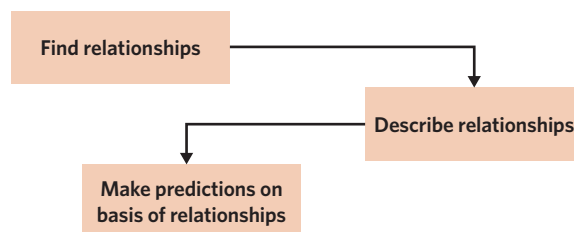
Figure 3 Aims of correlational research

Correlation refers to the strength of the relationship between variables, or in other words, how likely they are to occur together. A correlation can be positive (variables change together in the same way; i.e. both increase or decrease as the other does) or negative (variables change in opposite directions; i.e. as one increases the other decreases). There can also be zero correlation; i.e. no relationship between variables. At the end of any correlational research, the strength of correlation between variables is measured. Some types of correlational research include:

- some forms of fieldwork
- observational studies
- examining archival data (i.e. data collected before research begins)
- surveys.

Correlational studies are likely to be conducted when researchers wish to observe the general relationships and associations between variables, often in a real-world setting. Table 1 outlines some circumstances in which correlational research is more likely to be used.

Table 1 Examples of circumstances in which correlational research is more likely to be used

Circumstance	Example
The relationship between variables is less likely to be causal (i.e. two variables often occur together (correlate) but one does not necessarily cause the other).	The variable of high test scores on a VCE mathematics exam might correlate with high test scores for mathematics questions on the General Assessment Test, but one does not cause the other. This distinguishes this methodology from experiments, which are more controlled and aim to establish the specific effect of one variable on another.
There is thought to be a causal relationship between variables, but the variables are too difficult, dangerous, or unethical to actively manipulate.	If a relationship between rainfall and low mood is predicted, the variable of rainfall is impossible to manipulate, so researchers may instead elect to simply measure it and participants self-rated mood scores.
A new measurement procedure or tool needs to be tested.	If a research team develops a new emotional intelligence test and wants to see if it is accurate and reliable, they may provide this test alongside other, already validated emotional intelligence tests to see if there is a correlation between all tests' scores.
It is more valuable or practical to collect data in a real-world setting.	Parenting styles can be researched using both controlled experiments and correlational studies. To understand the effects of different parenting styles, a researcher may use correlational study methods, such as observing the different effects of these parenting styles within different family homes. This allows the researcher to quickly record multiple associations between parenting styles and children's behaviour. In contrast, a controlled experiment might be used when a researcher wishes to know the effect of one specific parenting style on a specific behaviour of children. The latter would require more careful planning and a more specific object of inquiry.

USEFUL TIP

The primary difference between controlled experiments and other, non-experimental forms of psychological study is how researchers deal with variables. In experiments, researchers actively manipulate, measure, and control variables in highly controlled settings. In other forms of research, while there are variables, they are not so actively manipulated.

USEFUL TIP

Correlation versus causation

To understand the difference between controlled experiments and correlational studies, it's important to know the difference between 'correlation' and 'causation'. Correlation refers to the strength of relationship between variables; i.e. how likely it is that they would occur together in some predictable way (e.g. if one increases, the other decreases). On the other hand, causation refers to a relationship between variables wherein a change in one variable causes a change in another (e.g. if one increases, the other decreases because of the other one). Correlation and causation can occur simultaneously; however, it's very important to know that correlation does not always equal causation.

Figure 4 presents an example of this concept. Hot weather directly causes sunburn and an increase in ice cream sales, so causation is present. However, ice cream sales and sunburn are only correlated (specifically, increase together) and don't directly cause each other

In controlled experiments, researchers aim to establish a causal relationship. However, the experiment has to meet requirements, such as controlling extraneous variables, for causation to be determined. This ensures that the independent variable is the only variable responsible for changes in the dependent variable. As such, it is often difficult for causation to be established. In correlational studies, causation cannot be determined.
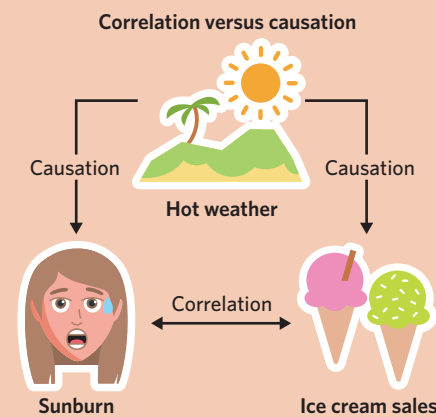
Figure 4 An example of the difference between correlation and causation

There are other types of psychological studies that are not explained here. If you are interested, you can research the following:

- observational studies – a type of correlational study in which a researcher passively watches participants with no active participation or intervention.
- longitudinal studies – a type of study and research design involving repeated observation of participants over a long time period at specified time intervals.
- cross-sectional studies – a type of study in which data is collected about a specific group of people (a research population) at one point in time.

Other processes and techniques

Classification and identification

As part of their research and practice, psychologists often need to classify and identify specific phenomena:

- **Classification** is the arrangement of phenomena, objects, or events into manageable sets.
- **Identification** is a process of recognition of phenomena as belonging to particular sets or possibly being part of a new or unique set.

These processes enable psychologists to create a theoretical language from which to describe and build upon their objects of inquiry, form theories, and make predictions.

Classification is used by psychologists to create labels or groups for phenomena that may help to provide some functional or theoretical benefit. For example:

- in clinical psychology, psychologists have created groupings of symptoms, behaviours, and other characteristics into different mental disorders. Major depressive disorder is one example. There are both functional and theoretical arguments in favour of such a classification system.
- in psychology, researchers may wish to classify different affects (emotions). For example, classifying a human affect as 'disgust' may involve understanding the set of characteristics (emotions, reactions, physiological responses and so on) that occur when 'disgust' is felt. This may have theoretical benefits, such as being able to research when or what causes disgust in humans.

Identification is used by psychologists to then ascribe phenomena to a particular classification; in other words, to assign certain things to their respective label or group. For example:

- clinical psychologists may diagnose a patient with a particular mental disorder based on matching what they observe in reality to the 'set' of symptoms in a classification system. This may allow them to provide an explanation for the patient's symptoms and possibly more targeted treatment.
- In a study on people's reactions to breaching moral codes or norms, such as violence, it may be helpful to identify different reactions, like disgust, in order to understand patterns of human behaviour and mental states.

Fieldwork

Fieldwork refers to any research involving observation and interaction with people and environments in real-world settings, conducted beyond the laboratory. It often involves the researcher collecting data first hand, and 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. Fieldwork is generally used to determine correlation, rather than causation.

Fieldwork is often used when:

- researchers wish to investigate correlation rather than causation. For this reason, the circumstances in which correlational studies would be conducted also apply here.
- it is important to the research that data is collected in a real-world, authentic setting. For example, a study on the effect of fragrance on customer behaviour in a shopping centre would likely be conducted using methods of fieldwork in the shopping centre setting, rather than in a laboratory under highly controlled conditions. Likewise, the effects of hospital ward appearance, such as lighting, on patient recovery times would also likely be conducted using fieldwork.

Classification
the arrangement of phenomena, objects, or events into manageable sets

Identification a process of recognition of phenomena as belonging to particular sets or possibly being part of a new or unique set

Fieldwork any research involving observation and interaction with people and environments in real-world settings, conducted beyond the laboratory

Literature review

Literature review refers to the process of collating and analysing secondary data related to other people's scientific findings and/or viewpoints, in order to answer a question or provide background information to help explain observed events, or as preparation for an investigation to generate primary data. Primary data refers to data collected first-hand by a researcher, whereas secondary data refers to data collected by others. You will learn more about primary and secondary data later in this chapter. A literature review helps researchers understand the current state of scientific knowledge and progress with regards to a certain topic or phenomenon.

This methodology is often used before conducting a new study and/or collecting primary data, or when someone begins to research a new topic. For example, if a researcher wants to investigate the effect of positive mood on prosocial behaviour, they may do a literature review by reading and summarising the current work on this topic. This would help them to refine their ideas and generate a clear topic for their own research that is more likely to address any gaps of knowledge in the scholarship.

Modelling

Modelling refers to 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 know, understand, or simulate the system.

Modelling is used by psychologists and researchers to help them and others know, understand, problem solve, or simulate various psychological phenomena. Models can be:

- physical; for example, a plastic human brain. This can be used as an explanatory tool by psychologists wishing to explain brain processes and regions to patients, fellow researchers or students. Physical models are useful for explaining, simplifying, or demonstrating complex phenomena, especially when it is impractical or unethical to have the 'real' thing.

- conceptual; for example the multi-store model of memory. This divides human memory into three 'stores': sensory memory, short-term memory, and long-term memory. Conceptual models are useful for simplifying, explaining, or demonstrating complex systems and other phenomena. By representing memory in this way, psychologists are able to remove the 'noisiness' of many of the biological processes that occur in the brain, and just explain memory in simplified, lay-person terms.

Product, process, or system development

Have you ever used a meditation app on your phone? There are many technologies, products, processes, and systems created on the basis of scientific research and development that help people in their daily life. **Product, process, or system development** refers broadly to the 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.

Product, process or system development is used when psychologists, developers, or researchers have identified a human need that can be served by technology or scientific knowledge and procedures. For example, meditation apps were created to meet the human need of wanting a convenient way to practice mindfulness. Quality meditation apps may be informed by scientific research and were created on the basis of product development.

Simulation

Simulation refers to the process of using a model to study the behaviour of a real or theoretical system. Simulations are useful for understanding how different variables operate in a system. Researchers would be likely to use a simulation when it would be too complex, impractical, or dangerous to test the relationships between variables in reality.

Simulations may also be used for explanation and understanding. Think of neurons (a type of cell) in the brain firing or growing in response to learning. A computer program may be used to model what happens at the micro level and is valuable because it provides visual access to otherwise inaccessible phenomena.

Evaluating investigation methodologies 0.0.2.1.1

Choosing the best investigation methodology for your specific research question or aim can be difficult: it depends on the specific psychological phenomena under investigation, as well as the resources available to the researcher. In order to choose the most appropriate methodologies, it is important to understand their advantages and disadvantages.

Literature review
the process of collating and analysing secondary data related to other people's scientific findings and/or viewpoints in order to answer a question or provide background information to help explain observed events, or as preparation for an investigation to generate primary data

Modelling
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 know, understand, or simulate the system

Image: Rattiya Thongdumhyu/Shutterstock.com
Figure 5 An example of a physical model is a cross-sectional model of the brain

Product, process, or system development
the 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

Table 2 Advantages and disadvantages of different investigation methodologies

Investigation methodology	Advantages	Disadvantages
Controlled experiments	- They allow researchers to infer causal relationships between, and draw conclusions about, specific variables. - They provide researchers with a high level of control over conditions and variables. - They follow a strictly controlled procedure so it can be repeated to check results. - They can allow researchers to test hypotheses more quickly than in real-world settings. - The high control of variables may mean prevention of extraneous and confounding variables.	- As they are often conducted in a laboratory or highly controlled setting, the setting may not be reflective of real life. This may affect participants' responses. - Because experiments involve human control and manipulation of variables, they are open to researcher error or 'experimenter effects'. - It can be time-consuming and expensive to manipulate and measure certain variables. - Confounding or extraneous variables can still occur.
Case study	- They provide highly detailed, rich information about a particular phenomenon under study. This can also provide new knowledge about other phenomena, e.g. studying brain trauma may inform us about brain function. - They allow phenomena, including rare phenomena, to be examined in depth, which can provide ideas for future studies and hypotheses. - They can incorporate other scientific methodologies to gain data.	- Results cannot be generalised (applied) to a wider population, as case studies often only involve a small group of people or one person. - Case studies are subject to researcher bias and errors, as often one or only a few researchers. - It can be difficult to draw conclusions about cause and effect. - Case studies can be time-consuming.
Correlational study	- There is no manipulation of variables required. - They can provide ideas for future hypotheses and research, as well as form the basis for theories. - They can provide information about the relationships and associations between variables. - They can be conducted in naturalistic settings, so findings are applicable to real work.	- Their results cannot draw conclusions about cause and effect. - They can be subject to the influence of extraneous variables.
Classification and identification	- It provides a common language to communicate about scientific phenomena. - It helps to simplify, explain and describe complex phenomena. - It allows scientists to form more targeted solutions or interventions to real problems. - It allows researchers to form theories and hypotheses about labelled phenomena.	- It can over-simplify reality. - Labels and language can be inaccurate and create bias.
Fieldwork	- It can be conducted in naturalistic settings, so findings are more applicable to the real world. This means it has high ecological validity. - Fieldwork provides rich, detailed data. - Fieldwork can use a broad range of different methodologies depending on the object of inquiry and resourcing needs. - As it can occur over a longer time period, it can uncover information that may not be immediately obvious to researchers and participants.	- It can be time-consuming and expensive to conduct and then record data. - It can generally not inform conclusions about cause and effect. - Due to lengthy procedures in a real-world setting, fieldwork is difficult to replicate in order to verify results. - It is difficult to control the environment and extraneous variables, as researchers do not precisely manipulate variables.
Literature review	- It provides background information on specific phenomena that can inform new studies and hypotheses. - It allows researchers to understand the current 'state of play' for a specific object of inquiry and answer questions. - Through information synthesis, it may uncover patterns of knowledge or gaps of knowledge.	- It may be time-consuming. - It may be difficult to do if little research has been done on a topic. Continues ▶

Table 2 Continued

Investigation methodology	Advantages	Disadvantages
Modelling	• It can provide explanatory tools. • Physical modelling allows researchers to know, understand and problem solve. • Conceptual modelling can simplify and explain certain phenomena.	• As models are often used to simplify and communicate ideas, they may over-simplify or inaccurately represent reality.
Product, process or system development	• It creates products, processes and systems that may meet a human need.	• It can be expensive and time-consuming.
Simulation	• Simulation provides insight into potential circumstances and events. • It allows researchers to view micro, hard-to-see phenomena, such as neurons, in detail. • It allows researchers to see events that might otherwise be too time-consuming, dangerous or impractical to see in reality.	• It can be time-consuming and expensive. • It is subject to programming and human error so may not always be an accurate prediction or reflection of reality.

Controlled experiment designs 0.0.2.2

KEY SCIENCE SKILLS

In the study design, this theory relates to the following dot point:
- Plan and conduct investigations
  - determine appropriate investigation methodology: case study; classification and identification; controlled experiment (within subjects, between subjects, mixed design); correlational study; fieldwork; literature review; modelling; product, process or system development; simulation
- Analyse and evaluate data and investigation methods
  - evaluate investigation methods and possible sources of error or uncertainty, and suggest improvements to increase validity and to reduce uncertainty

In the previous section, you learnt that controlled experiments are one type of study researchers conduct in psychology. You will now learn about the different experimental designs researchers can use in a controlled experiment: within subjects, between subjects, and mixed design.

Theory details

Controlled experiments are perhaps one of the most strict and rigorous methodologies used in psychological research. They are often used because they allow a researcher to strictly manipulate variables of interest (independent variables) in a controlled environment and measure their effect on another variable (the dependent variable). As mentioned, this allows researchers to infer a more causal relationship between variables. For example, researchers may want to know if the consumption of caffeine (IV) impacts alertness (DV).

In controlled experiments, there are control and experimental groups or conditions:

- An **experimental group** refers to the group of participants in an experiment who are exposed to a manipulated independent variable (i.e. a specific intervention or treatment).
- A **control group** refers to the group of participants in an experiment who receive no experimental treatment or intervention in order to serve as a baseline for comparison.

Experimental group
the group of participants in an experiment who are exposed to a manipulated independent variable (i.e. a specific intervention or treatment)

Control group the group of participants in an experiment who receive no experimental treatment or intervention in order to serve as a baseline for comparison

In most controlled experiments, it is expected that there is at least one control and one experimental group. In these scenarios, the control group serves as a valuable baseline with which to compare the results of an experimental group.

However, it is sometimes not possible to have both an experimental and a control group. For example, imagine a researcher wants to investigate the differences in reaction times between different sexes. Their independent variable is sex, so it is likely that their participants will be split into three groups – females, males, and other. However, the sex of participants is not something that this researcher can manipulate or randomise, and no one sex is acting as the 'control'.

This type of experiment is known as a quasi-experiment.

Participants		
Control group or condition	**Experimental group or condition 1**	**Experimental group or condition 2**
No caffeine	Exposed to a manipulated independent variable (intervention) e.g. 20mg caffeine	Exposed to a manipulated independent variable (intervention) e.g. 40mg caffeine
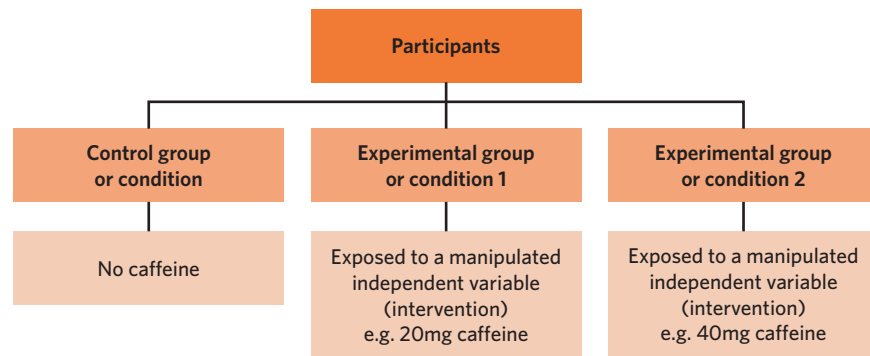
Figure 6 An experiment on the impact of caffeine on alertness, with one control group and two experimental groups

Within controlled experiments, there are different experimental designs. These designs determine the structure of an experiment in terms of what conditions participants complete. As with any investigation methodology, choosing the best or most appropriate experimental design depends on the research topic and the nature of evidence required to meet an experiment's aim and inform its hypothesis. Three experimental designs that you will learn about are:

- within subjects
- between subjects
- mixed design.

Within subjects 0.0.2.2.1

A **within-subjects design** is an experimental design in which participants complete every experimental condition.

For example, in a within-subjects experiment on the effect of classical music on mood, participants may have their mood measured before listening to classical music and then while listening to classical music.

Between subjects 0.0.2.2.2

A **between-subjects design** is an experimental design in which individuals are divided into different groups and complete only one experimental condition.

For example, in a between-subjects experiment on the effect of natural light on patient recovery time in hospital, one group of participants may be in a hospital ward with natural lighting, and another group may be in a hospital ward without natural light. This allows the experimenter to compare the effect of different light sources on patient recovery time for participants in both groups.

Within-subjects design (also known as repeated measures or within-groups design) an experimental design in which participants complete every experimental condition

Condition A   Condition B

Figure 7 In within-subjects designs, participants complete every experimental condition

Between-subjects design (also known as independent-groups design or between-groups design) an experimental design in which individuals are divided into different groups and complete only one experimental condition

Condition A   Condition B
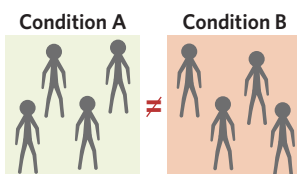
Figure 8 In a between-subjects design, each participant is assigned to only one experimental condition and completes just that condition

A matched-participants design is a specific type of between subjects experimental design that attempts to control for participant differences across experimental conditions. In a matched-participants design, the sample is first grouped into pairs ('matched-participants') that share relevant characteristics, such as age, gender and so on. Each member of the pair is then assigned a different experimental condition so that their results may be compared.

Mixed design 0.0.2.2.3

A **mixed design** refers to an experimental design which combines elements of within-subjects and between-subjects designs. This allows experimenters to note differences that occur within each experimental group over time, and also compare differences across experimental groups.

For example, in an experiment about the role of smell in anxiety, a researcher may have two experimental conditions: the presence of an unpleasant smell and the presence of a pleasant smell. Participants may be divided into one of two experimental conditions and complete a task with either of the two smells present. This reflects a between-subjects design. However, the experimenter may also measure participants' anxiety in both groups before (to provide a baseline for comparison) and after the completion of a task with a smell present. This latter element reflects a within-subjects design. This allows participants' own results to be compared over time.

Choosing a controlled experiment design 0.0.2.2.4

Knowing which experimental design to choose is an important skill of researchers and depends on the specific object of inquiry, in addition to the time and resources available to conduct an experiment. Knowing the advantages and disadvantages of each design is a good starting point for choosing an appropriate experimental design.

> **Mixed design**
> an experimental design which combines elements of within-subjects and between-subjects designs

Figure 9 An example of a mixed design structure

Table 3 The advantages and disadvantages of different experimental designs

Experimental design	Advantages	Disadvantages
Within subjects	• Ensures that the results of the experiment are more likely due to the manipulation of the independent variable than any differences between participants that would occur if they were in separate groups. • Less people are needed because each participant completes each experimental condition. • Good for real-world settings and phenomena, such as the impact of certain teaching methods on learning (e.g. this could be assessed before with a pre-test, and after with a post-test when a teaching method is used on the same students).	• It can produce order effects; i.e. completing one experimental condition first and then the other/s may influence how participants perform in the latter condition/s (e.g. due to fatigue, practice, participants' expectations, and so on). • In addition, a participant dropping out of a within subjects experiment has a greater impact on the study as the experimenter loses two data points instead of one.
Between subjects	• May be less time-consuming than within-subjects design as different participants can complete the different conditions simultaneously and procedures do not need to be repeated. • Does not create order effects.	• May require more participants than a within-subjects design. • Differences between participants (participant differences) across groups can affect results (i.e. results may be due to the split of participants instead of the independent variable).
Mixed design	• Allows experimenters to compare results both across experimental conditions and across individuals/participants/groups over time. • Allows multiple experimental conditions to be compared to a baseline control group.	• Can be more costly and time-consuming to plan, conduct, and then analyse results. • Demanding for researchers and assistants to be across multiple methods.

Types of fieldwork 0.0.2.3

Figure 10 Certain types of fieldwork, such as focus groups or yarning circles, yield unique and valuable data

You have now learnt about the methodology of fieldwork and some of its advantages and disadvantages. You will now learn more about some of the specific research techniques used in fieldwork.

Theory details

To recap, fieldwork refers to any research involving observation and interaction with people and environments in real-world settings, conducted beyond the laboratory. It is a very important type of psychological research because it is said to have high ecological validity. This means that its findings can be applied well to the real-world, as it is generally conducted in naturalistic settings. This makes it different from controlled experiments in highly controlled settings, which have lower ecological validity.

Table 4 Types of fieldwork

Types of fieldwork	Description
Direct observation	A method of fieldwork in which a researcher watches and listens to the participants of a study, with no direct intervention and involvement, or manipulation of variables.
Qualitative interviews	Qualitative interviews involve a researcher asking questions to gather in-depth information about a particular topic, theme, or idea. The interview may be structured (or semi-structured), but the questions are generally open ended so that participants can provide lengthier, more detailed answers. This provides rich, qualitative data for the researcher to analyse.
Questionnaires	Questionnaires are a set of questions or prompts given to participants to answer digitally or with pen and paper. Questions may be open-ended, wherein participants can freely answer a question, or closed, wherein participants select an answer from a given set of responses. The answers of respondents are then analysed by a researcher.
Focus groups	Running focus groups is a qualitative research method which involves a researcher conducting a discussion with a small group of people (usually 8–12) on a specific topic. Groups are formed on the basis of some shared characteristics (e.g. participants' background or demographics) relevant to the discussion. For example, a researcher may form a group with 14–16 year old adolescent girls and run a discussion on experiences and feelings of exclusion at high school. Participants' responses and interactions with each other are recorded to form rich, qualitative data.
Yarning circles	In Aboriginal and Torres Strait Islander cultures, a yarning circle is a traditional approach to group discussion which involves talking, exchanging ideas, reflection and deep, considered listening without judgement. Conducting psychological research through yarning circles enables a more culturally appropriate approach to research and data collection when working with Aboriginal and Torres Strait Islander Peoples. Although they have been compared to Western focus groups, yarning circles are unique in their emphasis on a lack of judgement, letting go of preconceived notions, and key cultural principles such as respect, inclusion, and sharing. The role of the researcher is also different, as they must become an active member of the discussion, not just a neutral facilitator. The focus of the facilitator is not to obtain knowledge or information for themselves, but to contribute to a circular information exchange that can potentially produce new knowledge for all members.

Theory summary

In this lesson, you learnt about the various investigation methodologies used to conduct psychological research and how to evaluate them. You also learnt more about the different experimental designs used in controlled experiments, as well as different types of fieldwork.

```
                    ┌─────────────────────────────────────┐
                    │ Research methodologies used in        │
                    │ psychology                            │
                    └─────────────────────────────────────┘
```

Research methodologies used in psychology

Investigation methodologies	Controlled experiment designs	Fieldwork

Psychological studies
- Controlled experiments
- Case studies
- Correlational study

Controlled experiment designs
- Within subjects
- Between subjects
- Mixed design

Fieldwork
- Qualitative interviews
- Questionnaires
- Focus groups
- Yarning circles

Other processes and techniques
- Classification and identification
- Field work
- Literature review
- Modelling
- Product, process, or system development
- Simulation

Figure 11 Summary of lesson 1B

1B Questions

Theory review

Question 1

In psychology, what do investigation methodologies refer to? **(Select all that apply)**

I.   Types of studies researchers can conduct.

II.   Processes and techniques used by researchers to obtain data.

III. Only processes or techniques used during a study.

Question 2

When choosing the most appropriate investigation methodologies to use, researchers should consider
(Select all that apply)

I.   the advantages and disadvantages of each methodology.

II.   the specific subject matter or topic they are studying.

III. the nature of evidence required to answer the research question.

Question 3

One important type of study and methodology in psychology is a controlled experiment. Compared to other investigation methodologies, controlled experiments generally involve

A.   more control of variables and conditions.

B.   less control of variables and conditions.

Question 4

Because controlled experiments are so rigorous and strict, they all follow the same structure and approach.

A.   True.

B.   False.

Question 5

Which of the following are types of fieldwork? **(Select all that apply)**

I.   Controlled experiments.

II.   Within subjects.

III. Yarning circles.

IV.   Focus groups.

V.   Direct observation.

Assessment skills

Perfect your phrasing

Question 6

Which of the following sentences is most correct?

A.   A fundamental difference between experiments and correlational studies is that experiments involve active **manipulation** of at least one variable, whereas correlational studies only involve **measuring** variables.

B.   A fundamental difference between experiments and correlational studies is that experiments involve **changing** at least one variable, whereas correlational studies only involve active **recording** variables.

Question 7

Which of the following sentences is most correct?

A.   In a **within-subjects** experimental design, all participants complete all conditions of the experiment, whereas in a **between-subjects** design, they only complete one condition of the experiment.

B.   In a **between-subjects** experimental design, all participants complete all conditions of the experiment, whereas in a **within-subjects** design, they only complete one condition of the experiment.

Problem-solving

The following assessment skills type reflects the study design assessment type:

- problem-solving involving psychological concepts, skills and/or issues

Use the following information to answer questions 8–10.

Ziad is a budding researcher in the field of psychology. He is very passionate about the role family can play in education outcomes. He wants to know how much of an impact parents can have on their children's attitudes toward school. Ziad has not done much research on it yet and isn't sure where to start.

Question 8

Which of the following would be an appropriate investigation methodology for Ziad to use at this stage of his research?

A.   A case study.

B.   A literature review.

Question 9

After conducting some background research and refining his ideas, Ziad narrows down the scope of what he wants to research. More specifically, he wants to know if there is any relationship between parents' own modelling of self-education (e.g. reading, attending classes or completing courses) on their children's attitudes towards school.

Which of the following would be a more appropriate investigation methodology for Ziad to use at this stage of his research?

A.   Correlational research.

B.   Controlled experiment.

Question 10

After establishing that there is a relationship between parental modelling of self-education and children's positive attitudes towards schooling, Ziad wants to understand if there is a causal relationship between these two variables.

Which investigation methodology might help Ziad to see if there is a causal relationship between these variables?

A. Direct observation.

B. Controlled experiment.

Exam-style

Remember and understand

Question 11   (1 MARK)

An advantage of controlled experiments is that

A. they have high ecological validity because they are conducted in real-world settings.

B. when conducted well, they allow causation to be inferred.

C. no active manipulation of variables is required by the researcher.

D. they always prevent confounding and extraneous variables.

Question 12   (1 MARK)

A disadvantage of the between-subjects experimental designs is that

A. they can produce order effects.

B. they are demanding for researchers because they have to be across multiple methods.

C. participant differences across groups may affect results.

D. less people are needed because each participant completes each experimental condition.

Question 13   (1 MARK)

Which of the following best describes where fieldwork takes place and the role of the researcher?

	Setting	Role of researcher
A.	Laboratory	Actively manipulating variables
B.	Real-world settings	Actively manipulating but not recording or observing variables
C.	Laboratory	Recording and observing
D.	Real-world settings	Recording and observing

Question 14   (2 MARKS)

Outline one advantage and one disadvantage of case studies as an investigation methodology.

Apply and analyse

Use the following information to answer questions 15 and 16.

Mariam wants to volunteer for an organisation that helps individuals living in unstable housing arrangements. The organisation has identified five key risk factors that could potentially impair a volunteer's social and emotional wellbeing while they are working in the role. Online, Mariam is asked a set of questions. The first asks her to select a range of options which help to identify whether she has biases or prejudices towards individuals living in unstable housing. She is then asked to write a response to the prompt, 'describe why you think you would be suitable for this role.'

Adapted from VCAA Psychology exam 2021 Q45 and Q46

Question 15 (1 MARK)

Mariam is

A. part of a literature review, as her responses are a form of secondary data.

B. taking part in a case study, as she is the only volunteer at the organisation.

C. completing a questionnaire, using both open and closed questions.

D. taking part in a simulation activity.

Question 16 (1 MARK)

The investigation methodology identified in question 15 is commonly used as a part of

A. an experiment.

B. fieldwork.

C. modelling.

D. classification.

Question 17 (2 MARKS)

Compare the role of the researcher in controlled experiments and direct observation within fieldwork.

Question 18 (3 MARKS)

Ciro is a high school teacher who is teaching his chemistry class about chemical structures. To do this, he uses a computer software which allows him to zoom in and alter molecules, and project this on a screen for his students to see.

What investigation methodology is Ciro using? Outline an advantage and a disadvantage of this methodology.

Evaluate

Question 19 (4 MARKS)

Nora wants to test the efficacy of a new drug to improve memory using a controlled experiment. To do this, she divides her 500 participants into two groups: one group receives the active treatment drug, while the other group receives an inactive tablet (placebo) that has no effect. Before beginning the experiment, every participant from both groups completes a test of memory ability. After trialling either the active drug or placebo, all participants complete the same test. Both groups' results are then compared.

Explain which controlled experiment design was used in Nora's study. Outline one advantage and disadvantage of this design.

Questions from multiple lessons

Question 20 (1 MARK)

Which of the following best describes a role of the researcher and an aim of controlled experiments?

	Role of researcher with regard to variables	Aim
A.	Manipulation of the independent variable.	To establish a causal relationship between variables.
B.	Only measurement of all variables.	To understand the general relationships and associations between variables.
C.	Manipulation of the dependent variable.	To establish a causal relationship between variables.
D.	Only measurement of all variables.	To understand the general relationships and associations between variables.

1C Population, sample and sampling

1A 1B **1C** 1D 1E 1F 1G

0.0.3.1
Population and sample

0.0.3.2
Sampling techniques

0.0.3.2.1 Convenience sampling

0.0.3.2.2 Random sampling

0.0.3.2.3 Stratified sampling
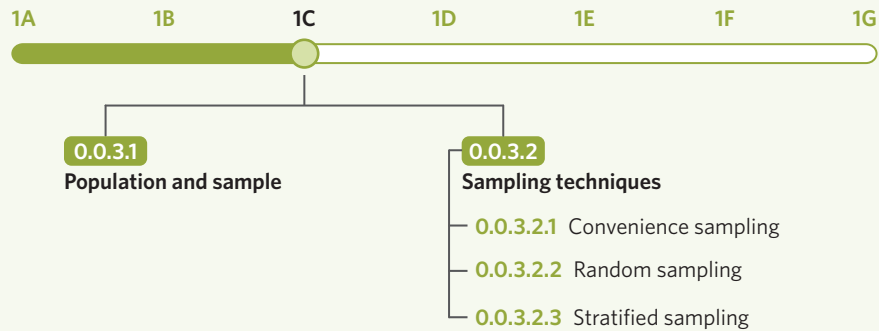
In the previous lesson, you learnt about all the different types of investigation methodologies researchers have to choose from. If they choose to conduct a controlled experiment, they must also decide exactly who the focus of the research is and then recruit people to participate in their study.

In this lesson, you will learn about the difference between a population (the people who are the focus of a study) and a sample (people who participate in a study), and the advantages and disadvantages of each method used to gather a sample.
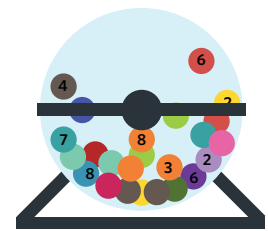
Population and sample 0.0.3.1

KEY SCIENCE SKILLS

In the study design, this theory relates to the following dot point:

- Plan and conduct investigations
  - design and conduct investigations; select and use methods appropriate to the investigation, including consideration of sampling technique (random and stratified) and size to achieve representativeness, and consideration of equipment and procedures, taking into account potential sources of error and uncertainty; determine the type and amount of qualitative and/or quantitative data to be generated or collated

In any psychological experiment, researchers aim to investigate a particular group of people (the research population). However, populations can be very large and it can often be impossible to test everyone in them. As such, researchers must gather a smaller subset of people from the population to run their experiment on. This smaller subset is known as the study's sample.

Theory details

An important part of any psychological study is who the study is about. The **population** of an experiment refers to the group of people who are the focus of the research and from which the sample is drawn. For example, year 12 VCE Psychology students might be the focus of a study about academic stress, with ten classes across the state being selected to make up the sample. Confining research to a specific group of people allows researchers to draw conclusions and obtain knowledge about the group.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

KEY TERMS

Population (also known as research population) the group of people who are the focus of the research and from which the sample is drawn

LESSON LINK

In lesson **1A Introduction to research**, you learnt about the importance of having an experimental hypothesis. By limiting research to a specific population, researchers are better able to make conclusions about this hypothesis within the confines of a controlled experiment.

Sample a subset of the research population who participate in a study

Generalisable (also known as generalisability) the ability for a sample's results to be used to make conclusions about the wider research population

From the research population, a sample is drawn. The **sample** of a study, also considered the study's 'research participants', refers to a subset of the research population who participate in a study. A sample is used because it is often not possible to test everyone in a given population. For example, testing all year 12 VCE Psychology students would be difficult and time-consuming, so instead, a select group of the population would be used in the study. A sample's results can then be used to make conclusions about the wider research population; this is referred to as generalising results.
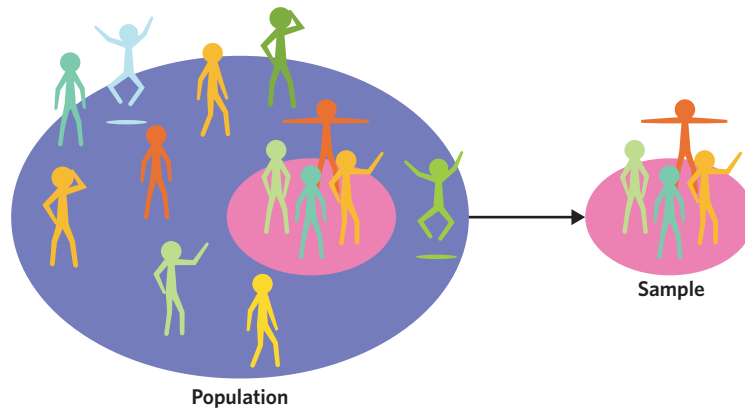
Figure 1 In a study, the population is the wider group of interest, while the sample refers to the people within the population who participate in the study, the sample's results may be generalised to the population

In an ideal world, the sample of a study would be highly representative of the research population. This allows a study's results to be more robust (accurate) and **generalisable** to the population. This refers to the ability for a sample's results to be used to make conclusions about the wider research population.

USEFUL TIP

To make the results of a research study generalisable, the research sample must be representative of the population. The word 'representative' means that the people in the sample represent the wider population by having the same characteristics.

Before you learn how to make a sample representative, there are some words you should understand.

- Each population can be described in terms of demographics, which simply means different factors or categories, such as gender, age, occupation, and many more.
- To make a sample representative, it must have the same proportion of relevant demographics as the target population.
  - 'Proportion' is a word used to describe the amount of something in relation to a bigger whole. For example, if you are cutting up a cake, and your friend gets a bigger piece than you, you may say that they got a bigger proportion of the whole cake.
  - In Psychology, your sample should have the same proportion of relevant characteristics as your target population.
    - For example, if you are running an experiment in your school and the population consists of 30% year 9's, then 30% of your sample must also be from year 9.

When you are evaluating how appropriate a sample is in an exam question, you can consider how representative the sample is likely to be of the entire population.

A highly representative sample would reflect the makeup of the research population in terms of the proportions of relevant demographics and other characteristics of the study. For example, in a study on Australian fathering styles, the sample should contain similar proportions of fathers to the population in terms of their ages, number of children, socioeconomic statuses, nationalities, and so on. By contrast, an unrepresentative sample would be more homogenous (containing the same kind); for example, selecting only 40-year-old Greek-Australian fathers with two children. This sample is not representative of the population of Australian fathers, and therefore, potential findings from this study would not be able to be generalised to the population.

Achieving a representative sample is dependent on:

- its size. The bigger a sample, the more likely it is to be representative of the population.
- the sampling techniques used. How a sample is selected can determine whether it is biased or representative in terms of how accurately it reflects the population's makeup.

Figure 2 shows how, although a sample may be smaller than the population, it can still be representative by having the same proportional makeup of different characteristics (as represented by the colours) that are present in the population.

Research population **Sample**
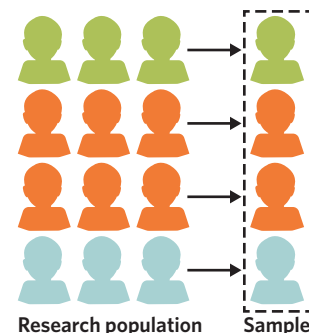
Figure 2 A representative sample occurs when certain demographic characteristics are included in proportion to how they appear in the population

Sampling techniques 0.0.3.2

> **KEY SCIENCE SKILLS**
>
> In the study design, this theory relates to the following dot point:
> - Plan and conduct investigations
>   - design and conduct investigations; select and use methods appropriate to the investigation, including consideration of sampling technique (random and stratified) and size to achieve representativeness, and consideration of equipment and procedures, taking into account potential sources of error and uncertainty; determine the type and amount of qualitative and/or quantitative data to be generated or collated

There are different ways a sample can be gathered for an experiment, each with its own advantages and limitations.

Theory details

A sample is said to be representative when certain demographic characteristics are included in proportion to how they appear in the population. The way a sample is selected from the population for a study, known as the **sampling technique**, can influence whether this is achieved. There are three sampling techniques that you should be familiar with:

- convenience sampling
- random sampling
- stratified sampling.

Sampling technique the way a sample is selected from the population for a study

Convenience sampling any sampling technique that involves selecting readily available members of the population, rather than using a random or systematic approach

Random sampling any sampling technique that uses a procedure to ensure every member of the population has the same chance of being selected

Convenience sampling 0.0.3.2.1

Convenience sampling refers to any sampling technique that involves selecting readily available members of the population, rather than using a random or systematic approach. Some examples of convenience sampling include:

- asking the first 200 people who enter a sporting stadium to complete a survey.
- a psychology professor asking her students to participate in an interview.
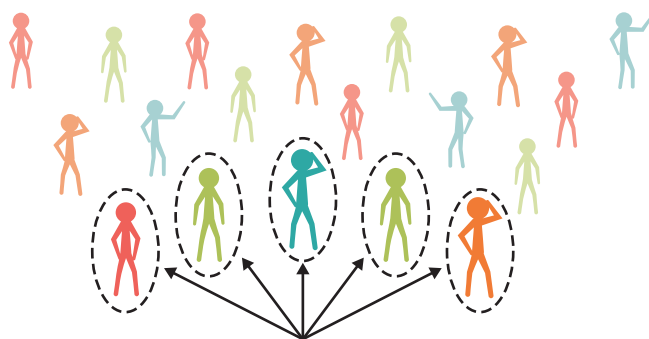
Figure 3 In convenience sampling, a researcher uses readily available members of the population

Random sampling 0.0.3.2.2

Random sampling refers to any sampling technique that uses a procedure to ensure every member of the population has the same chance of being selected. An example of random sampling is putting all members of a population's names into a computerised random generator to select a set of names for the sample.

USEFUL TIP

In past VCAA exams, students have been asked to identify the sampling technique used when a researcher puts out an advertisement for participants in a newspaper or similar medium. This is an example of convenience sampling. By making a 'call out' for participants, the researcher is quickly and easily selecting the most readily available people (those who first respond to the advertisement), rather than following some process of random generation or stratification first.

Stratified sampling 0.0.3.2.3

Within any given population, there are different subsets of people called strata. Strata reflect different demographic characteristics, such as age, socioeconomic status, or gender. **Stratified sampling** refers to any sampling technique that involves selecting people from the population in a way that ensures that its strata (subgroups) are proportionally represented in the sample. The process of stratified sampling involves:

1. dividing the research population into different strata based on characteristics relevant to the study.

2. selecting participants from each stratum in proportion to how they appear in the population, which is shown in figure 4. This selection process can be random (e.g. using a random generator) or systematic.

For example, in a study on VCE students, relevant strata may be age, gender, the type of school students attend (e.g. public, private, or independent), and the subjects they take. Once these strata have been identified, participants for the study could then be selected from each stratum in proportion to how they appear in the population. This could involve selecting every 100th student for each stratum on the VCE enrolment list that year (a systematic approach).
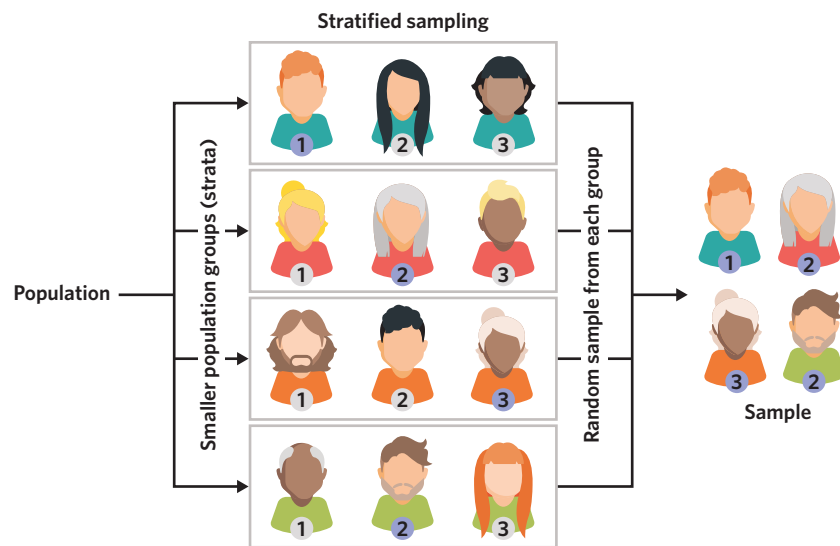
Figure 4 Stratified sampling involves dividing the population into distinct strata, and then making sure each stratum is proportionally represented within the sample

There are advantages and disadvantages in using each sampling technique. These are outlined in table 1.

Table 1 Advantages and limitations of each sampling technique

Sampling technique	Advantages	Limitations
Convenience sampling	• The most time-effective and can be cost-effective.	• The most likely to produce an unrepresentative sample, thereby making it harder for researchers to generalise results to the population.
Random sampling	• The sample generated can be more representative than convenience sampling. • It reduces experimenter bias in selecting participants. • It can make a fairly representative sample if the sample is large.	• It may be time-consuming to ensure every member of a population has an equal chance of being selected for the sample. • It may not create an entirely representative sample when the sample is small.
Stratified sampling	• The most likely to produce a representative sample.	• It can be time-consuming and expensive. • It can be demanding on the researcher to select the most appropriate strata to account for.

Allocation

Once a sample has been selected, researchers must allocate the participants to the different experimental groups or conditions. **Allocation** refers to the process of assigning participants to experimental conditions or groups. For example, in a study testing the effect of a new drug, there may be a control group (receives no active treatment) and an experimental group (receives the trial drug). Here, allocation would involve assigning half the participants to each group. A common type of allocation is random allocation, which ensures every sample participant has an equal chance of being allocated to any group within the experiment.

Allocation the process of assigning participants to experimental conditions or groups
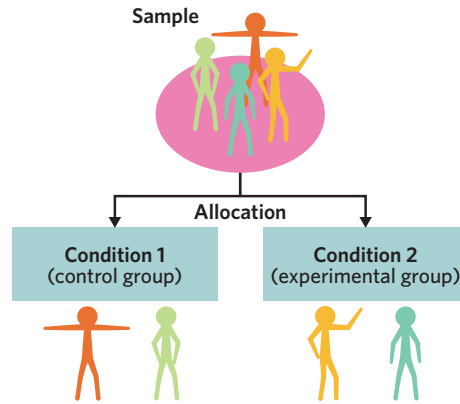
Figure 5 Allocation refers to the process of assigning participants to each experimental group or condition

Theory summary

In this lesson, you learnt the difference between a study's population and sample. You also learnt some different sampling techniques and some of their advantages and limitations. Importantly, you learnt that both the size of the sample and the sampling technique used can affect how representative a sample is of the research population.
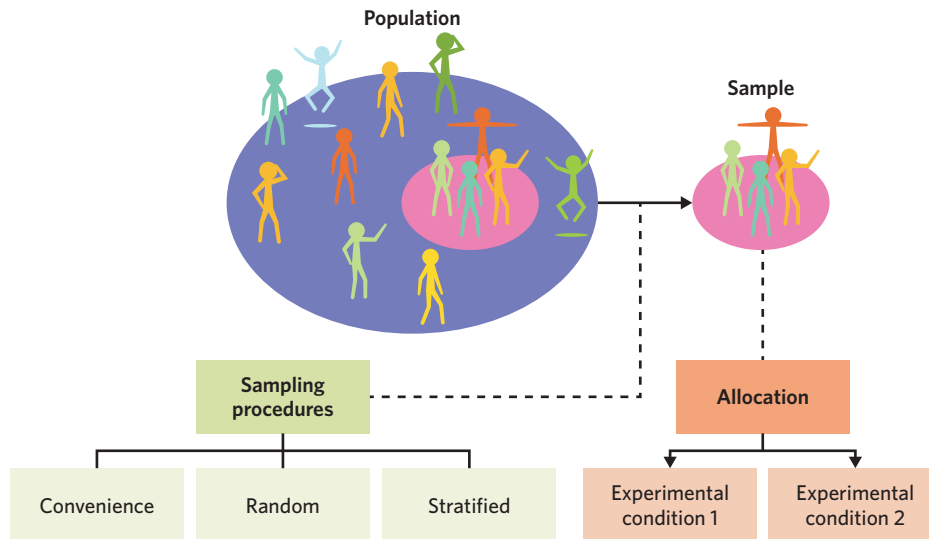
Figure 6 1C lesson summary

1C Questions

Theory review

Question 1

The population is

A. the group of people who participate in a study.

B. the group of people who are the focus of a study.

Question 2

The bigger the sample, the more likely it is to be representative of the population.

A. True.

B. False.

Question 3

Sample size is the only thing that may impact how representative a sample is of the population.

A. True.

B. False.

Question 4

Which type of sampling method is least likely to have a representative sample of the population?

A. Convenience sampling.

B. Random sampling.

C. Stratified sampling.

Assessment skills

Perfect your phrasing

Question 5

Which of the following sentences is most correct?

A. The representativeness of a sample refers to how well its results can be generalised to the population.

B. The representativeness of a sample refers to how closely it resembles the characteristics of the research population.

Question 6

Which of the following sentences is most correct?

A. Random sampling ensures that every member of the population has an equal chance of being selected to participate in the study.

B. Random sampling ensures that every member of the population can participate in the study fairly.

Question 7

Which of the following sentences is most correct?

A. Stratified sampling ensures that the sample includes people from each stratum in proportion to how they appear in the population.

B. Stratified sampling ensures that the sample has the right number of people for every strata in the population.

Problem-solving

The following assessment skills type reflects the study design assessment type:

- problem-solving involving psychological concepts, skills and/or issues

Use the following information to answer questions 8–10.

Aisling wants to conduct an experimental study on Australian mothers and their mood variations in the month following childbirth. However, there are many thousands of new mothers in Australia.

Question 8

What should Aisling do?

A. Obtain a sample for her study.

B. Choose a different population for her study.

Question 9

Which sampling method would help Aisling obtain a more representative sample for her study?

A. Convenience sampling.

B. Stratified sampling.

Question 10

After obtaining a sample, what should Aisling do next?

A. Use an allocation procedure to assign them to experimental groups.

B. Stratify her participants into different experimental groups.

Exam-style

Remember and understand

Question 11   (1 MARK)

A limitation of stratified sampling is that it

A. is difficult to ensure every member of the population has an equal chance of being selected.

B. may be more time-consuming for the researcher.

C. produces a highly representative sample.

D. is unlikely to be representative.

Question 12   (1 MARK)

A sampling technique that uses a procedure that ensures that every member of the population has the same chance of being selected is

A. convenience sampling.

B. random sampling.

C. stratified sampling.

D. random allocation.

Question 13   (2 MARKS)

List two ways to increase the representativeness of a sample.

Question 14   (4 MARKS)

Using examples, compare how random sampling and stratified sampling are used to select a sample.

Apply and analyse

Question 15   (1 MARK)

Yasmine is conducting a large study on the effect of providing misinformation about certain medical treatments. To recruit participants, she puts sign-up poster advertisements around the science departments at her local university. What sampling technique is Yasmine using?

A. Convenience sampling.

B. Random sampling.

C. Stratified sampling.

D. Random-stratified sampling.

Question 16   (4 MARKS)

Professor Snickers is investigating the potential effect of meditation and age-related cognitive decline amongst middle-aged Melbourne women. He needs to recruit 200 participants quickly in time for coordination with his team next month.

With reference to the conditions of professor Snickers' study, explain one advantage and one limitation of Professor Snickers' use of convenience sampling.

Questions from multiple lessons

Use the following information to answer questions 17 and 18.

Dr Mitar investigated the effect of ketamine on treating those with depression. Using 20 patients from his psychiatry clinic, as well as some of his colleagues, he first measured the severity of their symptoms with a self-report questionnaire and a qualitative interview. After patients took the required dosage for six weeks, he then tested the severity of their symptoms again using the same measures.

Question 17   (1 MARK)

Identify the research design and sampling technique used by Dr Mitar.

	Research design	**Sampling techniques**
A.	Between subjects	Random
B.	Within subjects	Convenience
C.	Mixed design	Stratified
D.	Case study	Random-stratified

Question 18   (1 MARK)

Based on the information provided, what might a disadvantage be of Dr Mitar's research?

A. The sampling technique used may be time-consuming because Dr Mitar needs to ensure that every member of a population has an equal chance of being selected.

B. The sampling technique used is time efficient.

C. It may produce order effects.

D. Results between the control and experimental condition cannot be compared.

1D Preventing error and bias

1A	1B	1C	1D	1E	1F	1G

0.0.4.1
Extraneous and confounding variables

0.0.4.1.1 Examples of extraneous and confounding variables

0.0.4.2
Preventing extraneous and confounding variables
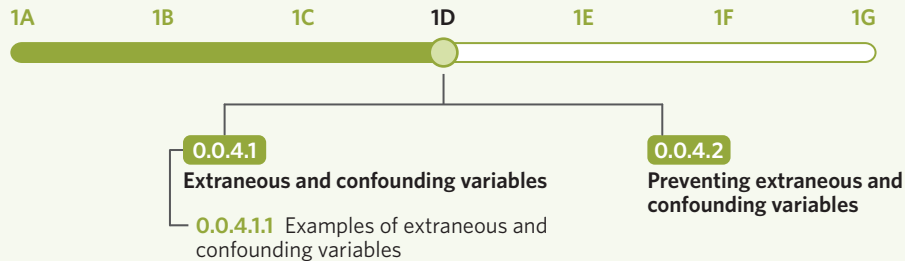
When conducting research, there are many unexpected things that can occur. This can introduce error and bias, and impact the results of the study. In this lesson, you will learn about some of the problems researchers can face when conducting experiments, as well as ways to prevent or minimise them.

Extraneous and confounding variables 0.0.4.1

Confirmation bias

Facts | What you see | Your prior beliefs

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

KEY SCIENCE SKILLS

In the study design, this theory relates to the following dot point:

- Plan and conduct investigations
  - design and conduct investigations; select and use methods appropriate to the investigation, including consideration of sampling technique (random and stratified) and size to achieve representativeness, and consideration of equipment and procedures, **taking into account potential sources of error** and uncertainty; determine the type and amount of qualitative and/or quantitative data to be generated or collated

As you've learnt, the aim of a controlled experiment is to establish a causal relationship between the independent variable and the dependent variable. To ensure that a clear conclusion can be drawn, researchers must exclude other possible explanations for their results. Part of this involves accounting for extraneous and confounding variables.

Theory details

Picture this: your VCE Psychology class has been selected to participate in a study on the effect of using mnemonic devices on information retention, as measured by your Psychology SAC and final exam scores. Mnemonic devices refer to devices that help people to remember information, such as the use of rhymes or acronyms. At the end of the year, the study's results show that you and your classmates have performed well above the state's average. It must surely be due to all the mnemonic devices you've been using! Or is it? Can you think of any other possible reasons (variables) for your exceptional scores? Maybe it is thanks to your amazing teacher or the resources offered by your school? Maybe you're all just really hard-working individuals who love the subject, or maybe your school canteen served you all performance-enhancing lunches for the past year.

In experimentation, errors refer to changes to the dependent variable caused by something other than the independent variable. All good psychological research must consider what errors may arise when conducting the research and take steps to prevent these errors. All other variables that may affect the dependent variable, be it performance-enhancing food or an amazing teacher, are referred to as extraneous variables. An **extraneous variable** is any variable that is not the independent variable but may cause an unwanted effect on the dependent variable. These variables should be controlled (kept constant between experimental groups), or at least monitored, so that they do not interfere with the results.
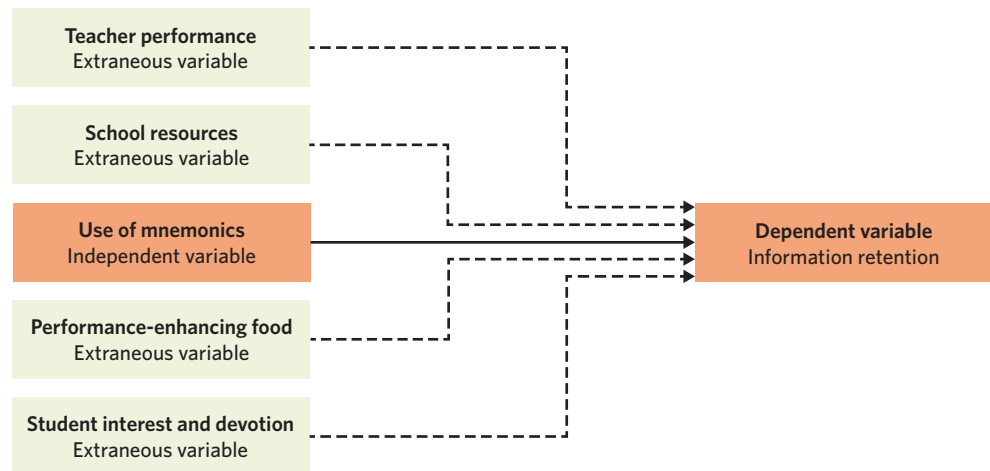
Figure 1 In an experiment, extraneous variables are variables other than the independent variable which may affect the dependent variable (results)

Unfortunately, it is not always possible to control for all extraneous variables. This can happen for a variety of reasons, such as time, cost, and practical constraints, or just by simply not being able to predict something. If, at the conclusion of a study, a variable other than the independent variable can be identified as definitely affecting the results, it becomes a confounding variable. A **confounding variable** refers to a variable that has directly and systematically affected the dependent variable, apart from the independent variable. A confounding variable may have been an extraneous variable that has not been controlled for, or a variable that simply cannot be controlled for. Confounding variables interfere with the investigation by providing alternate explanations for the results, as it cannot be confirmed whether the independent variable or confounding variable caused the changes to the dependent variable.

Importantly, confounding variables can only be identified at the end of an experiment, as they must be shown to have systematically (consistently and in a predictable way) and directly affected results. This can only be known by analysing the results. For example, in the study your class participated in, maybe the resources your school offered systematically and directly affected your SAC and exam scores. In order to identify this as a confounding variable, some pattern of the resources' effect must be identified in the results; for example, maybe the more students in a class that used the resources, the higher that class's results were. This shows that the variable (school resource use) affected the results in a systematic and direct way.
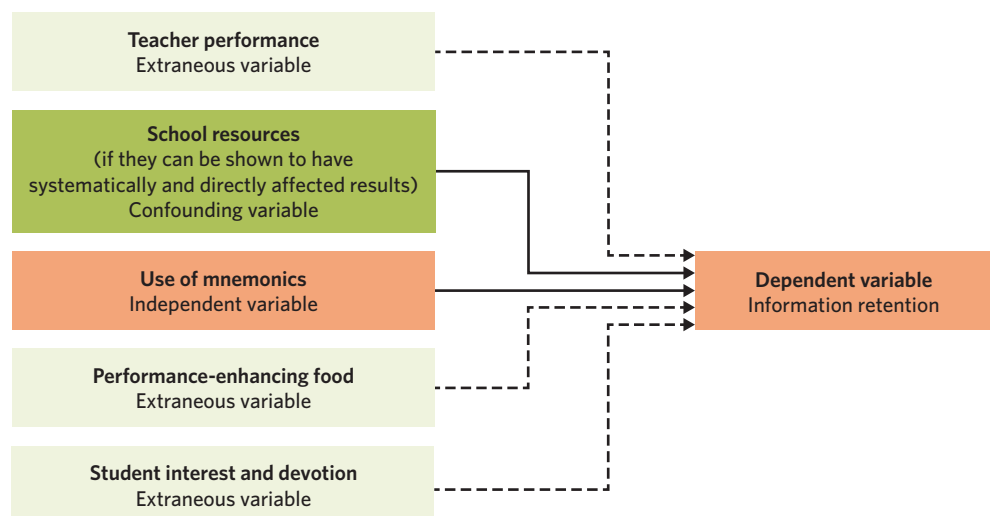
Figure 2 If a variable, other than the independent variable, has been shown to affect the dependent variable in a systematic and direct way, it is a confounding variable

Examples of extraneous and confounding variables 0.0.4.1.1

In order to best prevent possible extraneous and confounding variables to improve your research, it helps to be aware of some common sources of error. In this lesson, you will learn about the following types of extraneous and confounding variables:

- participant-related variables
- order effects
- placebo effects
- experimenter effects
- situational variables
- non-standardised instructions and procedures
- demand characteristics.

Participant-related variables

Participant-related variables, also known as individual participant differences or subject variables, refer to characteristics of a study's participants that may affect the results. This includes characteristics like participants' age, intelligence, and socioeconomic status. When they are not a feature of the experiment, participant-related variables can be extraneous or confounding variables as they are likely to vary within the sample, and subsequently impact the results of the study. For example, in the experiment on the effect of mnemonic devices on information retention, participants' intelligence may be a participant-related variable that could impact the dependent variable.

Order effects

Order effects refers to the tendency for the order in which participants complete experimental conditions to have an effect on their behaviour. This occurs primarily in within-subjects experimental designs. Some examples of order effects include:

- practice effects, which mean that participants perform better in later conditions due to having done it before.
- fatigue effects, which mean that participants perform worse in later conditions due to being tired or bored from completing a prior task.

Imagine you are conducting research on the effect of caffeine on driving. You want to compare how well participants complete a driving circuit both with and without the influence of caffeine. You ask participants to complete the course first without having any caffeine, and then again after consuming 40 mg of caffeine. How might this impact results? By practising the driving course, participants may perform better the second time they complete it. Contrastingly, participants may experience fatigue effects due to having had a long day at the driving school. Either way, the impact of order effects makes it difficult to say that caffeine had an impact on driving quality.
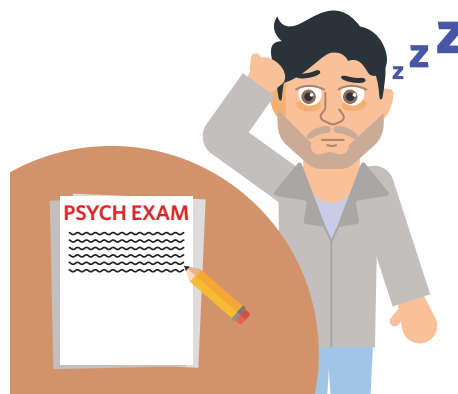
Figure 3 Fatigue effects are one example of order effects

Placebo effects

A **placebo** is an inactive substance or treatment, such as a sugar pill. The **placebo effect** refers to when participants respond to an inactive substance or treatment as a result of their expectations or beliefs. In other words, participants' responses are not due to the chemical properties of a substance taken, the processes in an intervention, or their allocation to an experimental condition, but rather how they believe it should make them feel or act. Imagine you are given a pill that is said to wake you up. An hour after taking it, you feel spritely and alert, only to be told that the pill contains only herbs that, if anything, should make you sleepy. You would be experiencing the placebo effect, as your brain's expectation of what would happen influenced how you felt. Importantly, this does not mean that what you felt was false or not real, but rather, was caused by your psychological expectations. Our mind is a very powerful thing! This can be a problem for researchers, as without careful control, it may be unclear whether results are due to what the researcher is trialling or due to participants' expectations.

Participant-related variables (also known as individual participant differences) characteristics of a study's participants that may affect the results

Order effects the tendency for the order in which participants complete experimental conditions to have an effect on their behaviour

---

LESSON LINK

Order effects are a limitation of within-subjects designs, which you learnt about in lesson **1B Scientific research methodologies**.

Placebo an inactive substance or treatment

Placebo effect when participants respond to an inactive substance or treatment as a result of their expectations or beliefs

---

Experimenter effect

The **experimenter effect**, also known as experimenter bias, refers to when the expectations of the researcher affect the results of an experiment. If experimenters have strong expectations or wish to see a certain result, they may inadvertently bias the way they collect and record data, or how they interact with participants. For example, they may be more likely to pay attention to what confirms their expectations (confirmation bias), leading to inaccurate results.

Situational variables

Situational variables refer to any environmental factor that may affect the dependent variable. Temperature, lighting, weather, and time of day are all examples of situational variables. When these can or do affect the dependent variable in an unwanted way, they become extraneous and/or confounding variables. For example, if a room is too hot, this may affect participants' concentration on a test. If test performance is the dependent variable, then the temperature would be an extraneous variable. This would particularly lead to error if different participants were exposed to different situational variables, such as some being in a cool temperature room and others in a hot temperature room, as their task performance (dependent variable) may vary due to temperature rather than their ability.

Figure 4 Background noise is one situational variable that may be an extraneous variable, depending on the experiment

Non-standardised instructions and procedures

As you know, experiments have at least two groups or conditions. Although they may be testing different manipulations of the independent variable, it is very important that the procedures in each group are as similar as possible. This ensures the results are more likely to be due to the independent variable and not some variation in the testing environment. For example, if you are testing the effect of background music on test performance, one group may complete the test with background music while another completes it without. To be able to draw a conclusion about the difference between the two groups, the conditions of the test should be the same: participants should have similar lighting and temperature, and complete it at similar times. Furthermore, the procedures should be the same: participants should receive the same instructions, amount of time, use the same materials, and so on. **Non-standardised instructions and procedures** occur when directions and procedures differ across participants or experimental conditions. This introduces unwanted situational variables for either specific participants or entire experimental groups.

Demand characteristics

Demand characteristics refer to cues in an experiment that may signal to a participant the intention of the study and influence their behaviour. These can be extraneous variables as participants may be more likely to conform to the study's hypothesis and meet the study's 'demands'. For example, participants may be in a study that first asks them to complete a questionnaire about their ability to concentrate. This may signal to participants that the study is testing concentration in some way, so for the following test procedures, they are highly alert.

Preventing extraneous and confounding variables 0.0.4.2

> **KEY SCIENCE SKILLS**
>
> In the study design, this theory relates to the following dot point:
> - Analyse and evaluate data and investigation methods
>   – evaluate investigation methods and possible sources of error or uncertainty, and suggest improvements to increase validity and to reduce uncertainty

Although there are many ways extraneous and confounding variables occur, there are also many ways experimenters can prevent them. We will now look at some of these ways.

Theory details

Sampling size and procedures

Having a large sample size increases the sample's representativeness of the population, which means that the sample is more likely to have a similar level of diversity as it does in the population. Therefore, if a study has a large sample, the findings from that study are more likely to be unbiased, compared to a small sample which may lack diversity, and therefore be biased. For example, a study investigating mental health and wellbeing among adults which contains a tiny sample of three adults in their 20s, may find that levels of mental health and wellbeing are particularly low. However, this finding may have been impacted by the biased sample, as it does not account for adults in other age groups, and is therefore not representative of the population.

You can also think about the impact of sample sizes when considering individual participant differences. In smaller samples (e.g., a study with three people), if a participant's data is an outlier there will be more pronounced effects on the results than in a larger sample (e.g. a study with 3000 people), where the outlier may not impact the overall mean, or other results.

Furthermore, using more objective sampling procedures, like random or stratified sampling also ensures a more representative sample, which again, helps to ensure a sample which is unbiased.

Experimental design choice

As you now know, the extraneous variable of 'order effects' occurs in a within-subjects design. Choosing an alternative design when order effects may be an issue is one way to prevent this extraneous variable. Conversely, a within-subjects design prevents participant differences from impacting results, because the same people are completing each condition.

Counterbalancing

As you've learnt, there are advantages to using a within-subjects experimental design. Fortunately for researchers, there is a way to minimise or at least account for the influence of order effects on results without choosing a different design. This is known as counterbalancing.

Counterbalancing is a method to reduce order effects that involves ordering experimental conditions in a certain way. A common example may involve splitting the participants in half: one half completes one experimental condition (A) first, followed by the other condition (B). The other half of participants complete the conditions in reverse order (B, then A). Therefore, the results of each participant in each condition can still be compared as they still complete every experimental condition. It also ensures that any results due to order effects are accounted for, as each order is tested equally. As a result, any overall change in the dependent variable across all participants cannot be due to the order in which conditions were completed. Furthermore, the results across alternative orders may be examined independently to determine if any order effects had a major impact.

> **Counterbalancing**
> a method to reduce order effects that involves ordering experimental conditions in a certain way

Figure 5 How counterbalancing may occur
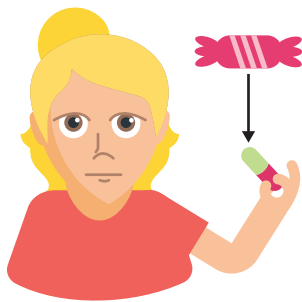
Figure 6 Placebos are often administered in experiments that test the efficacy of a new drug or treatment. Randomised, double-blind placebo controlled studies are considered the 'gold standard' in such research

Single-blind procedure
a procedure in which participants are unaware of the experimental group or condition they have been allocated to

Double-blind procedure a procedure in which both participants and the experimenter do not know which conditions or groups participants are allocated to

Placebo

Studies that test the efficacy of new drugs or treatment interventions typically have at least two experimental groups. One group is generally provided with the active substance or intervention, while another group may be given a placebo. As a reminder, a placebo (not to be confused with the placebo effect) is an inactive substance or treatment, such as a sugar pill. The purpose of providing placebos is to compare the results of participants given an active intervention, with those who are in the controlled placebo group. If those who received the true substance or intervention showed significantly different responses compared to the control group (who received the placebo), researchers may make firmer conclusions about the effectiveness of the trial substance or intervention. In this way, placebos don't necessarily stop the placebo effect, but help researchers understand how significantly an active intervention may affect individuals. If there is no significant difference in results between groups, researchers would not be able to conclude that the effect of an intervention (e.g. an active pain medication) is stronger than a placebo effect in response to a placebo (e.g. a sugar pill).

Single-blind procedures

A **single-blind procedure** is a procedure in which participants are unaware of the experimental group or condition they have been allocated to. This helps reduce participants' expectations; for example, they may not know whether they are receiving a placebo or the active medication. This also demonstrates how single-blind procedures may reduce the placebo effect. Similarly, single-blind procedures can also minimise demand characteristics, as there are fewer cues participants can use to infer a study's hypothesis, and other participant expectations which may influence results.

Double-blind procedures

A **double-blind procedure** is a procedure in which both participants and the experimenter do not know which conditions or groups participants are allocated to. For example, in a study testing the efficacy of a new medication, neither the experimenter nor the participants would know if they were receiving the active drug or a placebo. Instead, a research assistant would record the allocations. This helps to prevent the extraneous variables of experimenter and participant expectations.
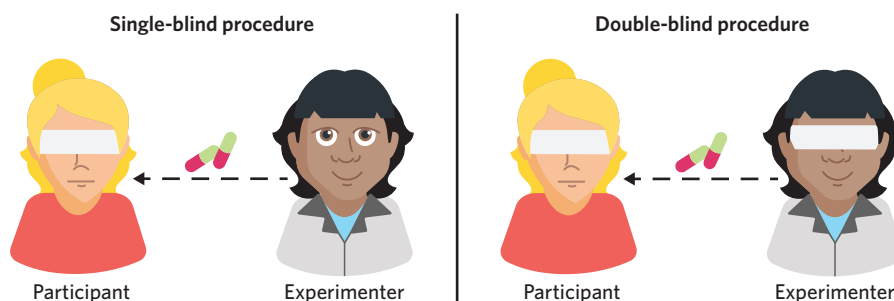
Figure 7 How a single versus double-blind procedure might work when trialling a new medication

Standardised instructions and procedures

Ensuring that each participant in an experiment receives the exact same instructions and follows the same procedures in each condition allows researchers to more conclusively infer that results are due to the independent variable. This minimises the extraneous variables of non-standardised instructions and procedures (situational variables).

Controlled variables

As you learnt in lesson 1A, experimenters may hold certain variables, other than the independent variable, constant. This is when they become 'controlled variables', so that their impact is systematically minimised and accounted for. This can be used for a range of extraneous variables. For example, in a study on the effect of running on mood, the situational variable of time of day may be held constant for all experimental conditions. This is a controlled variable enabled by having standardised procedures.

Theory summary

In this lesson, you learnt about various kinds of extraneous and confounding variables. You also learnt about the strategies researchers may use to prevent or minimise their effects. Table 1 summarises these.

Table 1 Summary of the ways to prevent different extraneous and confounding variables

Ways to prevent extraneous and confounding variables	The extraneous and confounding variables this can prevent, minimise or account for
Sampling size and procedures	• Participant-related variables
Experimental design choice	• Order effects, if a within-subjects design is not used • Participant-related variables (differences), if within-subjects or a matched-participants design is used
Counterbalancing	• Order effects
Placebo	• Placebo effects
Single-blind procedures	• Participant-related variables and expectations • Demand characteristics • Placebo effect
Double-blind procedures	• Experimenter effects • Participant expectations • Demand characteristics
Standardised testing conditions and procedures	• Situational variables • Non-standardised testing conditions and procedures • Demand characteristics
Controlled variables	• Most extraneous variables that have the ability to be controlled

1D Questions

Theory review

Question 1

Extraneous and confounding variables are both **(Select all that apply)**

I.   undesirable in an experiment.

II. variables that have affected the dependent variable in an unwanted way.

III. something which researchers should aim to prevent.

IV. determined at the conclusion of a study.

Question 2

It is possible to prevent all extraneous variables.

A. True.

B. False.

Question 3

The difference between extraneous and confounding variables is that you cannot control confounding variables, whereas you can control extraneous variables.

A. True.

B. False.

Question 4

Which of the following are ways to prevent extraneous and confounding variables? **(Select all that apply)**

I. Placebo effects.

II. Standardised instructions and procedures.

III. Situational variables.

IV. Single-blind procedures.

V. Double-blind procedures.

Assessment skills

Perfect your phrasing

Question 5

Confounding variables are variables that

A. have **systematically** and **directly** affected the dependent variable in an unwanted way.

B. have **methodically** and **consistently** affected the dependent variable in an unwanted way.

Question 6

The placebo effect occurs when

A. participants are given an inactive substance.

B. participants have a response to an inactive intervention due to their expectations and beliefs.

Problem-solving

The following assessment skills type reflects the study design assessment type:

- problem-solving involving psychological concepts, skills and/or issues

Use the following information to answer questions 7–9.

Urvi wanted to investigate the effect of using polite softening phrases in requests for favours on participants' willingness to perform said favour. Softening phrases include phrases such as 'would you mind...' or 'would you be ever so kind as to...'. In a local library, the first 20 people that entered were asked to hold a confederate's (research actor's) property for five minutes while they went to the bathroom. Different forms of requests were used for each half of the participants:

The first 10 participants were asked to hold the actor's property using the phrase 'Could you hold my things for five minutes while I go to the bathroom?'

The last 10 participants were asked to hold the actor's property using the phrase 'Would you be ever so kind as to hold my things for five minutes while I go to the bathroom?'

Question 7

Which of the following is an extraneous variable that could impact Urvi's experiment?

A. Non-standardised instructions and procedures, as participants were asked different questions.

B. Participant differences, as each individual's own characteristics (such as their busyness that day) may impact their willingness to perform the favour.

Question 8

What procedure could Urvi use that may prevent this extraneous variable? **(Select all that apply)**

I. Using a larger sample size.

II. Using a different experimental design, such as a within-subjects or a matched-participants design.

III. A double-blind procedure.

IV. Counterbalancing.

Question 9

Which of the following best describes how Urvi could use a controlled variable to control for this extraneous variable?

A. By asking participants all the same question.

B. By holding the participant differences (such as the activity participants were doing in the library, such as people reading books or on a computer) constant.

C. By conducting the experiment in a range of different settings.

Exam-style

Remember and understand

Question 10   (1 MARK)

Which of the following is a way to control the extraneous variable of experimenter bias?

A. Single-blind procedures.

B. Double-blind procedures.

C. Counterbalancing.

D. Order effects.

Question 11   (1 MARK)

Which of the following is an example of a situational variable?

A. Experimenter bias.

B. Participant differences.

C. Temperature.

D. Confounding variables.

Question 12   (3 MARKS)

Using an example, explain how single-blind procedures may be used to control for extraneous variables.

Apply and analyse

Use the following information to answer questions 13 and 14.

Pedro conducted research to find out whether the type of music people listened to affected their levels of stress. Twenty participants were exposed to simulations of two different stressful scenarios. In the morning, the participants were told to listen to classical music after exposure to the first simulation and, in the afternoon, they were told to listen to heavy metal music after exposure to the second simulation. Physiological measures of stress were used before and during the simulations. Higher levels of arousal indicated greater stress.

Readings from the EEG and EMG were quantified as stress level scores from 0 to 10. A change score was calculated by subtracting the pre-simulation stress level score from the during-simulation stress level score.

Question 13   (1 MARK)

Which one of the following is a potential confounding variable in Pedro's research?

A. Using the same participants in both conditions, as there may be fatigue effects.

B. Using only 20 participants, as this does not allow for generalisation of the results.

C. Telling participants to listen to a particular type of music, as this may bias participants.

D. Using only one strategy in each condition, as this does not allow for comparison.

Adapted from VCAA Psychology exam 2019 Q11

Question 14 (1 MARK)

What is one strategy Pedro could use to account for the potential confounding variable outlined in question 13?

A. Order effects.

B. Single-blind procedures.

C. Counterbalancing.

D. The use of a placebo.

Question 15 (2 MARKS)

Doctor Shwepp is conducting a between-subjects experiment on the role that energy drinks may play in anxiety symptoms at work.

Doctor Shwepp identifies three different groups, each comprising of 20 people:

• Group A is to consume 473mL of energy drink in the morning.

• Group B is to consume 250mL of energy drink in the morning.

• Group C is to consume no energy drinks in the morning.

Identify one relevant extraneous variable that Doctor Shwepp should consider in designing his investigation. Justify your response.

Adapted from VCAA Psychology exam 2018 Q6c

Questions from multiple lessons

Use the following information to answer questions 16 and 17.

Dr Vloof wants to test the efficacy of a new stress medication. In her experiment, group 1 are given the new medication and group 2 are given a sugar pill, which has no active ingredients.

Question 16 (1 MARK)

The sugar pill given to group 2 is

A. a placebo, intended to account for the placebo effect.

B. the placebo effect, intended to account for the placebo.

C. a placebo, intended to account for experimenter bias.

D. the placebo effect, intended to account for participant differences.

Question 17 (1 MARK)

The experimental design being used by Dr Vloof is

A. within subjects, with group 1 being the experimental group and group 2 the control group.

B. between subjects, with group 1 being the experimental group and group 2 the control group.

C. within subjects, with group 1 being the control group and group 2 the experimental group.

D. between subjects, with group 1 being the control group and group 2 the experimental group.

1E Organising and interpreting data

1A	1B	1C	1D	**1E**	1F	1G

- **0.0.5.1** Types of data
- **0.0.5.2** Processing quantitative data
  - **0.0.5.2.1** Percentages
  - **0.0.5.2.2** Measures of central tendency
  - **0.0.5.2.3** Measures of variability
- **0.0.5.3** Presenting data
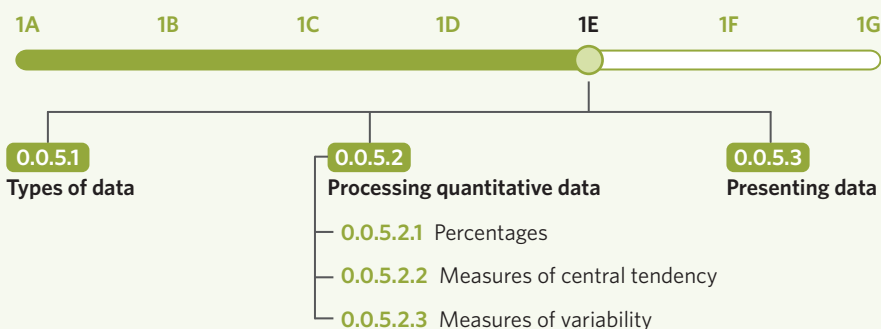
In research, we always talk about the importance of 'data'. The purpose of an experiment, for example, is to generate 'data' that either supports or rejects a hypothesis. But what exactly is data, and what are the different types of data researchers are trying to obtain through experimentation? How do researchers organise, interpret, and communicate their data? In this lesson, you will learn about the different types of data researchers collect and how they may present this data, as well as how they process quantitative (numerical) data.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

Types of data 0.0.5.1

KEY SCIENCE SKILLS

In the study design, this theory relates to the following dot point:

- Generate, collate and record data
  - systematically generate and record primary data, and collate secondary data, appropriate to the investigation
  - record and summarise both qualitative and quantitative data, including use of a logbook as an authentication of generated or collated data

There are different types of data researchers collect during investigations.

Theory details

Data refers to any information used as part of or generated by an investigation. Different forms of data can help to answer different kinds of questions, with researchers often aiming to collect different types of data in one investigation. A research finding is more robust when it can be supported by multiple types of data.

In this lesson, you will be learning about different types of data, which are presented in figure 1.

KEY TERMS

Data information used as part of or generated by an investigation
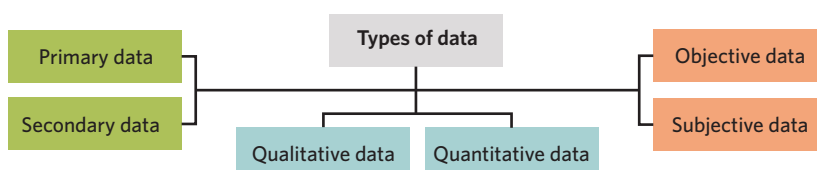
Figure 1 The types of data that you will learn about in this lesson

Primary data
data collected first-hand by a researcher

Secondary data
data sourced from others' prior research

Quantitative data
data that is expressed numerically

Qualitative data
data that is expressed non-numerically

Objective data factual data that is observed and measured independently of personal opinion

Subjective data data that is informed by personal opinion, perception, or interpretation

Primary and secondary data

Primary data refers to data collected first-hand by a researcher. It may be collected in a variety of ways, such as through experimentation, observation, or survey. By contrast, **secondary data** refers to data sourced from others' prior research, not collected directly by the current researcher. Secondary data may be obtained from processes like accessing data from publicly available databases or using data that other researchers have previously collected.

Primary data versus secondary data
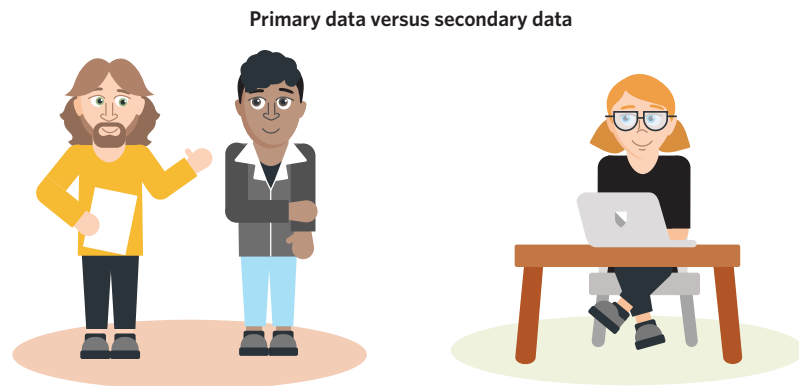
Figure 2 Primary data is sourced first hand by a researcher in their own study, whereas secondary data comes from past research

Quantitative and qualitative data

Quantitative data is data that is expressed numerically, such as test scores or measurements of weight. By contrast, **qualitative data** is data that is expressed non-numerically; for example, a participant's verbal description of how they are feeling. Qualitative data may be collected through methods such as open-ended questionnaires and interviews, while quantitative data may be collected via methods such as close-ended surveys, rating scales, or multiple choice questions. Qualitative data may sometimes be converted into quantitative data using systematic methods and analyses.

Objective and subjective data

Objective data is factual data that is observed and measured independently of personal opinion. Objective data is collected using measurement tools that ensure the same results are obtained by different researchers. Examples of objective data include a person's weight in kilograms or their numerical scores on an intelligence test. These are both forms of objective data as they do not require personal opinion or interpretation by the researcher.

By contrast, **subjective data** is data that is informed by personal opinion, perception, or interpretation. Often, subjective data comes from participants' own qualitative descriptions and self-reports. Subjective data cannot easily be interpreted by a researcher, with subjective measurements unlikely to yield the same results when collected by different researchers. Subjective data can be valuable because it provides rich, qualitative descriptions of personal experience; however, in rigorous research, it is usually combined with and supported by other objective data that is verifiable (able to be shown as accurate).

USEFUL TIP

It's important to know that objective data can be about individuals and their personal thoughts, biological processes, behaviours, and preferences. The difference is that it is just observed and measured without bias or requiring a researcher's interpretation. For example, personal experiences of stress can be measured objectively through scores on a standardised mood test or a combination of physiological measurements like heart rate. They can also be measured subjectively, such as through participants' qualitative descriptions of their recent stressful experiences.

Processing quantitative data 0.0.5.2

Before they can draw conclusions, researchers need to summarise, organise, and describe their data to form their results. Part of this includes processing their raw (unprocessed) quantitative data so they can make meaningful comparisons and observations about their results.

Theory details

A rigorous psychological experiment or study may collect a variety of quantitative data. Scores from multiple tests, participants' self-reported ratings on scales and questionnaires, and physiological measurements (like heart rate or blood pressure) may all be forms of quantitative data collected by just one study. When this data is first collected, it is in a raw, unprocessed form. In order to make meaningful comparisons and observations, and notice patterns, a researcher must process all of this numerical information.

In scientific research, **descriptive statistics** are statistics that summarise, organise, and describe data. In other words, they process quantitative data in its raw form and allow it to be described further. Before applying descriptive statistics, researchers should account for any missing or incomplete data as this can affect their usefulness and accuracy in summarising data. There are a few methods which can be taken into account for missing or incomplete data depending on what is appropriate for each study, such as deleting the missing or incomplete data cases from the data set.

Descriptive statistics
statistics that summarise, organise, and describe data

Examples of descriptive statistics that you will learn about in this lesson are presented in figure 3.
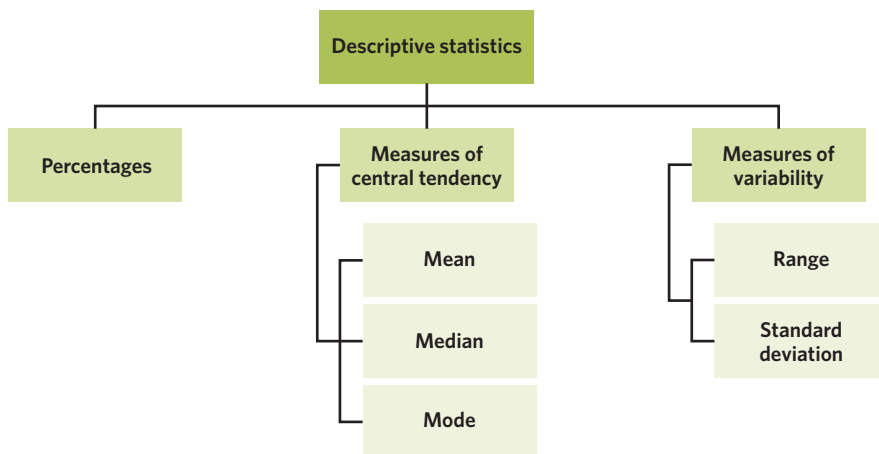
Figure 3 Examples of descriptive statistics in scientific research

WANT TO KNOW MORE?

It is important to understand that descriptive statistics cannot be used to make inferences and draw conclusions about a research population. Rather, descriptive statistics just describe, organise, and summarise a study's data. However, inferential statistics are another type of statistic that is used to make inferences and draw conclusions about whether results are meaningful, significant, and can be generalised to the population of interest.

Percentages 0.0.5.2.1

Percentages are a very common and useful descriptive statistic. By organising results in percentages, researchers can more easily notice patterns and trends, such as the percentage of participants that scored in the high bracket. Percentages are calculated by multiplying the ratio of a total by 100. This could be done using the following steps:

1. Find the total amount of something you want to know as a percentage. For example, if you want to calculate a participant's test scores as a percentage, the total amount would be the number of marks or items on a test. E.g. 30 marks.

2. Divide the given number/score/mark by that total number. E.g. if a participant scored 15 marks out of 30 on the test, you would divide 15 by 30.

3. Multiply that ratio (e.g. 15/30) by 100 to get your final percentage. E.g. 15/30 × 100 = 50%.

$$\text{Percentage formula} = \frac{\text{given number}}{\text{total number}} \times 100$$

Percentage change

After converting results into percentages, researchers may also wish to know the total percentage change; i.e. how much total percentages increased or decreased. This may be between experimental conditions or groups, or between different participants over time. This allows for comparison of results; for example, it might be helpful to summarise that an experimental group's scores were overall 30% higher than a control group's.

To calculate percentage change, use the following steps.

1. Calculate the difference between the first and second percentage being compared (subtract the new percentage from the old percentage).

2. Divide this difference by the first percentage.

3. Multiply this by 100.

$$\text{Percentage change formula} = \frac{\text{old number} - \text{new number}}{\text{old number}} \times 100$$

If the result is a positive number, this is a percentage increase. If the result is a negative number, this is a percentage decrease.

Measures of central tendency 0.0.5.2.2

> **Measures of central tendency** descriptive statistics that summarise a data set by describing the centre of the distribution of the data set with a single value
>
> **Mean** a measure of central tendency that describes the numerical average of a data set, expressed as a single value

Measures of central tendency are descriptive statistics that summarise a data set by describing the centre of the distribution of the data set with a single value. They are useful for researchers as it gives them a good picture of common or standard responses. There are three measures of central tendency that you should know:

- mean
- median
- mode.

Mean

The **mean** is a measure of central tendency that describes the numerical average of a data set, expressed as a single value. It is often referred to as the 'average' of a data set and is calculated by summing (adding up) the total of all data values and then dividing this total by the number of data values in the data set. The mean is helpful because it can tell a researcher what the typical response or score is. However, the mean is more helpful when data values are distributed around a 'centre' (a 'normal distribution'), and is less helpful when data values are widely distributed, in which case the data set is likely to be influenced by extreme values and outliers.

Figure 4 The mean is a very useful measure of the 'average' response in a study when the data set is distributed symmetrically around the centre (i.e. follows a 'normal distribution')
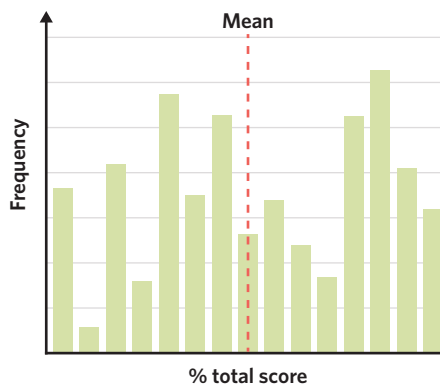
Figure 5 The mean is less indicative of a true common response, even though it is the mathematical average, when a data set is asymmetrical or unevenly distributed

WANT TO KNOW MORE?

When data is evenly or 'normally distributed', it appears in a graph as a symmetrical shape described as a 'bell curve' (shown in figure 4). When data appears as a bell curve, the mean is a more valuable measure of central tendency.

Researchers should be careful to account for **outliers**, or values that differ significantly from other values in a data set, as they make the mean a less accurate summary of the average data value. Outliers can be observed in visual representations of data, in which the outlier may lie far away from the rest of the data points in the data set. Outliers can occur for numerous reasons, including by chance. As a result, outliers are expected to occur more in data sets with a large sample (VCAA). Outliers can also occur due to measurement and recording errors, and could at times negatively impact the validity of research.
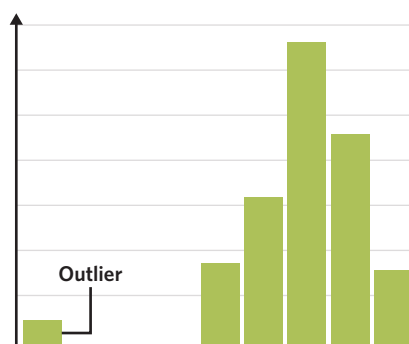
Figure 6 An example of an outlier in a data set (bar chart)

Outlier a value that differs significantly from other values in a data set

Median a measure of central tendency that is the middle value in a data set ordered from lowest to highest

Mode a measure of central tendency that is the most frequently occurring value in a data set

Median

The **median** is a measure of central tendency that is the middle value in a data set ordered from lowest to highest. If there are two central numbers, they are summed (added together) and then divided by two.

The median is useful for researchers to identify a more typical response when the data is not evenly distributed around the centre, or when there are outliers. In such a case, it would be preferable to look at the median instead of the mean to summarise a data set because it is less influenced by outliers or extremely low or high values.
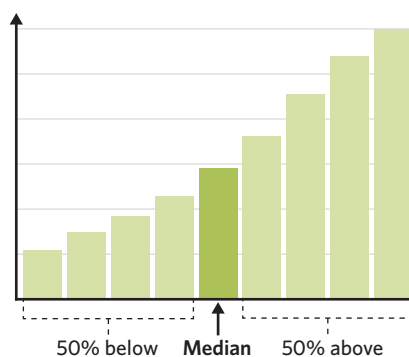
Figure 7 An example of the median value in a data set

Mode

The **mode** is a measure of central tendency that is the most frequently occurring value in a data set. It is the least commonly used measure of central tendency, but is useful for knowing the most common and frequently occurring value. Further, it helps researchers to understand the centre of the data set when the mean or median cannot be calculated.

Figure 8 In the above data set, '8' is the mode because it is the most frequently occurring value

Measures of variability statistics that summarise and describe the spread and distribution of a data set

Range a measure of variability that is a value obtained by subtracting the lowest value in a data set from the highest value

Standard deviation a measure of variability, expressed as a value that describes the spread of data around the mean

Measures of variability 0.0.5.2.3

Measures of variability are statistics that summarise and describe the spread and distribution of a data set. This can include the difference between data points in a data set, or the difference of a data point from the mean. Measures of variability help indicate how widely participants' responses vary in a data set. There are two measures of variability that you should know:

- range
- standard deviation.

Range

The **range** is a measure of variability that is a value obtained by subtracting the lowest value in a data set from the highest value. The range is used to summarise the overall dispersion (distribution) of scores.

3   7   7   8   9   12   14

14 − 3 = **11**

Figure 9 The range is a simple calculation of the highest value minus the lowest value to roughly indicate the dispersion of data

Standard deviation

The **standard deviation** is a measure of variability, expressed as a value that describes the spread of data around the mean. In other words, the standard deviation number shows how much data 'deviates' from the mean. The higher this value, the greater the data values in the set differ from the mean. Standard deviation is calculated using a mathematical formula. However, you are not expected to know this formula or how to calculate the standard deviation.

The standard deviation is useful for researchers as it shows the dispersion of data, which provides more detailed information about the true nature of a data set compared to the range. This primarily allows for an awareness of the differences in participants' responses. Further, standard deviation allows comparisons to be made between different data sets based on their dispersions. This is not something the mean alone can indicate. Figure 10 shows two data sets with the same mean overlapping. Data set 1 would have a lower standard deviation because its values are clustered more closely around the mean. By contrast, data set 2 would have a higher standard deviation as the data values spread more widely around the mean.
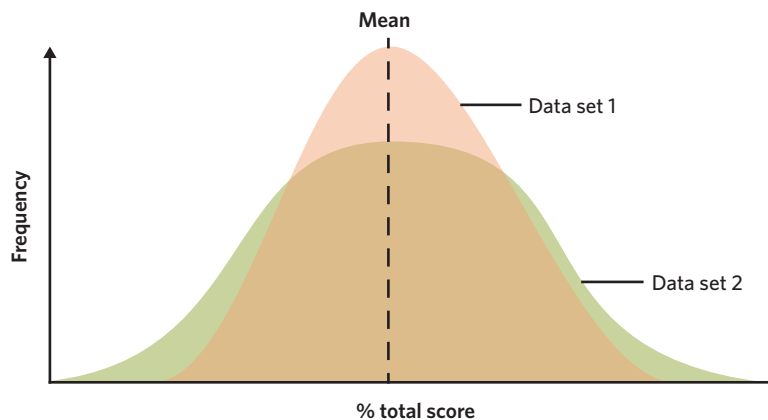
Figure 10 When different data sets have the same mean, the standard deviation can describe how they differ in terms of dispersion

Presenting data 0.0.5.3

Presenting data visually allows researchers to summarise and communicate their findings in a highly accessible format.

Theory details

Tables

A **table** is a presentation of data arranged into columns and rows. It helps researchers to organise and summarise their data in a more accessible format, as well as show the relationship between certain variables. Table 1 shows an example of a table from the Australian Bureau of Statistics.

Table 1 An example of a table presenting data (Australian Bureau of Statistics, 2022)

Age range	Males (%)	Females (%)	Persons (%)
16–24	31.2	46.6	39.6
25–34	21.9	32.1	27.1
35–44	18.5	20.7	19.7
45–54	16.5	24.3	21.0
55–64	14.6	18.9	17.1
65–74	9.5	13.1	11.4
75–85	2.8	4.9	3.7

Table a presentation of data arranged into columns and rows

Bar chart a graph displaying the relationship between at least two variables using rectangular bars with heights or lengths proportional to the values they represent

Bar charts

A **bar chart** is a graph displaying the relationship between at least two variables using rectangular bars with heights or lengths proportional to the values they represent. They may be displayed horizontally or vertically, but importantly, the bars are of equal width and are separated by space. A bar chart shows the relationship between variables: one axis shows categories of data, while the other shows frequencies or amounts. This helps researchers summarise and communicate their data. When graphs are used to plot the relationship between experimental variables, the independent variable appears on the horizontal axis (x-axis) while the dependent variable appears on the vertical axis (y-axis), or vice versa if the bar chart is displayed vertically.
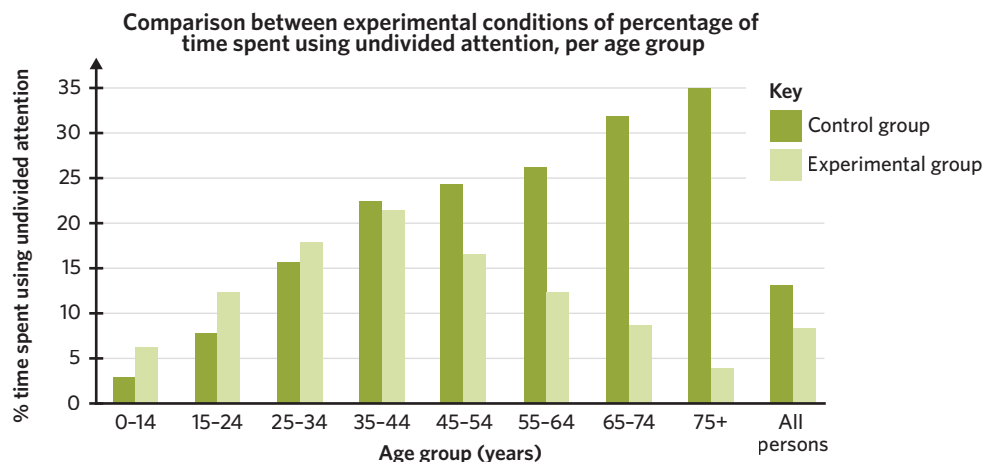
Figure 11 An example of a bar chart

Line graphs

Line graph a graph displaying the relationship between at least two variables using a straight line to connect data points

A **line graph** is a graph displaying the relationship between at least two variables using a straight line to connect data points. Line graphs often are used to show data patterns and changes over time. As with bar charts, one axis generally shows categories of data, while the other shows frequencies or amounts.

Persons aged 18 years and over – proportion with high or very high levels of psychological distress, 2017–18
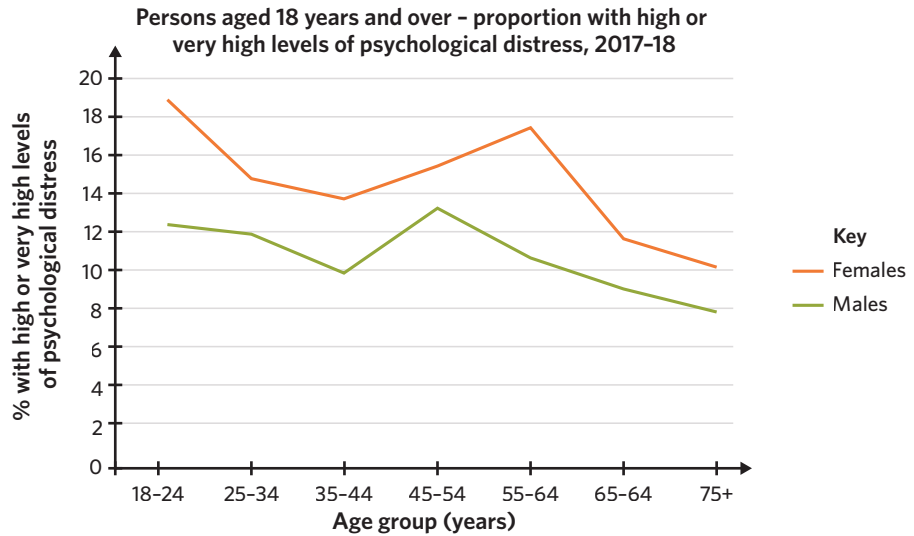
Figure 12 An example of a line graph from the Australian Bureau of Statistics (2018)

Graphing conventions

All graphs should have:

- a title
- the x and y axes labelled with their appropriate variable
- units of measurement labelled on each axis
- if it displays experimental variables, the independent variable should be on the x-axis, while the dependent variable should be on the y-axis.

Theory summary

In this lesson, you learnt about the types of data collected by researchers:
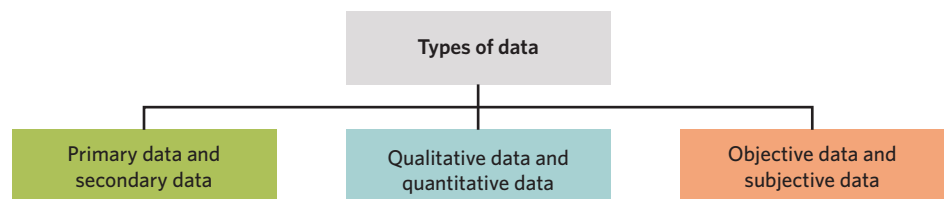
Figure 13 Types of data collected by researchers

You also learnt about different ways of processing and presenting data:

Table 2 Different data tools and their purposes

Data form	Purpose
Percentages and percentage change	• Summarise raw data into a meaningful value • Allow for comparisons to be made between data points or sets
Mean	• Describe the average of a data set • Summarise the typical participant response or data when the data is evenly (normally) distributed
Median	• Describe the middle value in a data set • Summarise data, especially when the data is not evenly distributed or there are outliers

Continues ▶

Theory summary

Table 2 Continued

Data form	Purpose
Mode	• Describe the most frequently occurring data value • Summarise data, especially when the mean and median cannot be calculated
Range	• Summarise the overall dispersion of scores by describing the difference between the lowest and highest values in a data set
Standard deviation	• Summarise the dispersion of data by describing the spread of data around the mean
Table	• Organise, summarise, and communicate data
Bar chart	• Organise, summarise, and communicate data, especially to show the relationship between variables
Line graph	• Organise, summarise, and communicate data, especially about the relationship between variables over time

1E Questions

Theory review

Question 1

Generally speaking, a robust finding in psychological research is supported by multiple forms of data.

A. True.

B. False.

Question 2

_____ is data from others' past research, whereas _____ is collected first-hand by a researcher in their current research.

Which of the following best fills in the blanks?

A. Primary data; secondary data

B. Secondary data; primary data

Question 3

A person's feelings can only be collected in the form of subjective data, not objective data.

A. True.

B. False.

Question 4

Raw quantitative data is always easy to understand and interpret.

A. True.

B. False.

Question 5

Which of the following are descriptive statistics? **(Select all that apply)**

I. Measures of central tendency.

II. Measures of variability.

III. Percentages.

IV. Tables and graphs.

Question 6

The _____ is the mathematical average of a data set, whereas the _____ is the middle of a data set that has been ordered from lowest to highest.

Which of the following best fills in the blanks?

A. mean; median

B. median; mean

Question 7

Tables, bar charts, and line graphs are useful for **(Select all that apply)**

I. summarising data.

II. organising data.

III. communicating data.

IV. drawing conclusions from data about the research population.

Assessment skills

Data analysis

The following assessment skills type reflects the study design assessment type:

- a data analysis of generated primary and/or collated secondary data

Use the following information to answer questions 8–10.

Carlos conducted a study on the relationship between sleep deprivation and concentration, as tested through a visual-spatial reasoning test. Greater percentage errors on the test demonstrated poorer visual-spatial reasoning.

The relationship between sleep deprivation and concentration
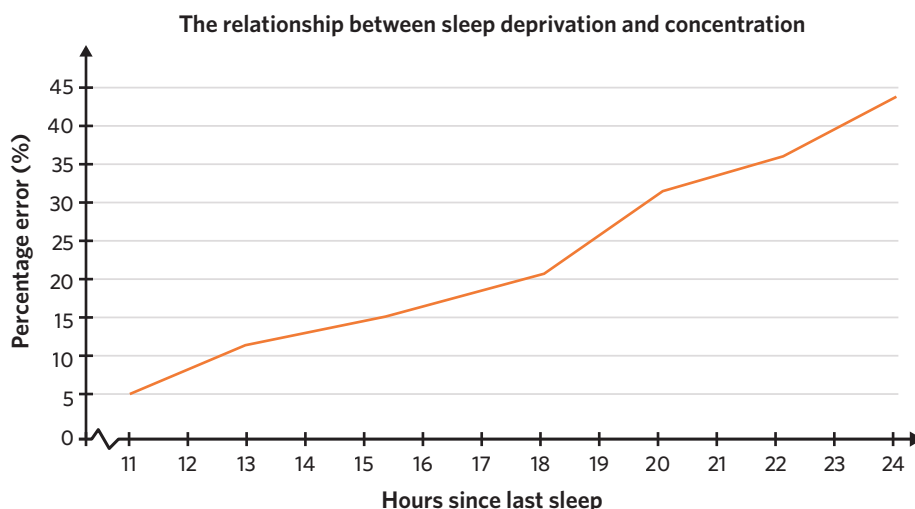
Adapted from VCAA Psychology exam 2021 Q4

Question 8

What is the name given to this way of displaying data?

A. Bar chart.

B. Line graph.

C. Table.

Question 9

What is the type of data displayed?

A. Qualitative data.

B. Quantitative data.

Question 10

Which of the following statements best summarises the data?

A. As participants' sleep deprivation increases, visual-spatial reasoning abilities decrease.

B. As participants' sleep deprivation increases, visual-spatial reasoning abilities increase.

Perfect your phrasing

Question 11

Which of the following sentences is most correct?

A. Standard deviation describes **the spread of data around** the mean.

B. Standard deviation describes **how similar all data is to** the mean.

Exam-style

Remember and understand

Question 12   (1 MARK)

Participants' responses on a rating scale from 1 to 5 is an example of which type of data?

A. Subjective and quantitative.

B. Objective and quantitative.

C. Subjective and qualitative.

D. Objective and qualitative.

Question 13   (1 MARK)

As a measure of variability, standard deviation

A. describes the differences in a data set, with a higher value indicating a greater spread.

B. describes the differences in a data set, with a lower value indicating a greater spread.

C. describes the spread of values around the mean in a data set, with a higher value indicating a greater spread.

D. describes the spread of values around the mean in a data set, with a lower value indicating a greater spread.

Question 14   (2 MARKS)

List two situations when one should use the median as a measure of central tendency instead of the mean.

Apply and analyse

Question 15   (1 MARK)

Hester conducted a study on participants' levels of distress after experiencing road accidents. She collected various forms of data, including participants' responses to open-ended interview questions. What type of data is this an example of?

A. Subjective and quantitative.

B. Objective and quantitative.

C. Subjective and qualitative.

D. Objective and qualitative.

Question 16   (1 MARK)

Murat is a research assistant asked by his head researcher to display their data in a bar chart. Overall, the data shows that as people spend more time on screens, the lower their motivation to exercise. Which of the following bar charts would Murat be most likely to create?

A.

B.

C.

D.
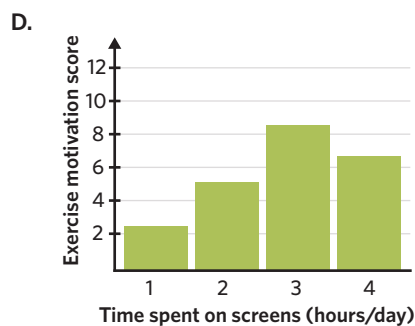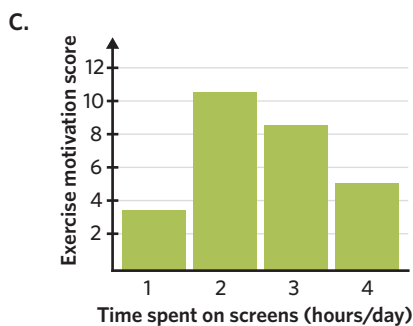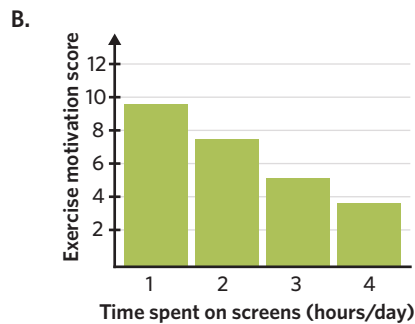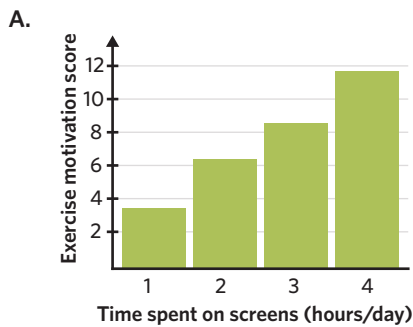
Question 17   (2 MARKS)

Rhian is processing the data from her study and finds an even, normal distribution of values around the mean. Describe how standard deviation could give Rhian more detail about her data set.

Questions from multiple lessons

Question 18   (1 MARK)

Abdullah hypothesises that reading for half an hour before sleeping will decrease the time it takes to fall asleep. To investigate this, he asks his participants to read for 30 minutes before bed and records how many minutes they take to fall asleep. On the second night, he asks participants to do other things before bed and also records how many minutes they take to fall asleep.

Which of the following identifies the type of data collected and experimental design being used?

	Type of data	Experimental design
A.	Qualitative	Between subjects
B.	Qualitative	Within subjects
C.	Quantitative	Between subjects
D.	Quantitative	Within subjects

1F Evaluating research
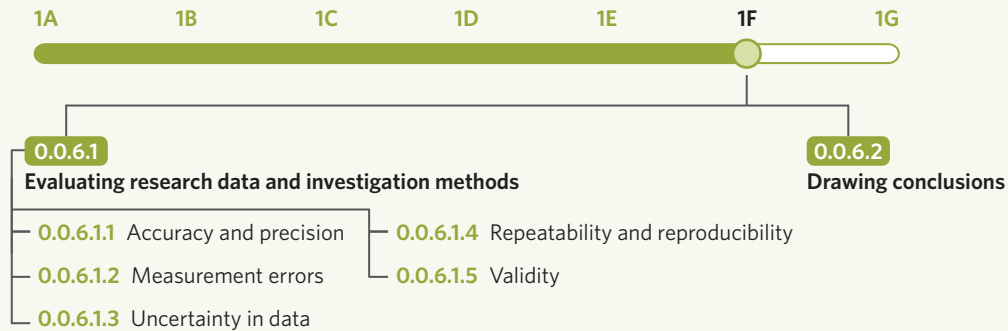
You now know about many of the steps involved in psychological research. However, before researchers can publish their research, they have to evaluate it to ensure it is accurate and of high quality. In this lesson, you will learn about some of the key concepts researchers must consider when evaluating research. You will also learn about how researchers draw conclusions following this evaluation.

Evaluating research data and investigation methods 0.0.6.1

KEY SCIENCE SKILLS

In the study design, this theory relates to the following dot points:

- Analyse and evaluate data and investigation methods
  - identify and analyse experimental data qualitatively, applying where appropriate concepts of: accuracy, precision, repeatability, reproducibility and validity; errors; and certainty in data, including effects of sample size on the quality of data obtained
- Construct evidence-based arguments and draw conclusions
  - evaluate data to determine the degree to which the evidence supports or refutes the initial prediction or hypothesis

ACTIVITY
Log into your Edrolo account for activities that support this lesson.

At the end of a study, as you learnt, researchers must process the quantitative data gathered throughout the study. However, they also must evaluate their data and the methods used to obtain their data using a range of key concepts. We will now explore some of these key concepts used to evaluate research data before conclusions can be drawn.

Theory details

After research is conducted and data is organised, researchers must rigorously evaluate their research before conclusions can be drawn. To do this, they use a range of statistical procedures, as well as consider if their research was high quality and free from errors. If there are too many errors, or researchers determine that they did not uphold certain standards in their procedures and methodology, then it is unlikely that conclusions can be drawn from their research and their findings will not be published. The following concepts are important standards and ways researchers can evaluate their study.

Accuracy and precision 0.0.6.1.1

In psychological research, accuracy and precision are concepts used to evaluate the correctness of measurement, and therefore how prone measurements were to error. A simple example of a measurement is measuring weight.

Accuracy refers to how close a measurement is to the true value of the quantity being measured. **True value** refers to the value, or range of values, that would be found if the quantity could be measured perfectly. An accurate measurement of weight, for example, would use a scale that perfectly records an object's weight. An inaccurate measurement of weight might use a poor quality scale that is grams or even kilograms off the true weight of the object measured. In psychology, accuracy is not described numerically; measurement values are simply described as more accurate or less accurate (VCAA).

By contrast, **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. Using the weight example, a precise measurement of weight means that the scale displays the exact same measurement each time the same item is weighed. An imprecise weight measurement would mean that even when weighing the same item, the scale might show different measurements each time.

Importantly, it is possible for a measurement to be accurate but imprecise, and it is also possible for a measurement to be precise but inaccurate. This is demonstrated in figure 1. Taking a dartboard as a metaphor, an accurate measurement should hit the bullseye; i.e. hit (measure) what it is supposed to. A precise measurement would hit the same place each time, regardless of how close it is to the bullseye.

High accuracy, high precision   **Low accuracy, high precision**   **High accuracy, low precision**   **Low accuracy, low precision**
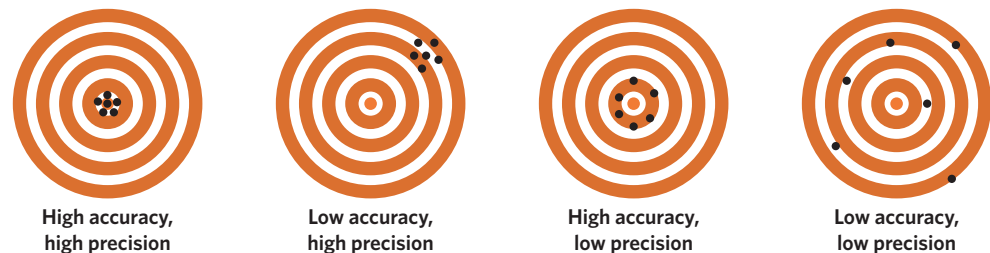
Figure 1 Accuracy and precision are distinct concepts used by scientists to think about errors in measurement

Measurement errors 0.0.6.1.2

In lesson 1D, you learnt about all the types of experimental errors that should be accounted for to prevent the occurrence of extraneous and confounding variables. However, there are other types of errors that can occur in psychological research when taking measurements; these are known as systematic errors and random errors.

Systematic errors

Systematic errors are errors in data that differ from the true value by a consistent amount. For example, systematic errors from a scale may mean that readings are consistently 100 grams lighter than the true value of an object's weight. The consistency or 'systematicness' of an error means that repeating measurements will not improve them (VCAA). Instead, researchers should be aware of the systematic error occurring and account for it, or if it is their error, become more practised with the measurement tool. The presence of systematic errors means the accuracy of measurement is affected (VCAA).

Systematic errors may occur due to:

- environmental factors
- observational/researcher error
- incorrect measurement instrument calibration (VCAA).

Random errors

Random errors are errors in data that are unsystematic and occur due to chance. While random errors also result in measurements that differ from the true value, they do not occur in a consistent way like systematic errors. For example, a random error may be a scale that weighs the same object and shows different, unpredictable readings each time. The presence of random errors means the precision of measurement is affected (VCAA).

Random errors may occur due to:

- poorly controlled or varying measurement procedures
- imperfect or faulty measurement tools, e.g. a scale that is running out of battery
- variations in measurement contexts, including differences between participants and environmental differences. For example, taking a measurement of participants' concentration at night might result in a different measurement of that same variable taken in the morning.

Random errors may be reduced by:

- repeating and conducting more measurements
- calibrating measurement tools correctly
- refining measurement procedures
- controlling any other extraneous variables
- increasing the sample size of participants (VCAA).

Systematic errors	affect the	accuracy
Random errors	affect the	precision
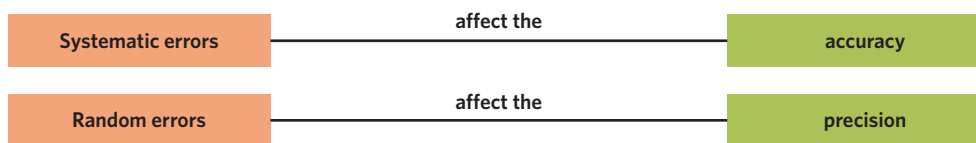
Figure 2 Summary of the relationship between accuracy and precision, and systematic and random errors
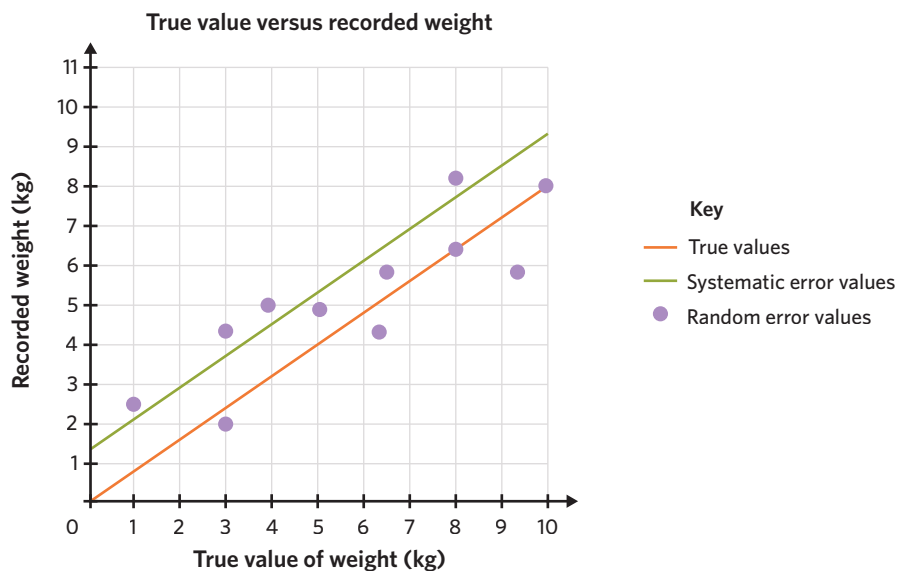
Figure 3 An example of what systematic and random errors from a scale might look like when graphed

Uncertainty in data 0.0.6.1.3

While we might aim to obtain a 'true value' of height or weight, the 'true value' of stress, happiness, or concentration is harder to define. Humans have developed very precise ways of measuring some things, such as millimetres, but not all psychological phenomena are so easy to measure with certainty. **Uncertainty** refers to the lack of exact knowledge relating to something being measured due to potential sources of variation in knowledge. For example, a study may aim to test 'positive mood' and use a range of measures that attempt to assess it. However, given the blurred boundaries of what 'positive mood' truly is, researchers would still have some uncertainty in its assessment. The uncertainty of measurement reflects the lack of exact knowledge regarding the true value and less quantifiable nature of what is being measured.

Part of evaluating research data in psychology involves acknowledging and accounting for this uncertainty. This can involve a range of approaches, such as suggestions for future research and what later iterations of research might target to make findings more robust.

Uncertainty the lack of exact knowledge relating to something being measured due to potential sources of variation in knowledge

Repeatability and reproducibility 0.0.6.1.4

One way of evaluating psychological findings and investigations as a whole is using the concepts of repeatability and reproducibility. Given psychology's strict adherence to a scientific method and iterative nature, particularly hypothesis testing and re-testing, it is extremely important that psychological experiments are able to be repeated. This ensures that any findings are not one-off anomalies and can be confirmed or expanded upon by future research. A scientific finding or study that is both repeatable and reproducible is considered stronger.

Repeatability

Repeatability is the extent to which successive measurements or studies produce the same results when carried out under identical conditions within a short period of time (e.g. same procedure, observer, instrument, instructions, and setting). In short, repeatability is the extent to which the same study or measure used under the same conditions will produce the same results.

Reproducibility

Reproducibility is the extent to which successive measurements or studies produce the same results when repeated under different conditions (e.g. different participants, time, observer, and/or environmental conditions). In other words, reproducibility may be thought of as the extent to which the same study or measure, used under different conditions or with different people or procedures, will produce the same results.

Repeatability the extent to which successive measurements or studies produce the same results when carried out under identical conditions within a short period of time (e.g. same procedure, observer, instrument, instructions, and setting)

Reproducibility the extent to which successive measurements or studies produce the same results when repeated under different conditions (e.g. different participants, time, observer, and/or environmental conditions)
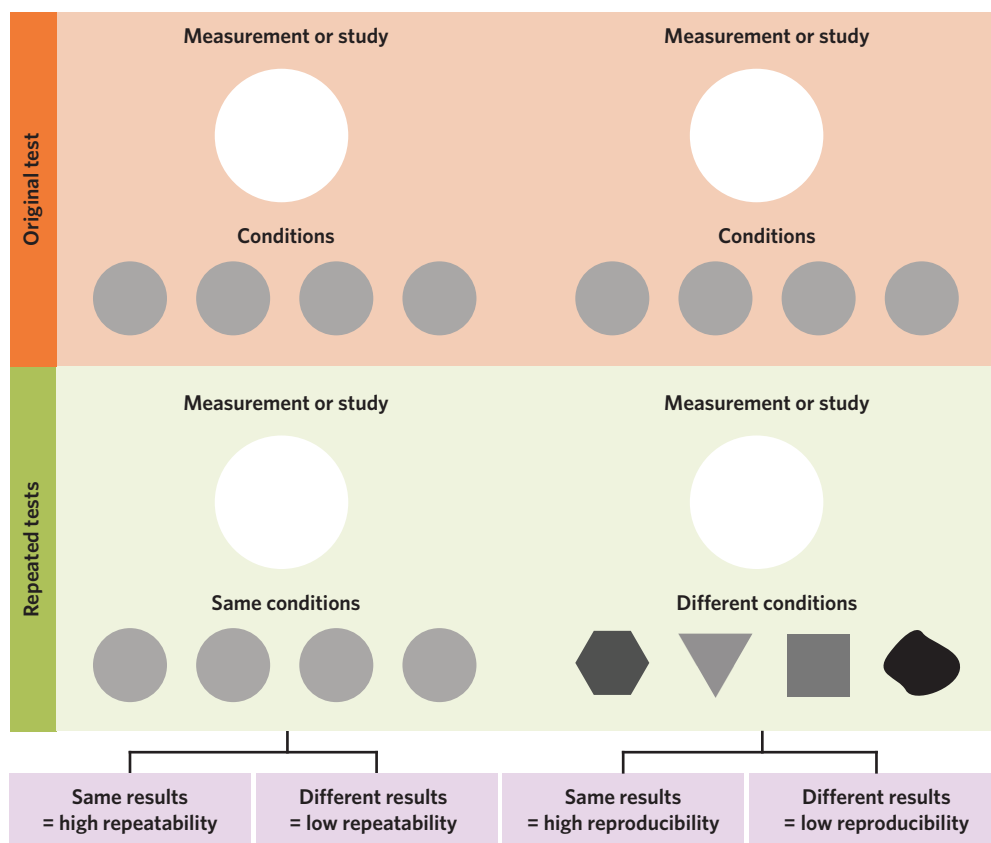
Figure 4 Conceptual diagram of the difference between repeatability and reproducibility

WANT TO KNOW MORE?

Another consideration of psychological research is reliability. Reliability refers to the extent to which a study or specific measure produces consistent results. This includes consistency over time, across individual test items, and between different researchers.

Although rigorous scientific methods are a supposed hallmark of psychology, the discipline has suffered from the 'replication crisis'. The replication crisis is an ongoing and broad problem some sciences face, including psychology. It refers to the phenomenon that some reported results are challenging or impossible to reproduce, or have been supported by poor quality statistical procedures. As such, the credibility of many findings have been called into question.

Since this problem was first raised, scientists, including psychologists, have sought to reform particular practices to rectify conditions that have led to this crisis. For example, the 'Open science' movement has advocated for 'pre-registration'. Here, psychologists are encouraged to pre-upload their hypotheses and methods for approval from peers. It can be considered like a pre-peer review. Additionally, the encouragement of data-sharing means that psychologists are less likely to manipulate data for outcomes that may support their hypotheses.

Validity 0.0.6.1.5

Validity refers to the extent to which psychological tools and investigations truly support their findings or conclusions. Validity as a concept may be applied to evaluate a specific measurement tool or to an investigation as a whole. A valid measure is one that measures what it intends to measure. When evaluating an investigation, there are two distinct types of validity: internal validity and external validity.

Internal validity

Internal validity is the extent to which an investigation truly measures or investigates what it claims to. If internal validity is lacking, then the results of an investigation may not be true and a conclusion cannot be drawn. Researchers should consider the following points if they are to achieve internal validity:

- the adequacy of measurement tools and procedures. Do they test what they claim to?
- the adequacy of the experimental design. Did it minimise extraneous variables?
- the adequacy of sampling and allocation procedures. Was the sample and its allocation representative and unbiased?
- whether the independent variable truly affected the dependent variable. Were there confounding or extraneous variables?

Figure 5 Validity is an umbrella term, under which are the concepts of internal validity and external validity

> **Validity** the extent to which psychological tools and investigations truly support their findings or conclusions
>
> **Internal validity** the extent to which an investigation truly measures or investigates what it claims to
>
> **External validity** the extent to which the results of an investigation can be applied to similar individuals in different settings

LESSON LINK

In lesson **1D Preventing error and bias**, you learnt about extraneous and confounding variables. Controlling these types of experimental errors helps to ensure that internal validity is not compromised. This is because the presence of these variables means that variables other than the independent variable may impact the dependent variable, and there are alternative explanations for results.

External validity

External validity is only considered when internal validity is present. **External validity** is the extent to which the results of an investigation can be applied to similar individuals in different settings (VCAA). This different setting could be a different time (e.g. repeating an investigation later) or a different environment.

External validity can be improved by:

- using sampling procedures that create a more representative sample; i.e. more similar to people in the real world.
- having broad inclusion criteria (characteristics of people in the sample); i.e. having a diverse range of people in the sample, including culturally, again so it is more representative of people in the real world.
- using a larger sample size, which makes it more likely to be representative of the population.

Table 1 Summary of the difference between internal and external validity

	Internal validity	**External validity**
Key question	Did the study truly measure what it claimed to?	Can the study's results be applied to similar people in other contexts?
Area of consideration	Inside the present study	Beyond the present study

Drawing conclusions 0.0.6.2

After using the methods of evaluation we have discussed to check if their research is of high quality, researchers are more equipped to draw a valid conclusion for their study.

Theory details

In psychological research, a **conclusion** is a statement that summarises the findings of a study, including whether the hypothesis was supported or rejected. The term conclusion may also refer to the final section of a written report or article in psychology that summarises the findings and makes final recommendations for future research. Table 2 outlines what should be considered when making conclusions and strategies researchers may use for each.

Conclusion a statement that summarises the findings of a study, including whether the hypothesis was supported or rejected

Table 2 Important considerations when drawing conclusions in psychological research

Consideration	Questions to consider
The extent to which the data (evidence) supports or rejects the hypothesis	• What did the data and statistics (descriptive and inferential) reveal? Does it support or reject the hypothesis? • Was the data set complete or did it exclude important information? • Were accuracy, precision, repeatability, reproducibility, validity, errors, and the certainty of data ensured?
Whether further evidence is required	• What did the data and statistics (descriptive and inferential) reveal? • Was the data set complete or did it exclude important information? • Were accuracy, precision, repeatability, reproducibility, validity, errors, and the certainty of data ensured? • Was the aim of the study met? Why or why not?
Whether there are clear recommendations for further studies	• What might future studies do to make the present findings more robust? • What modifications to the present study could make its findings more robust? For example, should it be conducted again using a different sample, under different conditions, or using an alternative method or measurement tool? • If accuracy, precision, repeatability, reproducibility, validity, errors, and the certainty of data were not ensured, how might they be? • If there were extraneous and confounding variables, how could they be controlled for?

WANT TO KNOW MORE?

In real-world psychological investigations, conclusions must be based on inferential statistics. Unlike descriptive statistics, which merely summarise the data, inferential statistics help researchers to 'infer' and make conclusions about the research population.

Inferential statistics enable researchers to comment on the statistical significance of their results; i.e. how likely the results were truly due to the causal relationship between variables, as opposed to chance or randomness. This judgement is derived from a specific type of inferential statistic known as the p-value.

LESSON LINK

In lesson **1A Introduction to research**, you learnt about why psychology is a science. It is important that conclusions do not state that something was 'proved' or 'disproved', as this goes against the iterative nature of psychology as a science that is open to testing, retesting, and review. Instead, a conclusion should simply state whether the hypothesis was supported or rejected within the confines of the present study.

Theory summary

In this lesson, you have learnt what a conclusion is in psychological research. You have also learnt about some very important concepts researchers use to evaluate the quality of their research procedures and the data they collect before making conclusions.
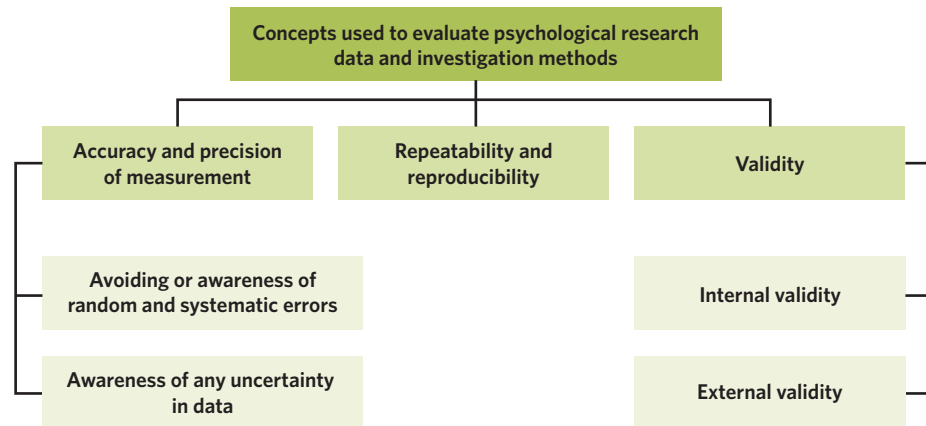
Figure 6 Summary of lesson 1F

1F Questions

Question 1

After researchers process their quantitative data, they are ready to make a conclusion.

A. True.

B. False.

Question 2

A conclusion is

A. a summary of results that states whether the aim was met.

B. a summary of results that states whether the hypothesis was supported or refuted.

Question 3

Which of the following are important concepts researchers should apply when evaluating their research?
(Select all that apply)

I. Validity.

II. Reproducibility.

III. Repeatability.

IV. Conclusivity.

V. True value.

Question 4

_____ assesses whether a study investigated what it intended to measure, whereas _____
assesses whether a study's results can be applied to similar individuals in different settings.

Which of the following best fills in the blanks?

A. Internal validity; external validity

B. External validity; internal validity

Question 5

_____ is affected when there are random errors, whereas _____ is affected when there are
systematic errors.

Which of the following best fills in the blanks?

A. Precision; accuracy

B. Accuracy; precision

Question 6

If researchers are very careful and use rigorous methods, they can produce findings with certainty.

A. True.

B. False.

Question 7

Validity is

A. the degree to which psychological tools, findings, and studies **are factual**.

B. the degree to which psychological tools, findings, and studies **truly support their findings**.

Question 8

Accuracy is

A. how closely a measurement is to the **real value** of what is being measured.

B. how closely a measurement is to the **true value** of what is being measured.

Problem-solving

The following assessment skills type reflects the study design assessment type:

- problem-solving involving psychological concepts, skills and/or issues

Use the following information to answer questions 9–11.

Peter just collected data for a research project on the effectiveness of a coping mechanism for stress. He had to record participants' height and weight as part of this research. Upon examining participants' recorded height, he noticed something funny: all participants' heights seemed off and, when he checked, he realised they were all 10 centimetres too high.

To ensure his data is of high quality, Peter wants to re-record participants' heights and avoid making the same mistake. In order to do this, Peter should identify which type of error he made and how it occurred.

Question 9

Which of the following is the type of error Peter made?

A. Systematic error.

B. Random error.

C. True value error.

Question 10

What does this mean for Peter's research?

A. His research lacks precision.

B. His research lacks accuracy.

Question 11

Which of the following is a way Peter could reduce these errors in future? **(Select all that apply)**

I. Make sure his measuring instrument (e.g. tape measure) is correct.

II. Make sure he observes and records the heights correctly.

III. Ensure that there is a bigger sample size of participants.

Exam-style

Remember and understand

Question 12   (1 MARK)

The presence of confounding variables most directly affects

A. external validity.

B. internal validity.

C. reproducibility.

D. repeatability.

Question 13   (2 MARKS)

Compare repeatability and reproducibility.

Apply and analyse

Question 14 (1 MARK)

A measurement tool that consistently predicts intelligence amongst children, adolescents, and adults
is likely to have

A. high repeatability.

B. high reproducibility.

C. high validity.

D. high precision.

Use the following information to answer questions 15 and 16.

Doctor Juan was conducting a study on the relationship between height and dating confidence amongst
18 to 25-year-old males. The true value of the men's heights were recorded, as well as Doctor Juan's own
corresponding recordings of these heights, is plotted on the graph below.
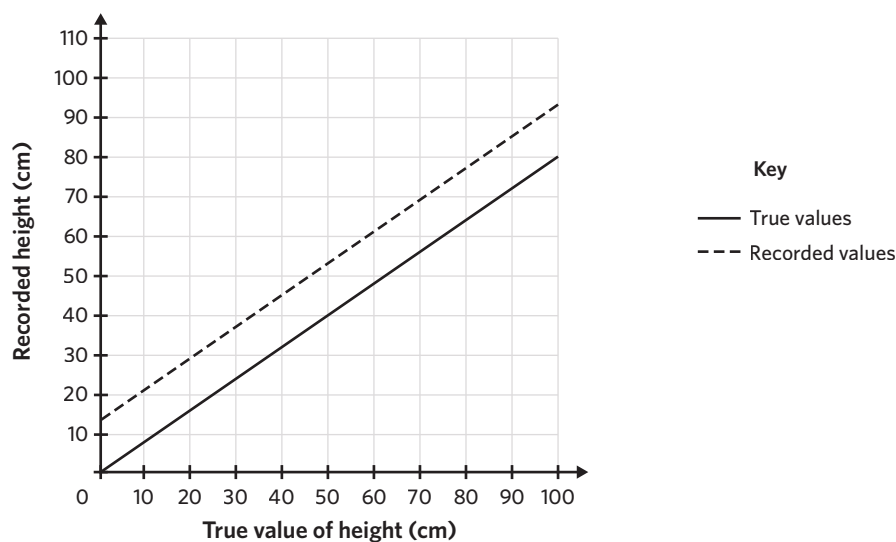
Question 15 (1 MARK)

This graph reveals that Doctor Juan's recording of participants' height was

A. precise and accurate.

B. accurate, but not precise.

C. precise, but not accurate.

D. neither accurate nor precise.

Question 16 (1 MARK)

Which of the following is the type of error in Doctor Juan's study and a possible strategy Doctor Juan could
use to reduce such errors?

A. random errors and by ensuring there are no participant-related extraneous variables.

B. random errors and by recalibrating his measurement instrument.

C. systematic errors and by ensuring there are no participant-related extraneous variables.

D. systematic errors and by recalibrating his measurement instrument.

Question 17 (4 MARKS)

Stefan conducted a study to test whether a new running technique increased runners' speed. When he used
the technique with his sample of participants, he found that it increased their speed each time. However, after
the study, his colleague tested the same technique with another group of similar runners, but in a different city,
and found that it was ineffective.

With reference to repeatability and reproducibility, outline one strength and one weakness of Stefan's study.

Questions from multiple lessons

Question 18   (3 MARKS)

Maria conducted a study on beach volleyball players' levels of anxiety prior to games. Maria wished to investigate whether higher levels of pre-game anxiety improved performance. After completing her research, Maria discovered that all the games she conducted testing in were practice matches performed on players' home courts.

Identify and explain how an extraneous variable may have affected Maria's ability to draw a valid conclusion.

1G Ethical considerations

1A   1B   1C   1D   1E   1F   1G

0.0.7.1
Ethical concepts

0.0.7.2
Ethical guidelines

0.0.7.3
Factors relevant to psychological issues
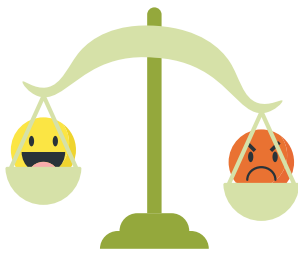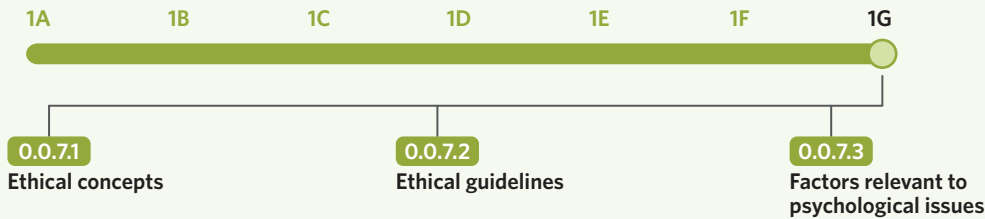
ACTIVITY

Log into your Edrolo account for activities that support this lesson.

Is it okay to test a brand new drug, the risk of which is not yet known, on humans or animals? What if this drug could potentially save the lives of millions? Is it okay to record people without them knowing if it might help researchers to answer questions that could improve the state of modern schooling, or the way parents look after their children? And what about lying: is it okay to lie to people about why they are being asked a series of highly personal questions? What if they are told the truth later? All of these considerations concern ethics, which is a branch of knowledge and ideas that are concerned with what is morally right or wrong.

In this lesson, you will learn about the ethical concepts and guidelines that must be kept in mind when conducting research in the field of psychology.

Ethical concepts 0.0.7.1

KEY SCIENCE SKILLS

In the study design, this theory relates to the following dot point:
- Comply with safety and ethical guidelines
  - demonstrate ethical conduct and apply ethical guidelines when undertaking and reporting investigations

Ethical concepts are the moral guiding principles that should be followed and considered when doing psychological research, practice, or examining a psychological issue.

Theory details

Imagine you are in a crowded shopping centre on the weekend. As you are strolling around, concentrating on finding your way, a person comes from behind you and steals your bag, threatening to physically hurt you if you try to get it back. They run off.

You're quite shaken up by this event and take a seat to collect yourself. Eventually, you pull yourself together, still feeling fairly anxious, and leave the shopping centre. On your way out, a person stops you and pulls you aside revealing that you have been a participant in a study on people's fear reactions in crowded versus non-crowded environments. They ask you to subsequently fill out a survey.

How do you feel? You may feel a sense of anger or betrayal: how could people, without your permission, make you feel so distressed? Someone could have gotten hurt! Was that study really fair? Honest? Worth the harm it caused? All of these considerations are examples of ethical concepts.

In psychology, **ethical concepts** refer to the broad, moral guiding principles that people should consider when conducting research, practising psychology, or when analysing a psychological issue or debate. In contrast to ethical guidelines, ethical concepts are not prescribed by a specific rulebook, body or organisation. Instead, they are just general principles that can help researchers and students of psychology act and think in a more morally-conscious way. Some ethical concepts you may be familiar with include:

- beneficence
- integrity
- justice
- non-maleficence
- respect.

These concepts are displayed in figure 1 and will be described in table 1.
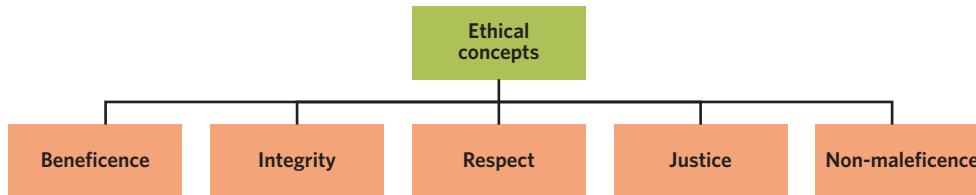
Figure 1 Ethical concepts relevant to psychology

Table 1 Ethical concepts in psychology

Ethical concept	Definition	Relevant considerations
Beneficence	**Beneficence** refers to the commitment to maximising benefits and minimising the risks and harms involved in taking a particular position or course of action (VCAA).	Some considerations related to beneficence include: • whether the research design minimises harm. • where harm is a necessary part of the research, it is outweighed by the merits (benefits) of the study. • participants' welfare.
Integrity	**Integrity** is the commitment to searching for knowledge and understanding, and 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 (VCAA).	Some considerations related to integrity include: • objective and open reporting and recording of results. • processes of peer review. • thoroughness of any literature review and other research procedures.
Justice	**Justice** in research is 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 (VCAA).	Some considerations related to justice include: • objectivity in evaluating results. • ensuring the research design and suggestions on the basis of conclusions are not discriminatory against certain groups. • ensuring psychological practice does not stereotype or discriminate. • equity in access to psychological services and findings. Continues ▶

Table 1 Continued

Ethical concept	Definition	Relevant considerations
Non-maleficence	**Non-maleficence** is the principle of avoiding causing harm. However, as a position or course of action 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 (VCAA).	Some considerations related to non-maleficence include: • designing research to minimise psychological and physical harm. • participants' welfare. • cost-benefit analyses of whether benefits outweigh the risks.
Respect	**Respect** is the 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, ensuring that they are empowered where possible and protected as necessary (VCAA).	Some considerations related to respect include: • respect for and consideration of the welfare of human and non-human research participants. • protection of participants' autonomy. • respect for individuals' personal beliefs and cultures.

Non-maleficence (also known as the no-harm principle) the principle of avoiding causing harm

Respect the 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

Ethical guidelines 0.0.7.2

KEY SCIENCE SKILLS

In the study design, this theory relates to the following dot point:
- Comply with safety and ethical guidelines
  – demonstrate ethical conduct and apply ethical guidelines when undertaking and reporting investigations

---

Ethical guidelines refer to the rights participants are entitled to in research and that researchers must ensure are provided.

Theory details

Although general ethical concepts are very important to keep in mind, there is also a set of ethical guidelines researchers must consider and follow when conducting investigations. In VCE Psychology, **ethical guidelines** include the procedures and principles used to ensure that participants are safe and respected. When you evaluate research yourself, you should consider whether these guidelines have been followed.

Ethical guidelines (also known as participants' rights) the procedures and principles used to ensure that participants are safe and respected

Where do ethical guidelines come from? In Australia, the Australian Psychological Society has developed a Code of Ethics that all psychologists must follow, and a set of accompanying guidelines. This has been used as the code for Australian psychology since 2010, when it was adopted by the Psychology Board of Australia.

This Code of Ethics has the same guidelines as the National Statement on Ethical Conduct in Human Research (last updated in 2018). This statement was issued by the National Health and Medical Research Council (NHMRC), which is a governmental body responsible for research guidelines.

Importantly, there are also specific guidelines that must be followed when working with Aboriginal and Torres Strait Islander Peoples and communities, including:

- Ethical conduct in research with Aboriginal and Torres Strait Islander Peoples and communities: Guidelines for researchers and stakeholders (NHMRC)
- Code of Ethics for Aboriginal and Torres Strait Islander Research (Australian Institute of Aboriginal and Torres Strait Islander Studies).

Before any psychological research begins, it must be approved by an ethics committee that ensures the study is designed in a way that meets ethical standards. We will now look at the following ethical guidelines, which may also be considered as participants' rights in research:

- confidentiality
- informed consent procedures
- use of deception
- debriefing
- voluntary participation
- withdrawal rights.

Participants should be made aware of their rights at the beginning of a study. It is the role of researchers to ensure that these guidelines are upheld. These ethical guidelines are displayed in figure 2 and explained in table 2.
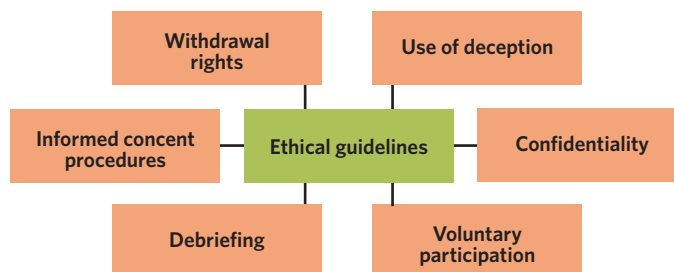
Figure 2 Ethical guidelines in psychology

Confidentiality the privacy, protection and security of a participant's personal information in terms of personal details and the anonymity of individual results, including the removal of identifying elements

Informed consent procedures processes that ensure participants understand the nature and purpose of the experiment, including potential risks (both physical and psychological), before agreeing to participate in the study

Deception the act of intentionally misleading participants about the true nature of a study or procedure

Debriefing a procedure that ensures that, at the end of the experiment, the participant leaves understanding the experimental aim, results and conclusions

Table 2 Ethical guidelines and participants' rights in research

Ethical guideline	Definition	Ways this guideline may be ensured
Confidentiality	**Confidentiality** refers to the privacy, protection and security of a participant's personal information in terms of personal details and the anonymity of individual results, including the removal of identifying elements (VCAA).	• Having data storage tools and procedures that are safe and secure. • Anonymising participants' results when sharing or publishing them.
Informed consent procedures	**Informed consent procedures** are processes that ensure participants understand the nature and purpose of the experiment, including potential risks (both physical and psychological), before agreeing to participate in the study (VCAA).	• Voluntary written consent should be obtained by the experimenter. If participants are unable to give this consent, then a parent or legal guardian should provide this (VCAA). • Participants under 18 must have their parents or guardians give consent. Participants should give consent as well where possible. • Participants who for other reasons, such as disability, cannot give consent, must also have someone give consent on their behalf.

Continues ▶

Table 2 Continued

Ethical guideline	Definition	Ways this guideline may be ensured
Use of deception	**Deception** refers to the act of intentionally misleading participants about the true nature of a study or procedure. Deception is only permissible when participants' knowledge of the true purpose of the experiment may affect their behaviour while participating in the study, and the subsequent validity of the experiment (VCAA). It should only be used when necessary. For example, a study may use a confederate (research actor) that acts as though they need help in order to record participants' responses to such a situation. Knowing the confederate is acting would impact the validity of the results.	• The possibility that deception may be used must be outlined in the consent form. • Any deception used during research must be fully explained at the conclusion of the study. • Participants' questions should be answered at the conclusion of a study.
Debriefing	**Debriefing** is a procedure that ensures that, at the end of the experiment, the participant leaves understanding the experimental aim, results and conclusions (VCAA). Debriefing must be conducted at the end of every study.	• Participants' questions should be answered at the conclusion of a study. • Support should be offered to participants to address any harm from the study. • Debriefing must occur at the conclusion of the study and participants must be told about any deception.
Voluntary participation	**Voluntary participation** is a principle that ensures there is no coercion or pressure put on the participant to partake in an experiment, and they freely choose to be involved (VCAA).	• In order to have true voluntary participation, there must also be informed consent. • Participants must not be coerced, but rewards for participation are permitted. However, there can be no negative consequences if a participant does not agree to participate.
Withdrawal rights	**Withdrawal rights** refer to the right of participants to be able to discontinue their involvement in an experiment at any time during, or after the conclusion of, an experiment without penalty (VCAA).	• Participants' results should be removed from the study if they wish to withdraw at any point, even after the conclusion of the study. • Participants should not be coerced in any way to remain in the study. • Any compensation offered for time spent at the beginning of the study should still be offered to participants who withdraw.

Voluntary participation
a principle that ensures there is no coercion or pressure put on the participant to partake in an experiment, and they freely choose to be involved

Withdrawal rights
the right of participants to be able to discontinue their involvement in an experiment at any time during, or after the conclusion of, an experiment without penalty

WANT TO KNOW MORE?

In lesson **1D Preventing error and bias**, you learnt about the use of placebos in studies to serve as a comparative baseline. There are certain ethics surrounding the use of placebo medication in psychological research including:

• Informed consent: participants must be made aware that they could be allocated to an experimental condition in which they may receive a placebo. They must also be told about any potential negative side effects of taking a placebo.

• Voluntary participation: if participants are taking a treatment already, they must be told to stop for the duration of the study. This must be voluntary.

• Debriefing: participants must be thoroughly debriefed at the conclusion of the study and told if they received a placebo or not.

• Withdrawal rights: participants must be told that they can withdraw at any time, especially with regard to taking a placebo.

Factors relevant to psychological issues 0.0.7.3

When analysing psychological issues, one should consider the relevance of any social, economic, legal, and political factors. These can have ethical implications.

Theory details

In addition to considering ethical concepts and guidelines, researchers and psychologists should also consider the relevance of any sociocultural, economic, legal, and political factors to their:

- research
- analysis and evaluation of psychological issues
- work in the field.

These factors are important to ethics as they play a part in what is considered right and wrong. For example, something that is illegal may be considered wrong under the view of the law, but for some sociocultural groups, be seen as acceptable or ideal. When you analyse issues in Psychology as part of your VCE studies, you should also consider these factors. It's important to know that these factors are broad in nature and may overlap. In some contexts, for example, an economic factor may also be a sociocultural one. These factors are outlined in figure 3.
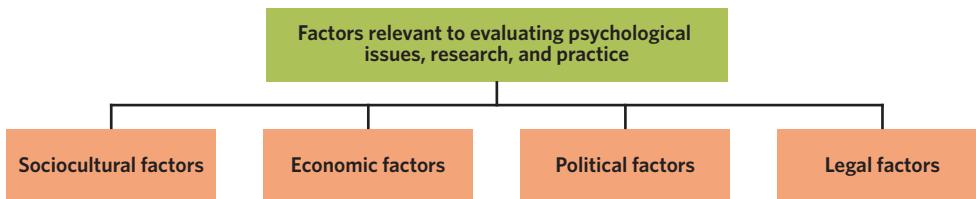
Figure 3 Factors to consider when evaluating psychological issues, research and practice

The factors relevant to psychological issues are explored in table 3. It's important to know that these four types of factors are umbrella terms. Within each type, there could be multiple factors. For example, a person's income, their job, and their family and friends' wealth could all be classed under the umbrella of 'economic factors'.

Table 3 Different factors relevant to psychological issues

Factor	Explanation
Sociocultural factors	Sociocultural factors are the environmental conditions that impact the practices, beliefs, social norms, and expectations of individuals or groups. These factors include family support, education history and opportunity, and availability of healthcare. For example, when evaluating a psychological issue, considering the relevance of people's religious beliefs might be a sociocultural factor that requires consideration.
Economic factors	Economic factors are financial factors, such as the income of individuals, as well as financial characteristics of a study, such as the funding of the research.
Legal factors	Legal factors relate to how the law and legal systems influence individuals, groups, and organisations. When examining a psychological issue, one might consider whether any laws were broken. Further, when designing research, experimenters should ensure they are following relevant legislation.
Political factors	Political factors are the environmental conditions that impact the beliefs and actions of groups and individuals, including political climate, government policies and decisions, and international relations.

Worked example

Psychological issue: The accessibility of mental health care services in Australia

We can see these four factors at play when we analyse and evaluate real-world issues or debates in psychology. There are many contemporary issues and debates in psychology, such as the use of animals in research, how to best address mental illness, the mind-body debate, the use of drugs for mental health and so on.

Accessing mental health care services (services and tools to treat mental health problems or mental illness) is a much-debated psychological issue in contemporary Australia for many reasons. Some argue that it is not accessible enough across wider society and needs to be improved. There are a range of factors that influence why people may or may not access mental health care services. We will now discuss these factors through the lens of the four umbrella factors in table 4. When you read these factors, consider how they may influence someone's perceptions about the ethics of the issue; i.e. what is right or wrong.

Table 4 Applying the four factors to the psychological issue of accessing mental health care services in Australia

Factor	Examples relevant to the issue of accessing mental health care in Australia
Sociocultural factors	• Stigma refers to a sense of shame surrounding something. There is often a sense of shame or embarrassment around having mental health issues and seeking help. This may serve as a barrier, stopping some people from accessing psychotherapy. • Some cultures or social groups may, for a variety of reasons, be opposed to seeking mental health support. This may stem from a lack of belief in the importance of mental health, or again, stigmatisation. For example, men may be more hesitant to seek support as there is a societal and cultural expectation on men to be less emotional. Although this narrative may be shifting in Australia, it may still affect some. • Education is another social factor that may affect access to psychotherapy. People may not be informed about the availability of services, or more generally, the importance of mental health. • Culturally appropriate mental health care may also be limited for certain cultural groups. Much of modern psychotherapy was developed using western subjects, meaning its methods may not be appropriate or sensitive to other populations. This may prevent these populations from seeking mainstream mental health care services. • Therefore, we can view this factor in regard to the ethical concept of respect. Ensuring that all people, regardless of their culture are treated with respect, can help address this issue and increase access to mental health services.
Economic factors	• The affordability of mental health services is a major barrier for some in accessing them. Some mental health services, such as seeing a therapist, can be very expensive. • The cost of medication may also be a major barrier for some. • It is important to consider whether people have fair access to mental health services and medications, which is reflective of the ethical concept of justice as all people should have a fair distribution and access to mental health services.
Legal factors	• Not all forms of mental health care are legal. In Australia, while talk therapy with a registered psychologist is legal, some other forms of therapy are not. For example, in some parts of the world, it is legal to undergo sessions with a therapist while under the influence of drugs like MDMA or psilocybin. This is not the case in Australia. • When decisions are made regarding whether certain forms of mental health care are legal, it is important to consider it through the ethical lens of beneficence. Policy-makers need to consider if the potential benefits of a psychological treatment outweigh any risks.
Political factors	• Government policies and legislation surrounding mental health care directly impact people's ability to access these services. Again, policy makers often consider ethical considerations, like beneficence, when making decisions. • In Australia, Medicare subsidises (partially covers the cost of) a number of sessions with a psychologist. This means the out-of-pocket fee a person has to pay a psychologist is reduced. However, some argue that this subsidy is not enough as the remaining fees can still be costly and people may need more than 20 sessions. • The legislation dictates that to access these sessions, people must also have a mental health care plan. This involves going to a doctor and filling out paperwork to get approved. This also relates to the ethical concept of justice in that it attempts to create a fairer distribution and access to mental health services.

Theory summary

In this lesson, you learnt all about ethics in Psychology. You learnt the difference between the ethical concepts and ethical guidelines, as well as some factors that are important when analysing contemporary issues and debates in the field of psychology.

Ethical considerations		
Ethical concepts The broad moral guiding principles	**Ethical guidelines** Participants' rights in research	**Other factors relevant to psychological issues** Broad factors used to evaluate psychological issues, research, and practice
• beneficence • integrity • justice • non-maleficence • respect	• confidentiality • informed consent procedures • use of deception • debriefing • voluntary participation • withdrawal rights	• sociocultural factors • economic factors • legal factors • political factors

Figure 4 Components of ethical considerations in VCE Psychology

1G Questions

Theory review

Question 1

_____ refer to the broad moral guiding principles that psychologists and researchers should consider, whereas _____ are the rights research participants have and a researcher must ensure are met.

Which of the following best fills in the blanks?

A. Ethical concepts, ethical guidelines.

B. Ethical guidelines, ethical concepts.

Question 2

Which of the following are examples of ethical concepts? **(Select all that apply)**

I. Justice.

II. Respect.

III. Confidentiality.

IV. Legal factors.

V. Beneficence.

Question 3

Which of the following are examples of ethical guidelines? **(Select all that apply)**

I. Integrity.

II. Withdrawal rights.

III. Debriefing.

IV. Justice.

V. Voluntary participation.

Question 4

Sociocultural, economic, legal, and political factors all have an influence on the ethics of a situation.

A. True.

B. False.

Assessment skills

Perfect your phrasing

Question 5

Which of the following sentences is most correct?

A. Withdrawal rights refer to the **right** of participants to be able to discontinue their involvement in an experiment at any time **during or after the conclusion of an experiment**, without penalty.

B. Withdrawal rights refer to the **ability** of participants to be able to discontinue their involvement in an experiment at any **time of a study**, without penalty.

Text analysis

The following assessment skills type reflects the study design assessment type:

- media analysis of one or more contemporary media texts.

Use the following information to answer questions 6–8.

> **We mightn't like it, but there are ethical reasons to use animals in medical research**
>
> *Author: Trichur Vidyasagar (Professor, Department of Optometry and Vision Sciences and Melbourne Neuroscience Institute, The University of Melbourne).*
>
> The media regularly report impressive medical advances. However, in most cases, there is a reluctance by scientists, the universities, or research institutions they work for, and the media to mention animals used in that research, let alone non-human primates. Such omission misleads the public and works against long-term sustainability of a very important means of advancing knowledge about health and disease.
>
> Consider the recent report by Ali Rezai and colleagues, in the journal Nature, of a patient with quadriplegia who was able to use his hands by just thinking about the action. The signals in the brain recorded by implanted electrodes were analysed and fed into the muscles of the arm to activate the hand directly.
>
> When journalists report on such bionic devices, rarely is there mention of the decades of research using macaques that eventually made these early brain-machine interfaces a reality for human patients. The public is shielded from this fact, thereby lending false credence to claims by animal rights groups that medical breakthroughs come from human trials with animal experiments playing no part.
>
> Development of such brain-machine interfaces requires detailed understanding of how the primate brain processes information and many experiments on macaques using different interfaces and computing algorithms. Human ethics committees will not let you try this on a patient until such animal research is done.
>
> Read the full article on The Conversation: https://theconversation.com/we-mightnt-like-it-but-there-are-ethical-reasons-to-use-animals-in-medical-research-58878
>
> (Vidyasagar, 2016)

Question 6

The article mentions that 'human ethics committees will not let you try this on a patient until such animal research is done.' Which of the following ethical concepts might be the most relevant reason for this?

A. Integrity.

B. Non-maleficence.

Question 7

Which of the following ethical concepts might be most clearly compromised by the use of animals in research?

A. Respect.

B. Beneficence.

Question 8

The article states that '… in most cases, there is a reluctance by scientists, the universities, or research institutions they work for, and the media to mention animals used in that research, let alone non-human primates.' Which of the following factors is most likely to account for this?

A. Economic factors.

B. Sociocultural factors.

C. Legal factors.

Exam-style

Remember and understand

Question 9   (1 MARK)

Which of the following is an ethical guideline that must be followed before the beginning of a study?

A. Debriefing.

B. Informed consent.

C. Withdrawal rights.

D. Confidentiality.

Question 10   (1 MARK)

Debriefing must be conducted

A. at the end of every study.

B. only when deception is used.

C. only when participants request it.

D. when an error has occurred.

Question 11   (1 MARK)

Anonymising participants' data is an example of

A. debriefing.

B. withdrawal rights.

C. confidentiality.

D. deception.

Question 12   (2 MARKS)

Identify and outline one ethical concept.

Apply and analyse

Question 13   (1 MARK)

Gillian is conducting research on the effects of study on the sleep patterns of adolescents. She recruits 20 16-year-old students from a local secondary school.

Before commencing this experiment, Gillian is ethically required to collect informed consent from

A. the adolescents.

B. a parent/legal guardian.

C. the adolescents and their teachers.

D. the adolescents and their parent/legal guardian.

Adapted from VCAA Psychology exam 2019 Q37

Question 14 (4 MARKS)

Doctor Petsopoulos is conducting a trial to test the efficacy of psilocybin on patients' mood and creativity. He uses a between-subjects group and gives the control group a placebo to serve as a baseline.

Explain how Doctor Petsopoulos would satisfy ethical guidelines in terms of using a placebo in his study.

Adapted from VCAA Psychology exam 2019 Q6c

Questions from multiple lessons

Use the following information to answer questions 15–17

Professor Zeitgeist wants to test an intervention for improving low mood through cardiovascular exercise. He plans to recruit participants from the university's gym.

After reading the participant information sheet about the specific purposes of the study and signing a consent form, the groups will be randomised to either the experimental condition or the control condition. The experimental group will be told to complete a gym circuit for 45 minutes of vigorous exercise, with no break or option to leave. The control group will not complete any exercise after providing consent.

Immediately after either condition, the participants will rate their feelings of mood across the study period, then Professor Zeitgeist plans to discuss the findings with the participants and any uncomfortable experiences they had. The groups will be assessed on their mood ratings. The key outcome will be the difference between the two conditions.

Adapted from VCAA Psychology exam 2021 Q37–39

Question 15 (1 MARK)

The ethics review panel requested modifications when it first received Professor Zeitgeist's study proposal.

Based on the information provided above, what did Professor Zeitgeist fail to consider?

A. Deception.

B. Debriefing.

C. Informed consent.

D. Withdrawal rights.

Question 16 (1 MARK)

Which experimental research design and sampling procedure is Professor Zeitgeist adopting?

A. Within subjects with random sampling.

B. Between subjects with stratified sampling.

C. Between subjects with convenience sampling.

D. Within subjects with random stratified sampling.

Question 17 (1 MARK)

Professor Zeitgeist is concerned with how generalisable his findings are to people who cannot afford gym memberships and can only exercise outdoors or in makeshift settings.

Professor Zeitgeist's concern is primarily considering the influence of

A. political factors on the external validity of his results.

B. political factors on the internal validity of his results.

C. economic factors on the external validity of his results.

D. economic factors on the internal validity of his results.

Chapter 1 review

Chapter summary

In this chapter, you learnt about what constitutes scientific research, its process, and how it is evaluated.

In lesson **1A Introduction to research**, you learnt about how to identify scientific research and the fundamentals of psychological research. Specifically, you learnt about:

- the difference between scientific and non-scientific ideas.
- models and theories.
- the scientific method, including
  - aims and hypotheses
  - variables.

In lesson **1B Scientific research methodologies**, you learnt about the different types of scientific investigation methodologies that researchers may use, including when they are appropriate and how they are evaluated. Specifically, you learnt about:

- types of psychological studies, including
  - controlled experiments (within subjects, between subjects, and mixed designs)
  - case studies
  - correlational studies.
- other processes and techniques, including
  - classification and identification
  - fieldwork (such as direct observation, qualitative interviews, questionnaires, focus groups, and yarning circles)
  - literature review
  - modelling
  - product, process, or system development
  - simulation.
- evaluation of investigation methodologies.

In lesson **1C Population, sample, and sampling**, you learnt about the ways in which researchers choose the participants for their study. Specifically, you learnt about:

- the difference between a population and a sample.
- sampling techniques, including
  - convenience sampling
  - random sampling
  - stratified sampling.
- allocation.

In lesson **1D Preventing error and bias**, you learnt about the potential problems that researchers face when conducting experiments, as well as ways to prevent or minimise them. Specifically, you learnt about:

- extraneous and confounding variables, including
  - participant-related variables
  - order effects
  - placebo effects
  - experimenter effects
  - situational variables
  - non-standardised instructions and procedures
  - demand characteristics.
- the prevention of extraneous and confounding variables, including
  - counterbalancing
  - placebo
  - single-blind procedure
  - double-blind procedure.

In lesson **1E Organising and interpreting data**, you learnt about the different types of data and how this data is organised, interpreted, and communicated. Specifically, you learnt about:

- the ways to categorise data, including
    - primary versus secondary data
    - quantitative versus qualitative data
    - objective versus subjective data.
- the processing of quantitative data through descriptive statistics, including
    - percentages
    - measures of central tendency (mean, median, and mode)
    - outliers
    - measures of variability.
- the presentation of data, including
    - tables
    - bar charts
    - line graphs.

In lesson **1F Evaluating research**, you learnt about the key concepts that must be considered when evaluating scientific research. Specifically, you learnt about:

- accuracy and precision, including
    - systematic errors
    - random errors
    - uncertainty in data.
- repeatability and reproducibility.
- validity, including
    - internal validity
    - external validity.
- drawing conclusions.

In lesson **1G Ethical considerations**, you learnt about the strict ethical guidelines and rules that psychological research must adhere to. Specifically, you learnt about:

- ethical concepts, including
    - beneficence
    - integrity
    - justice
    - non-maleficence
    - respect.
- ethical guidelines, including
    - confidentiality
    - informed consent procedures
    - deception
    - debriefing
    - voluntary participation
    - withdrawal rights.
- factors to consider when evaluating psychological issues, including
    - sociocultural factors
    - economic factors
    - legal factors
    - political factors.

1G

Must follow... **Ethical guidelines**

Which are informed by...

Ethical concepts

1A

Non-scientific ideas (pseudoscience)

vs.

Scientific ideas

Models and theories

Independent variables

Dependent variables

(Sometimes) controlled variables

Inform...

Psychological research

Types...

Aim

Hypothesis

Controlled study:
• within subjects
• between subjects
• mixed design

Psychological studies:
• case studies
• correlation studies

Other:
• literature review
• modelling
• product, process, or system development
• simulation

Fieldwork:
• observation
• interviews
• questionnaires
• focus groups
• yarning circles

1B

Sample is created

Through methods such as...

convenience sampling

random sampling

stratified sampling

population

Impacts generalisability to...

1C

1D

Extraneous and confounding variables

May be impacted by...

Research is conducted

Prevented by...

• counterbalancing
• placebo
• single-blind procedure
• double-blind procedure

Data is collected

Organised and interpreted through descriptive statistics

1E

Percentages

Central tendency

Variability

Outliers

Table

Bar chart

Line graph

Types of presentations

Data is presented

1E

Evaluation

Is based on...

accuracy and precision

repeatability and reproducibility

validity

1F

Conclusion can be made

CHAPTER 1 REVIEW

Chapter review activities

Review activity 1: Summary table

This chapter provided a comprehensive overview of the process of, and the considerations involved in, conducting scientific research. The table below separates some key concepts that you have learnt into the different stages of conducting research. For each concept, outline key information. This may include defining the concept, outlining other related terms, or a detailed description. You may also provide one or more examples of each concept.

	Concept	Key information	Example
1. Prior to conducting research	Consideration of scientific versus non-scientific ideas		
	Developing an aim		
	State a hypothesis		
	Choice of investigation methodology		
2. During research	Sample is obtained		
	Measurement of variables		
	Consideration of ways to prevent error and bias		
3. After research	Organisation of data		
	Presentation of data		
	Evaluation of study		
	Conclusion		

Review activity 2: Label the scenario

For each research scenario listed below, identify the investigation methodology that has been used. Choose from the following:

- case study
- correlational study
- controlled experiment
- focus group.

Scenario 1: A researcher is interested in discovering the cause of a very rare disease that only a handful of people worldwide are known to have. She decides to select a sample of three individuals who are living with the disease and studies them in-depth, collecting qualitative data through interviews.

Scenario 2: A psychologist is interested in exploring whether having three school terms (instead of four) would positively impact the wellbeing of students. To begin with, they decide to sample a small group of high school students from schools across Victoria and ask them questions as a group.

Scenario 3: A scientist is interested in the effects that exercise has on reaction times. She selects a random sample of participants and allocates them to two groups. One group completes a week of morning and afternoon exercises, while the other group does not. Both groups are made to complete a task measuring reaction time at the end of the week.

Scenario 4: A researcher is interested in whether living in metropolitan or rural settings has an impact on mental wellbeing. She selects a random sample of participants and gives them a wellbeing questionnaire. She then compares the results of those living in metropolitan areas and those living rurally.

Chapter 1 test

Multiple choice

Question 1 (1 MARK)

Which of the following would qualify as a within subjects design?

A. Measuring the amount of sleep that pregnant mothers get before having a baby and then measuring again after they give birth.

B. Testing participants' IQ and levels of creativity in order to determine if there is a relationship between the two.

C. Measuring the height of participants at the beginning of a study, and then again after 10 years in order to determine the average growth of adults per year.

D. Analysing the beliefs of individuals from Western and Eastern cultures by conducting a qualitative interview with one sample from each culture.

Question 2 (1 MARK)

Allocation involves

A. allocating a group of individuals to represent the population.

B. selecting people from the population in a way that ensures that its strata (subgroups) are proportionally represented in the sample.

C. assigning participants to experimental conditions.

D. allocating the investigation methodology that will be used for the study.

Question 3 (1 MARK)

Which of the following is **not** true about ethics in research?

A. The no-harm principle suggests that any unnecessary harm to participants should be avoided.

B. Ethical guidelines are broad moral principles that inform ethical concepts in research.

C. Participants are able to withdraw from the research at any point in the study, this includes their data also being removed.

D. The use of deception in research is permissible when participants' knowledge of the true purpose of the experiment may affect their behaviour while participating in the study.

Question 4 (1 MARK)

Which of the following statements regarding external validity is the most accurate?

A. External validity is only considered when internal validity is achieved.

B. External validity is the extent to which an investigation truly measures what it claims to.

C. External validity is the extent to which the results of an investigation can be applied to different individuals in similar settings.

D. External validity can be improved by using a stricter inclusion criteria.

Question 5 (1 MARK)

If a researcher wanted to report on the extent to which the participant's results differed from one another, what statistic would be most appropriate?

A. The mean.

B. A bar chart.

C. The outliers.

D. The standard deviation.

Short answer

Question 6   (10 MARKS)

Niam is in university and has been asked to evaluate whether a specific paper involves a scientific idea or a non-scientific idea.

a.   Using an example, explain what is meant by a non-scientific idea. (2 MARKS)

b.   Outline three qualities that would indicate that the paper involves a scientific idea. (3 MARKS)

c.   Identify and explain the method that is most commonly used in the investigation of scientific ideas. (2 MARKS)

d.   Niam is then asked to write a potential conclusion for the idea outlined in the paper. Identify the three considerations Niam should address when writing her conclusion. (3 MARKS)

Question 7   (5 MARKS)

Pearl is interested in investigating the influence of groups on individual behaviour. She selects a sample of 20 high-school students and assigns half of the sample to the control and half of the sample to the experimental group.

a.   Outline the conditions of the control and the experimental group for this study and explain why control groups are beneficial to scientific research. (3 MARKS)

b.   Pearl's study provided promising results about the effectiveness of this strategy. However, she is worried that her findings were just a fluke. Describe two measures that Pearl could use in order to ensure her findings are not a 'one-off'. (2 MARKS)

Question 8   (10 MARKS)

Meadow has set out to conduct her first-ever scientific investigation. She wants to study the effects of previous experience and expectations on taste perception. So far, Meadow has recruited 10 participants who responded to her advertisement in the newspaper. However, she now has no plan for how she will proceed with her study.

You are recruited to complete Meadow's study for her and write a report about your findings.

Your report should include:

- any relevant introductory statements.
- the methods and procedures of the investigation.
- the type of data that was collected and how this would be reported.
- an evaluation of the study, including any limitations and any improvements that could be implemented in future research.

UNIT 1

How are behaviour and mental processes shaped?

In this unit students examine the complex nature of psychological development, including situations where psychological development may not occur as expected. Students examine the contribution that classical and contemporary knowledge from Western and non-Western societies, including Aboriginal and Torres Strait Islander peoples, has made to an understanding of psychological development and to the development of psychological models and theories used to predict and explain the development of thoughts, emotions and behaviours. They investigate the structure and functioning of the human brain and the role it plays in mental processes and behaviour and explore brain plasticity and the influence that brain damage may have on a person's psychological functioning.

Reproduced from VCAA VCE Psychology Study Design 2023–2027

UNIT 1 AOS 1

What influences psychological development?

The psychological development of an individual involves complex interactions between biological, psychological and social factors. In this area of study students explore how these factors influence different aspects of a person's psychological development, recognising that individuals are not fixed from birth but instead can grow and change psychologically across their lives.

Students consider the interactive influences of hereditary and environmental factors on a person's psychological development. They explore psychological development across the life span through the lens of emotional, cognitive and social development, including the consideration and evaluation of relevant models and theories.

Students explore concepts of normality and neurotypicality and consider how typical or atypical psychological development in individuals may be culturally defined, classified and categorised. They consider how normal cognitive variations within society can be illustrated through consideration of neurodiversity, investigating selected developmental differences. The role of mental health workers, psychologists, psychiatrists and organisations in supporting psychological development and the diagnosis and management of atypical behaviour is considered, and depending on interest and context, students may extend their understanding of atypical behaviour to explore the diagnosis and treatment of selected mental disorders.

Outcome 1

On completion of this unit the student should be able to discuss complexity of psychological development over the life span, and evaluate ways of understanding and representing psychological development.

Reproduced from VCAA VCE Psychology Study Design 2023–2027

CHAPTER 2

The complexity of psychological development

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

Image: GoodStudio/Shutterstock.com

2A Nature versus nurture

2A   2B   2C   2D

1.1.1.1
Psychological development

1.1.1.2
Hereditary and environmental factors

    1.1.1.2.1 Nature

    1.1.1.2.2 Nurture

    1.1.1.2.3 The interaction between hereditary and environmental factors
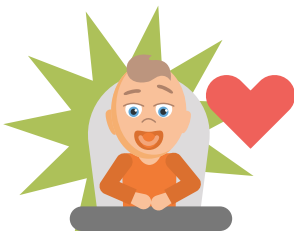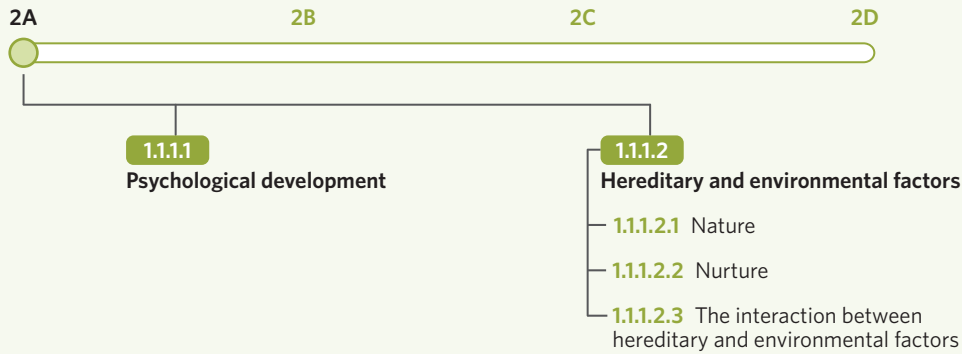
Were you always destined to be who you are today? What would change if you were born to different parents, or if you went to a different school? Would you still be the same person deep down, or are we just products of our environment? The question as to whether our individual biology (nature) or our external worlds (nurture) have a greater impact on who we are is one that is greatly explored in psychology. In this lesson, you will learn about this debate and how it is linked to psychological development. You will also learn about how hereditary and environmental factors interact and influence development.

Psychological development 1.1.1.1

Think back to your 5-year-old self. Do you look the same? Do you think the same? Do you have the same interests? Development refers to the growth and change within an individual's lifespan. Psychological development encompasses changes across multiple domains, including emotional, social, and cognitive growth.

Theory details

KEY TERMS

Psychological development
an individual's changes in functioning across multiple domains, including the lifelong growth across emotional, cognitive, and social domains

Psychological development refers to an individual's changes in functioning across multiple domains, including the lifelong growth across emotional, cognitive, and social domains. You do not wake up one day and suddenly have the ability to effectively process information, understand abstract concepts, and regulate your emotions. Rather, these changes occur over time as psychological development is a lifelong gradual process. While physical development is overt and observable, psychological development is more complex and hidden, meaning that we don't even realise it is taking place until we reflect on how much our abilities have changed. The main domains of psychological development include cognitive, emotional, and social growth, which are explored in table 1.

Table 1 Aspects of psychological development

Aspect	Definition	Examples
Cognitive development	The changes in thought processes that occur as we age. This includes a more sophisticated production of thought as well as the ability to comprehend and organise information from the internal and external environment.	- Learning a second language. - Learning your times tables. - Understanding that others have a different perspective to your own. Continues ▶

Table 1 Continued

Aspect	Definition	Examples
Emotional development	The continuous, lifelong changes in skills that allow individuals to control, express, and recognise emotions in an appropriate way.	• Learning how to appropriately express emotions, such as anger. • Recognising your own emotions. • Understanding how others around you feel.
Social development	The lifelong changes in skills that allow individuals to effectively and appropriately interact with others.	• Learning how to have conversations with others. • Learning how to appropriately communicate with your work colleagues.

These aspects of development are interconnected and dependent on one another. This means that they often do not develop in isolation and instead are symbiotic, in that as one develops, the other aspects often follow. Our social development, for instance, may provide us with experience that in turn informs our emotional development. For example, being a part of a close-knit social circle may give an individual more opportunities to learn how to recognise and express emotions. Alternatively, one's emotional development, such as the ability to recognise the emotions of others, may advance their cognitive development by positioning them in situations where complex problem-solving skills are required. For example, recognising emotions in others may promote better conflict resolution skills during social conflict.

In this chapter, you will learn about the different aspects of psychological development and how they interact to understand the complexity of psychological development.
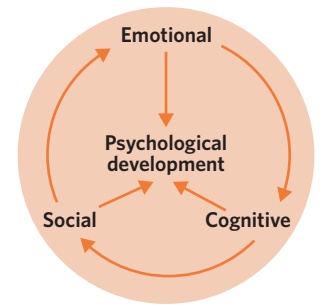
Hereditary and environmental factors 1.1.1.2

We have learnt that psychological development encompasses a range of interconnected dimensions, such as emotional, social, and cognitive development. But what causes this development to progress? Philosophers and psychologists have been debating this question throughout history. Researchers now agree that the complexity of human development relies on an interaction of both nature and nurture and therefore, the influence of both hereditary and environmental factors.

Theory details

What would you be like if you were born in a different country? What about if you had different parents? Imagine if you were taller or naturally more skilled at a certain hobby. How different would your life be? For centuries, philosophers and psychologists have wanted to know what influences the development of an individual's characteristics. What makes each individual different? What makes us, us? There used to be two main schools of thought in answering this question:

1. The first school of thought suggested that each individual was unique due to their biology or genes. This school of thought put an emphasis on **hereditary factors** – factors that influence development and are genetically passed down from biological parents to their offspring.

2. The second school of thought suggested that each individual was unique due to their experiences and how these experiences shaped them. This school of thought put an emphasis on **environmental factors** – factors that influence development and arise from an individual's physical and social surroundings.

The two schools of thought had opposing ideas and for centuries psychologists and philosophers debated which school of thought was right. This debate, now known as the 'nature versus nurture' debate, questions whether development is dependent on hereditary (nature) or environmental (nurture) factors.

Nature 1.1.1.2.1

The nature side of the debate holds the belief that development was directly caused by one's genetic composition, also known as hereditary factors. It is believed that an individual's development is predestined at birth. This includes aspects such as intelligence, personality, and interests. This school of thought suggests that, even if you were born or raised in a different environment, if your genetics were the same your development would be unlikely to change.

Heritable traits, such as hair colour or eye colour, involve the expression of certain genes that biological parents hold. In this sense, it is clear how certain characteristics are already predetermined, with some traits being set before birth.

Figure 1 Emotional, social, and cognitive development all influence and interact with one another in order to contribute to psychological development as a whole

Hereditary factors factors that influence development and are genetically passed down from biological parents to their offspring

Environmental factors factors that influence development and arise from an individual's physical and social surroundings

Genetic predisposition
the increased likelihood to develop certain traits, including diseases, if certain conditions are met

But what about psychological development? Theorists on the nature side of the debate also believed that hereditary factors could influence an individual's traits through genetic predisposition – a concept that is maintained in contemporary psychology. **Genetic predisposition** refers to the increased likelihood to develop certain traits, including diseases, if certain conditions are met. In this respect, a person with a genetic predisposition to certain mental health disorders may have inherited genes that make them more likely to develop a particular condition than the average person. For example, if a child has a family history of depression, they are more likely to experience depression in their lifetime (Sullivan et al., 1996), however genetic predispositions do not guarantee any specific outcome. Certain personality traits and levels of intelligence have also been linked to genetics, with individuals having a predisposition to inherit certain traits.

Nurture 1.1.1.2.2

Opposing the nature school of thought were the theorists who believed that nurture was the defining factor of development. These individuals held the belief that humans are shaped by their environment, experiences, geography, and social circle.

John Locke, a philosopher, famously coined the term *'tabula rasa'*, which means 'blank slate' in Latin. This idea emphasised that every person is born as a 'blank slate' and it is our experiences that shape us. Therefore, this concept emphasised the role of environmental factors (i.e. nurture) on a person's development. For example, parents or caregivers may shape the development of their kids by teaching them what is right and wrong, as well as important skills and functions.

This notion was supported by the behaviourism school of thought. This historical perspective was proposed by psychologist John Watson, who observed the relationships between stimuli in the environment and subsequent behaviours. Watson proposed that individuals can learn by experiencing the rewards and punishments that follow a behaviour they may have carried out. They can also learn from observing other people's behaviours and subsequent consequences.

Figure 2 John Locke's 'tabula rasa' theory of development suggests that humans start as a blank slate/canvas and are shaped by their environment

Like behaviourism, historically, there have been a range of philosophies that investigated the effect of environmental factors on development. Over time, contemporary psychology has extended upon these historical theories. Current psychological research tells us that there are a range of environmental factors which significantly shape development. These include your:

- education
- socioeconomic status
- cultural expectations
- religious rituals and practices
- social groups, including your friends and sporting teams
- job
- your physical surroundings, e.g. growing up in a small town, by a beach, or in the city
- early childhood experiences.

The interaction of hereditary and environmental factors on psychological development 1.1.1.2.3

Now that you have learnt about the evidence that each school of thought uses to support their beliefs, you may be wondering which one is correct. In contemporary psychology, it is accepted that neither is correct in isolation, and instead, psychological development is the product of the interaction between hereditary and environmental factors.

Imagine the interaction of these factors as the process of turning on a light. The electricity flowing through its connected wires gives it the ability to be turned on at any time (similar to a genetic predisposition), however it requires an environmental trigger (flicking the switch) for this process to occur. If the switch was not flicked or electricity was not connected, the particular outcome would not occur. This is very similar to how hereditary and environmental factors work together to influence development. This interaction involves a continual, reciprocal relationship between an individual's environment and their hereditary factors, with the genes of each individual impacting the environmental influences that may shape who they are, and vice versa.

Figure 3 Just like turning on a light, psychological development is influenced by the interaction between the environment (flipping the light switch) and one's genetic potential (electricity)

For example, the genes we inherit may influence how we interact with our environment. If you are born with a naturally warm temperament, this may make you more likely to develop strong social relationships with others, leading to the development of a bubbly personality. In the same way, an individual may have early life experiences in a large and loud extended family environment, causing them to develop a tendency to be loud in order to stand out in their environment and be heard. Within this interaction, both nature and nurture provide different influences on development.

A real life example of the influence of nature and nurture on development is that of Jack and Oskar. Jack and Oskar were identical twins who were separated at birth. Oskar was raised Catholic in a Nazi household, whereas Jack was raised in a Jewish household in Trinidad.

When reunited for a twin study, the pair quickly began to dislike each other due to their moral and political differences. However, the more time that they spent together the more they realised how similar they truly were. Table 2 demonstrates the observed similarities and differences.

Table 2 List of similarities and differences in Jack and Oskar that were observed by researchers

Similarities	Differences
• The men showed up wearing almost identical outfits. • Both reported reading books back to front. • Both had a habit of wearing rubber bands on their wrists. • Both had experienced dreams in which they killed the other twin. • Both walked in a similar fashion.	• Oskar spoke German, whereas Jack spoke Yiddish. • Jack was a Jewish officer in the Israeli navy. • Oskar was a Catholic and enthusiastic member of Hitler Youth.

This extraordinary case demonstrates that environmental influences can completely change the course of an individual's life, however, this influence is not strong enough to erase the effects of genetic influences. Instead, development is a dynamic interaction of both influences.

(Segal, 2017)

It is currently understood that the impact of nature and nurture on development is equivalent. In addition, despite certain characteristics or outcomes of development appearing to be easily attributed to either hereditary or environmental factors, it can often be difficult to distinguish between the two in terms of their influence. Trying to do this poses questions that cannot be easily answered.

For example, if two very intelligent parents give birth to an equally intelligent child:

- is this because intelligence is genetically inherited?
- is it because well educated parents are more likely to encourage their children to learn and do well in school?

These questions are unlikely to be answered with confidence due to the interactive nature of environmental and hereditary factors. Another example that demonstrates this is if two basketball players gave birth to a child who grew up to be a 200cm tall NBA player. This does not mean that there is a specific gene which makes an individual a good basketball player. Instead, it shows how the child's hereditary (height) and environmental (parent's influence) factors interacted to shape their development, as demonstrated in figure 4.
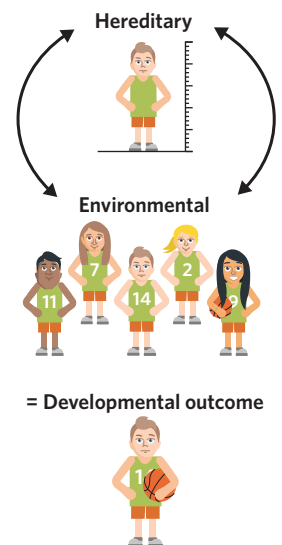
Figure 4 The interaction of heredity and environmental factors in influencing developmental outcomes

USEFUL TIP

The tomato seeds shown in figure 5 can only grow into a tomato plant due to their genetic material providing them with this potential, and not the potential to grow into a different plant, such as an apple tree (nature). Even though both seeds have the same genetic potential, we can see how their growth depends on how much nurture they receive. Seed 1 may not have received enough sun, water, or care, meaning that it only grew into a little seedling with the inability to produce fruit. In contrast, seed 2 received adequate nurture from the environment (sun and water) and met its potential by flourishing into a big tomato plant growing lots of fruit.
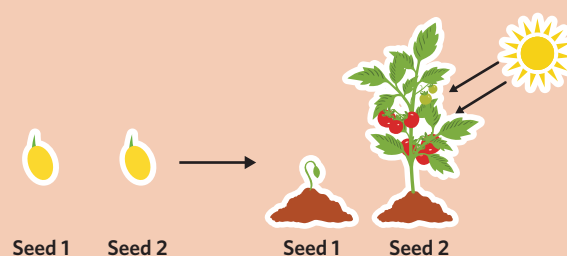
Figure 5 The interaction of nature and nurture is illustrated through the example of two tomato seeds

Theory summary

In this lesson, we have learnt about psychological development and its subdivisions: cognitive, social, and emotional development. We also learnt about the history of the nature versus nurture debate, including the beliefs of each of the schools of thought. Finally, we learnt about the interactive nature of hereditary and environmental factors in relation to their impacts on psychological development, as demonstrated in figure 6.

| Nature (hereditary) | + | Nuture (environmental) | = | Psychological development |

Figure 6 Hereditary and environmental factors are interconnected and work together to influence development

2A Questions

Theory review

Question 1

Which three aspects does psychological development encompass?

A.   Emotional, personality, and cognitive development.

B.   Emotional, social, and cognitive development.

C.   Intellectual, personality, and social development.

Question 2

Psychological development stops once an individual reaches adulthood.

A.   True.

B.   False.

Question 3

Which of the following best describes the relationship between the three aspects of psychological development?

A.   The three factors are interconnected and influence each other's development.

B.   The three aspects develop independently and are influenced by heredity and environmental factors.

Question 4

In terms of development, hereditary factors are _____, whereas, environmental factors are _____.

Which of the following best fills in the blank?

A.   attributed to nurture; attributed to nature

B.   genetically based; the influence of one's outer world

Question 5

The nature versus nurture debate led to the understanding that nurture has a greater impact on development than nature.

A.   True.

B.   False.

Question 6

Which of the following best describes the nature of the influence that hereditary and environmental factors have on development?

A. Hereditary and environmental factors interact with one another to influence development.

B. Hereditary and environmental factors operate independently to influence development but sometimes lead to the same developmental outcomes.

Assessment skills

Text analysis

The following assessment skills type reflects the study design assessment type:

- media analysis of one or more contemporary media texts

Use the following information to answer questions 7–9.

> **Media text 1**
>
> Is being seven feet tall in America the easiest way to become rich? Pablo Torre, a writer for the magazine Sports Illustrated, published a statistic suggesting that this could in fact be true.
>
> It was stated that the probability of an American male between six feet, six inches and six feet, eight inches becoming an NBA player was 0.07%, however, this probability increased to 17% for someone who was seven feet or taller. In addition to this, the current 39 players listed at six feet, 11 inches were paid an average of $4.9 million, or about 20% less than those who are seven feet tall.
>
> These players have been described as winning the 'genetic lottery' and are perceived as being born to be professional basketballers.
>
> (Diamond, 2013)

Question 7

In terms of influences on development, what type of factor is height?

A. Environmental.

B. Nurture.

C. Hereditary.

Question 8

What other developmental influences could contribute to this higher probability for seven-foot-tall men to become NBA players? **(Select all that apply)**

I. Taller children may be more likely to be encouraged to pursue basketball as a sport by their parents.

II. Taller children are naturally more coordinated and therefore make better players.

III. Basketball scouts may be more likely to notice and encourage children who are exceptionally tall to play the game.

Question 9

How does the increased probability of becoming an NBA player for seven-foot-tall men support the notion that development is a product of the interaction of both hereditary and environmental factors?

A. It demonstrates that an individual's genetically inherited traits can influence their experience in the world and therefore their development.

B. It demonstrates that an individual's genetically inherited traits can directly control how much money they earn and therefore their quality of life.

C. It demonstrates that the way parents raise their children determines how tall they will grow up to be and therefore what opportunities they will have access to.

Data analysis

The following assessment skills type reflects the study design assessment type:

- a data analysis of generated primary and/or collated secondary data

Use the following information to answer questions 10–12.

A twin study was conducted to determine the role of genetics in peanut allergies. The researchers used a twin study – in which pairs of identical and fraternal (non-identical) twins were used as participants. The use of twins as participants assists researchers to differentiate between genetic and environmental influences.

To determine the genetic nature of peanut allergies, researchers recruited pairs of twins in which at least one twin had a peanut allergy. 58 pairs of twins were studied and the rates of peanut allergies were compared between identical (sharing 100% of DNA) and fraternal twins (sharing 50% of DNA) (Sicherer, et al. 2000).

If the prevalence of peanut allergies in the individual was higher in the identical twin group, as compared to the fraternal twin group, this would suggest a strong genetic influence on the prevalence of the allergy.

The results are graphed below.

Rates of peanut allergies

Key
Both twins having an allergy
Only one twin having an allergy
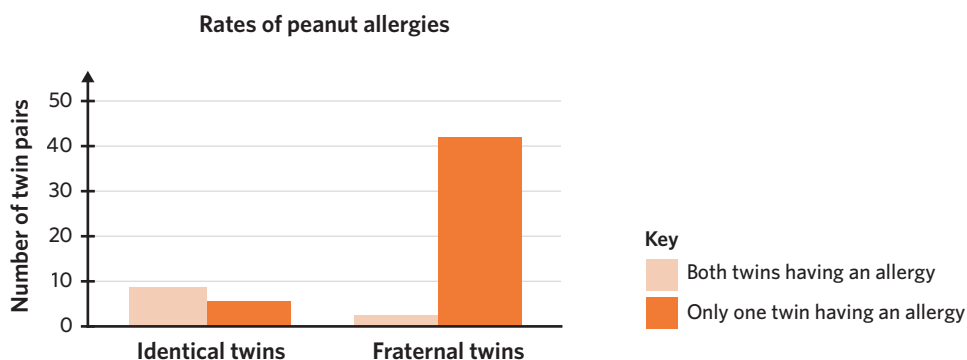
Need help? Remember that the researchers were interested in the genetic component of peanut allergies, not how frequently they occurred.

Question 10

What are the dependent and independent variables of this experiment?

A. The dependent variable is the occurrence of a peanut allergy, whereas the independent variable is the type of twin pair.

B. The dependent variable is the type of twin pair, whereas the independent variable is the occurrence of a peanut allergy.

C. The dependent variable is the amount of DNA shared by the twins, whereas the independent variable is the occurrence of a peanut allergy.

D. The dependent variable is the severity of the peanut allergy, whereas the independent variable is the amount of DNA shared by the twins.

Question 11

How do twin studies help researchers to attempt to differentiate between environmental and hereditary influences?

A. Because twins always have the same genetics and environments, development outcomes can be measured for two people at the same time and are, therefore, less time-consuming.

B. Because twins (especially identical twins) share a significant amount of DNA, environmental effects or differences are more easily measured and manipulated.

C. Twins are more likely to be willing to participate in research and therefore using them gives more opportunities for data to be collected.

D. Twins often both live in the same environment therefore it is easier to measure genetic influences.

Question 12

From the graph provided, what can be concluded about the heritability of peanut allergies?

A. Peanut allergies are not hereditary at all as not all of the twins shared the allergy.

B. Being a fraternal twin means that you are more likely to have a peanut allergy.

C. Peanut allergies are largely heritable as twins who were more genetically similar were more likely to share the allergy, as opposed to those who were less similar.

D. Peanut allergies are completely genetic.

Exam-style

Remember and understand

Question 13 (1 MARK)

An example of emotional development would be

A. learning to control your emotions.

B. developing a sense of humour.

C. the ability to maintain a close relationship.

D. being able to speak in front of a large crowd.

Question 14 (1 MARK)

In terms of the nature versus nurture debate, which statement would a member of the nurture school of thought likely **not** believe?

A. Genetics provide little influence on development as compared to environmental factors.

B. Humans begin life as a 'blank slate' and are shaped by their experiences.

C. The primary influence of development stems from factors that are genetically passed down from parents to offspring.

D. Twins that are separated at birth are likely to have significantly different developmental outcomes as compared to those who grew up in the same environment.

Question 15 (1 MARK)

Jamie's parents have both been diagnosed with clinical depression.

This means that

A. Jamie will also experience depression in his lifetime.

B. Jamie will have the same chance of experiencing depression in his lifetime as his peers.

C. Jamie will have an increased predisposition to developing depression.

D. Jamie will have developed a genetic immunity to depression.

Question 16 (1 MARK)

The increased likelihood to develop certain traits (including diseases) if certain conditions are met is known as

A. genetic predisposition.

B. the nature school of thought.

C. hereditary factors.

D. DNA.

Question 17 (2 MARKS)

Explain the phrase 'blank slate' in terms of the nurture school of thought.

Apply and analyse

Question 18   (1 MARK)

Bella's parents were both world-renowned artists, a talent that they found came easily to them. Bella remembers that when she was young her parents would often paint with her, take her to art classes, and take her on trips to the art gallery. When Bella grew up, she too became a talented artist and pursued that skill as a career.

Bella's artistic skills were likely a result of

A.   the impact of nature, with Bella inheriting great artistic skills from her parents.

B.   the impact of nurture, with Bella learning great artistic skills due to her being exposed to art from a young age.

C.   hereditary factors, with the genes for great artistic skills being passed on to Bella at birth.

D.   the interaction of nature and nurture, with Bella inheriting artistic qualities from her parents and her artistic skills being nurtured from a young age.

Question 19   (3 MARKS)

Explain how social development and emotional development could interact during psychological development.

Question 20   (4 MARKS)

Compare hereditary and environmental influences on development, with reference to an example of each.

Question 21   (5 MARKS)

Ricky and Karl are identical twins, meaning that they share 100% of their DNA. Ricky and Karl were separated at birth and were therefore raised in separate families. Ricky grew up to be shy, reserved, and was eventually diagnosed with depression. In comparison, Karl grew up to be outgoing, extroverted, and had no mental health issues.

a.   Provide a possible explanation as to why the twin's personalities differed, despite sharing 100% of each other's DNA. (2 MARKS)

b.   With reference to genetic predisposition, explain why Ricky may have developed depression when Karl did not. (3 MARKS)

Evaluate

Question 22   (4 MARKS)

Outline one strength and one limitation for each school of thought in the nature versus nurture debate.

2B The biopsychosocial model

2A	2B	2C	2D

1.1.2.1
The biopsychosocial model

1.1.2.2
The biopsychosocial approach to mental wellbeing

1.1.2.3
The biopsychosocial approach to psychological development
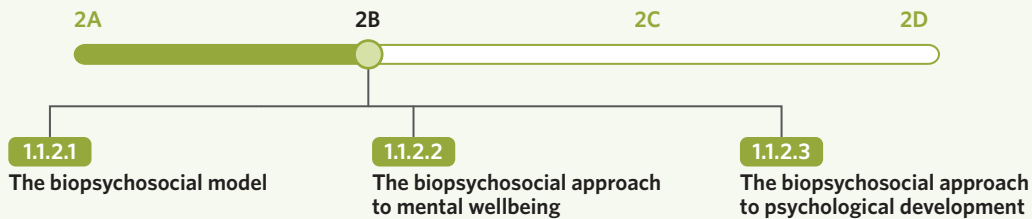
Throughout our lives we are constantly changing and evolving. What specifically shapes our psychological development and mental wellbeing? If we were influenced by only biological factors, we may not differ significantly from our siblings. If we were influenced by only social factors, we may not differ significantly from our peers. If we were influenced by only psychological factors, our thoughts would remain unchanged by our external world. Therefore, in order to understand the human experience, we need to consider all three of these domains. In this lesson, you will learn about the role of the biopsychosocial model in considering psychological development and mental wellbeing.

The biopsychosocial model 1.1.2.1

We have already learnt that both nature and nurture contribute to psychological development. However, that still leaves us with the question, what factors determine who we are and how we experience the world? In this lesson, you will learn about the biopsychosocial model as an interdisciplinary approach to psychological development and mental wellbeing and will explore the different factors it encompasses.

Theory details

The **biopsychosocial model** is a holistic, interdisciplinary framework for understanding the human experience in terms of the influence of biological, psychological, and social factors. Though it was originally created for the purpose of establishing a more effective model in the consideration of mental health and wellbeing, it can be applied to many disciplines. In this lesson, we will investigate the biopsychosocial model in relation to both mental wellbeing and psychological development.

The biopsychosocial model was established by George Engel in 1977. Engel perceived that many aspects of human health were being considered in a strictly medical or biological sense. He believed that the consideration of biological, psychological, and social factors, and their interactions with one another, was imperative when working with patients. Therefore this model works to explain how the interaction of these factors influence overall health, wellbeing, and development. These factors can influence the domains of mental wellbeing and psychological development in both positive and negative ways. In table 1, these three key factors are explored in detail.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

KEY TERMS

Biopsychosocial model
a holistic, interdisciplinary framework for understanding the human experience in terms of the influence of biological, psychological, and social factors

Biological factors
internal genetic and/
or physiologically
based factors

Psychological factors
internal factors pertaining
to an individual's mental
processes, including their
cognition, affect, thoughts,
beliefs, and attitudes

Social factors external
factors relating to an
individual's interactions
with others and their
external environment,
including their
relationships and
community involvement

Table 1 Explanation of biological, psychological, and social factors in terms of the biopsychosocial model

	Explanation	Examples	Interactions with other domains
Biological factors	**Biological factors** are internal genetic and/ or physiologically based factors. These factors can be innate, such as genetic predispositions passed down from one's parents, or can come about later in life, such as through taking certain medications.	• Genetic predispositions • Medications/substances • Nutrition • Sleep • Diseases and immune system functioning • Hormones	• The psychological experience of chronic stress can influence bodily processes (due to stress hormones being released) and cause physiological illness. • An individual's social circle can influence their behaviours, such as consuming drugs and/or alcohol. This can in turn affect the individual's biology. • An individual's access to health care services (social) may also influence their physical health.
Psychological factors	**Psychological factors** are internal factors pertaining to an individual's mental processes, including their cognition, affect, thoughts, beliefs, and attitudes. In essence, psychological factors are everything that an individual experiences within their mind.	• Attitudes/beliefs • Emotions (affect) • Personality • Coping skills • Sense of self • Self-esteem • Thoughts • Memories and learning	• The biological state of having a chronic illness has the potential to cause psychological distress. • Social isolation or having a strong social circle can influence an individual's psychological state.
Social factors	**Social factors** are external factors relating to an individual's interactions with others and their external environment, including their relationships and community involvement. This can include close personal relationships as well as an individual's experience within a greater society.	• Interpersonal relationships • Attachment style • Cultural norms • Socioeconomic status • Education • Physical environment • Family environment • Level of social support	• Certain biological chronic illnesses and diseases may cause an individual to be bedridden and therefore may lead to social isolation. • Psychological factors, such as individuals having a low sense of self-esteem may prevent them from forming meaningful social relationships.

The biopsychosocial approach to mental wellbeing 1.1.2.2

The biopsychosocial model is an interdisciplinary framework, meaning that it can be applied to multiple fields. In this section of the lesson, we will explore how this framework can be applied to mental wellbeing specifically.

Theory details

As previously mentioned, the biopsychosocial model can be applied to mental wellbeing. **Mental wellbeing** refers to an individual's current psychological state, involving their ability to think, process information, and regulate emotions. An individual may be considered to have high or low levels of mental wellbeing depending on their ability to function day-to-day, have stable patterns of mood, and their ability to cope with and overcome the pressures of life (resilience). But what influences these differing levels of mental wellbeing?

According to the biopsychosocial model, mental wellbeing is influenced by the interaction of biological, psychological, and social factors. Any one of these factors can increase or decrease the potential for an individual to have high levels of mental wellbeing. Some considerations to note include:

- Low levels of mental wellbeing can be improved by addressing a combination of these factors.
- High levels mental wellbeing cannot be attained if only one factor of the biopsychosocial model is focused on, all need to be addressed.

Think of the model as a table as depicted in figure 1, if one of the table's legs is removed, it can no longer stand.
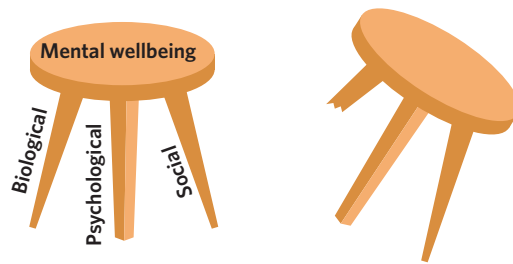
Figure 1 High levels of mental wellbeing often requires all three aspects of the biopsychosocial model to be strong, just like the legs of a table

For example, if an individual is diagnosed with anxiety, we may assume that they likely are experiencing low levels of mental wellbeing. In order to improve this individual's mental wellbeing, simply providing them with medication, such as benzodiazepines may not be helpful on its own. This is because, without any social support or cognitive therapy, there will likely still be underlying issues feeding into the individual's low mental wellbeing. Perhaps they are socially isolated, causing them to feel more anxious, or perhaps they are using poor coping skills that worsen their symptoms. This is why it is integral to consider all factors when trying to promote or maintain high levels of mental wellbeing.

Although all three aspects of the biopsychosocial model should be considered when approaching mental wellbeing, it is not realistic in the human experience to always have little to no issues in one's social life, physical health, and cognition. Experiencing a disruption to one of these factors does not mean that an individual will spiral directly into low levels of wellbeing.

Figure 2 outlines some factors that have the potential to influence mental wellbeing.
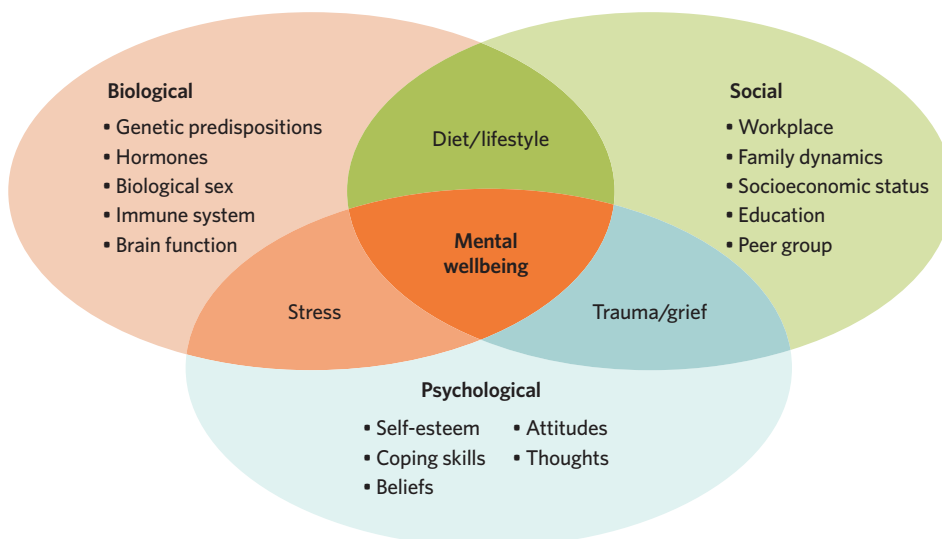
Figure 2 Possible biopsychosocial influences on mental wellbeing

Mental wellbeing
an individual's current psychological state, involving their ability to think, process information, and regulate emotions

LESSON LINK

The biopsychosocial framework can be applied to most aspects of the human experience. In **Units 3&4 Psychology**, you will use this model to consider specific phobias and the maintenance of mental wellbeing.

When using the biopsychosocial framework to consider mental wellbeing, think of your mental wellbeing as a glass of water. Positive influences on your mental wellbeing will fill your glass with more water, and factors that may disrupt your wellbeing are like drops of food colouring.

The more protective influences you have related to your wellbeing, the more diluted the negative factors become, leading to overall higher levels of mental wellbeing. Likewise, the more negative factors you experience, the more drops of food colouring you will see, and the lower your overall wellbeing will be.

This is depicted in figure 3.

Figure 3 The holistic impacts of positive and negative influences on mental wellbeing

PSYCHOLOGY EXPLORATION

The comorbidity (the presence of multiple diseases or disorders) between diabetes and depression is relatively common. However, in 2016, Habtewold et al. investigated the biopsychosocial predictors of depression in Ethiopian patients with type 2 diabetes. The study found that the greatest predictors of comorbidity occurring were:

- whether the patient was divorced (social)
- occupation – with 'housewife' being the most significant predictor (social)
- diabetic complications (biological)
- having experienced a negative life event within the previous six months (social/psychological)
- poor social support (social).

Interestingly, a patient's lack of fear of diabetic complications and death (psychological factor) was most notably associated with reduced levels of depression comorbidity.

This study demonstrates that there is no one factor that causes poor mental wellbeing and suggests that depression is not a direct result of diabetes. Instead it is the combination of biopsychosocial factors that can either act as protection against or increase the risk of developing a mental health disorder.

(Habtewold et al., 2016)

The biopsychosocial approach to psychological development 1.1.2.3

Theory details

You have previously learnt that certain factors interact to influence psychological development, but what are these factors specifically? In this section of the lesson, you will explore how the biopsychosocial model can be used to explain psychological developmental outcomes.

The biopsychosocial model can also be applied to psychological development. We know that **psychological development** refers to an individual's changes in functioning across multiple domains, including the lifelong growth across emotional, cognitive, and social domains. This development encompasses various aspects of an individual's life. When considering the biopsychosocial model, the emotional (affect) and cognitive aspects of development are contained within the psychological dimension of the framework.

An individual's development is impacted by the sum of all of the biopsychosocial influences encountered within their life. These influences can begin to take effect as early as infancy. Often in development, the effect (either positive or negative) of one aspect of the biopsychosocial model, during infancy or early childhood, can influence a series of outcomes that contribute to the individual's positive or negative experiences throughout childhood and adulthood. Using attachment theory as an example, this is demonstrated in figure 4. For instance, attachment theory refers to the strength of an emotional bond between an infant and their primary caregiver. Attachment theory suggests that during infancy, the quality of this bond is a direct predictor of the infant's emotional and social outcomes later in life.

Psychological development
an individual's changes in functioning across multiple domains, including the lifelong growth across emotional, cognitive, and social domains
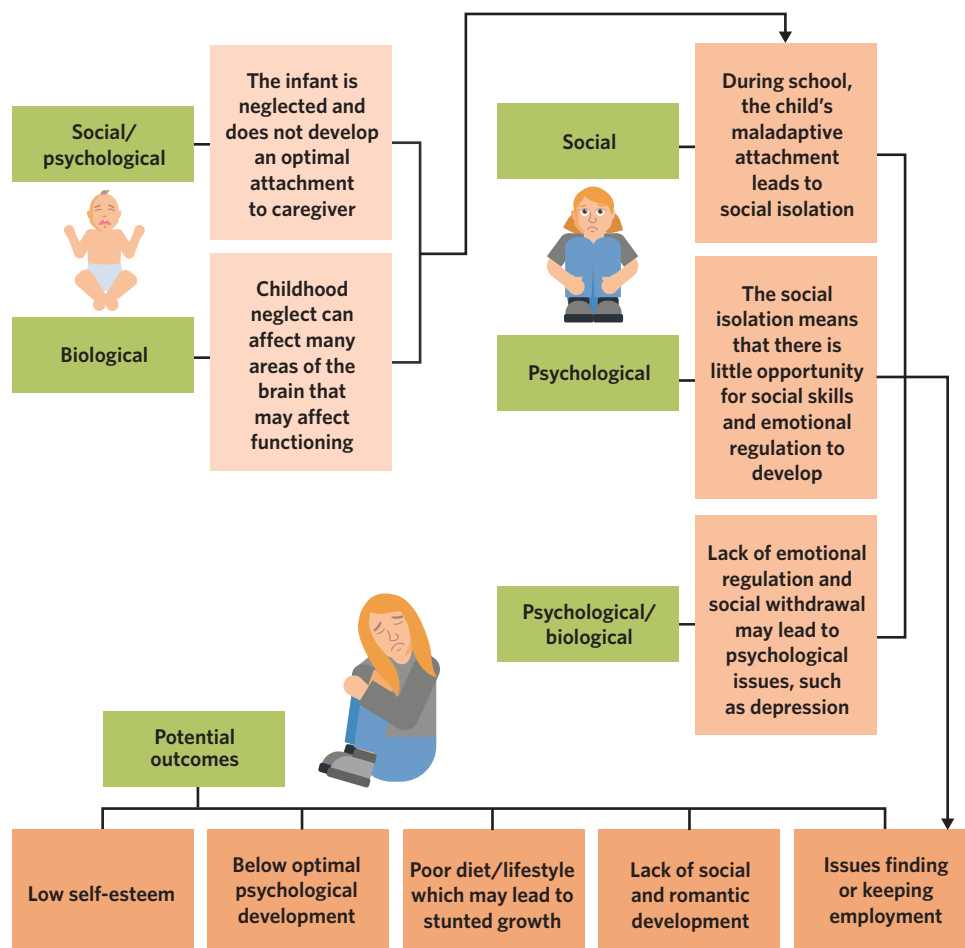
Figure 4 Example of a series of development outcomes stemming from infancy

However, as with the biopsychosocial model of mental wellbeing, there are many possible factors and related outcomes for psychological development. One negative biopsychosocial influence on its own is not enough to disrupt development, just as one positive biopsychosocial influence on its own is not enough to cause optimal psychological development. For example, if in figure 4, an intervention was implemented during childhood to support social development, the following developmental outcomes would likely be different, even if not optimal. Therefore, it is the sum and interaction of these influences that creates the developmental outcome. Possible biopsychosocial influences on psychological development are outlined in figure 5.
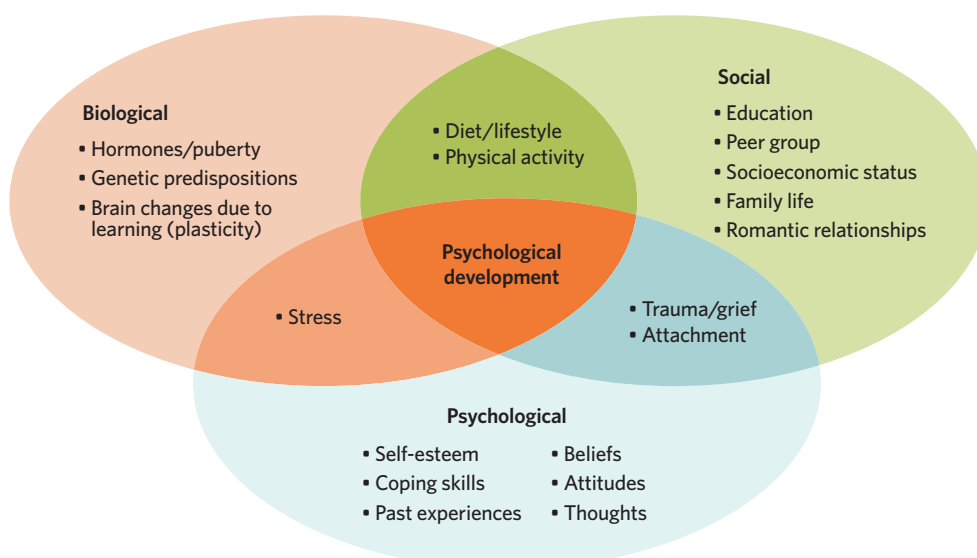
Figure 5 Biopsychosocial influences on psychological development

You may notice that the biopsychosocial factors for psychological development are similar to those for mental wellbeing. This is because the aspects of who you are do not exist in isolation. Your mental wellbeing and psychological development are integrated into your overarching sense of self, accompanied by all other domains that you may consider integral to your identity and functioning. Humans are not comprised of independent parts, which is why the biopsychosocial framework is so important in understanding how you came to be who you are. It encompasses all aspects of your life and experience to ultimately provide a holistic and all-encompassing consideration.

Theory summary

In this lesson, you have learnt that the biopsychosocial model is an interdisciplinary, holistic framework used to consider various aspects of the human experience. It consists of:

- biological factors
- psychological factors
- social factors.

You learnt about how this framework can be applied to mental wellbeing and to psychological development and most importantly, the interactive nature of the biopsychosocial factors.

2B Questions

Theory review

Question 1

What are the three aspects of the biopsychosocial model?

A. Biological, psychosocial, and genetic.

B. Biological, psychological, and social.

C. Biological, psychosocial, and sociocultural.

Question 2

A factor that is physiologically based is known as a

A. biological factor.

B. genetic factor.

C. psychological factor.

Question 3

Mental wellbeing is

A. a state of happiness, contentment, and satisfaction with life.

B. the presence or absence of mental health disorders.

C. an individual's psychological state, involving their ability to think, process information, and regulate emotions.

Question 4

When aiming to improve mental wellbeing, a strictly biological approach should be the first point of action.

A. True.

B. False.

Question 5

The outcomes of biopsychosocial influences are usually a result of a combination of factors rather than the consequence of one individual factor.

A. True.

B. False.

Question 6

Psychological development refers to an individual's changes in functioning across multiple domains, including **(Select all that apply)**

I. social.

II. cognitive.

III. emotional.

IV. linguistics.

Assessment skills

Text analysis

The following assessment skills type reflects the study design assessment dot point:

- analysis and evaluation of an experiment or case study

Use the following information to answer questions 7–11

Case study

Sam is a 15-year-old boy who was referred to a mood and anxiety disorder assessment clinic following a fight with a member of his soccer team. The fight prompted Sam's parents to speak to his GP. Prior to the fight, Sam's parents had noticed some marked changes in his behaviour. The changes Sam's parents observed were as follows:

- greater irritability
- withdrawal from friends
- sudden drastic weight loss
- issues sleeping.

It was also noted that Sam's father had previously suffered from clinical depression. During the assessment process, the psychiatrist found out that, three months earlier, Sam had broken up with his girlfriend of eight months. In addition, several days prior to the breakup, Sam's father had been hospitalised due to his mental health issues. Sam reported that he had been spending his time ruminating (thinking about things over and over) about conversations he had with his ex girlfriend.

(Hall & Mufson, 2009)

Question 7

Sam's family history of depression and reported changes in diet and sleep would be considered

A. genetic factors.

B. external factors.

C. biological factors.

Question 8

Sam's breakup and his subsequent rumination on the breakup could be considered to be a combination of psychological and social factors.

A. True.

B. False.

Question 9

In order to improve Sam's mental wellbeing, the psychiatrist should consider a strictly psychological approach.

A. True.

B. False.

Question 10

His father's history of depression could have affected Sam's mental wellbeing due to

(Select all that apply)

I.   genetic predisposition (biological factor).

II.   stress incurred as a result of witnessing another's mental health struggles (psychological factor).

III. the potential for childhood neglect from a depressed parent to lead to issues with relationships and emotional regulation later in life (social factor).

Question 11

Which of the following best represents what influenced Sam's reduced levels of mental wellbeing?

A.   A combination of social factors, such as his drastic weight loss, psychological factors, such as his social withdrawal, and biological factors, such as his irritability.

B.   The genetic predisposition Sam held caused his symptoms, such as social withdrawal, mood changes, and sleep/diet changes to manifest.

C.   The combined influence of biological factors, such as genetic predisposition, social factors, such as his breakup, and psychological factors, such as stress and rumination.

Exam-style

Remember and understand

Question 12   (1 MARK)

The biopsychosocial model is best described as

A.   an interactive framework that is exclusively used in treating mental health issues.

B.   a fixed, structured framework by which the same approach can be applied to all individuals, regardless of circumstance.

C.   an interdisciplinary framework, which can be applied to the majority of areas of an individual's life.

D.   an effective framework that was created to be used as a way to treat mental health disorders without having to assess multiple factors.

Question 13   (1 MARK)

The use of the biopsychosocial model is most appropriate in what situation?

A.   Painful physical injuries, such as a broken bone.

B.   Complex chronic diseases and mental health issues.

C.   Getting good grades.

D.   All of the above.

Question 14   (1 MARK)

Psychological factors encompass

A.   thoughts, emotions, and memories of past experiences.

B.   attitudes, parental influence, and beliefs.

C.   beliefs, thoughts, and the chemical structure of the brain.

D.   emotions, friendships, and memories.

Question 15   (1 MARK)

In terms of the biopsychosocial model, mental wellbeing

A.   is influenced by the interaction and sum of biological, psychological, and social factors.

B.   becomes disrupted when one of the biopsychosocial factors has a negative influence.

C.   is only experienced at high levels when an individual is positively influenced by all three biopsychosocial factors.

D.   is only experienced at low levels when an individual is negatively influenced by biological, psychological, and social factors.

Question 16 (3 MARKS)

Provide an example of one biological factor, one psychological factor, and one social factor that has the potential to impact psychological development.

Apply and analyse

Question 17 (1 MARK)

Jasmine is the top student in her university class. She has always found school to be relatively easy and has always been praised for her intelligence.

In terms of psychological development in relation to the biopsychosocial model, which factors would have likely influenced Jasmine's intelligence?

	Biological	Psychological	Social
A.	Jasmine likely grew up on a healthy diet which caused her brain to grow.	Jasmine is naturally intelligent and has high levels of cognition.	Jasmine likely received a good education.
B.	Jasmine's parents raised her to value education.	Jasmine has a good memory.	Jasmine's friends are likely also intelligent.
C.	Jasmine experienced low levels of childhood stress.	Jasmine believes that she is a good student.	Jasmine does not have friends which gives her more time to study.
D.	Jasmine's parents are likely intelligent and this may have been genetically passed down.	Jasmine likely has confidence in her academic abilities.	Jasmine received support and praise from her parents and peers.

Question 18 (1 MARK)

Opal has been experiencing significantly low levels of mental wellbeing. Which of the following set of interventions most appropriately uses the biopsychosocial model to address Opal's mental wellbeing?

	Biological	Psychological	Social
A.	Medication, such as an antidepressant.	Adoption of more effective coping skills.	Ensuring Opal has a close, supportive social circle.
B.	Instructing Opal to cut out dairy from her diet.	Helping Opal to change any negative thought patterns she may have.	Improving Opal's family dynamics.
C.	Improving Opal's sleeping patterns.	Reducing the stigma that Opal has around mental health.	Improving Opal's self-esteem.
D.	Medication, such as an antidepressant.	Encouraging Opal to remove herself from environments which elicit stress, such as school.	Encouraging Opal to find a boyfriend so that she is not as lonely.

Question 19 (3 MARKS)

With reference to the biopsychosocial model, provide an example of a negative biopsychosocial influence that may occur during childhood and explain how it may create a pattern of negative outcomes later in life.

Questions from multiple lessons

Question 20 (1 MARK)

In terms of the nature versus nurture debate, biological factors of the biopsychosocial model

A. are always attributed to nature.

B. are not relevant to the nature versus nurture debate.

C. can be an example of either nature or nurture.

D. are always attributed to nurture.

Question 21   (2 MARKS)

Identify one similarity and one difference between the concepts of nature and nurture, and the biopsychosocial model.

Question 22   (2 MARKS)

In a research setting, why is it difficult to study the aspects of nature, nurture, and the biopsychosocial framework in isolation?

2C Psychological development across the lifespan

2A   2B   2C   2D

1.1.3.1

Psychological development across the lifespan

- **1.1.3.1.1** Emotional development
- **1.1.3.1.2** Cognitive development
- **1.1.3.1.3** Social development
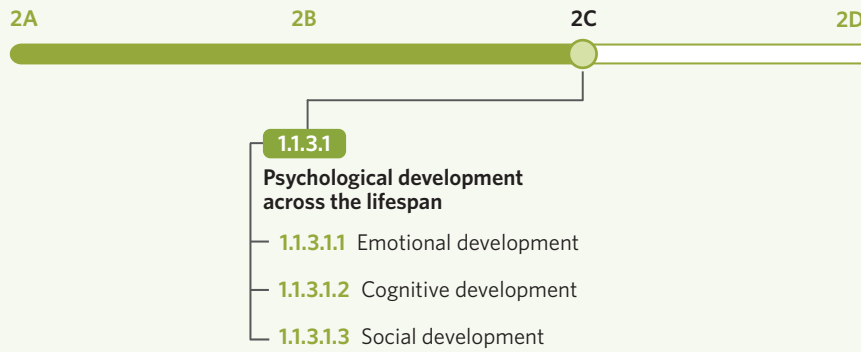
As we develop, we know that there is a particular age where we can expect that we will stop physically growing. But what about our psychological development? Psychological development is a lifelong process that is personal to each of us and continues to influence how we experience the world until the day we die. In this lesson, we will learn about psychological development across the lifespan and relevant theories.
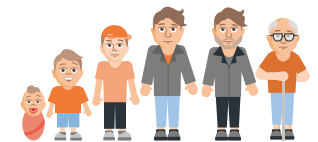
Psychological development across the lifespan 1.1.3.1

We have already learnt about psychological development and its multiple aspects; emotional development, cognitive development, and social development. In this lesson we will delve further into how these aspects develop and evolve across various stages of the lifespan.

Theory details

We spend our whole lives evolving, changing, and adapting, both physiologically and psychologically. This process of development is unique to each person, but does follow a general trajectory (trend) across the lifespan. Therefore, instead of outlining changes that occur at a very specific age, we tend to use broad periods that capture the experience of psychological development for the general population. These periods of the lifespan are outlined in table 1.

Table 1 Developmental periods across the lifespan

Age range	Name of period
0–12 months	Infancy
1–3 years	Toddlerhood
3–12 years	Childhood
12–19 years	Adolescence
19–35 years	Young adulthood
35–65 years	Middle adulthood
65+ years	Late adulthood

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

USEFUL TIP

It is important to not confuse psychological development with cognitive development. Although we often use the terms 'psychological' and 'cognitive' when speaking about functions of the brain, they reflect different aspects of the human experience. Psychology is the 'umbrella term' for everything that occurs within our consciousness, whereas cognition relates specifically to thoughts that we may have and is an aspect of psychological development

These time periods are not concrete and often vary slightly between different developmental theories. When exploring development, it is important to note that theories are simply ideas used to explain a phenomenon, and while they can be supported by data, this does not mean that they are necessarily factual. Throughout this lesson, we will explore some popular theories that have been developed in an attempt to explain the timeline and processes of psychological development, particularly emotional, cognitive, and social development.

Emotional development 1.1.3.1.1

Emotional development refers to the continuous, lifelong development of skills that allow individuals to control, express, and recognise emotions in an appropriate way. Emotions refer to temporary feelings which arise from personal experiences, usually occurring as an unconscious response. We all experience a range of emotional reactions in our lives, with everyone feeling angry, sad, relieved, and excited at some point in time. Like all forms of development, the range of emotions, and our knowledge of how and when to express these emotions, becomes increasingly sophisticated as we age and develop.

One way that emotional development is conceptualised is through the development of 'theory of mind'. Theory of mind refers to an individual's ability to attribute and understand mental states, beliefs, experiences, and emotions of oneself and others. During infancy and early childhood, children have already begun to develop skills that will allow theory of mind to develop later in life (Westby & Robinson, 2014; De Villiers & De Villiers, 2014). These skills include:

- recognising the emotions of others
- assigning words to certain emotions, such as 'happy' or 'sad'
- participating in imaginary play
- understanding that the expression of certain emotions may lead to consequences.

As children progress through childhood, they obtain more skills that contribute to the development of theory of mind. When theory of mind is developed, the individual should have little issues with recognising and understanding the emotional experience of themselves and others. Therefore, through the development of theory of mind, children should be able to exercise the skill of empathy, which is the understanding of another person's emotional state from their perspective as opposed to that of one's own. Upon reaching adulthood, and achieving a fully developed theory of mind, individuals should reach a state of emotional intelligence. Emotional intelligence refers to an individual's ability to monitor their own and others' emotions and use this information to guide their thoughts and behaviours (Salovey & Mayer, 1990).

Another theory that is used to explain the process of emotional development is the theory of attachment. **Attachment** is a long-lasting bond between two individuals. In attachment theory, attachment specifically refers to the bond between an infant and their primary caregiver. According to this theory, the attachment formed significantly impacts the infant's emotional development. It has the potential to enhance or reduce their ability to understand and express their own emotions, as well as recognise the emotions of others throughout their lifespan.

One of the main researchers associated with the attachment theory was John Bowlby, who described attachment as a necessary component to ensure that a child experiences a normal and optimal process of emotional development. Through his research, which spanned from 1944 to 1988, Bowlby proposed two main categories of attachment styles, both of which lead to different outcomes in an individual's subsequent emotional development. These categories of attachment styles are outlined in table 2.

Table 2 Attachment styles and their influence on emotional development

Category of attachment style	Description	Developmental outcomes
Secure attachment	Secure attachment involves the needs of the infant being consistently met by their primary caregiver/s, allowing the infant to feel calmed by the presence of the caregiver when they feel distressed.	Likely to lead to 'healthy' emotional development later in life, including: • a sense of trust in others • feeling valued by others • feeling secure in expressing one's emotions • development of skills which can assist the individual in dealing with challenging social circumstances, such as a breakup. Continues ▶

Table 2 Continued

Category of attachment style	Description	Developmental outcomes
Insecure attachment	Insecure attachment may involve the primary caregiver/s inconsistently meeting the infant's needs or consistently ignoring their needs, commonly leading to infants not seeking comfort from the caregiver or being overly desperate for comfort from their caregiver when they experience distress.	Likely to lead to 'unhealthy' emotional development later in life, including: • either craving or rejecting affection • increased feelings of anxiety • inappropriate expression of, or the inability to, express emotions.

WANT TO KNOW MORE?

Researchers Bartholomew and Horowitz (1991) built upon Bowlby's original model to create a theory of attachment in adulthood. Their model, which is depicted in figure 1, is centred around two main factors: avoidance and anxiety. In this model, avoidance refers to an individual's perspective of others, and anxiety refers to an individual's perspective of themselves.
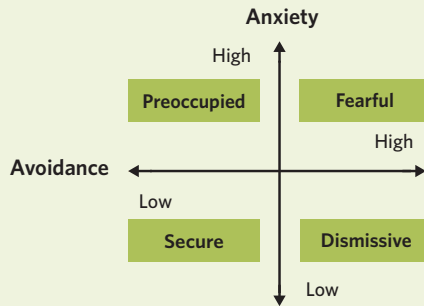
Figure 1 Bartholomew and Horowitz's model of attachment in adulthood

Bartholomew and Horowitz proposed that adults fit into one of the four categories of the model based on their attachment style: preoccupied attachment, fearful attachment, secure attachment, or dismissive attachment. The emotional outcomes associated with each category are outlined in table 3.

Table 3 Emotional outcomes associated with adult attachment styles

Category of attachment	Outcomes
Preoccupied	• Emotional expressiveness • High levels of self-disclosure • Feeling unable to be alone
Fearful	• Low self-confidence • Fear of intimacy
Secure	• Comfortable with intimacy • High levels of confidence • Warmth and friendliness
Dismissive	• High levels of confidence • Low levels of emotional expressiveness

Like many theories, the attachment theory is not a perfect model of emotional development and has some limitations. Despite attempting to explain the differences between individuals' experiences of emotional development, the theory fails to account for cross-cultural differences that may impact development. Further, the theory focuses on attachment style during infancy and then proceeds to jump directly to the developmental outcomes that are evident in adulthood, with little explanation as to what occurs in between.

Cognitive development 1.1.3.1.2

Has the way in which you think changed over time? Do you find it easier to make sense of new information now compared to when you were younger? Our cognitive processes continue to develop and strengthen throughout our lifespan. **Cognitive development** refers to the continuous, lifelong development of the ability to think, comprehend, and organise information from the internal and external environment.

Think about what you are currently learning at school. Would your five-year-old self be able to comprehend the same information that you do today? The answer is most likely no. This is because cognitive development is a gradual and life-long process and is somewhat reliant on biological and physical development. For example, one reason that children are universally unable to speak until they reach a certain age range is because, in order to produce and understand speech, certain neural networks are required (Guenther, 1994). These neural networks and connections grow and develop from infancy well into adulthood to facilitate different areas of cognitive development. This concept is known as synaptic plasticity and will be explored further in the next lesson.

An example of synaptic plasticity can be seen through the development of the frontal lobe. The frontal lobe is responsible for higher order functions, such as planning, decision making, working memory, and impulse control. Therefore, as the frontal lobe develops and the neural connections get stronger, an individual's ability to exercise these functions increases. However, the frontal lobe does not reach full development until an individual reaches the age of 25, further demonstrating that cognitive development is a process that does not exclusively occur in childhood.

Jean Piaget is one of the many psychologists who focused on this area of development. Piaget (1936) famously developed a theory of cognitive development after he noticed that the underlying cognitive processes function differently between children and adults. Piaget's theory outlines four distinct stages of cognitive development, during which certain cognitive skills and abilities should be developed in order to achieve normal levels of cognitive functioning in adulthood. The stages operate in a linear fashion, meaning that in order to progress to the next stage, a child must first meet the requirements of the previous stages. Furthermore, according to this theory, children are expected to all progress through these stages following the same timeline, with no variation between individuals. These stages are outlined in table 4.

Cognitive development
the continuous, lifelong development of the ability to think, comprehend, and organise information from the internal and external environment

USEFUL TIP

To remember Piaget's stages of cognitive development in the correct order you can think of the acrostic **S**mall **P**igs **C**an **F**ly.

Sensorimotor stage

Preoperational stage

Concrete operational stage

Formal operational stage

Image: Sudowoodo/Shutterstock.com

Figure 2 You can use the acrostic Small Pigs Can Fly to remember Piaget's stages

Table 4 The stages of Piaget's theory of cognitive development

Age range	Stage	Key developments in cognition
0–2 years	**Sensorimotor**	• Children develop object permanence, meaning they understand that an object continues to exist even if it cannot be seen. • Children will begin to perform goal-directed behaviour, which involves engaging in behaviour to meet a goal that has been purposefully planned. For example, an infant might want to play with a specific toy. When they achieve goal-directed behaviour, they realise that they can reach out their hand and grasp the toy in order to achieve this goal.
2–7 years	**Preoperational**	• At the beginning of this stage, children are egocentric, meaning that they cannot understand the perspectives of others. In such a way, children may believe that the way in which they think about the world is exactly the same as how everyone else does. By the end of this stage, children should overcome this egocentrism. • Children overcome centration (only being able to focus on one feature or characteristic of an object). • Children learn to understand reversibility (the knowledge that objects are able to change and then return to their original form). An example of this is playdough, which you can roll out into a long, thin line and then return it to its original shape as a round ball.
7–12 years	**Concrete operational**	• Children develop the understanding of conservation, which is the knowledge that the properties of an object remain consistent even when the object's appearance is altered. For example, understanding that when water from a tall, skinny glass is poured into a short, wide glass, the quantity of water remains the same. • Children develop the skill of classification, which is the ability to group objects or concepts into categories which are organised on the basis of common features. For example, a child may understand that fruits are sweet, therefore when tasting a sweet strawberry for the first time, the child would be able to group it with other fruits on the basis of this common feature. • Children are able to perform simple mental operations, such as mathematical skills, including addition and subtraction.
12+ years	**Formal operational**	• Children develop the ability to produce abstract thought, which involves the consideration of concepts that are not tangible and therefore require imagination rather than senses. For example, the concept of love or the concept of society would require abstract thought to be understood. • Children develop the ability to use reason and logic. Logic is the ability to objectively consider a problem and consider all possible solutions, whereas reasoning involves using logic to process a concept and to reach a sensible and valid conclusion.

WANT TO KNOW MORE?

Have you ever played peek-a-boo with a young infant? Did you wonder why infants find it so entertaining or even really scary?

The inability for infants to understand object permanence explains why they find the game peek-a-boo so fascinating. When an adult is playing peek-a-boo with a young infant and hides their face behind their hands, the infant is unable to understand that the person's face exists behind their hands. For this reason, when the adult removes their hands and their face becomes visible again, the infant becomes extremely surprised and often appears visibly delighted or scared, often leading to laughter or tears.

Despite the structured and testable nature of Piaget's theory of cognitive development, it has still received criticism. One major limitation of Piaget's theory is that it fails to account for developmental diversity, which is the idea that development is unique to any given individual. In addition, Piaget's research method was heavily flawed as he based his theory on observational research of his own children. The theory is also seen as very rigid, with the age ranges assigned to each stage being relatively concrete and therefore expects every individual to develop at the same rate.

Social development
the continuous, lifelong development of certain skills, attitudes, relationships, and behaviours that enable an individual to interact with others and to function as a member of society

Social development 1.1.3.1.3

Think about who you would consider to be a friend. How many of these friendships developed in primary school, or at least many years ago? Whether your social circle has changed or remained the same throughout your life, your social development is ever changing. **Social development** is the continuous, lifelong development of certain skills, attitudes, relationships, and behaviours that enable an individual to interact with others and to function as a member of society.

Social development involves a key set of skills that begin to develop even before an infant can create or understand speech. Infants may begin to demonstrate social behaviours by smiling at others, developing an attachment to caregivers or objects, and may even imitate those around them. By the age of three or four, most children begin to develop a sense of confidence in their interactions with others. At this age, children will typically begin to learn to share, take turns, follow simple rules, and form friendships with others. By the age of six, most children will learn to develop deeper friendships with other children, learn to compare themselves to others, learn how to listen to and communicate with others, and learn how to initiate play with other children (Malik & Marwaha, 2022).

It is important to note that social development is an area of psychological development that is heavily influenced by the external world, hence why social development is experienced differently between individuals. For example, parents have the ability to influence their children's social development both explicitly and implicitly. Parents may implicitly influence a child's social development by acting as mediators between their children and their children's involvement with their peers and the community. A child who is not encouraged or allowed to participate in extracurricular activities may experience a different timeline of social development in comparison to a child who is. In addition, parents may explicitly influence a child's social development by establishing social rules, such as teaching a child to say please and thank you or establishing boundaries between sibling interactions. Children's social development is also influenced by their experiences within a school setting and peer relationships. School is a setting in which many children learn social skills, such as how to manage conflict, listen to instructions, turn-taking in both play and conversations, and how to work in a team. These skills can set children up for successful social interactions later in life, such as within the workplace. Further, research has found that social interactions between children of similar ages and skill levels promotes the development of essential social skills (Bukwowski et al., 2011).

When Erik Erikson found out that his father was not actually his biological father, he began to take an interest in developmental psychology. Erikson (1950) developed a theory known as the psychosocial crises, which emphasises the interaction between social and psychological influences on development across the lifespan. Erikson's theory outlines eight separate stages of development which occur throughout the entire lifespan. At each of these stages, Erikson proposed that the individual faces a psychological crisis, which is a tension point arising when there is conflict between an individual's capabilities and personal desires, and the desire to meet the expectations of society. To successfully resolve each psychosocial crisis, the tensions need to be balanced out. Each crisis can lead to positive or negative impacts on one's social development depending on whether the crisis is resolved or unresolved. These crises and their possible developmental outcomes are explained in figure 3 and table 5.

Infant	Toddler	Pre-schooler	Primary schooler	Adolescent	Young adult	Middle age	Older adult
Trust: Infants' needs are reliably met **vs. mistrust**	**Autonomy:** Encouraged to make choices independently **vs. shame and doubt**	**Initiative:** Independent plans encouraged **vs. guilt**	**Industry:** Proud of performances **vs. inferiority**	**Identity:** Strong belief of self **vs. role confusion**	**Intimacy:** Can form strong relationships **vs. isolation**	**Generativity:** Contributed to others' wellbeings **vs. stagnation**	**Integrity:** Satisfied reflection of life **vs. despair**

Figure 3 Erik Erikson's psychosocial crises across the lifespan

Table 5 Erik Erikson's psychosocial crises across the lifespan and their impact on social development

Age range	Crisis	Explanation	Crisis resolved	Crisis unresolved
0–1 years	**Trust vs. mistrust**	• In this stage, infants are completely dependent on their caregivers.	• If an infant is surrounded by reliable caregivers who consistently respond to and meet their needs, they will likely develop a sense of trust. • This trust will help with the development of trusting relationships in adulthood.	• If caregivers are unresponsive to an infant's needs, the infant may develop a sense of mistrust. • This lack of trust may eventuate into paranoia, fear, and a lack of safety in adult relationships.
1–3 years	**Autonomy vs. shame/doubt**	• This stage involves toddlers experiencing an enhanced level of independence while learning about the world through exploration.	• If toddlers are encouraged to act independently in their exploration and play, a sense of autonomy is developed. • This allows toddlers to act with independence in the future, including in relationships and workplaces.	• If a toddler has their choices doubted or denied by a caregiver repeatedly, they will begin to doubt their ability to make decisions. • This sense of shame and doubt may lead to feelings of being ridiculed by peers or being overly dependent in adult relationships.
3–6 years	**Initiative vs. guilt**	• Children begin to actively interact with others.	• Initiative involves the implementation of purposeful plans during social interactions as well as the ability to produce independent thought. • When the process of initiative is encouraged, individuals will feel that they are being listened to and respected, leading to an enhanced level of self-confidence.	• Displays of initiative by the child are not encouraged by others, leading to a lack of initiative. • Experiences of rejection or punishment may lead to a sense of guilt. • In adulthood, this may lead to self-doubt and allowing others to be in control of relationships.
6–12 years	**Industry vs. inferiority**	• At the beginning of this stage, children start to be measured on their performance in multiple aspects of life. For example academic performance at school. • Children will compare their own performance to the performance of others.	• If children feel proud of their performances, they will develop a sense of industry, in which they will hold the belief that they are competent. • This is usually as a result of caregivers providing encouragement to children.	• If children feel inadequate when comparing themselves to others they will develop a heightened sense of inferiority. • Children may also lack encouragement from caregivers to exert effort and achieve goals, further leading to a sense of inferiority as they may lack a sense of capability to perform well.
12–19 years	**Identity vs. role confusion**	• During this stage, individuals attempt to navigate their social world and seek clarity on who they are, their capabilities, and their role in the world.	• If these points become clear, a sense of identity is developed. Identity involves holding a strong belief in who you are and what your beliefs and values are. • A sense of identity is attained when the ability to make choices that align to your beliefs and values while staying true to yourself occurs.	• Role confusion lacks this strong sense of self. This involves uncertainty about your identity as well as what you want to do in the future and trying to fit in with different types of people to see what best fits with who you are. • If role confusion is never resolved, the individual will have a weak sense of self and remain uncertain about who they are in the future.

Table 5 Continued

Age range	Crisis	Explanation	Crisis resolved	Crisis unresolved
19–30 years	Intimacy vs. isolation	• This stage involves young adults attempting to navigate and establish their social relationships, specifically focusing on romantic relationships. • As an early adult, this stage involves seeking intimacy in the form of strong and committed romantic relationships.	• If a young adult has a strong sense of self and trust, they will likely be able to experience intimacy within their relationships.	• If these traits are lacking and intimacy fails to occur, and individuals feel that they are lacking romantic connection, they can often feel isolated and lonely. • This often involves individuals avoiding vulnerability with others, leading to an inability to form intimate romantic relationships.
30–64 years	Generativity vs. stagnation	• This stage occurs in middle adulthood and involves individuals evaluating whether they lead a purposeful and meaningful life. • This involves people evaluating whether their actions contributed to the lives of the next generation.	• This sense of purposefulness is known as generativity. • It can involve raising children, volunteering, or working with children. These activities can give an individual a sense of purpose through contributing to society in a meaningful way.	• For those who reflect and realise that they have not contributed to the lives of the next generation, they may experience stagnation. • Stagnation may involve a sense of disconnect from community or society, feeling as if too much focus has been directed to the self, and can sometimes lead to a 'mid-life crisis'.
65+ years	Integrity vs. despair	• The final stage ranges from the mid-sixties until the end of life. This stage involves reflecting on your life and evaluating whether you have succeeded and achieved your goals.	• If an individual experiences satisfaction with their achievements, this is called integrity. It involves looking back on the past with acceptance and pride.	• For those who look back on their life with regrets and a lack of pride, there will be an experience of despair. • This is due to the sense that they did not accomplish what they should have, leading to a sense of bitterness.

Just like the other theories explored in this lesson, Erikson's psychosocial crises are not based on objective scientific research and therefore have limitations. Firstly, Erikson's theory was based heavily on case studies and biographical data that reflected Western standards. This data is therefore subjective and is culturally biased. In addition, the theory has not been updated since its development in 1950 and therefore does not account for societal changes, such as the rise of technology.

Theory summary

In this lesson, we learnt about how psychological development, including emotional, cognitive, and social development, takes place across the lifespan. Within these aspects, we also explored theories that were established to explain the process of psychological development, which are outlined in figure 4

```
                    Psychological development
                    /          |            \
            Emotional       Cognitive        Social
                |               |               |
        Attachment theory  Piaget's theory  Erikson's psychosocial
                                             theory
```
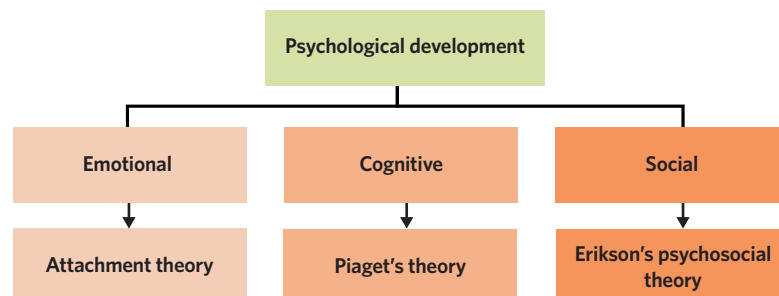
Figure 4 The aspects of psychological development and their relevant theories

2C Questions

Theory review

Question 1

Psychological theories are **(Select all that apply)**

I.   scientific, evidence-based explanations for phenomenons.

II.   ideas that are not necessarily supported by scientific evidence.

III. random guesses as to why things occur.

IV. used to explain how certain psychological processes occur.

Question 2

The duration of psychological development ranges from infancy to adolescence.

A. True.

B. False.

Question 3

The stages of development across the lifespan are

A. fixed and consistent between theories.

B. inaccurate and disproven.

C. a general guide and vary between theories.

Question 4

Every individual attaches to caregivers in the same way.

A. True.

B. False.

Question 5

Cognitive development involves

A. a child's increased ability to form meaningful relationships.

B. a discovery of Jean Piaget, which led to his fame in the field of psychology.

C. the ability to produce thought, and comprehend and organise information.

Question 6

Erik Erikson's theory of psychosocial development is a completely accurate and proven theory of social development.

A. True.

B. False.

Assessment skills

Data analysis

The following assessment skills type reflects the study design assessment type:

- a data analysis of generated primary and/or collated secondary data

Use the following information to answer questions 7–10

Testing Piaget's theory of cognitive development

A study was conducted in a classroom of 26 children to assess which stage of Piaget's theory of cognitive development the children were currently experiencing.

The students were first presented with two equal balls of clay and were asked to identify whether they perceived the two pieces to be equal or not. Following this, the researcher took one of the balls of clay and rolled it out into a long, thin shape whilst the children watched. The students were then asked again to judge if there was the same amount of clay in each piece.

Trial 1

Trial 2

Student perceptions of clay sizes

Key ▮ Equal in size ▮ Not equal in size
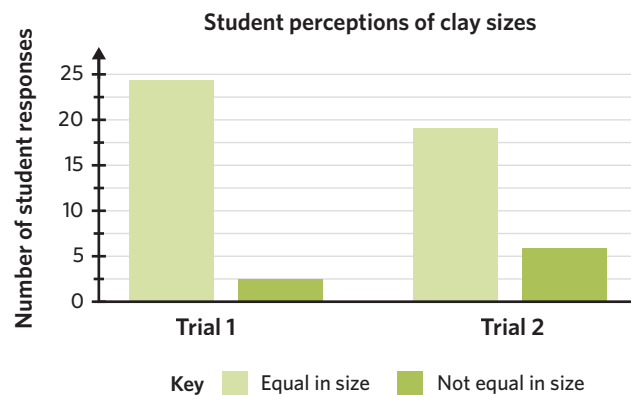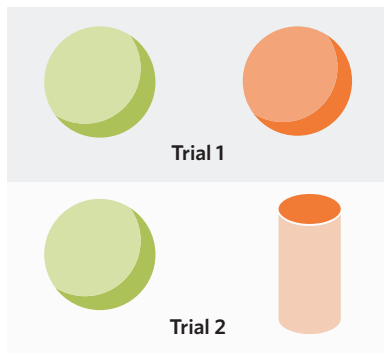
Question 7

What is the independent variable and what is the dependent variable of this study, respectively?

A. The shape of the clay, the children's perception of the clay.

B. The children's perception of the clay, the shape of the clay.

C. The trial number, the stage of development of the children.

D. The stage of development of the children, the trial number.

Question 8

During trial 2

A. more children perceived the clay to be equal in size than in trial 1.

B. the children's answers were more unanimous than in trial 1.

C. more children answered correctly than in trial 1.

D. less children perceived the clay to be equal in size than in trial 1.

Question 9

What was the difference in the amount of children who perceived the clay to be equal in size between trial 1 and trial 2?

A. 22.

B. 13.

C. 5.

D. This information cannot be determined from the graph.

Question 10

Why were the class's answers not unanimous? **(Select all that apply)**

I. The timeline of development may vary slightly between individuals.

II. Piaget provides an age range for cognitive achievements, not a specific age.

III. Smarter students are more likely to answer correctly.

IV. Piaget's theory was largely inaccurate, as demonstrated by the research's lack of unanimity.

Exam-style

Remember and understand

Question 11　(1 MARK)

Broad age ranges are used to map out psychological development because

A. the human lifespan has increased over time.

B. developmental changes follow a rigid, universal timeline.

C. the timeline of psychological development varies between individuals.

D. psychological development follows a concrete trajectory.

Question 12　(1 MARK)

Attachment theory suggests that

A. an individual's emotional development is influenced by their early attachment to a primary caregiver.

B. an individual's cognitive development is dependent on their early attachment to a primary caregiver.

C. attachment is unlikely to affect development but may lead to emotional wellbeing or distress.

D. If an individual develops an insecure attachment style, they will always experience maladaptive emotional development.

Question 13　(1 MARK)

Which of the following is **not** something that is said to occur during cognitive development?

A. An increase in the ability to comprehend and organise information.

B. An increase in the ability to control one's emotions in response to negative thoughts.

C. The growth and development of neural networks.

D. The development of abstract thinking.

Question 14　(1 MARK)

The school environment fosters social development in children because

A. it is a setting in which children are taught important social skills, such as how to tie their shoes and how to catch the bus.

B. parents are unable to influence their child's social development on their own.

C. in school, children learn new concepts, such as maths.

D. it is a setting in which children are taught important social skills, such as how to manage conflict and take turns during play.

Question 15　(6 MARKS)

Explain the three aspects of psychological development, using an example for each.

Apply and analyse

Question 16   (1 MARK)

When Ruby was young, she remembers getting angry and throwing a tantrum when her friends didn't want to share their toys, often calling them 'mean' or 'rude'. Now, as an adult, Ruby does not mind if her friends don't want to share their belongings and she can often identify a logical reason for their decision.

Which of the following is **not** true about Ruby?

A.   Ruby has reached a state of emotional intelligence.

B.   Ruby has developed theory of mind.

C.   Ruby is able to exercise the skill of empathy.

D.   Ruby's tantrums as a child suggest that she has not yet completed her emotional development.

Use the following information to answer questions 17 and 18.

Marriane is 20 years old. She grew up with loving but busy parents and always did well throughout school. However, Marriane, as an adult, finds it difficult to voice her needs in her relationships and often just lets others take control.

Question 17   (1 MARK)

What area of Marriane's development was likely affected in her early life?

A.   Social development.

B.   Emotional development.

C.   Cognitive development.

D.   Psychological development.

Question 18   (2 MARKS)

Considering development across the lifespan, is it possible for Marriane to change these negative developmental outcomes?

Evaluate

Question 19   (3 MARKS)

Evaluate whether Piaget's theory is adequate in explaining cognitive development.

Questions from multiple lessons

Question 20   (1 MARK)

In terms of nature versus nurture, attachment theory emphasises the influence of what factors on development?

A.   Environmental factors.

B.   Hereditary factors.

C.   Psychological factors.

D.   Biological factors.

Question 21   (4 MARKS)

With reference to biological, psychological, and social factors, explain how a secure attachment can support healthy psychological development.

2D Critical and sensitive periods

2A   2B   2C   2D

1.1.4.1
Maturation
 └ **1.1.4.1.1** Plasticity during maturation

1.1.4.2
Types of developmental periods
 └ **1.1.4.2.1** Critical periods
 └ **1.1.4.2.2** Sensitive periods
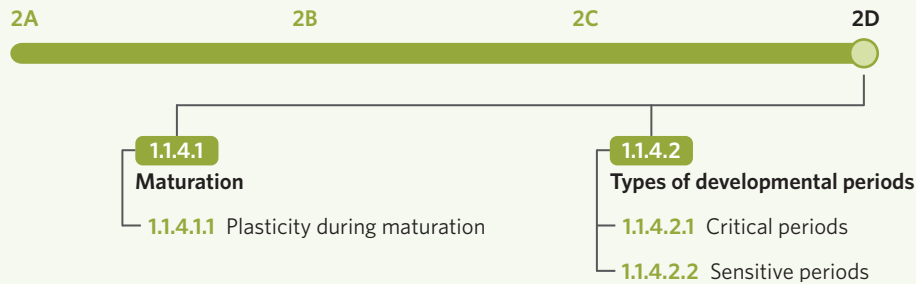
Can our skills develop at any time? Is there a set age at which certain skills need to have been developed? Is it too late to become as good at speaking French as someone who was raised in Paris? In this lesson, you will learn about maturation, and two types of time periods for skill development: critical and sensitive periods.

Maturation 1.1.4.1

You may know some people who seem more mature than others. How do we mature? Is this process the same for all people? The time periods during which we develop vary between people, and differ between specific skills and functions. The period for each skill is determined by the process of maturation.

Theory details

Maturation is the biologically programmed process of growth that has a fixed sequence and facilitates all aspects of our development as we grow. Our brain has its own developmental 'map' which is determined at conception. This map sets out a timeline for when certain developmental events will occur and is specific to each individual. Maturation relies on this map to facilitate all areas of development, including cognitive and physical development. For example, the trajectory of learning to walk is genetically determined and mapped out in our brain, but this could differ between people. Consider two toddlers, where one may have started walking a lot earlier than the other simply based on their own developmental trajectory. Despite this, at the age of three, they have the same walking ability as each other.

Plasticity during maturation 1.1.4.1.1

The brain operates like a complex system of highways with lots of lanes, detours, and exits, through a series of pathway-like structures (you will learn a lot more about these structures later in chapter 5). These pathways can be altered or strengthened as the result of experiences, similar to the way a muscle gets stronger with repeated use. **Plasticity** refers to the brain's ability to physically change shape in response to experience and learning. Experiences throughout our life can help shape or add to the brain's map, therefore altering the individual's unique maturation sequence and plasticity. This allows them to develop skills in the way that has been mapped out (Rutter et al., 2004). All individuals will experience typical development as long as their experiences do not interfere with the processes set out by normal maturation.

Infants and children have more malleable brains, meaning that the brain's structural pathways can change physically and with ease in response to experiences during maturation. An individual's readiness to change follows a relatively linear sequence throughout the lifespan. Certain periods in infancy and childhood are more suited to acquiring certain psychological functions, as these periods best suit the brain's developmental timeline.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

KEY TERMS

Maturation the biologically programmed process of growth that has a fixed sequence and facilitates all aspects of our development as we grow

Plasticity the brain's ability to physically change shape in response to experience and learning

LESSON LINK

Maturation is an innate process that is determined before birth, therefore acting as a source of nature; that is, a biological factor of development. To allow the plans laid out by maturation to come to life, certain experiences need to occur, acting as a source of nurture. To revisit these concepts, return to lesson **2A Nature versus nurture**.

Types of developmental periods 1.1.4.2

When watching the Australian Open, some people may wish they were enrolled in tennis lessons when younger. While they can still learn how to play, they may have missed the optimal time to learn in order to gain a professional edge. Skills required for tennis are acquired within both critical and sensitive periods, which you will learn about in this section of the lesson.

Theory details

Critical periods
the narrow, rigid developmental period in which a specific function or skill must be learnt

Sensitive periods
the optimal developmental period for a specific function or skill to be learnt in the fastest and easiest way

There are two key periods that the development of skills or functions may operate within. **Critical periods** are the narrow, rigid developmental periods in which a specific function or skill must be learnt, while **sensitive periods** are the optimal developmental period for a specific function or skill to be learnt in the fastest and easiest way. Some specific skills or functions have a critical period while others have a sensitive period. These time periods are determined by the process of maturation. Due to the brain's high malleability at a younger age, some brain regions will be more responsive to environmental stimuli during this time. However, after this time period has passed they may be less responsive to the same environmental stimuli.

Critical and sensitive periods are described to provide different 'windows of opportunity' in which skills and functions can develop. The different sizes of these windows of opportunity are visualised in figure 1.

As highlighted in figure 1, the main difference between sensitive and critical periods is the flexibility of each period, as represented by the size of the window of opportunity. The larger window for sensitive periods (when compared to critical periods) represents the much larger period of time they typically occupy, while critical periods usually have a smaller time frame. In general, critical periods are less flexible, while sensitive periods have greater flexibility in which a skill or function can be developed.

Critical periods

Sensitive periods

Figure 1 Critical periods are less flexible due to having smaller windows of opportunity in which skills and functions can be developed when compared to sensitive periods

Critical periods 1.1.4.2.1

Some functions have set time periods in which they must develop, in order to develop at all throughout the lifespan. If these functions are not acquired during their critical periods, they may never develop, or may not be fully functional. From a psychological perspective, this is known as the critical period hypothesis, in which it is hypothesised that certain skills or functions need to be acquired within the limited time of a critical period. This is mainly due to the brain's processes and levels of plasticity at this time. This hypothesis is particularly relevant for language acquisition.

Example of first-language acquisition

Language acquisition, or the ability to perceive and comprehend language, and produce and communicate with speech, is one of the most well-known critical periods for humans. Researchers, such as Noam Chomsky (1965), suggested that humans are born with a predisposition to acquire (or learn) language. This means that babies are equipped with the tools to acquire language from birth. This predisposition enables them to hear speech whilst in their mother's womb. The critical period hypothesis suggests that there is a set period in which all components (comprehension of language, verbal production etc.) of language acquisition need to develop, or they may never fully develop.

This acquisition period varies, but it is believed that first-language acquisition (acquisition of native language) needs to occur in the first three to five years of life. If a child is deprived of language exposure in the first five years of life, they can still develop language. However, they will never be able to acquire language skills that compare to those of a native speaker who did receive exposure during the critical period.
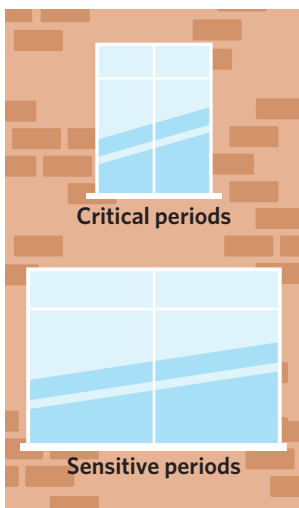
One example of a critical period in animals is imprinting, in which a newborn bird becomes emotionally attached to the first living thing they see after birth. Typically the newborn bird sees the mother first, encouraging survival as they will follow and be protected by their mother. However, if the bird first sees a human or another animal, its survival may be threatened, particularly as the process of imprinting is irreversible. This demonstrates the very short window of critical periods. A common example of imprinting is ducklings walking in a line behind their mother.
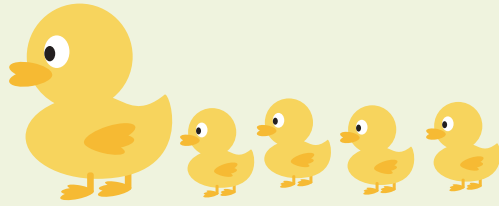
Figure 2 Imprinting is often seen by ducklings walking in a line behind their mother

Sensitive periods 1.1.4.2.2

Sensitive periods occur when the brain is most sensitive to learning from environmental influences. As such, sensitive periods involve the optimal period for a skill to be developed, although the time frame of development is more flexible than critical periods. This most commonly occurs during infancy and early childhood due to the greater level of plasticity at this time. The strengthening or growing of the number of connections within the brain facilitates greater communication between the brain's regions. This results in more efficient brain functioning in these areas, which is easier to achieve during sensitive periods. The more these connective pathways are used or stimulated, the stronger they become.
You will learn about this concept in more detail in chapter 5.

But what happens if you miss a sensitive period? Do you miss the opportunity to develop the skill? The flexibility of sensitive periods means that you will still be able to learn a skill or function outside of the sensitive period. If exposed to the right environment, the skill will still be able to develop but it will be a much lengthier and more difficult process.

Example of acquisition of a second language

The acquisition of a second language involves a sensitive period. A second language is much easier and faster to learn up until the age of 12 due to the processes of maturation and brain plasticity (DeKeyser et al., 2010). It is believed that the earlier a second language is acquired, the more potential there is to learn this language to a greater level of fluency. If a second language is learnt as an adult, it is much more difficult to reach a 'native-speaker' level of fluency, and the specific grammar rules of the language will be developed to a lesser extent than if learnt as a child (Abrahamsson & Hyltenstam, 2009).

PSYCHOLOGY EXPLORATION

The sensitive period of learning languages is not exclusively restricted to verbal language. A study on British Sign Language (BSL) found that people born deaf who learnt sign language at an older age performed worse on grammatical tasks in BSL than deaf people who learnt it at a younger age. This demonstrates the importance of learning a language early in life. Furthermore, the performance of deaf individuals who learnt sign language at an older age was compared with people who had adequate hearing and learnt sign language as a second language at the same age. People who had adequate hearing performed better than those who were deaf. This suggests that learning something about language, whether sign language or verbal language, can make you better at learning other types of language later in life.

(Cormier et al., 2012)

Table 1 Summary of critical and sensitive periods

	Characteristics	Examples of language acquisition
Critical period	• Skills or functions within a set critical period must be learnt during this predetermined period. • Critical periods start and finish suddenly.	• There is a critical period between the ages of three to five in which children need to learn their native first language in order to learn it at all.
Sensitive period	• Particular skills and functions with sensitive periods will be easiest to learn during this developmental period, however, have the ability to be developed at a later time. • Sensitive periods start and finish more gradually than critical periods.	• The acquisition of a second language involves a sensitive period and is easier to learn as a child. This can still be learnt as an adult, it may just be slower and require a bit more effort.

The story of Genie

The devastating story of Genie is a case study that helped researchers understand the critical and sensitive periods involved in language acquisition. Genie experienced extreme levels of neglect, abuse, and isolation from 20 months of age up until she was discovered at 13.5 years old in 1970 (Weston, 2002). During this time, she was isolated in a locked room and was never spoken to.

When she was discovered, she was significantly behind children her age in many aspects of development, such as being able to talk and walk. Researchers and psychologists began working with Genie to see if she could acquire language. Initially, Genie was unable to produce language however, over time Genie was able to learn and add words to her vocabulary. However, this process was far more difficult and lengthy compared to the rate at which infants and toddlers expand their vocabulary.

After a few years, Genie was able to verbally produce single words and even combine two words to form a sentence (Curtiss et al., 1974). Despite this, Genie was not able to develop certain skills required in language acquisition, including

- fully understanding all aspects of grammar.
- verbally producing sentences.
- understanding intonation (the pattern involving rises and falls in pitch when speaking to convey meaning).

This suggests that some aspects of first language acquisition (e.g. verbal language production) are actually sensitive periods, while others (e.g. understanding intonation) have critical periods.
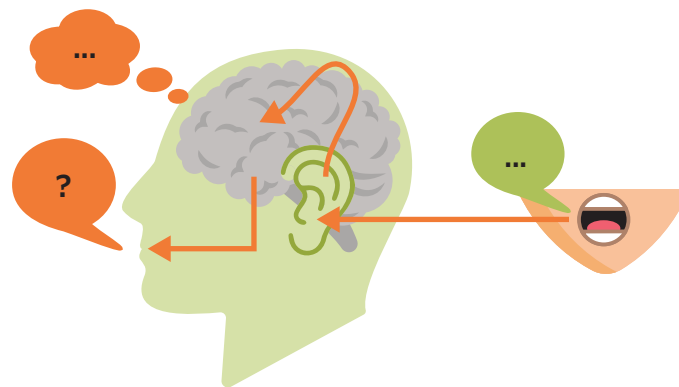
Figure 3 Even though Genie was able to display that she understood sentences, she was unable to verbally produce sentences herself

Theory summary

In this lesson, you learnt about the differences between sensitive and critical periods. In learning about the characteristics of both of these periods, you also learnt about the contributing role of maturation and processes of brain plasticity. You also learnt about the story of Genie and the knowledge her case study provided about language acquisition.

2D Questions

Theory review

Question 1

Critical periods are rigid while sensitive periods are more flexible.

A. True.

B. False.

Question 2

Critical periods refer to specific times in which skills _____, whereas sensitive periods refer to times in which specific skills _____.

Which of the following best fills in the blank?

A. are most optimally learnt; have to be learnt

B. have to be learnt; are most optimally learnt

Question 3

Which of the following is true of maturation? **(Select all that apply)**

I. The timing of both critical and sensitive periods relies upon the process of maturation.

II. Maturation is a mainly emotional process.

III. Everybody matures at the same rate.

IV. Individuals have their own unique rate of maturation.

Question 4

The story of Genie did not provide researchers with insight into the sensitive and critical periods of language acquisition.

A. True.

B. False.

Question 5

Which of the following is the most correct explanation for why it is easier to learn multiple languages as a child than as an adult?

A. Children's brains are more malleable and able to be shaped by exposure to experiences, such as new languages.

B. Adults have passed the critical period of language acquisition, so will not be able to develop grammatical skills in a second language.

C. Acquiring a second language is a critical period that takes place during childhood.

Assessment skills

Perfect your phrasing

Question 6

Which of the following sentences is most correct?

A. Critical periods are narrow periods in which a function **should** be learnt.

B. Critical periods are narrow periods in which a function **must** be learnt.

Question 7

Which of the following sentences is most correct?

A. Plasticity is highest during infancy when the brain is more **malleable** and can easily be reshaped in response to experience.

B. Plasticity is highest during infancy when the brain is more **advanced** and can easily be reshaped in response to experience.

Text analysis

The following assessment skills type reflects the study design assessment type:

- analysis and evaluation of an experiment or case study

Use the following information to answer questions 8 and 9.

You have learnt about the case study of Genie, however, there are other individuals that have had similar early experiences. In the 1930s, Isabelle was discovered at the age of seven, after having lived in a dark room most of her life. She had the mental age of a 19-month-old child, and her only human contact was with her deaf-mute mother. From the time she was initially found and observed, a number of developments occurred:

- Isabelle had no prior knowledge of language, however, after a couple of months of intense verbal training she could start to put longer sentences together.
- After one year of training she was able to read.
- Isabelle had an extremely low IQ score when first found, however after two years she had caught up to the normal IQ score for her age.

Isabelle's case was far more successful than Genie's due to being found at an age several years younger than that of Genie.

(Nolin, 2012)

Question 8

Comparing Genie and Isabelle, why could being found at a younger age have allowed Isabelle to experience greater psychological development than Genie?

A. Isabelle was training to read for a year, whereas Genie was not trained to read for as long as Isabelle.

B. Isabelle was discovered closer to her critical period for first language acquisition, so she could still catch up to her peers, whereas Genie was discovered longer after this critical period for first language acquisition, thus was more limited in her language abilities.

C. Isabelle was smarter than Genie, as shown by her high IQ.

D. Isabelle was discovered closer to her sensitive period for first language acquisition, so she could still catch up to her peers, whereas Genie was discovered longer after this sensitive period for first language acquisition, thus was more limited in her language abilities.

Question 9

Differences between Isabelle and Genie in their ability to develop language indicate the presence of critical periods for some verbal skills, such as speaking in longer sentences.

A. True

B. False.

Exam-style

Remember and understand

Question 10 (1 MARK)

Which of the following is **not** a correct characterisation of the process of maturation?

A. Maturation is biologically programmed.

B. Maturation has a set sequence in which certain functions need to develop.

C. The sequence of maturation is different at birth for all individuals.

D. Maturation is predetermined.

Question 11 (1 MARK)

Skills that are optimal to learn at certain points in time but can still be learnt at later times have a

A. critical period.

B. sensitive period.

C. specific time in which they have to be learnt or they won't be learnt at all.

D. short time period in which they need to be developed.

Question 12 (1 MARK)

Genie was discovered at the age of 13.5 after being isolated in a room where she was never spoken to. When discovered, she was unable to talk. Researchers worked with Genie to develop her language abilities. She was able to expand her vocabulary, but was unable to fully understand grammar and verbally produce sentences.

What did the story of Genie help researchers understand?

A. You have to learn words and add to your vocabulary in the first few years of life or you will not learn any words in your lifetime.

B. Not learning to talk in the first few years of life means that you will never be able to talk.

C. Grammar skills can be learnt at any age.

D. Certain processes involved in language acquisition have sensitive periods, while others have critical periods.

Question 13 (1 MARK)

How are critical and sensitive periods different?

A. If not learnt during the optimal time period, functions with a sensitive period can still develop later in life but functions with critical periods can only be learnt during a set time.

B. Critical periods are set from birth but sensitive periods are not.

C. Sensitive periods rely on the process of maturation but critical periods do not.

D. Sensitive periods are more rigid than critical periods.

Question 14 (1 MARK)

Identify one similarity of sensitive and critical periods.

Apply and analyse

Use the following information to answer questions 15 and 16.

Asanka and Sharni are friends who went to primary and high school together. At the age of three, Sharni's parents taught her how to speak Spanish. Spanish was a second language for Sharni as she had already learnt English. Asanka had always loved listening to Sharni and her family speaking Spanish and decided at the age of 21 that she would also learn Spanish as a second language.

Question 15 (1 MARK)

Which of the following is most correct?

A. Asanka will be able to learn Spanish at a faster rate than Sharni did.

B. Asanka will learn Spanish at a slower rate than Sharni did because it is less optimal for the brain to learn a second language at the age of 21, compared to as a child.

C. Asanka will not be able to learn Spanish as a second language because learning a second language has a critical period.

D. Asanka will not be able to learn Spanish as a second language because learning a second language has a sensitive period.

Question 16   (1 MARK)

Learning a second language after previously learning one's native language

A.   has a critical period as it needs to be learnt before the age of 30.

B.   takes less time than learning a first language.

C.   has a sensitive period in which it is harder but still possible to develop after the age of 12.

D.   has a critical period in which it has to be learnt before the age of 12.

Question 17   (3 MARKS)

Kairo and Logan grew up with cousins who spoke Japanese and struggled to speak English. At the age of three, Logan decided that he wanted to learn Japanese so that he could better communicate with his cousins. With their help, he was able to fluently speak Japanese by the age of six. Kairo said he could not be bothered to learn Japanese until he was 23 years old when he decided that he wanted to learn.

a.   State whether the acquisition of a second language has a sensitive or critical period.   (1 MARK)

b.   Predict whether Kairo would learn Japanese faster or slower than his brother by referring to the type of period the acquisition of a second language is.   (2 MARKS)

Question 18   (3 MARKS)

Due to Genie growing up without exposure to language, she was unable to talk when she was discovered at the age of 13. Over time, she was able to learn some skills associated with language acquisition. However, Genie was still unable to learn some processes, including correct use of grammar.

a.   Based on Genie's scenario, identify whether learning grammar has a sensitive or critical period. Justify your response.   (2 MARKS)

b.   In relation to brain plasticity, explain why it would have been easier for Genie to learn grammar at a younger age.   (1 MARK)

Question 19   (3 MARKS)

The critical period hypothesis states that if the first language is not acquired during its critical period, it may never develop. Describe the main findings of Genie's case study, and relate these back to the critical period hypothesis, justifying whether you believe the critical period hypothesis was supported or not.

Question 20   (4 MARKS)

Compare critical and sensitive periods, with reference to an example of each.

Questions from multiple lessons

Question 21   (1 MARK)

The process of maturation has a fixed sequence that informs all aspects of our development as we grow. In the context of nature and nurture, 'nature' involves the predetermined sequence in which a person is meant to mature. Several factors operating under the title of 'nurture' can change the trajectory of maturation. Environmental factors that can directly alter this trajectory can include

A.   family history of type 2 diabetes.

B.   whether you receive adequate nutrition during childhood.

C.   the height of your father.

D.   the age at which your mother first reached puberty

Chapter 2 review

Chapter summary

In this chapter you learnt about the different aspects and theories of psychological development and specifically how development shapes us into who we are.

In lesson **2A Nature versus nurture**, you learnt about the debate regarding what influences our development. Specifically, you learnt about:

- hereditary factors
- environmental factors
- the interaction between hereditary and environmental factors.

In lesson **2B The biopsychosocial model**, you learnt about Engel's biopsychosocial framework. Specifically, you learnt about:

- the three factors of the model
  - biological factors
  - psychological factors
  - social factors
- the use of the biopsychosocial model in approaching mental wellbeing
- the use of the biopsychosocial model in approaching psychological development.

In lesson **2C Psychological development across the lifespan**, you learnt about how psychological development progresses throughout one's life and the theories used to explain this. Specifically, you learnt about:

- the life-long process of psychological development
- emotional development
  - attachment theory
- cognitive development
  - Piaget's theory of cognitive development
- social development
  - Erikson's psychosocial theory of development.

In lesson **2D Critical and sensitive periods**, you learnt about the different types of periods in which skills or functions develop. Specifically, you learnt about:

- maturation
  - brain plasticity
- critical periods
- sensitive periods.
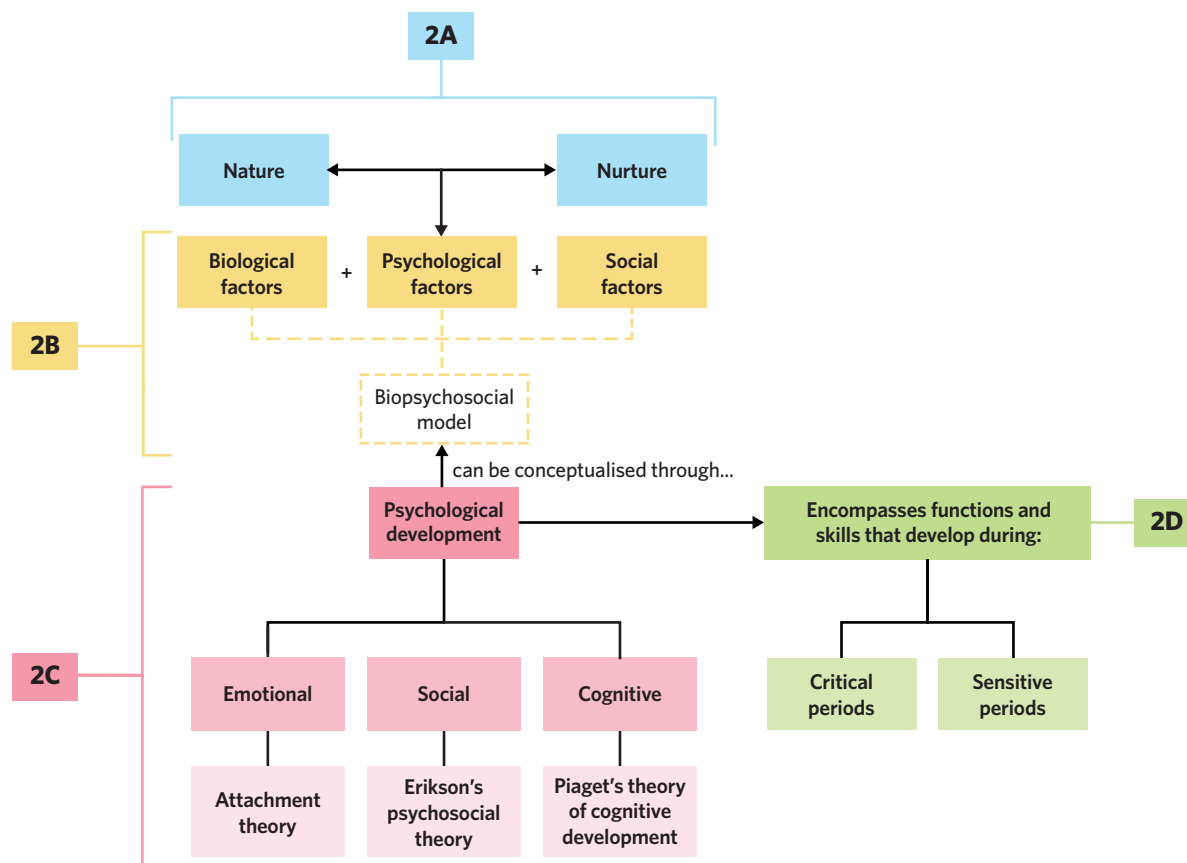
Chapter review activities

Review activity 1: Fill in the table

There are many factors that can influence an individual's psychological development. The table below summarises some of these factors. Copy out and fill in the table.

Factor	Description	Potential influences on development
Nature		
Nurture		
Biological factors		
Psychological factors		
Social factors		
Critical periods		
Sensitive periods		

Review activity 2: Fill in the blanks

Fill in the blanks with the following terms.

- Biological
- Cognitive
- Empathy
- Life-long
- Social
- Think
- Neural
- Psychological
- Theory of mind
- Emotional
- Organise
- Social

Jacinta is 5 years old and is experiencing some issues at school. She finds it difficult to understand her friend's emotions from their perspective, a skill known as _____. Further, it is likely that her _____ and therefore _____ development is not yet developed as she has trouble recognising and controlling her own emotions. However, despite this, Jacinta's _____ development seems to be progressing very well as she has already learnt how to share, take turns, and to follow rules. Jacinta's _____ development is also progressing as she is developing the ability to _____, comprehend, and _____ information. She is able to pick up these skills as her _____ networks are going through a stage of growth and development. Jacinta's development is a _____ process that will continue to be influenced by _____, _____, and _____ factors.

Chapter 2 test

Multiple choice

Question 1 (1 MARK)

Psychological development refers to

A. the ability to produce thought, and comprehend and organise information from the internal and external environment.

B. internal factors pertaining to an individual's mental processes, including their cognition, affect, thoughts, beliefs, and attitudes.

C. an individual's changes in functioning across multiple domains, including the life-long growth across emotional, cognitive, and social domains.

D. the physiological growth of the brain including structural changes within neural connections.

Question 2 (1 MARK)

The current understanding of the impacts of nature and nurture on development is that

A. nature and nurture both play a key role in influencing development as they interact with one another and rarely operate in isolation.

B. nature and nurture both play a key role in influencing development as they operate in isolation in order to influence different aspects of developmental outcomes.

C. factors associated with nature are the most dominant influence on development.

D. factors associated with nurture are the most dominant influence on development.

Question 3 (1 MARK)

Which of the following statements regarding the biopsychosocial approach to psychological development is **not** correct?

A. An individual's development is impacted by the sum of all of the biopsychosocial influences encountered within their life.

B. Biopsychosocial influences on development begin to take effect during infancy and continue throughout adulthood.

C. Using a biopsychosocial approach to consider psychological development involves the consideration of biological, psychological, and social influences.

D. One negative biopsychosocial influence on its own is enough to cause maladaptive development.

Question 4 (1 MARK)

Respectively, examples of theories that are used to explain the processes of social, emotional, and cognitive development are

A. psychosocial theory, attachment theory, and Piaget's theory of cognitive development.

B. attachment theory, psychosocial theory, and Piaget's theory of sensorimotor development.

C. psychosocial attachment theory, Piaget's theory of development, and the psycho-cognitive theory.

D. None of the above.

Question 5   (1 MARK)

Which of the following outcomes may occur if a person attempts to learn Italian as a second language after the sensitive period for acquiring a second language has passed?

A.   They will find learning Italian easier after the sensitive period as compared to during the sensitive period.

B.   They will not be able to learn Italian.

C.   They will experience no additional difficulty in learning Italian.

D.   They will find learning Italian more difficult after the sensitive period as compared to during the sensitive period.

Short answer

Question 6   (3 MARKS)

With reference to hereditary and environmental factors, explain why two intelligent parents may produce an equally intelligent child.

Question 7   (2 MARKS)

Why does an individual experience more critical and sensitive periods during infancy and childhood as compared to later in life?

Use the following information to answer questions 8–10.

Adrian is a 30-year-old man. Despite being good at his job, having good physical health, and being considered an intelligent man, Adrian struggles with making and maintaining friendships. Adrian finds it difficult to converse with people, and as a result, has no close friends and has never been in a romantic relationship. Whilst talking to people, Adrian often finds himself thinking that he is making a fool of himself and spends most of his time with others worrying and feeling not good enough.

Question 8   (4 MARKS)

Using examples from the scenario, identify and explain the area of psychological development that Adrian has likely experienced disruption to.

Question 9   (3 MARKS)

With reference to a relevant theory, explain how Adrian's childhood may have influenced his difficulties with interpersonal relationships later in life.

Question 10   (3 MARKS)

In terms of the biopsychosocial model, despite experiencing issues with his relationships, why may Adrian still be able to do well in his professional career?

Question 11   (10 MARKS)

Nikita is a famous guitarist. Nikita's parents were also musicians and as a child, she was encouraged to pursue the same path by her teachers and peers. Nikita's family is of high socioeconomic status and, therefore, had no issue in paying for her childhood guitar lessons. However, despite her professional success, Nikita has been experiencing significant distress in her life. Nikita finds herself unable to control her emotions and switches between experiencing inappropriate emotional outbursts and being unable to express her emotions at all. This issue also impacts her social life, as Nikita has been unable to maintain any stable relationships throughout her life. Other than her guitar skills, the only other area of her life that Nikita feels that she excels in is her intellectual abilities, and she considers herself to be quite intelligent.

With reference to the biopsychosocial framework, nature, nurture and the theories associated with psychological development, discuss Nikita's developmental outcomes, including her career and her psychological development.

CHAPTER 3

Defining and supporting psychological development

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

Image: GoodStudio/Shutterstock.com

3A Categorising typical and atypical behaviour

3A	3B	3C	3D

1.1.5.1
Criteria for categorising behaviour

— **1.1.5.1.1** Cultural perspectives

— **1.1.5.1.2** Social norms

— **1.1.5.1.3** Statistical rarity

— **1.1.5.1.4** Personal distress

— **1.1.5.1.5** Maladaptive behaviour

1.1.5.2
Evaluating the criteria for categorising behaviour

Taking your first steps when you turn one, learning to read at the age of five, and getting your first job when you are 16 are all 'typical' behaviours. But how do you know that it is, in fact, typical? What influences whether a behaviour is considered to be typical or atypical? In this lesson, you will learn about criteria used to categorise behaviours as either typical or atypical, and learn about the usefulness and limitations of using such criteria.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

KEY TERMS

Typical behaviour
an activity that is consistent with how an individual usually behaves

Atypical behaviour
an activity that is unusual or unnatural according to how an individual usually behaves

Criteria for categorising behaviour 1.1.5.1

We do not simply view behaviour and then deem it as either typical or atypical. Our perception is subconsciously influenced by criteria (meaning factors), such as cultural perspectives and social norms. We use these criteria, often without even realising it, to make a judgement about a behaviour.

Theory details

When you think of behaviour, your perception may be influenced by many criteria that are relevant to you and your experiences. These criteria help inform whether a behaviour is typical or atypical. **Typical behaviours** are activities that are consistent with how an individual usually behaves. For example, if somebody is extroverted, then behaviour that demonstrates these traits (e.g. being talkative) would be considered typical. By contrast, **atypical behaviours** are activities that are unusual or unnatural according to how an individual usually behaves. It is important to note then, that any kind of behaviour that someone might perceive as strikingly different or out of the ordinary may not be considered atypical if it reflects how the individual usually behaves.

USEFUL TIP

Typical and atypical behaviours are focused on individuals and how they usually behave. Therefore, when answering an assessment question about typical and atypical behaviours, think about whether the behaviour is usual for the individual in the scenario and try to maintain objectivity. Remember, a behaviour may be atypical for you but typical for someone else and that is okay!

Due to behaviour being intensely personal and dependent on circumstance, behaviours cannot always be labelled as either typical or atypical. Instead, what is deemed atypical or typical behaviour can change depending on situation and circumstance. Due to this, we use **psychological criteria**, which are standards against which a judgement can be made about a person's behaviour and abilities, to help understand others' behaviours. By using psychological criteria, we can then categorise behaviour as typical or atypical.

In the following sections of the lesson, we will learn about different psychological criteria used to categorise behaviour as typical or atypical. These criteria are presented in figure 1.
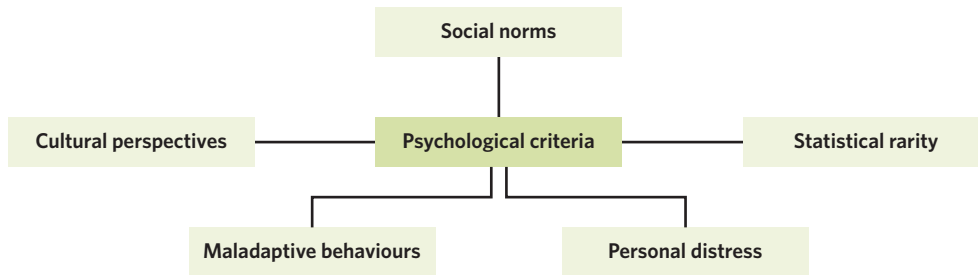
Figure 1 Psychological criteria for categorising behaviour

Cultural perspectives 1.1.5.1.1

Cultural perspectives are the influence of society and community on one's thoughts. Cultural perspectives involve the awareness of:

- different customs, beliefs, and traditions
- different rules and etiquette
- attitudes towards the importance of mental health.

When you use cultural perspectives to categorise a behaviour, you should be aware of a person's background and consider if the behaviour is actually typical in that culture. It is also important to note that a behaviour may be typical in one culture but atypical in another. An example of this is illustrated in figure 2.

Figure 2 Eating snails is common in France but uncommon in Mexico, and hence may be viewed as typical and atypical in these respective cultures

Social norms 1.1.5.1.2

Social norms are society's unofficial rules and expectations regarding how individuals should act. They exist on a larger and more generalised scale compared to cultural perspectives, which are specific to cultures. It is important to note that social norms and cultural perspectives are interlinked and that cultural perspectives often inform society's expectations.

When you use social norms to categorise a behaviour, you need to be aware of the expectations placed on a group of people but consider how an individual acts in accordance to these expectations. For example, many young people communicate via instant messaging services, and therefore it is typical of them to avoid phone calls and opt for text messaging instead. However, older people may be more used to communicating over the phone, and therefore, they may more typically use phone calls as a means of communication. In this case, different generations will have different unspoken social norms that dictate what is considered typical behaviour.

Psychological criteria (in relation to typicality) standards against which a judgement can be made about a person's behaviour and abilities

Cultural perspectives the influence of society and community on one's thoughts

USEFUL TIP

In the study design dot point for this lesson, VCAA uses the term '**psychological criteria**' to categorise behaviour as typical or atypical, but you can think of this term as factors. The psychological criteria that will be discussed in the lesson are factors that influence the way we view and distinguish between typical and atypical behaviours. Therefore, when answering an assessment question about psychological criteria, think about the factors that influence behaviour but make sure to refer to them as psychological criteria.

Social norms society's unofficial rules and expectations regarding how individuals should act

However, when using social norms to categorise a behaviour, you also need to be aware of changes over time and social shifts that are occurring. Using the same example as above, due to technological advancements, it is becoming more common for people of all ages to text rather than call. Therefore, if you were to receive a text from an elderly person today, this behaviour would now be considered typical as that is a usual behaviour, according to the social norm.

Individual's behaviour

| Social norms | →influences→ | Assessment of behaviour as typical or atypical | ←influences← | What is deemed typical and atypical behaviour for that individual |
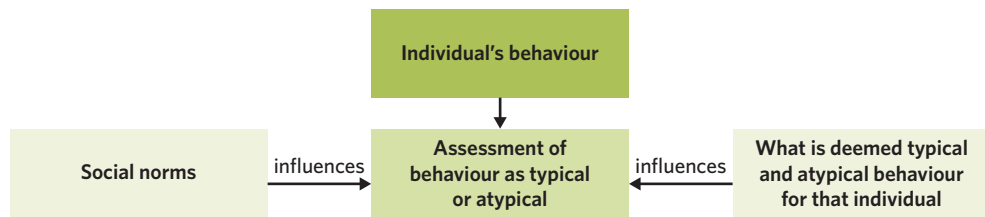
Figure 3   Social norms help categorise behaviour as typical or atypical, in combination with the typical or atypical behaviour unique to each individual

Statistical rarity 1.1.5.1.3

Statistical rarity
something that lies outside the range of statistical normality and is also unusual enough to be considered significant

Statistical rarity is something that lies outside the range of statistical normality and is also unusual enough to be considered significant. When categorising behaviour as typical or atypical, an individual's behaviour is often compared with others. If a large proportion of people exhibit a behaviour, then it is considered typical of that group, but if only a small percentage of people act similarly, then that behaviour is considered a statistical rarity. Thus, statistical rarity provides an objective way to categorise behaviours and acts as evidence for whether a behaviour is typical or atypical. It is important to understand that statistical rarity is still focused on individual behaviour, but it also compares behaviour to others, adopting a holistic but neutral approach.

When using statistical rarity to categorise behaviour, it is important to be aware of the fact that being outside the range of normality is not necessarily negative nor positive. For example, Albert Einstein was predicted to have had an IQ of 160 (LaLiberte, n.d.), which is a statistical rarity as only 0.003% of people have an IQ this high. Having such a high IQ is neither objectively positive nor negative, rather it is considered to be rare.

Personal distress 1.1.5.1.4

Personal distress
an aversive and often self-oriented emotional reaction

Personal distress is an aversive and often self-oriented emotional reaction. The emotional reaction does not always have to be grand and noticeable, just inconsistent with how the individual usually behaves. Sometimes, personal distress may be visual, for example continuously crying, however, it can also be internalised and hard to pick up on.

For example, if you get into a fight with a friend and stop talking to them, but start crying every time you see or think about your friend, you may be considered to behave in an atypical manner. This is because not talking to your friend is causing you distress and as a result, you act and feel differently from how you usually do.

There are many indications that a person is in personal distress. Some of the possible indicators are illustrated in figure 4.

Figure 4   There are many indicators that a person is in personal distress

Maladaptive behaviour 1.1.5.1.5

Maladaptive behaviour
an action that impairs an individual's ability to meet the changing demands of their everyday life

Maladaptive behaviour is an action that impairs an individual's ability to meet the changing demands of their everyday life. Maladaptive behaviours are similar to personal distress in that they cause an individual to be unable to cope, however, they are a more outward exhibition of atypical behaviour. Maladaptive behaviours will be discussed in more detail later in the chapter.

When you use maladaptive behaviours as criteria to categorise behaviour as typical or atypical, you should consider if the individual is acting in a way that prevents them from functioning effectively. For example, laying in bed and crying the day after a relationship break-up would not be a maladaptive behaviour, because it helps an individual to properly mourn a significant loss and adjust to no longer having a relationship with that person. By doing so, they would be able to better cope with the relationship break-up and return to functioning effectively.

However, the maladaptive behaviours can become atypical if they are prolonged. Using the example above, if the individual continues to stay in bed for weeks and misses school, which is something they care about and often work hard for, this behaviour would be both maladaptive and atypical. This behaviour is impairing their ability to meet changing demands of their everyday life and they are no longer acting as they usually do.

> **USEFUL TIP**
>
> It is important to note that maladaptive and atypical are not synonyms but rather concepts that relate to each other. Maladaptive behaviours involve acting in a way that hinders one's ability to adjust to their environment and function effectively, whereas atypical behaviours involve acting in a way that is unusual or different for them. If an individual begins exhibiting maladaptive behaviour, it can indicate that they are also behaving atypically as they are not acting as they usually would. However, an individual acting atypically does not always mean that they are engaging in maladaptive behaviour.
>
> For example, a teenager who was very obedient as a child may begin to push their parents' boundaries more and begin to defy expectations. This would be atypical as they would usually listen to and obey their parents but it may not necessarily be maladaptive as they could be adjusting to the new expectations of being a teenager or to a different social life.

Figure 5 summarises the psychological criteria for categorising behaviour as typical or atypical that you learnt about in this section of the lesson, including some considerations of each criterion.
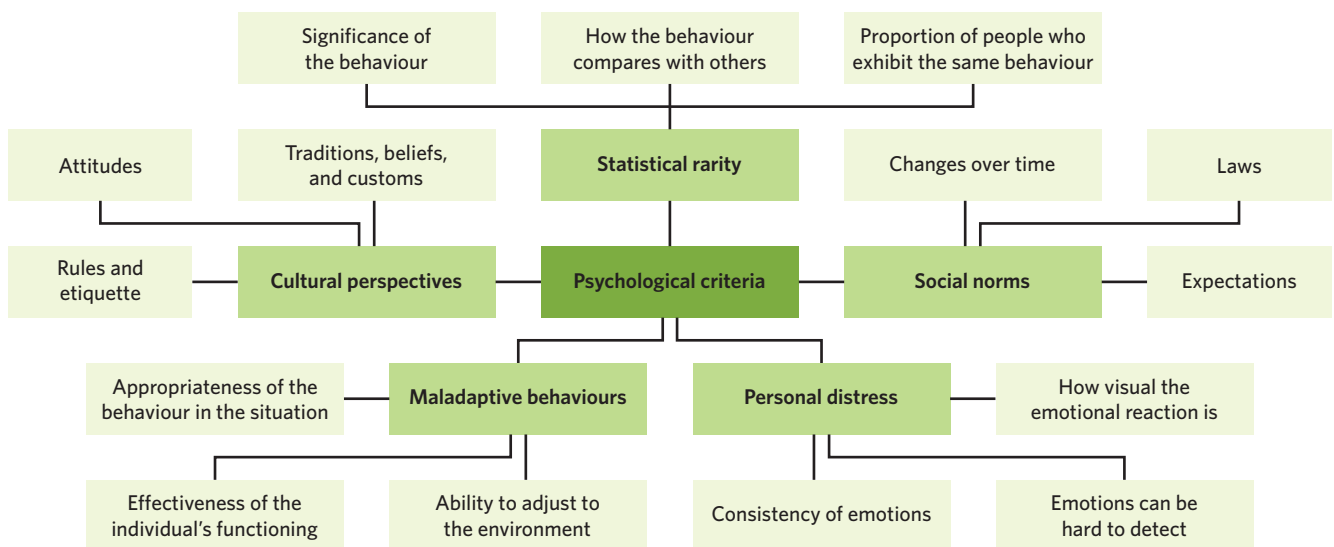
Figure 5 What to consider when using each psychological criteria for categorising behaviour

Evaluating the criteria for categorising behaviour 1.1.5.2

How do you know if you have categorised a behaviour appropriately? Could another psychological criteria have been more useful? All criteria have their strengths and limitations, and it is crucial to evaluate these so that you are providing the best categorisation possible.

Theory details

While criteria can be useful in categorising behaviour, they also have their limitations. It is important to be aware of the advantages and disadvantages of using certain criteria so that you can analyse and evaluate behaviour to the best of your ability. Table 1 outlines a strength and limitation of each psychological criterion.

Table 1 Strengths and limitations of psychological criteria used to categorise behaviour as typical or atypical

Psychological criteria	Strengths	Limitations
Cultural perspectives	• Enables different cultural contexts to be taken into account. • For example, in Japan, it is considered disrespectful to make eye contact with others but in Australia, it is considered a sign of respect.	• Cultural perspectives can allow for a collective evaluation of a behaviour rather than an individual evaluation. • In a multicultural society, different cultural norms can intersect making it difficult to isolate certain cultural influences on behaviour.
Social norms	• Acts as a baseline to compare behaviours to, allowing relatively easy identification of atypicality. • For example, if a child is jumping around in class, which is deemed to usually be unacceptable in classrooms, while the rest of his peers are sitting and working quietly, it would not require much effort to identify the behaviour as atypical.	• Social norms can depend on situations or contexts that we find ourselves in. As such, when using social norms as a criterion to classify behaviour it is important to take external factors into account, which can require effort. • For example, it would be considered typical to cheer loudly during a sports game but atypical during a debate performance.
Statistical rarity	• Provides an objective perspective, allowing for a more accurate way to categorise behaviours as typical or atypical. • For example, if only 2% of people act in a certain way, then that behaviour is objectively atypical.	• Not all statistical rarities are damaging or negative. • Can be difficult to understand and apply to an abstract concept, such as behaviour, possibly leading to a miscategorisation. • For example, it is difficult to confidently say that an exact percentage of people exhibit the same typical behaviour as there can be slight variations or different intentions.
Personal distress	• Can be used as an indicator when cultural, social, and statistical measures are not applicable or appropriate. • Can provide a visual indication that someone is behaving in a way that is uncommon for them, allowing for easier categorisation. • For example, if your friend is a typically confident public speaker but then has shaky hands and a trembling voice one day, it is physically observable that they are experiencing personal distress, which is atypical for them.	• Some individuals may conceal personal distress, causing difficulty in identifying atypical behaviours. • For example, an individual who prefers to be private about their emotions may suppress their personal distress and try to disguise their behaviour as usual. This concealment can then make it hard for others to realise or identify that the individual is in distress and behaving atypically.
Maladaptive behaviour	• Enables the consideration of the consequences of behaviour. • For example, if you notice that your friend is not studying the night before an exam, but you know that they usually do this so that they are calmer for the exam, you would recognise that this behaviour is not actually maladaptive.	• What is considered maladaptive is subjective and can change depending on who is judging the behaviour. • For example, one person may categorise avoiding talking to people before an exam as typical, because they think that it is adaptive and helps an individual to calm down, whilst another may categorise it as atypical because they think the behaviour is maladaptive and hindering their ability to adjust to the stress of the situation.

Theory summary

In this lesson, you have learnt about typical and atypical behaviours and the numerous psychological criteria used to categorise behaviours as typical or atypical. You should now be able to apply these criteria when analysing behaviours, as well as evaluate their usefulness and limitations.
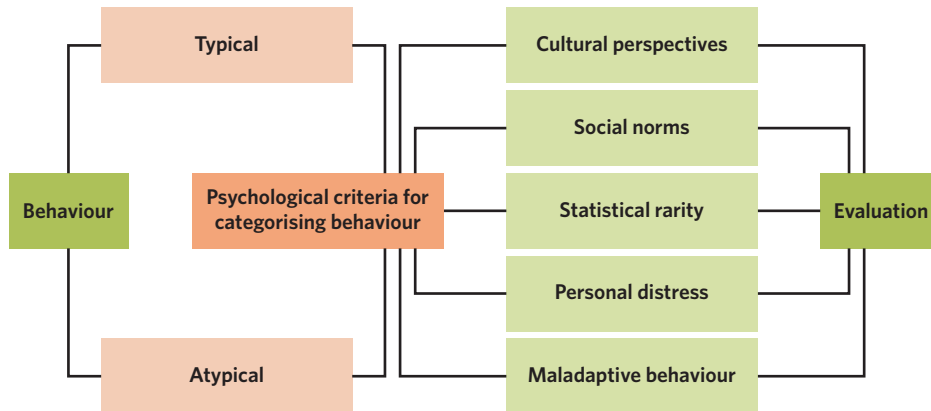
Figure 6 Summary of lesson 3A

3A Questions

Theory review

Question 1

Typicality is focused on behaviours that are usual for

A. an individual.

B. a group.

C. a culture.

Question 2

Behaviour that is typical for you is always typical for everyone else.

A. True.

B. False.

Question 3

Which of the following are psychological criteria used to categorise behaviours? **(Select all that apply)**

I. Culture.

II. Social norms.

III. Statistics.

IV. Personal distress.

V. Maladaptive behaviour.

Question 4

Which of the following might you feel if you are in personal distress? **(Select all that apply)**

I. Scared.

II. Excited.

III. Anxious.

IV. Joyful.

V. Guilty.

Question 5

It is important to be aware of the _____ and _____ of using criteria so that you are able to effectively _____ behaviour.

Which of the following best fills in the blanks?

A. history; negatives; categorise

B. usefulness; limitations; categorise

C. positives; history; diagnose

Assessment skills

Text analysis

The following assessment skills type reflects the study design assessment type:

- analysis and evaluation of an experiment or case study

Use the following information to answer questions 6–8.

> Agoraphobia is the phobia of being in open or unfamiliar places, in which escape may be difficult, resulting in avoidance of public situations.
>
> 30-year-old Lucy Fyles was a psychiatric inpatient unit worker when she first began to be affected by agoraphobia. She views the symptoms of her phobia, which includes shaking any time she has to go outside, as atypical as 'it appeared so suddenly' almost as if 'it came about overnight.' Although she is not completely housebound, she 'struggles to do everyday tasks' and has to 'take medication to go to the doctors'.
>
> (Marsh, 2021)

Question 6

Lucy Fyles views her agoraphobia as 'atypical'. Which psychological criterion was the **least** likely used to categorise her behaviour?

A. Cultural perspectives.

B. Personal distress.

C. Social norms.

D. Maladaptive behaviour.

Question 7

Which of the following statements suggests that using maladaptive behaviours to categorise Lucy's behaviour is the most appropriate?

A. 'It came about overnight', as it indicates that her symptoms were fast and random.

B. '[She has to] take medication to go to the doctors', as it insinuates she has to put in more effort to adapt to her environment.

C. 'It appeared so suddenly', as it suggests that she can not cope with her new condition.

D. '[She] struggles to do everyday tasks', as it illustrates that she is unable to adapt to her environment and function effectively.

Question 8

What makes maladaptive behaviours a useful psychological criterion to apply to behaviour?

A. They provide a visual indication that someone is behaving unusually.

B. Provides an objective way to categorise behaviours.

C. Knowing that a seemingly maladaptive behaviour may actually be adaptive in a specific context, allows for more accurate categorisation.

D. They act as a baseline to compare behaviours to, allowing identification of atypicality to be easier.

Data analysis

The following assessment skills type reflects the study design assessment dot point:

- a data analysis of generated primary and/or collated secondary data

Use the following information to answer questions 9–11.

Mrs Gilmore recently gave her maths class a test to see how well they understood the topic that they were learning. After the students did the test, she decided to collate the data and make a bar graph so that she could better understand it. The graph is presented below.

Students' results from recent maths test
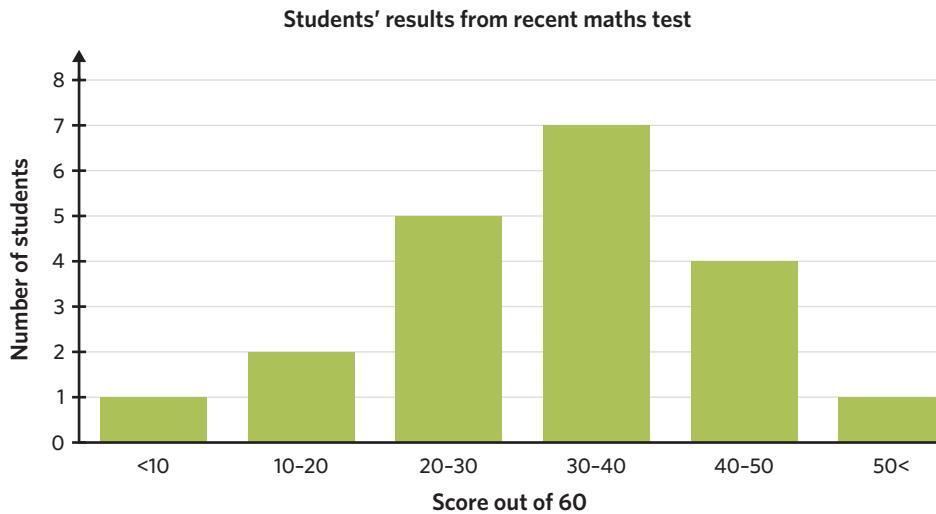
Question 9

Students who scored more than 50 out of 60 would be considered

- **A.** typical as only a small percentage of the class received this result.
- **B.** atypical as this result is a statistical rarity because only 1 person in the class got this score.
- **C.** typical as most of the students in the class got this result.
- **D.** atypical as it defies the social norms and cultural perspectives of the class.

Question 10

Scoring between 30–40 out of 60 would be categorised as

- **A.** atypical as most students in the class received this result.
- **B.** atypical as only the smart students got this score.
- **C.** typical as it lies within the average range of students' results.
- **D.** typical as no one got this score.

Question 11

What is a limitation of using statistical rarities to categorise behaviours?

- **A.** They depend on situations or contexts we find ourselves in.
- **B.** It can be difficult to understand and apply to an abstract concept, such as behaviour.
- **C.** They are subjective.
- **D.** They are objective.

Exam-style

Remember and understand

Question 12   (1 MARK)

Atypical behaviour is when

A.   someone behaves in a way that is usual for them.

B.   someone behaves in a way that is usual for everyone.

C.   someone behaves in a way that is unusual for them.

D.   someone behaves in a way that is unusual for everyone.

Question 13   (1 MARK)

What psychological criteria are most commonly used to categorise behaviour?

A.   Social norms; cultural perspectives; statistical rarity; personal distress; maladaptive behaviour.

B.   Statistics; social norm; personal distress; maladaptive behaviour; cultural perspectives.

C.   Cultural perspectives; statistical rarity; adaptive behaviour; social norms; personal distress.

D.   Personal distress; maladaptive behaviours; social norms; culture; statistical rarity.

Question 14   (2 MARKS)

Compare the use of cultural perspectives and social norms to categorise behaviours.

Question 15   (2 MARKS)

Outline a strength and a limitation of using statistical rarity to categorise behaviours as typical or atypical.

Question 16   (4 MARKS)

Explain what is meant by typical and atypical behaviours and, using an example, suggest how the same behaviour can be typical for one individual but atypical for another.

Apply and analyse

Question 17   (1 MARK)

Tanya is a very loud and extroverted person whilst her friend, Geetu, is reserved and introverted. At their friend's birthday party, people said that they were both talking to everyone and seemed to be having the time of their lives. In terms of typicality, how would Tanya and Geetu's behaviours be described?

	Tanya's behaviour	Reason	Geetu's behaviour	Reason
A.	Atypical	She was acting as she usually would.	Typical	She was acting as she usually would.
B.	Atypical	She was acting differently from how she usually would.	Atypical	She was acting as she usually would.
C.	Typical	She was acting as she usually would.	Typical	She was acting differently from how she usually would.
D.	Typical	She was acting as she usually would.	Atypical	She was acting differently from how she usually would.

Question 18   (3 MARKS)

Daniel is an exchange student from a country where people drink tea four times a day. When he came to Australia, his host family was very concerned about his habits and took him to see the school counsellor. Daniel was confused, but the school counsellor had told his host family to not worry.

In terms of typicality and psychological criteria, suggest why the school counsellor may have told Daniel's host family to not worry about his tea-drinking habits.

Evaluate

Question 19   (6 MARKS)

Rohan is a foster child. When he was 13-years-old, he was taken to see a psychologist as he was scared and refused to sleep alone. His psychologist explained to his foster parents that Rohan's behaviour was typical as he came from a culture in which children slept in the same room as their parents throughout the first few years of their lives but also warned that it is becoming atypical as only 3% of children retain this behaviour, rather than outgrowing the habit.

Identify psychological criteria that were used in the case study to categorise Rohan's behaviour, and evaluate the usefulness and limitations of the psychological criteria.

Questions from multiple lessons

Question 20   (4 MARKS)

Anant grew up in a family with 8 children and as a result, he didn't really get much attention or affection from his parents. He was a generally quiet and reserved toddler who tended to stick to himself and shy away from others. After his first week of Prep, Anant's teachers were really impressed with the way he was assertive and became friends with all his peers. They were so impressed to the point that they sent an email to his parents expressing their enthusiasm for having him in their class. However, Anant's parents were very confused after receiving the email and organised a meeting, in which they persistently argued that the teachers were not talking about their son, but some other student.

a.   Identify and explain whether Anant's behaviour as a toddler would be attributed to hereditary or environmental factors. (2 MARKS)

b.   Referring to typical and atypical behaviours, suggest why Anant's parents' are confused about Anant's behaviour after the first week of Prep. (2 MARKS)

STUDY DESIGN DOT POINT

- the concepts of normality and neurotypicality, including consideration of emotions, behaviours and cognitions that may be viewed as adaptive or maladaptive for an individual

3A	3B	3C	3D

- **1.1.6.1** Normality
- **1.1.6.2** Neurotypicality
- **1.1.6.3** Adaptive and maladaptive emotions, behaviours, and cognitions

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

KEY TERMS

Normality the state of having thoughts, feelings, and behaviours that are considered common and acceptable

Abnormality the state of deviating from the norm, usually in a way that is undesirable
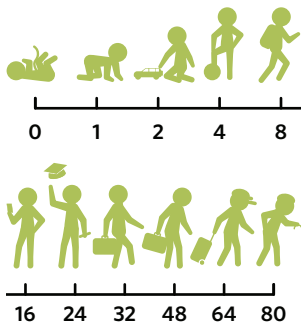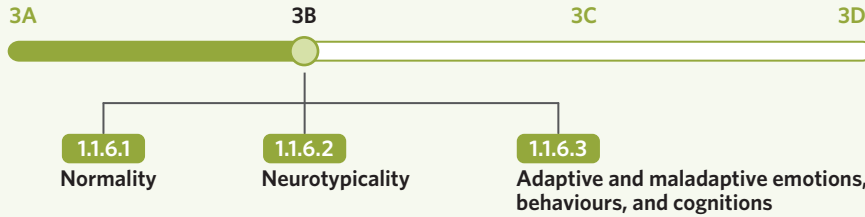
People grow and change psychologically across their lives in very different ways. But how do we know if we have developed 'normally'? What does it even mean to be normal? What you perceive as normal may not be the same for everyone else and what you think is abnormal may, in fact, be normal to others. In this lesson, you will explore the concepts of normality and neurotypicality, and develop an understanding of normal psychological development in relation to emotions, behaviours, and cognitions.

Normality 1.1.6.1

How do you define 'normal'? We tend to just perceive some things as 'normal' and others as 'abnormal' without really knowing why. The reason for this is that there are many factors, such as your background or beliefs, that influence your perception of normality.

Theory details

Broadly speaking, **normality** refers to the state of having thoughts, feelings, and behaviours that are considered common and acceptable. By contrast, **abnormality** is the state of deviating from the norm, usually in a way that is undesirable. The different approaches to understanding normality have attempted to define the factors that influence our understanding of what is regular and acceptable. These approaches are outlined in table 1.

Table 1 Summary of the different approaches to understanding normality

Approach to understanding normality	How it defines normality
The socio-cultural approach	People perceive things as normal according to a particular set of codes relating to the social and cultural context that they are part of.
The functional approach	People are considered normal if their thoughts, feelings, and behaviours allow them to cope with the demands of everyday lives.
The historical approach	What people perceive as normal changes throughout different historical periods.
The medical approach	Things that are abnormal have underlying biological causes and can be diagnosed clearly according to different symptoms.
The statistical approach	Normality is based on how the majority of people think, feel, and behave.
The situational approach	Normality is based on what is acceptable in different contexts.

In our society, there is a set pathway of psychological development that has been deemed as 'normal'. For example, children are expected to say their first word between 11 and 13 months, take their first steps around their first birthday, and learn how to read and write at the age of five. Due to individual differences, this developmental progression is not the same for everyone but it does influence how people are perceived and grouped in a societal context.

Because the concept of normality is multi-faceted and subjective, not everyone agrees on what constitutes normal. It is difficult to make definitive statements about normality, and sometimes inappropriate to draw conclusions due to the highly individual contexts that impact what can be considered normal. For example, the understanding of normality is crucial but problematic when discussing mental health (Piuva, 2010). It is useful in identifying troublesome emotions, behaviours, and cognitions, but it can also act as a source of insecurity for those diagnosed with mental health issues as they could feel alienated by their 'abnormal' label, potentially perpetuating their condition. Therefore, it is difficult to understand and explain normality, largely due to its continuously evolving nature.

USEFUL TIP

Normality is a hybrid concept (Piuva, 2010) and it can be quite difficult to comprehend. To help you, you can think of normality as a melting pot of social views and statistical calculations.

Note that all approaches to defining normality are subjective to an extent, and what you consider normal may be different to others (and that is completely okay). There is no set definition or recipe for the concept of normality. This means that, in an assessment question, you should carefully consider the individual context within the scenario and use this information to guide your response.
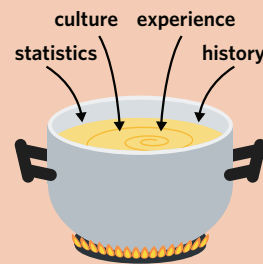
Figure 1 The concept of normality is like a melting pot of different views and factors

---

Neurotypicality 1.1.6.2

The term 'neurotypicality' is fairly new in the field of psychology, but it helps us conceptualise normality. It examines normality in terms of brain functioning and it arose alongside the term 'neurodiversity', which will be explored later in this chapter.

Theory details

Neurotypicality is a term that is used to describe individuals who display neurological and cognitive functioning that is typical or expected. This term arose alongside the term **neurodiversity**, which refers to variations in neurological development and functioning within and between groups of people, such as those experienced by people with autism. In this way, neurotypicality is a term that contrasts with neurodiversity.

Broadly speaking, neurotypical individuals display common behaviours and skills that follow a normal developmental trajectory and meet developmental milestones that have been standardised. For example, the North American Centers for Disease Control and Prevention have considered the following behaviours as typical events that a child should display:

- smiling at people at two months
- rolling from their back to their tummy at six months
- waving goodbye at 12 months
- trying to use a spoon at 18 months.

Common characteristics of neurotypical individuals include:

- having good communication skills
- having social skills similar to their peers
- being able to function in distracting environments without sensory overload
- being able to focus for prolonged periods
- being able to adapt to changes in routines.

From this, society tends to deduce that those individuals' brains are functioning as expected and therefore are normal.

Neurotypicality
a term used to describe individuals who display neurological and cognitive functioning that is typical or expected

Neurodiversity
variations in neurological development and functioning within and between groups of people, such as those experienced by people with autism

Figure 2 Characteristics common to a neurotypical individual

The term 'neurotypical' was first coined by Australian sociologist Judy Singer (1998) to simply refer to people who are non-autistic in her honours thesis. It is important to note that terms such as 'normal' and 'neurotypical' are not used in the psychological field to separate groups of people, but rather to help conceptualise the abstract workings of the human brain. Consequently, it is not 'good' to be neurotypical and 'bad' to be neurodiverse. Rather, 'neurotypical' and 'neurodiverse' can be considered as part of a continuum of normal brain functioning. You will learn more about what it means to be 'neurodiverse' later in this chapter.

PSYCHOLOGY EXPLORATION

1. The term 'autism' was first coined in 1911 by Eugen Bleuler, in response to Sigmund Freud's work on 'autoerotic' thinking in infancy and childhood. Bleurer essentially omitted the 'erot' part of the word 'autoerotism' as he disagreed with Freud's claim that infants viewed their bodies as love objects, and thus produced the term 'autism.'

2. Many child psychologists in the 1920s and 1930s, such as Jean Piaget, argued that children spent a lot of time fantasising about objects and bodies around them. He saw autism as just an early stage of human thinking that children outgrew once they began forming relationships.

3. In 1943, Leo Kanner described 'autism' as a medical condition but it was only acknowledged as an exclusive diagnosis in order to grant certain children their rights to education and access to social services.

4. In the early 1980s, psychologist Lorna Wing argued that autism was a kind of 'social impairment' that could be quantified, and rectified via targeted policies. This influenced British education reforms, allowing autistic children to be granted unique rights to education services. Wing also sparked a definition change in the Diagnostic and Statistical Manual of Mental Disorders (DSM) so that autism was no longer referred to as a stage of normal thinking but rather a unique 'impairment'.

5. In the 1990s, the number of individuals diagnosed with autism had exponentially grown and they began to challenge the stigma that autism meant being different, disadvantaged, disabled, or sick. This gave birth to the term 'neurodiversity', which recognises autism as a variation in normal thinking rather than a categorical medical problem. This then naturally gave rise to the term 'neurotypicality' to oppose the term 'neurodiversity', describing those who think normally and represent a wider diversity of thought.

Figure 3 Timeline of the terms 'autism', 'neurodiverse', and 'neurotypical' the figure description (Evans & Chaney, 2017)

Adaptive and maladaptive emotions, behaviours, and cognitions 1.1.6.3

When you fall and scrape your knee, do you get back up and check if you're bleeding, or do you start crying and seek your parents' attention? One of these options is considered adaptive and normal for your age right now, while the other is likely to be seen as maladaptive and abnormal. However, it is likely that this was viewed differently when you were two years old. Therefore, normality is also influenced by adaptive or maladaptive behaviour.

Theory details

To be **adaptive** means being able to adjust to the environment appropriately and function effectively. Adaptivity and normality often go hand in hand as being adaptive suggests that you are functioning in a way that is expected, and hence normal. By contrast, to be **maladaptive** means being unable to adapt to the environment appropriately and function effectively, and suggests abnormality. Figure 4 presents an example of an adaptive behaviour and a maladaptive behaaviour that a child may have on their first day of school.
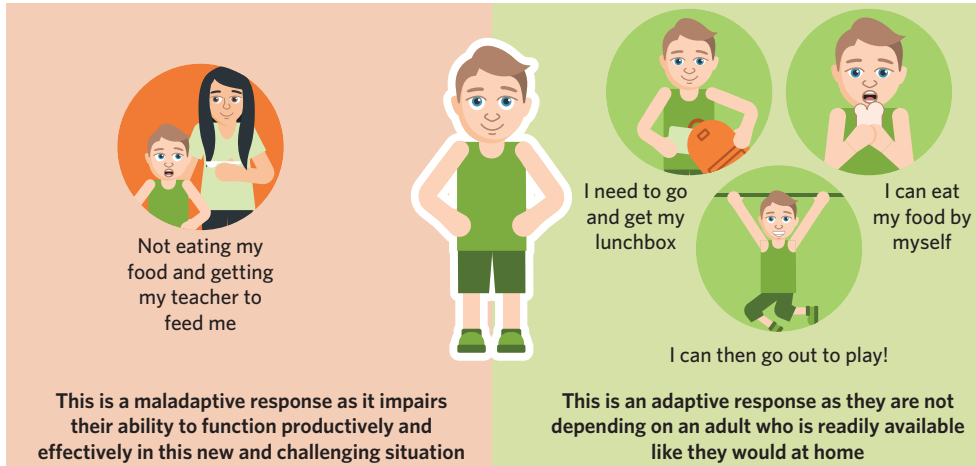
Figure 4 Adaptive and maladaptive responses a child may have at lunchtime on their first day of school

Psychological development is often monitored along three domains: emotions, behaviours, and cognitions. Therefore, when assessing how adaptive a person's behaviours are, you need to consider these three domains, which are detailed in table 2.

Table 2 Explanations and examples of adaptive and maladaptive emotions, behaviours, and cognitions

	Adaptive	Maladaptive
Emotions	Being able to effectively regulate and display emotions. • For example, being able to calm down by using coping strategies after your parents refuse to get you the new iPhone.	Being unable to effectively regulate and display emotions. • For example, staying mad at your parents for a month after they refuse to get you the new iPhone.
Behaviours	Activities that enhance an individual's ability to match the changing demands of their everyday life. • For example, going for a social drink, given you are of legal age, after work to catch up with friends.	Activities that hinder one's ability to meet the changing demands of everyday life. • For example, drinking so much that you are hungover and cannot work the following day.
Cognitions	Having awareness and knowledge that enables you to adjust to different environments and situations. • For example, evaluating a failed test at school as an opportunity to learn.	Lacking awareness and knowledge, which makes it difficult to adjust to different environments and situations. • For example, thinking that you will never get a job after failing a maths test.

Although there is a common perception that being adaptive means you are normal whilst being maladaptive means you are abnormal, this may not always be the case. For example, imagine you are sitting in class and the person sitting next to you starts rocking back and forth in their chair. This may be considered maladaptive in a quiet classroom setting as the person is not adjusting to their environment appropriately and functioning effectively. However, this behaviour, which is known as stimming, would be adaptive and normal for a child with autism as it helps them emotionally regulate and readjust to their surroundings. As mentioned earlier, being adaptive and maladaptive is just an approach to conceptualising normality and may not always be the same for everyone. It is important to think about the context in which something is happening and view through multiple perspectives if a response is actually adaptive or maladaptive and hence, normal or abnormal.

USEFUL TIP

Emotions such as sadness, worry, and fear are adaptive in many situations as it helps individuals confront and cope with stressors and threats that may arise. However, if they become persistent for prolonged periods of time and start to hinder your life, they could result in mental health disorders, such as depression, anxiety, or paranoia. This would then be perceived as maladaptive as you are no longer functioning effectively to meet the demands of your life.

Furthermore, our understanding of adaptive and maladaptive development changes according to context and age. For example, adults and children have different sleep requirements to function effectively. An adult sleeping for 7 hours a night is considered adaptive and normal, as they only require 7 hours to function properly, but it would be maladaptive and abnormal for an infant, who requires approximately 13.5 hours of sleep.

USEFUL TIP

VCAA specifies that you learn about normality, adaptiveness, and maladaptiveness in relation to psychological development. Therefore, this lesson relates these concepts to age and development across the lifespan. However, you can also learn about these concepts in relation to mental wellbeing. For example, mental health disorders are often perceived to be 'abnormal' and 'maladaptive' and talked about in opposition to what is normal, unless they are well managed.

Theory summary

In this lesson, you have learnt about normality and the numerous ways it can be defined, as well as what it means to be neurotypical and how the term came to be. You also learnt about adaptive and maladaptive emotions, behaviours, and cognitions as an alternative way to conceptualise normality.
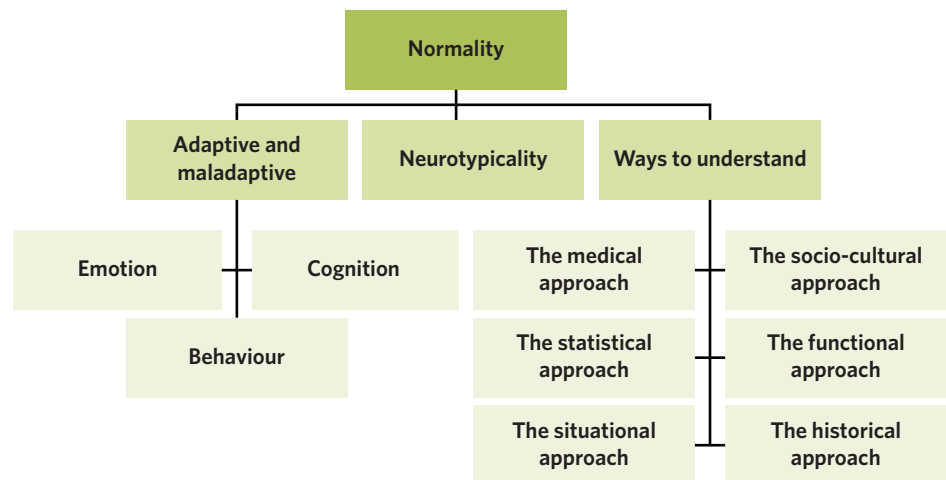
Figure 5 Summary of lesson 3B

3B Questions

Theory review

Question 1

Psychologists have agreed upon one universal approach to understanding normality.

A. True.

B. False.

Question 2

Which of the following is an approach to defining normality? **(Select all that apply)**

I. The socio-cultural approach.

II. The medical approach.

III. The universal approach.

Question 3

Things that seem maladaptive to you are always maladaptive to others also.

A. True.

B. False.

Question 4

Which of the following may be used to describe how normal an individual's neurological development is?

A. Adaptive and maladaptive.

B. Usual and unusual.

C. Neurotypical and neurodiverse.

Assessment skills

Perfect your phrasing

Question 5

Which of the following sentences is the most correct?

A. Neurotypical individuals are those who display **neurological** and cognitive functioning in a way that is typical or expected.

B. Neurotypical individuals are those who display **mental** and cognitive functioning in a way that is typical or expected.

Question 6

Which of the following sentences is the most correct?

A. Being adaptive is the **state of being able to adapt** to changing conditions.

B. Being adaptive is the **ability to adjust** to changing conditions.

Data analysis

The following assessment skills type reflects the study design assessment dot point:

• a data analysis of generated primary and/or collated secondary data

Use the following information to answer questions 7–9.

Dr Giveon wanted to investigate what influences a person's perception of normality. He hypothesised that participants who come from countries where using a utensil to eat is common are more likely to perceive an image of a child eating with their bare hands as abnormal than participants who come from countries where using hands to eat is common. Participants were simply shown the image and then asked to state if they thought the image was normal or abnormal.

The results of his study are displayed in the graph.

Perception of eating with bare hands

Key
Normal
Abnormal
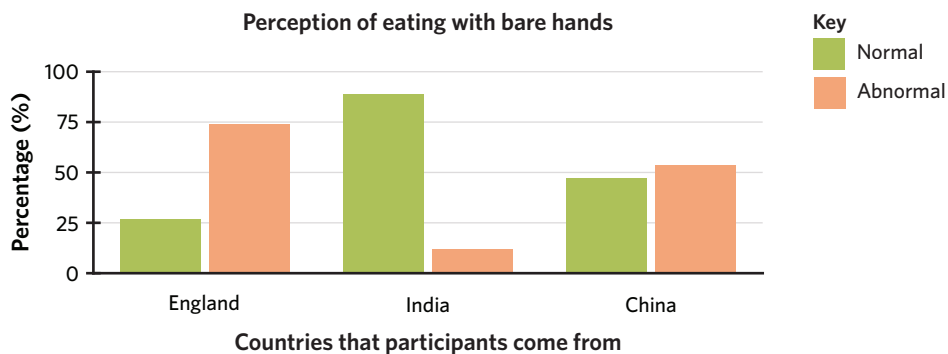
Question 7

What type of data is shown in the graph above? **(Select all that apply)**

I.   Subjective.

II. Objective.

III. Qualitative.

IV. Quantitative.

Question 8

Which approach to defining normality influenced Dr Giveon's hypothesis?

A.   The functional approach.

B.   The situational approach.

C.   The socio-cultural approach.

D.   The historical approach.

Question 9

Which of the following conclusions can be drawn from the data?

A.   All three groups have the same perception of the normality of eating with utensils due to the country they come from.

B.   Participants from England are more likely to perceive eating without utensils as normal as it is uncommon in their country.

C.   Chinese participants are more likely to perceive eating without utensils as abnormal as it is common in their country.

D.   Indian participants are less likely to perceive eating without utensils as abnormal as it is common in their country.

Exam–style

Remember and understand

Question 10   (1 MARK)

Which of the following is **not** likely to be considered a characteristic of a neurotypical individual?

A.   Communicates effectively.

B.   Can make friends.

C.   Struggles to focus.

D.   Can adapt to changes in routines.

Question 11   (2 MARKS)

Explain how crying and throwing a tantrum when you are lost at the supermarket is an adaptive behaviour for a 3-year-old but a maladaptive behaviour for a 17-year-old.

Question 12   (3 MARKS)

Using an example, differentiate between what is meant by 'adaptive' and 'maladaptive'.

Apply and analyse

Use the following information to answer questions 13 and 14.

Alicia is a high school student and she frequently throws tantrums when things don't go her way. Her mum told her that she is exhibiting the same behaviour as she did when she was a toddler and that she should stop. Her twin sister, Khushee, however, has always been a quiet child. Even as a toddler, Khushee would do her own laundry and help out with the dishes whenever she could.

Question 13 (1 MARK)

In terms of normality, which of the following best describes Alicia and Khushee's behaviours when they were a toddler?

	Alicia	Khushee
A.	Normal	Normal
B.	Abnormal	Abnormal
C.	Normal	Abnormal
D.	Abnormal	Normal

Question 14 (1 MARK)

In terms of adaptivity, which of the following correctly describes Alicia and Khushee's current behaviours?

	Alicia	Khushee
A.	Adaptive	Adaptive
B.	Maladaptive	Maladaptive
C.	Adaptive	Maladaptive
D.	Maladaptive	Adaptive

Use the following information to answer questions 15 and 16.

Malik is a year four student and he has just started public school after being homeschooled for 3 years. When he is told to pack up his toys and clean up for lunch at home, he happily obliges and does as his parents say. However, at school, he sits back confused and watches as everyone else packs up in a joint effort.

Question 15 (1 MARK)

Malik's emotions at home are

A. adaptive because he is responding appropriately and effectively to his normal environment.

B. maladaptive because he is not responding appropriately and effectively to his normal environment.

C. adaptive because he is not responding appropriately and effectively to his normal environment.

D. maladaptive because he is responding appropriately and effectively to his normal environment.

Question 16 (2 MARKS)

Discuss whether Malik's behaviours are adaptive or maladaptive at school.

Evaluate

Question 17 (6 MARKS)

Neel is a 13-year-old who recently moved from Sri Lanka to Australia. On his first day at his new school, he woke up at 5am and got to school at 7am as he usually did, even though the school day only starts at 9am. Students started entering the school grounds at 8:30am and Neel began to feel overwhelmed and highly anxious. This feeling remained until he was introduced to his class and he made a few friends.

a. Evaluate whether Neel's reactions on his first day of school were normal with reference to the time he arrived at school and the socio-cultural approach. (3 MARKS)

b. Evaluate whether Neel's reactions on his first day of school were normal with reference to his emotions and the situational approach. (3 MARKS)

Questions from multiple lessons

Question 18 (8 MARKS)

Calista grew up in rural Victoria with her parents and five siblings. As a child, Calista was very bubbly and positive. Unfortunately, her parents used to fight a lot and often left Calista and her siblings to look after themselves. Calista now wishes her parents were more involved in her life but doesn't really feel comfortable when they try to get involved. She also struggles to make new friends and trust others because she is afraid they will ignore her as her parents did. This has now begun to affect her bubbly personality and her performance at school.

a. Outline whether hereditary and/or environmental factors have influenced Calista's development. (4 MARKS)

b. In terms of emotions, behaviours, and cognitions, explain how Calista's environment could lead her to become a 'maladaptive individual'. (4 MARKS)

3C Neurodiversity

3A   3B   **3C**   3D

1.1.7.1
Neurodiversity
- **1.1.7.1.1** Autism spectrum disorder (ASD)
- **1.1.7.1.2** Attention-deficit/hyperactivity disorder (ADHD)
- **1.1.7.1.3** Dyslexia
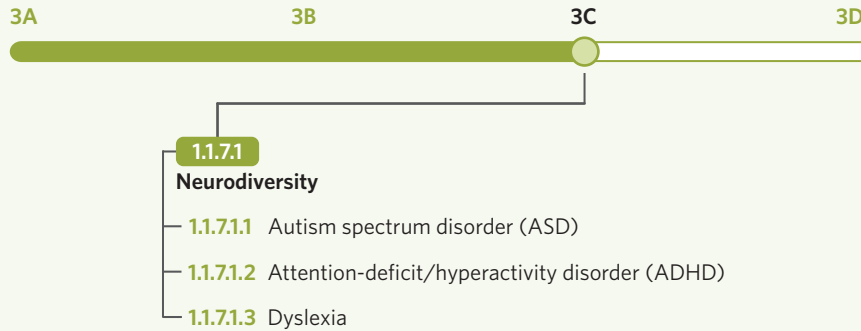
If you stand in a crowd and you look around, you may be able to see many diverse people – people from different cultures, different races, and different faiths. Just as there are variations in how people look and act, there are also variations in how people think. This is known as neurodiversity. In this lesson, you will learn about neurodiversity, which is an emerging area in psychology. In particular, you will explore three neurodivergent conditions: ASD, ADHD, and dyslexia.

Neurodiversity 1.1.7.1

Just like every person's physical appearance is different, every person's brain functioning is also unique. Neurodiversity is an overarching term used to describe this normal variety in brain development and embrace neural differences.

Theory details

Within society, there are normal variations of brain development, structure, and function, meaning that the ways in which individuals think and process the world naturally differ. Those who are diagnosed with developmental disorders, such as ASD, ADHD or dyslexia, are described as being **neurodivergent**, which refers to individuals who have a variation in neurological development and functioning. There are many ways to be neurodivergent, which results in **neurodiversity**, which is a term used to describe variations in neurological development and functioning within and between groups of people, such as those experienced by people with autism. This term is used in contrast with **neurotypicality**, which is a term used to describe individuals who display neurological and cognitive functioning in a way that is typical or expected. It is important to understand that the terms 'neurotypical' and 'neurodivergent/neurodiverse' co-exist and help to explain each other, as illustrated by table 1.

Table 1 The ways in which neurodivergent and neurotypical individuals differ

Neurotypical individual	Neurodivergent individual
• has traditionally good communication skills • can focus for prolonged periods • able to function in distracting environments without sensory overload • able to adapt to changes in routines	• better equipped to express themselves through creativity • may not be able to focus for extended periods but is very detail focused • tends to observe what happens around them and, as a result, may get distracted • may experience difficulty in adapting to change, especially if it is sudden
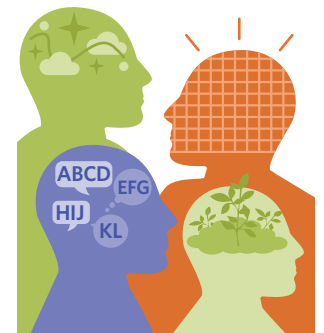
ACTIVITY
Log into your Edrolo account for activities that support this lesson.

KEY TERMS

Neurodivergent
individuals who have a variation in neurological development and functioning

Neurodiversity
variations in neurological development and functioning within and between groups of people, such as those experienced by people with autism

Neurotypicality
a term used to describe individuals who display neurological and cognitive functioning in a way that is typical or expected

As learnt in lesson 3B Normality and neurotypicality, the term 'neurodiversity' was coined in the 1990s by sociologist Judy Singer. The use of the term 'neurodiverse' to describe those who were historically seen as 'abnormal' signalled an important shift in how we understand varying brain development. We now understand that these conditions represent regular variations in brain development within society. The term works to create a social atmosphere in which brain diversity is normalised and celebrated, creating space and inclusion for those whose brains work differently. However, as the term is relatively new, it is still evolving and becoming more widely known and accepted.

It is important to note that the term 'neurodivergent' is specific to an individual, whereas 'neurodiversity' refers to groups of people. Individuals may be neurodivergent in that they think uniquely, however thinking processes may slightly differ between individuals in a group, causing there to be a neurodiversity.

PSYCHOLOGY EXPLORATION

Evolutions and limitations of the DSM

The Fifth Edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) is a guide for the assessment and diagnosis of psychological disorders. It was created in 1952 as a way of classifying and organising mental disorders, ensuring consistency between different psychological professionals. Since its creation, it has been revised seven times. With each revision, a broader range of symptoms were included and a greater emphasis was put on using non-stigmatizing language, as well as paying attention to risk factors, such as racism and discrimination (American Psychiatric Association, 2013).

An example of a revision made to the DSM includes the removal of Asperger's Disorder in 2013 and offering the new diagnosis of Autism Spectrum Disorder (ASD). Asperger's Disorder is often referred to as 'high-functioning autism' with less severe symptoms and the absence of language delays (Gamlin, 2017). The disorder has not been completely removed from the DSM, but rather reclassified as part of the DSM-5 Autism Spectrum (Gamlin, 2017). While the change reflects our evolving awareness of neurological diversity (evident in the inclusion of 'spectrum'), the widespread lack of understanding of the nuances of developmental disorders acts as a challenge. There is still work to be done to reduce the stigma around neurodiversity and to fully appreciate the differences in brain structures and functions.

It is important to view neurodiversity on a spectrum, as there can be a lot of overlap between the experiences of neurodiversity, as depicted in figure 1. People with a neurodivergent condition often appear to act similarly to neurotypical individuals, but they are different in terms of brain structure and function. Different developmental disorders can also involve similar symptoms and affect an individual's functioning to similar degrees. For example, individuals with autism and ADHD can both exhibit repetitive behaviours. However, brain structure and function would differ significantly between people with each neurological condition, which you will learn about later in this lesson.
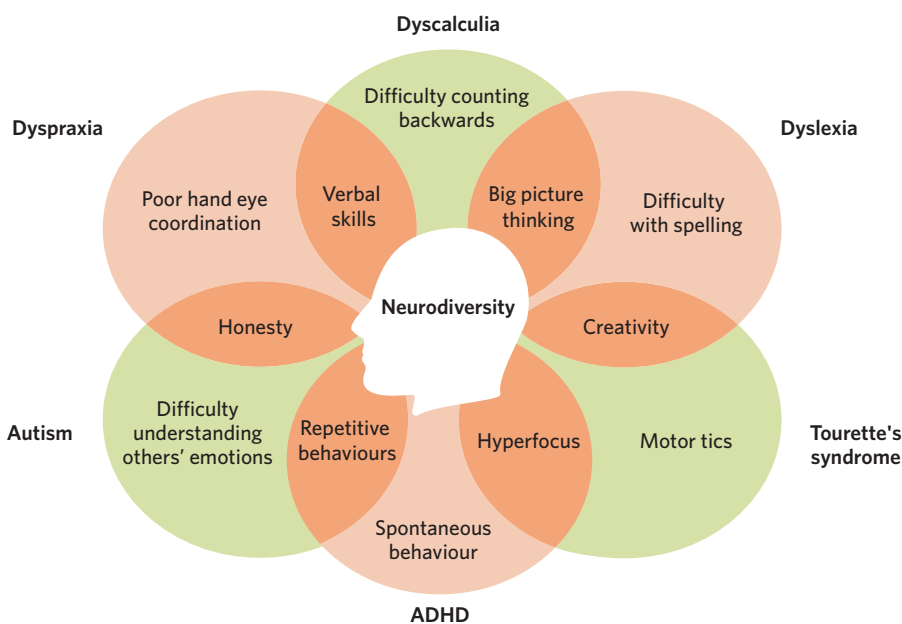
Figure 1 The neurodiversity spectrum

Common characteristics of neurodivergent individuals include:

- thinking creatively
- being detail-focused
- being very honest
- having high energy
- being very observant
- being good at problem-solving.

In the rest of this lesson, we will be exploring three examples of neurodivergent conditions:

- Autism spectrum disorder (ASD)
- Attention-deficit/hyperactivity disorder (ADHD)
- Dyslexia.
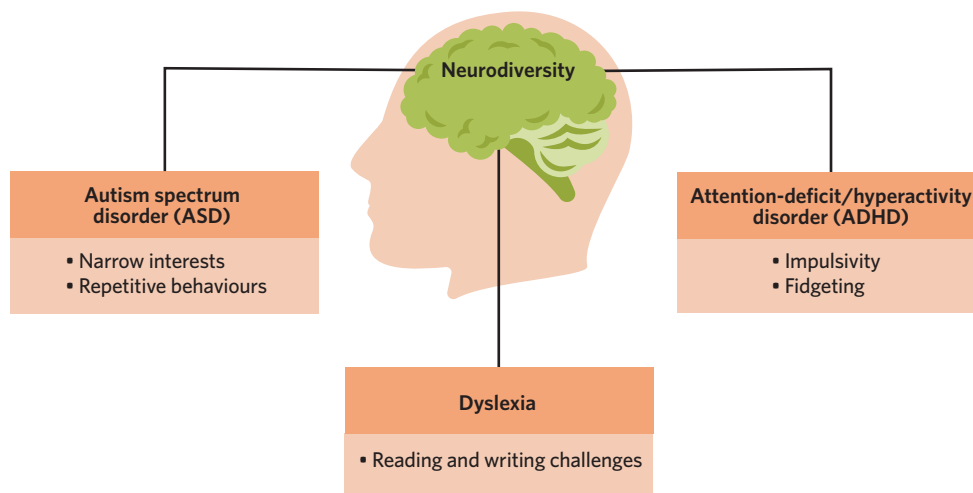
Figure 2 Three neurodivergent conditions discussed in this lesson

Autism spectrum disorder (ASD)
a neurodevelopmental condition characterised by impaired social interactions, verbal and non-verbal communication difficulties, narrow interests, and repetitive behaviour

Autism Spectrum Disorder (ASD) 1.1.7.1.1

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterised by impaired social interactions, verbal and non-verbal communication difficulties, narrow interests, and repetitive behaviours. The brains of individuals with autism are different to neurotypical individuals in the following ways (Ha et al., 2015):

- A greater brain volume in childhood; however, brain volumes become equivalent after adolescence.
- A thinner temporal cortex, which is associated with processing sounds and speech.
- A thicker frontal cortex, which is associated with complex social and cognitive processes.
- Smaller internal structures, such as the amygdala, which are involved in processing emotions.

An individual with ASD also experiences different strengths and challenges compared to a neurotypical individual. These are outlined in table 2.

Table 2 Some strengths and challenges of an individual with ASD (Exceptional Individuals, 2020)

Strengths	Challenges
- Exceptional attention to detail - Superior retention of facts - High level of motivation and enthusiasm in activities of interest - High degree of accuracy in various tasks - Innovative approaches to problem-solving - Able to follow instructions accurately and precisely - Able to see the world from an alternative perspective and therefore offer unique insights	- Being unable to make or keep eye contact - Being unable to read others' facial expressions and recognise others' emotions - Getting distressed by minor changes in routine - Having obsessive and singular interests - Delayed language skills - Delayed movement skills - Delayed cognitive or learning skills

Research has shown that one in 59 children are diagnosed with ASD (Exceptional Individuals, 2020). It is important to note that ASD can present itself in a variety of ways and diagnosed individuals may not all act in the same way. It has also been found that males are more likely to have this neurodivergence than females, with three in four diagnosed individuals being male (Exceptional Individuals, 2020).

WANT TO KNOW MORE?

Presentation of ASD

While ASD can present in a variety of ways, with differing severity in symptoms, it also presents differently between males and females. For example, some females can 'camouflage' their symptoms by using strategies, such as watching others and mimicking their behaviour, to hide social difficulties and blend in. This behaviour is called 'masking' as they try to disguise their ASD symptoms and act like a neurotypical individual.

Females are also often misdiagnosed or receive a delayed diagnosis due to the stereotype that they are more socially competent than males. Their awkwardness, uncomfortability, and difficulty in social situations are often overlooked, neglecting the possibility of having ASD. This creates a bias towards males in the diagnostic process and makes it challenging for females to receive a correct diagnosis.

(Autism SA, 2022)

It is also possible to intervene and manage the condition, however it is more effective if done at an earlier stage. Management strategies include:

- educational and developmental therapy
- behavioural therapy (to help learn life skills and overcome other challenges)
- speech, language, and occupational therapy (to help with social, communication, and language skills)
- medication (to tackle accompanying mental health issues, such as anxiety medication to calm worries and/or fears)
- psychotherapy (to help a person increase or build upon their strengths) (National Institutes of Health, 2017).

Attention-deficit/hyperactivity disorder (ADHD) 1.1.7.1.2

Attention-deficit/hyperactivity disorder (ADHD) is a neurological condition characterised by persistent inattention or hyperactivity that disrupts social, academic, or occupational functioning. The condition is commonly known for involving behavioural difficulties, such as fidgeting. There are no definitive causes for ADHD, as the condition is still being researched; however, there are ideas about the ways in which brain structure and functioning differ from that of a neurotypical person. These differences include:

- Hyperactivity (increased activity) and hypoactivity (decreased activity) in some brain regions which interfere with the brain's computing capacity to appropriately meet the cognitive demands of a task.
- Smaller volume of the amygdala and hippocampus, which impact emotional regulation and motivation.
- Delayed maturation of the cerebral cortex, which impacts cognitive and attention control.
- Faster maturation of the motor cortex which may induce symptoms, such as restlessness and fidgeting (Cronkleton, 2021).

A person with ADHD also faces different strengths and challenges to a neurotypical individual, and these are outlined in table 3.

> **Attention-deficit/ hyperactivity disorder (ADHD)** a neurological condition characterised by persistent inattention or hyperactivity that disrupts social, academic, or occupational functioning

Table 3 Some strengths and challenges of a person with ADHD (Exceptional Individuals, 2020)

Strengths	Challenges
• Hyperfocusing on a particular task of interest • Creative approaches to various tasks • Enthusiasm in what they do • Finding innovative ways to complete a task	• Time management • Staying concentrated • Staying on topic • Acting with rationality • Articulating feelings • Impulsivity

WANT TO KNOW MORE?

Despite the misconception that people with ADHD are 'easily distracted,' hyperfocus is a common behaviour associated with the neurological condition. Hyperfocus is when an individual is completely absorbed in a task, to the point where they appear to completely ignore everything else. An example of hyperfocus is when a child is fully engaged in a video game to the point where they do not hear a parent calling their name. Although hyperfocus seems contradictory as ADHD is often associated with inattention and impulsivity, it is reported as a positive state whereby people with ADHD actually engage in tasks for longer periods of time than typical.

Characteristics of hyperfocus include:

- an intense state of concentration/focus.
- diminished perception of unrelated external stimuli.
- improvement of task performance during a hyperfocus state.
- better engagement when the task is fun or interesting.

Hyperfocus can be both a strength and a challenge to individuals with ADHD. Using the example above, if a video game is particularly fun or interesting, a child with ADHD may enter an intense state of concentration (hyperfocus). In this state, they would be fully engrossed in the game, causing their perception of unrelated external stimuli, such as their parents calling their name, to be diminished. This state of total concentration can make it harder for the individual to work with others or in an environment where their attention may need to be easily gained by others. However, it can be highly beneficial in that it improves task performance. Due to individuals being less likely to be distracted by external stimuli, they pay extreme attention to the details of the task at hand, completing it to a high standard.

(Ashinoff & Abu-Akel, 2019)

Despite the misconception that only children have ADHD, research has shown that roughly 2.5% of adults also experience this neurological condition (Exceptional Individuals, 2020). It has also been found that males are three times more likely to be diagnosed with ADHD than females, and that 41% to 55% of families with one child with ADHD have one parent with it too (Exceptional Individuals, 2020).

It is also possible to intervene and manage the condition, even if it had been undiagnosed at an early age. Some management strategies include:

- medication (to help with focus)
- counselling and psychotherapy (to help address difficulties in everyday life and assist with time management, organisation, and planning)
- behavioural strategies (to regain control in life)
    - decluttering - having a clean space can help an individual have a clear mind
    - designating zones - to separate activities and parts of an individual's life so that they don't overlap and overwhelm them
    - use a planner - to know exactly what an individual has to do and when they have to do it
    - work in small increments - to prevent overworking and getting distracted (Managing Adult ADHD, n.d.).

Dyslexia 1.1.7.1.3

Dyslexia a neurologically based learning difficulty manifested as severe challenges in reading, spelling, writing words, and sometimes in arithmetic

Dyslexia is a neurologically based learning difficulty manifested as severe difficulties in reading, spelling, writing words, and sometimes in arithmetic. The brains of people with dyslexia are different to neurotypical individuals in the following ways:

- Decreased grey matter volume, which is related to reading skills, phonological (speech) processing, and spelling recognition.
- Weaker white matter organisation, which impacts reading speed.
- Hypoactivation of certain regions of the brain, which are responsible for recognising symbols and letters and associating them with sounds.
- Reduced neuroplasticity of left-hemispheric regions that are involved in language and reading (Raschle et al., 2011).

A person with dyslexia also faces different strengths and challenges to a neurotypical individual, and these are outlined in table 4.

Table 4 Some strengths and challenges of a person with dyslexia (Exceptional Individuals, 2020)

Strengths	Challenges
- Strong memory - Puzzle-solving skills - Spatial awareness - Initiating conversation - Problem-solving - Big-picture thinking - Narrative reasoning (creating vivid mental scenes to display important ideas and concepts from their life) - Three-dimensional thinking	- Difficulties with reading and writing - Slower learning - Problems forming words correctly, such as reversing sounds in words or confusing words that sound alike - Trouble understanding jokes or expressions - Lack of confidence in activities that involve reading and writing - Worry that they are 'behind' everyone else

Research has shown that one in ten people is likely to be dyslexic, meaning that there are around 700 million dyslexic people in the world. With this neurodivergence, men and women are equally impacted. Research has found that in children diagnosed with dyslexia, there is a 25–40% chance that they also have ADHD, but in children diagnosed with ADHD, there is only a 25% of having dyslexia (Bates, 2013). Therefore, having dyslexia means you have a greater chance of having ADHD, but the inverse relationship does not necessarily apply.

WANT TO KNOW MORE?

The term 'comorbidity' is defined as the simultaneous presence of more than one illness, disease, or disorder in an individual (APA Dictionary of Psychology, 2022). This essentially means that if you have a developmental disorder or a mental illness, it is likely that you may also have another. For example, an individual who has been diagnosed with ADHD may also have bipolar disorder. There are many explanations of the development of comorbidity, which are explained in table 5.

Table 5 Suggestions, explanations, and examples of the development of comorbidity

Suggestion	Explanation	Example
Direct causation	Having one condition leads to, or causes, another condition to occur.	A child with ASD may be more vulnerable to a reading disorder due to impairments in reading comprehension, language, and visual/auditory processing (Hendren et al., 2018).
Associated risk factors	Two conditions may have similar risk factors, causing them to occur simultaneously.	Low-self esteem is a risk factor for both anxiety and depression, causing the conditions to co-occur (Blanco et al., 2014).

It is also possible to intervene and manage the condition and some of these strategies include:

- learning via audio or video recordings
- using assistive technology to read text aloud
- using technology, such as word processors and electronic organisers, which can help with writing
- occupational therapy (to help learn ways to work around and manage issues caused by dyslexia in the workplace).

WANT TO KNOW MORE?

Dyslexia is not just having problems with reading and writing. There are four main types of dyslexia (Snowling et al., 2020), including:

- phonological dyslexia
  - difficulty processing the sounds of the individual letters and syllables, and inability to match them with the written forms.
- surface dyslexia
  - difficulty recognising whole words, which probably results from vision issues or visual processing difficulties in the brain.
- rapid naming deficit
  - difficulty naming a letter, number, colour, or object quickly and automatically.
- double deficit dyslexia
  - difficulty with both the phonological process and naming speed

Furthermore, dyslexia is commonly known as 'math dyslexia' as it involves difficulty in reading and applying numbers (Haberstroh & Schulte-Körne, 2019).
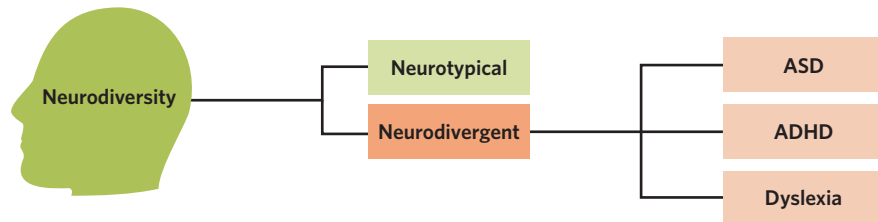
3C Questions

Theory review

Question 1

Neurodiversity focuses on brain **(Select all that apply)**

I. size.

II. development.

III. shape.

IV. function.

Question 2

Autism is a condition that can be classified as 'neurodivergent'.

A. True.

B. False.

Question 3

_____ is an overarching term for _____ and it aims to _____ such variations.

Which of the following best fills in the blanks?

A. Autism; neurodiversity; normalise

B. Neurodiversity; developmental disorders; normalise

C. Neurotypicality; disorders; exclude

Question 4

Which of the following examples of neurodivergence is largely characterised by behavioural difficulties?

A. Autism.

B. Dyslexia.

C. ADHD.

Question 5

A phenomenon has been found in which children with _____ are more likely to also have _____.

Which of the following best fills in the blanks?

A. ADHD; dyslexia

B. ADD; dyslexia

C. ADHD; dyscalculia

Assessment skills

Perfect your phrasing

Question 6

Which of the following sentences is most correct?

A. ADHD is a neurological disorder characterised by the **persistent** presence of symptoms that impair functioning.

B. ADHD is a neurological disorder characterised by the **repeated** presence of symptoms that impair functioning.

Question 7

Which of the following sentences is most correct?

A. Dyslexia is a neurological **disorder** that involves difficulties reading and writing.

B. Dyslexia is a neurological **disability** that involves difficulties reading and writing.

Problem-solving

The following assessment skills type reflects the study design assessment type:

- problem-solving involving psychological concepts, skills and/or issues

Use the following information to answer questions 8–11.

In Mr Geller's year 10 maths class, there is a student who has been diagnosed with ADHD. One day, Mr Geller decides to test different ways that he can help the student to focus better and do well in his class. On the first day, Mr Geller does not do anything differently but gives the student a worksheet and times how long they take to complete it. On the second day, Mr Geller provides some counselling, addressing issues that the student has in everyday life, and records how long the student takes to complete the same worksheet. On the final day, Mr Geller implements some behavioural strategies, such as instructing the student to declutter their workplace and work in small increments, before getting the student to complete the worksheet once again.

Question 8

What ethical consideration has Mr Geller breached?

A. Beneficence, as his experiment does not yield any useful information.

B. Informed consent, as he has not described the study to his student and received permission from the student and their parents for them to take part in the study.

C. Confidentiality, as he is not collecting data to publish or share with others.

D. No harm principle, as he is putting the student with ADHD in harm's way.

Question 9

Which of the following correctly identifies Mr Geller's independent variable (IV) and dependent variable (DV)?

	Independent variable	Dependent variable
A.	Management strategy	Time taken to complete the worksheet
B.	Diagnosis of ADHD	Time taken to complete the worksheet
C.	Management strategy	Diagnosis of ADHD
D.	Diagnosis of ADHD	Management strategy

Question 10

Which of the following is a possible confounding variable in this study? **(Select all that apply)**

I. Order effects, as the student is completing the same worksheet multiple times.

II. Experimenter bias, as Mr Geller probably wants his student to be able to better focus and may do everything he can to ensure that it happens.

III. Participant bias, as the student probably wants to get higher grades and may do everything he can do to achieve that.

Question 11

Using your knowledge of ADHD, what is likely to be the most effective method that Mr Geller can employ to assist his student in managing their neurological condition?

A. Doing nothing, as he would not be adding stress and potentially distracting the student.

B. Counselling, as Mr Geller will be able to find out exactly what is wrong with the student and give him advice to focus better.

C. Implementing behaviour strategies, as it equips the student with practical ways to manage his condition in class.

D. None of the methods tested will be effective as ADHD cannot be managed.

Exam-style

Remember and understand

Question 12 (1 MARK)

Which of the following is **not** a characteristic of a neurodiverse individual?

A. Thinking creatively.

B. Being detail-focused.

C. Focusing for prolonged periods.

D. Being good at problem-solving.

Question 13 (3 MARKS)

With reference to a strength and a challenge, describe dyslexia.

Apply and analyse

Question 14 (1 MARK)

Winnie, Christopher, and Eeyore are all neurodiverse students. Their teacher gave them an independent project in which they could make a presentation on any topic that they liked. While they did the project, their teacher noticed that Christopher was really enthusiastic about the project that he had chosen to do, but found it difficult to stay on topic and complete it. She also noticed that Eeyore paid a lot of attention to the details in their presentation but got very upset when minor changes had to be made. Finally, she noticed that Winnie was good at solving any problems that arose but really struggled with writing the cue cards needed for her presentation.

Which of the following correctly describes the conditions that these neurodiverse students may have?

	Winnie	Christopher	Eeyore
A.	ADHD	Dyslexia	Autism
B.	Dyslexia	ADHD	Autism
C.	Autism	ADHD	Dyslexia
D.	Dyslexia	Autism	ADHD

Question 15 (2 MARKS)

Alyse is a VCE student who is preparing for her psychology exam. However, she is struggling to study as she has dyslexia. She often reads 'hippocampus' as 'hypothalamus' and, as a result, answers any questions on the topic completely wrong.

Propose a strategy that Alyse can utilise to effectively manage her dyslexia while studying.

Question 16 (4 MARKS)

Compare autism and ADHD, with reference to similarities and differences.

Evaluate

Question 17 (5 MARKS)

Rory is a person with autism and they have been offered a new job at a company called Edlephant. The job involves a lot of teamwork, as Rory will be working on large-scale projects for the improvement of local community centres. The company is located in the city centre, which is often described as the 'hustle and bustle hub.' One of Rory's friends who works there has said that it is a very casual workplace where everyone is comfortable and often sarcastic with each other. She has also described the chatty and loud atmosphere as an aspect of the job that she absolutely loves. She did, however, warn that most plans and meetings are often changed last minute and often without explanation.

a. Determine and justify whether Edlephant is likely to be a neurodiverse workplace. (2 MARKS)

b. Considering their condition, evaluate whether the job is appropriate for Rory. (3 MARKS)

Questions from multiple lessons

Question 18 (1 MARK)

Describe how neurodiversity helps conceptualise normality.

Question 19 (2 MARKS)

Compare neurodiversity and neurotypicality.

Question 20 (3 MARKS)

Explain how a behaviour associated with ADHD may be considered typical and maladaptive.

STUDY DESIGN DOT POINT

- 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

3A	3B	3C	3D

1.1.8.1	1.1.8.2	1.1.8.3	1.1.8.4	1.1.8.5
Mental health workers	Psychologists	Psychiatrists	Mental health organisations	Culturally responsive practices

Who do you turn to when you struggle with mental wellbeing? Although your family and friends may be able to assist you, professional help may also be required. In this lesson, you will learn about mental health workers, psychologists, psychiatrists, and mental health organisations and specifically, their role in supporting psychological development and mental wellbeing. You will also learn about the importance of culturally responsive practice when diagnosing and managing atypical behaviour.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

KEY TERMS

Mental wellbeing an individual's current psychological state, involving their ability to think, process information, and regulate emotions

Psychological development an individual's changes in functioning across multiple domains, including the life-long growth across emotional, cognitive, and social domains

Mental health workers members of a mental health treatment team who assist in providing a wide range of services and care for patients with psychological or social problems

Mental health workers 1.1.8.1

There can be times when you need a little extra support in your psychological development and mental wellbeing. Luckily, there are many mental health workers who can provide this support and help you in the way that you need.

Theory details

As you progress throughout your life, you may need support with your mental wellbeing and psychological development. **Mental wellbeing** refers to an individual's current psychological state, involving their ability to think, process information, and regulate emotions. **Psychological development**, on the other hand, refers to an individual's changes in functioning across multiple domains, including the life-long growth across emotional, cognitive, and social domains. One way to receive mental and psychological support is by working with **mental health workers,** who are members of a mental health treatment team who assist in providing a wide range of services and care for patients with psychological or social problems.

Being a mental health worker encompasses many different responsibilities and they often work with people who are vulnerable and in need of help. They are required to have certain qualifications, undertake different tasks, work in different places, and assist a variety of people. These are all outlined in table 1.

Table 1 Characteristics of a mental health worker

Characteristic	Explanation
Qualifications	• Bachelor's degree in nursing or social work • Certification/qualification in mental health or community service
How they support mental wellbeing	Mental health workers have many roles in supporting mental wellbeing, including but not limited to: • ensuring medication is taken at appropriate times • helping people with mental illness find ways to manage uncomfortable situations • developing coping strategies that they practise with patients • maintaining health records, such as recording changes in the type and dosage of medication a client may take • engaging in community education programs to teach young people how to be aware of and support those with a mental illness • working with groups and conducting outreach assistance to help clients connect with the local community and manage daily activities • reviewing individual recovery plans and making necessary adjustments, such as recommending a new sleep schedule due to starting a new job.
How they support psychological development	Mental health workers have many roles in supporting psychological development, including but not limited to: • helping children with a neurological disorder at school, such as by providing assistance with challenging work • linking families of children who have disabilities with agencies and programs that can help them in times of need.
Who they work with	People with mental illnesses or struggles with psychological development, including but not limited to: • children with autism • young adults with ADHD • elderly people with dementia • mothers with postpartum depression.
Where they work	Mental health workers often work in a range of settings, these include but are not limited to: • client's home • community or mental health support centres • aged-care homes • rehabilitation centres • clinics • community-based non-government organisations • workplaces.

USEFUL TIP

It is important to note that mental health workers cannot diagnose mental illnesses nor are they qualified to give specific therapies, such as cognitive behavioural therapy or talking therapy. Their main goal is to assist in the rehabilitation of patients who have already received a diagnosis. You can think of them as the worker bees that work hard to protect and support their queen bee; many mental health workers deliver different services so that their one patient is well-cared for and the overall goal of rehabilitating the patient is achieved.
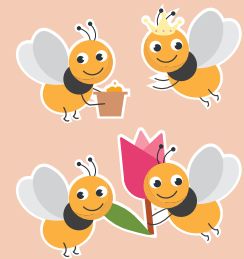
Figure 1 Mental health workers, like worker bees, do a range of tasks to support their patients

There are many different types of mental health workers and they all come together to provide holistic care in the management of a patient's psychological development and mental wellbeing.

Some examples include:

• social workers
  – They support people in making changes in their lives to improve personal and social wellbeing. They do this by identifying issues that require change and connecting people to appropriate sources of support, such as secure housing or therapy.

• youth workers
  – They support young people in developing the skills they need to make positive changes in their lives.

• occupational therapists
  – They promote wellbeing by enabling people to participate fully in the responsibilities of everyday life. For example, they may develop strategies for someone with ADHD to stay focused during the workday and identify ways to minimise distractions.

Psychologists 1.1.8.2

Psychologists are one of the most well-known types of mental health workers. They work to understand and assist clients in managing their thoughts, emotions, and behaviours.

Theory details

A **psychologist** is an individual who is professionally trained in one or more branches or subfields of psychology. This section of the lesson focuses on psychologists in a general sense. It is important to note that psychologists carry out different roles based on their field of specialisation. For example, an educational psychologist would mainly support students and their support systems.

An individual may see a psychologist when they are struggling with their mental wellbeing, looking to improve mental wellbeing, or looking for assistance with their psychological development. Psychologists can provide advice and strategies for people struggling with their mental wellbeing or psychological development. Some psychologists often focus on providing psychological assistance so they may use therapy, such as 'talk therapy', to help support an individual. Further details relating to psychologists are outlined in table 2.

Table 2 Characteristics of a psychologist

Characteristic	Explanation
Qualifications	• An accredited three-year undergraduate study in a bachelor's of psychology • A fourth year of honours study • Additional master's degree in area of specialisation (such as developmental or forensic psychology) • Potentially a PhD (if interested) • Work experience in the field of choice • Formal Australian Psychological Society registration

How they support mental wellbeing	Psychologists have many roles in supporting mental wellbeing specific to their specialisation, including but not limited to:
	• making a diagnostic judgement by identifying and considering a patient's context and symptoms
	• providing different types of therapy and counselling, such as:
	  – psychoanalysis
	  – psychodynamic approaches
	  – client-centred approaches
	  – cognitive behavioural therapy

How they support psychological development	Psychologists have many roles in supporting psychological development specific to their specialisation, including but not limited to: • assisting in the assessment and diagnosis of autism • providing counselling for individuals and loved ones during challenging times after diagnosis • developing strategies and support programs for managing ADHD, and if necessary, other conditions, such as depression or anxiety • assessing specific learning difficulties, helping plan for school and post-school options • referring the individual to medical specialists, such as neurologists, paediatricians, and psychiatrists.
Who they work with	Psychologists work with people who may be experiencing: • relationship problems • trauma • parenting issues • loss or grief • substance abuse. Psychologists also work with people who have: • a diagnosed mental health disorder • a chronic illness • learning difficulties.

Table 2 Continued

Characteristic	Explanation
Where they work	Psychologists often work in a range of settings, these include but are not limited to: • hospitals • community health services • schools • courts • prisons • the defence forces • private practice.

Though you do not need an official referral from a doctor to talk to a psychologist, in Australia you may be eligible for rebates (partial refunds) on psychologist fees through Medicare. To organise this, you can talk to your general practitioner (GP) doctor, who can create a mental health care plan and help you connect with a psychologist. There are also many organisations (which you will learn about later in this lesson) that can connect you with free psychological counselling and services. You should also note that psychologists are able to diagnose mental health and developmental disorders as they are qualified by the Australian Psychological Society (APS), but they will often work alongside psychiatrists and other medical professionals to ensure accuracy and holistic care.

PSYCHOLOGY EXPLORATION

There are many different types of psychologists who specialise in different areas and psychological needs. Some types of psychologists include:

• educational psychologists

   – They work to help children, parents, carers, and teachers understand the issues a child may experience at school.
   – They are specialised in working with children's development, behavioural issues, disability-related issues, and learning difficulties.

• clinical psychologists

   – They work to provide a wide range of psychological services to individuals with mental health problems.
   – They are trained in assessing and diagnosing mental illnesses and psychological problems as well as providing advice in clinical areas.

• health psychologists

   – They work to promote positive behaviours to reduce risk factors for poor health.
   – They specialise in helping people recover from, or manage, trauma, chronic pain, or a disability.

• neuropsychologists

   – They are trained in understanding the cognitive, emotional, and behavioural effects of a wide range of brain conditions, such as epilepsy.
   – They assess strengths and weaknesses to help diagnose mental disorders and tailor treatment plans to suit each individual.

It is also important to note that psychologists can also be academics and researchers. An example of this is Jean Piaget who studied and taught experimental and developmental psychology at The University of Geneva, in Switzerland, before he began research into child development. It was during this research that he created the cognitive development theory, which you learnt about in lesson 2C Psychological development across the lifespan.

Psychiatrists 1.1.8.3

Psychiatrists are another category of professionals who can provide support for mental wellbeing and psychological development. They have a medical role as well, making this a more difficult profession to obtain.

Theory details

A **psychiatrist** is a doctor who specialises in the diagnosis, treatment, prevention, and study of mental, behavioural, and personality disorders. The main difference between a psychologist and a psychiatrist is that a psychiatrist is a medical doctor, who has completed special training, and therefore can prescribe medication. Further details relating to a psychiatrist are outlined in table 3.

> **Psychiatrist** a doctor who specialises in the diagnosis, treatment, prevention, and study of mental, behavioural, and personality disorders

Table 3 Characteristics of a psychiatrist

Characteristic	Explanation
Qualifications	• Study medicine and complete a medical degree (4–6 years) • Do on-the-job training in a hospital after their degree (1 year) • Enrol and complete specialist training in psychiatry (5 years) with The Royal Australian and New Zealand College of Psychiatrists (RANZCP)
How they support mental wellbeing	Psychiatrists have many roles in supporting mental wellbeing, including but not limited to: • diagnosing and treating mental health issues • prescribing medication for mental health conditions • providing different types of talk-based therapies, such as cognitive behavioural therapy • conducting research to lead breakthroughs in psychiatry and mental health.
How they support psychological development	Psychiatrists have many roles in supporting psychological development, including but not limited to: • making the diagnosis • devising management plans for developmental conditions, such as ADHD • diagnosing and treating any associated mental health issues, including depression or alcohol and drug abuse • prescribing medication • keeping track of any medication side effects and the individual's physical health • providing resources for counselling and mentoring • providing referrals to other health professionals.
Who they work with	Psychiatrists work with a range of individuals, including but not limited to: • patients with mental health problems, as well as their families and carers • general practitioners and other health professionals, to best meet the mental health and emotional needs of patients.
Where they work	Psychiatrists often work in a range of settings, these include but are not limited to: • private, public, or academic practices • hospitals • clinics • community settings.

Unlike a psychologist, you need a referral in order to see a psychiatrist. The most common way to do this is to first approach a GP or psychologist with concerns about your or someone else's mental wellbeing and psychological development. The GP or psychologist may give you a referral if they believe it is necessary and you can then schedule an appointment with a psychiatrist.

A useful diagnostic tool that psychologists and psychiatrists turn to is the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5). The DSM-5 is a guide for the assessment and diagnosis of psychological disorders and is primarily used by mental health professionals to assist with the diagnosis and understanding of psychological disorders (American Psychiatric Association, 2019).

The DSM-5 is used for the following reasons:

- to compare patients' presentations with a standardised list of symptoms and criteria
- to make a consistent diagnosis using DSM criteria
- to communicate diagnostic information with other clinicians.

Mental health organisations 1.1.8.4

As the discussion around the importance of mental wellbeing increases, more and more mental health organisations have been established to assist people. There are many different organisations, but they all share the same goal – to support people's mental wellbeing.

Theory details

A **mental health organisation** is a company or group that works to address or advocate for mental health, such as through providing support or specialised services. Further details of mental health organisations are outlined in table 4.

Mental health organisation a company or group that works to address or advocate for mental health, such as through providing support or specialised services

Table 4 Characteristics of mental health organisations

Characteristic	Explanation

How they support mental wellbeing and psychological wellbeing	Mental health organisations are often specialised in one area, such as managing anxiety, and carry out a variety of services, such as:
	
	- raising awareness
	  - This is done through brochures and flyers containing research, statistics, and help services that individuals can turn to.
	- school-based early intervention programs
	  - This is done to educate young people and to equip them with ways to identify, manage, and work with a mental illness or neurological disorder.
	- over-the-phone counselling
	  - This is done to provide support to individuals in a way that is more personal but also private, if needed.
	- workshops
	  - This is done to educate individuals and teach them strategies to manage their condition.

Who they work with	Mental health organisations work with a range of individuals, including but not limited to: - children - families - adults with acquired brain injury or neurodegenerative conditions - people with intellectual disabilities - people with mental illness - Aboriginal and Torres Strait Islander people - war veterans.

PSYCHOLOGY EXPLORATION

There are many mental health organisations that are readily available for anyone to use. The following table provides information on two organisations along with the services that they provide.

Table 5 There are many mental health organisations available that address a variety of mental health issues

Organisation	Aim/s	Services and resources	How does this organisation reduce the negative impact of mental health problems?
Amaze (Amaze, 2022)	To provide a central information source and support individuals with autism and their families.	- Autism Connect helpline 1300 308 699 - Early Days Workshops to assist families with young children with the condition - Training and Professional Development for people with autism who are looking to enter the workforce.	- Builds autism understanding in the community - Influences policy change for people with autism and their families/supporters - Provides independent, credible information and resources to individuals, families, professionals, government and the wider community.
Beyond Blue (Beyond Blue, 2021)	1. Promote mental health and wellbeing 2. Be a trusted source of information 3. Work together to prevent suicide	24/7 phone service and online forum - Blue Voices: a group of people suffering from anxiety or depression who help in the development of mental health programs and services - Informative brochures, fact sheets, and flyers about mental health - Beyond Now: an app where people can create a suicide safety plan.	- Offers online and phone services for struggling individuals. - Provides fact sheets and informative resources to educate people about mental health - Helps reduce the negative impact of mental health problems by reducing the risk of suicide, through their app Beyond Now, where people can create a suicide safety plan.

Please note that these are only two examples of mental health organisations. Type the URL vichealth.vic.gov.au/be-healthy/ten-go-to-mental-health-organisations-for-young-people into your browser to find and learn more about other organisations.

Mental health workers, psychologists, psychiatrists, and mental health organisations don't work in isolation but rather, work together to provide holistic support for a patient. As an example, figure 2 shows how all these workers come together to assist someone with anxiety.

Mental health worker may link the patient and their family with anxiety management programs.

Mental health organisation may provide over-the-phone counselling when the patient feels that they feel overly anxious and need immediate help.

Patient with anxiety

Psychiatrist may prescribe anxiety medication to help manage symptoms.

Psychologist may help address intrusive and anxious thoughts and identify ways to manage them.

Figure 2 Mental health workers, psychologists, psychiatrists, and mental health organisations all work together to provide holistic support for a patient

Culturally responsive practices 1.1.8.5

As more people from different cultures seek mental and psychological help, it is important to be respectful of different traditions, views, and attitudes. By doing this, it means that mental health professionals are engaging in culturally responsive practices.

Theory details

Culturally responsive practices refer to acting in ways that respond to the needs of diverse communities and demonstrating an openness to new ideas that may align with different cultural ideas, beliefs, and values. It is important to practise in a culturally responsive way so that people from different cultures feel acknowledged, appreciated, and respected.

Culturally responsive practices acting in ways that respond to the needs of diverse communities and demonstrating an openness to new ideas that may align with different cultural ideas, beliefs, and values

Becoming culturally responsive is an ongoing process and can take some time. However, mental health professionals can develop the necessary skills and knowledge in the following ways:

- having an understanding of different cultures
- being able to accept differences without judgements
- being able to identify risk factors among specific groups without stereotyping people
- having an awareness of their own culture
- understanding inherent biases towards their own cultural values and behaviours
- being able to respond appropriately to attitudes, feelings, and circumstances of different people
- understanding the necessary structures and services to deliver cultural support and bring about systemic change.

All workers in the mental health field need to engage in culturally responsive practices to maintain the integrity of the profession. They need to be able to support psychological development and mental wellbeing, as well as diagnose and manage people's atypical behaviour, but can only do so by understanding the cultural factors influencing their behaviour. It is also important so that patients feel safe, acknowledged and that they are able to access the support. They should be given a safe space in which they can talk, address, and receive appropriate help for their psychological needs and this is better facilitated by culturally responsive practices.

LESSON LINK

In lesson **3A Categorising typical and atypical behaviour,** you learnt that you must be aware of different traditions, customs, and attitudes in cultures when categorising behaviour. Similarly, mental health workers must have an understanding of a client's culture so that they are better equipped to diagnose and manage atypical behaviour.

For example, a psychologist should be aware that it is uncommon for people from certain cultures to express emotions. So when they are working with a client from those cultures, they should not expect clients to readily share their emotional problems but rather, work to raise awareness and then address their problems.
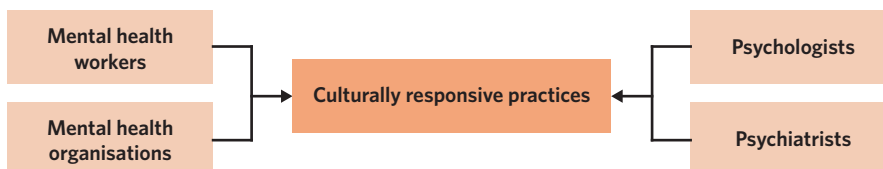
Figure 3 Culturally responsive practices should be at the centre of all mental health workers so that people from all cultures feel respected

Theory summary

In this lesson, you learnt about the role of mental health workers, psychologists, psychiatrists, and mental health organisations in supporting psychological development and mental wellbeing. You also learnt about the importance of culturally responsive practices in the diagnosis and management of atypical behaviour.

3D Questions

Question 1

Which of the following occupations can also be considered as 'mental health workers'? **(Select all that apply)**

I.   Teacher.

II.   Youth worker.

III.   Lawyer.

IV.   Social worker.

V.   Occupational therapist.

Question 2

Which of the following duties can a psychologist **not** do?

A.   Conduct research on psychological phenomena.

B.   Prescribe medication.

C.   Provide therapy.

Question 3

The same amount of study is needed to become a mental health worker, psychologist, and psychiatrist.

A.   True.

B.   False.

Question 4

Which of the following services does a mental health organisation provide? **(Select all that apply)**

I.   Raising awareness.

II.   Prescribing medication.

III.   School-based early intervention programs.

IV.   Over-the-phone counselling.

Question 5

It is important to practise in a _____ way so that people from _____ feel _____.

Which of the following best fills in the blanks?

A.   kind; Australia; acknowledged

B.   culturally responsive; different cultures; acknowledged

C.   professional; different cultures; isolated

Assessment skills

Text analysis

The following assessment skills type reflects the study design assessment type:

- media analysis of **one** or more contemporary media texts

Use the following information to answer questions 6–8.

> Following the COVID-19 lockdowns in 2020–2021, there have been growing concerns about Australia's approach to mental health recovery. In an article titled 'Lockdown toll: One in eight has new mental health condition' published in The Sydney Morning Herald on May 15, 2022, concerns about the depleted and exhausted mental health workforce in Australia was brought to attention.
>
> The article focused on the opinions of NSW Mental Health Commissioner Catherine Lourey who emphasised that Australia needs 'an intense focus on growing our existing workforce, re-training, and looking overseas to recruit more psychologists, peer workers, social workers, nurses, and counsellors.' She believes that this is crucial for getting Australians back on their feet after two long and taxing years of lockdowns.
>
> Professor Ian Hickie, co-director of the University of Sydney's Brain and Mind Centre, was also interviewed and he revealed that 'many reports indicate a need for ongoing support as the community realises COVID-19 will still cause disruption in their lives, even though lockdowns have ended.' He advocates it is not enough to just provide support once but continually so that citizens are able to process the devastations of the pandemic and able to improve mentally.
>
> (Carroll & Ward, 2022)

Question 6

Referring to the first quote provided in the media text, why is it important to grow Australia's existing mental health force?

A. To better assist the psychological development of citizens following COVID-19 lockdowns.

B. To ensure people are happy after being stuck in COVID-19 lockdowns.

C. To better assist the mental wellbeing of citizens following COVID-19 lockdowns.

D. To make sure children are developing at a normal pace after COVID-19 lockdowns.

Question 7

Referring to the second quote provided in the media text, how can Australia address the need for ongoing community support?

A. Increase access to psychologists and psychiatrists.

B. Train and recruit more mental health workers.

C. Fund more mental health organisations.

D. All of the above.

Question 8

Australia has a diverse society meaning that people of many different cultures will require mental health support. How can mental health workers ensure that they engage in culturally responsive practice?

A. By accepting differences without judgement.

B. By identifying risk factors among specific groups without stereotyping people.

C. By responding appropriately to attitudes, feelings and circumstances of people from their own culture.

D. All of the above.

Problem-solving

The following assessment skills type reflects the study design assessment type:

- problem-solving involving psychological concepts, skills and/or issues

Use the following information to answer questions 9–11.

Nick and Mason noticed that their daughter, Micky, had started to behave atypically. She finds it difficult to focus on her homework and spends a lot of time fidgeting and being unable to sit still. Nick and Mason suspect that Micky has ADHD but they are confused as to what to do next.

Question 9

What is the first course of action that Nick and Mason should take to support Micky in her psychological development?

A. Book an appointment with a psychiatrist.

B. Diagnose Micky with ADHD themselves and work to manage her condition.

C. Approach a GP with their concerns about Micky.

D. Ignore Micky's atypical behaviour and hope it goes away.

Question 10

Nick and Mason decide that Micky should see a psychologist. How may a psychologist support Micky's psychological development?

A. They may prescribe medication to manage her symptoms.

B. They may provide therapy to help Micky manage her symptoms.

C. They may provide counselling to Nick and Mason so they don't exhibit similar behaviour.

D. They may instruct Nick and Mason to withdraw her from school so she can get better.

Question 11

How could a mental health organisation help Nick and Mason in supporting Micky?

A. They may confirm Micky's diagnosis.

B. They may prescribe Micky medication to manage his symptoms.

C. They may create a recovery plan for Micky and his parents.

D. They may provide workshops that teach parents how to support their child in managing symptoms.

Exam-style

Remember and understand

Question 12 (1 MARK)

Which of the following types of people could be a client of mental health workers?

A. People with mental illnesses.

B. Children.

C. Elderly people.

D. All of the above.

Question 13 (1 MARK)

Harini is looking to become a psychologist after completing high school. Which of the following options outlines the responsibilities that Harini may have as a psychologist?

A. Refer clients to medical specialists; provide therapy and counselling; conduct research on psychological phenomena.

B. Prescribe medication; refer clients to medical specialists; provide counselling for loved ones.

C. Diagnose clients with depression; provide counselling for loved ones; prescribe medication.

D. Provide counselling to clients; prescribe medication; diagnose clients with anxiety.

Question 14   (1 MARK)

What are responsibilities that differ between a psychologist and a psychiatrist?

Question 15   (2 MARKS)

Using an example, explain how a mental health organisation assists in mental wellbeing.

Apply and analyse

Question 16   (1 MARK)

Maya has recently started working as a social worker. It has only been two weeks into the job but she has had to work in many places. Which of the following may be a place that Maya has worked at during these two weeks?

A. Rehabilitation centres.

B. Residential facilities.

C. Offices.

D. All of the above.

Question 17   (3 MARKS)

Sreya has been a registered psychologist for the past five years but her parents still mistake her for a psychiatrist. They keep asking Sreya to diagnose and prescribe medication to their florist's son who appears to have ADHD. Sreya refuses to do so and gets frustrated each time they bring this up with her. Referring to the similarities and differences between a psychologist and psychiatrist, suggest why Sreya might be getting frustrated each time her parents bring up the florist's son.

Questions from multiple lessons

Question 18   (1 MARK)

In relation to adaptivity, which three domains may psychologists consider when attempting to support psychological development?

Question 19   (3 MARKS)

Jovita is an exchange student and on her first day, she was visibly nervous and sat by herself at recess and lunch. Her teacher also noticed that she would take notes on everything he said during class, even instructions for group activities that she never took part in. With reference to a psychological criterion, outline how a psychiatrist may categorise Jovita's behaviour.

Question 20   (5 MARKS)

Dr Chelsea is a psychologist and she is working with her patient, Azfar, who has been referred by his school due to his recent behaviour. In class, Azfar has been really distracted and is unable to focus on his work. Even after his teacher checks on him and he seems fine, Azfar continues to zone out.

a. Identify one responsibility that Dr Chelsea would have in supporting Azfar's psychological development? (1 MARK)

b. With reference to social norms, suggest how Dr Chelsea may categorise Azfar's behaviour as atypical. (2 MARKS)

c. Dr Chelsea is told, in a later session, that Azfar was diagnosed with attention-deficit/hyperactivity disorder (ADHD) as a child. Dr Chelsea had suspected this was the case as Azfar was demonstrating similar behaviour and symptoms to clients that had been diagnosed with ADHD and were working with her to manage their condition. However, Azfar does not take medication nor has he seen a psychologist to help him manage his condition.

With the recently acquired knowledge, explain whether Dr Chelsea would categorise Azfar's behaviour as typical or atypical. (2 MARKS)

Chapter 3 review

Chapter summary

This chapter was all about defining and supporting psychological development. You learnt about the range of ways that you can understand psychological development and the many sources from which you can receive help.

In lesson **3A Categorising typical and atypical behaviour**, you learnt about the usefulness and limitations of psychological criteria used to categorise behaviour. In particular, you learnt about:

- the evaluation of psychological criteria, including:
  - cultural perspectives
  - social norms
  - statistical rarity
  - personal distress
  - maladaptive behaviour.
- behaviours, including:
  - typical behaviour
  - atypical behaviour.

In lesson **3B Normality and neurotypicality**, you learnt about the ways that normality can be understood. In particular, you learnt about:

- approaches to understanding normality
- neurotypicality
- adaptive and maladaptive emotions, behaviours, and cognitions.

In lesson **3C Neurodiversity**, you learnt about normal variations of brain development within society. In particular, you learnt about:

- neurodiversity
- neurodevelopmental disorders, including:
  - autism
  - attention-deficit/hyperactivity disorder (ADHD)
  - dyslexia.

In lesson **3D Role of mental health workers, psychologists, psychiatrists and organisations**, you learnt about the people and services that you can turn to when you need support with psychological development and mental wellbeing. In particular, you learnt about:

- mental health workers
- psychologists
- psychiatrists
- mental health organisations
- culturally responsive practices.
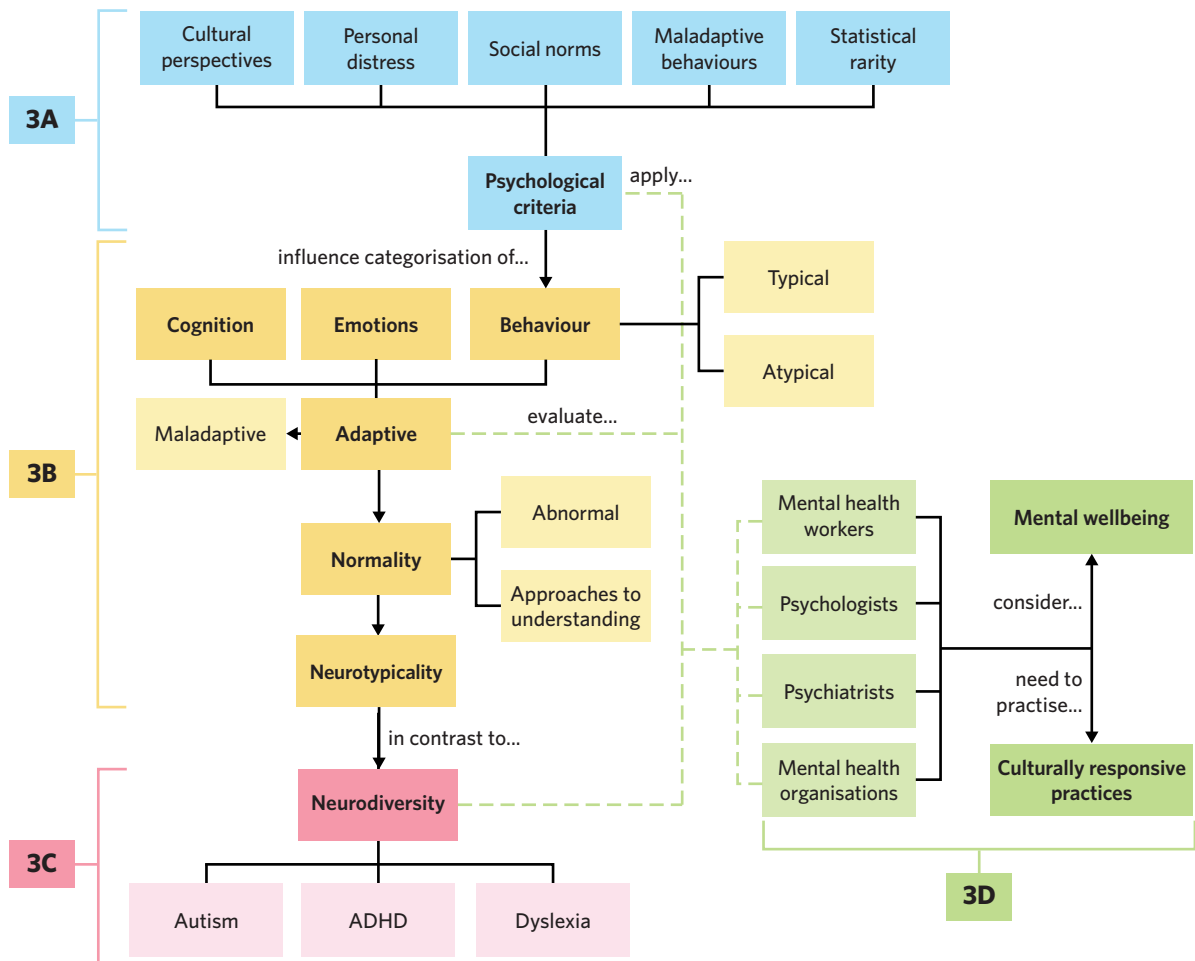
Chapter review activities

Review activity 1: Fill in the blanks

Fill in the blanks with the most appropriate terms from the word bank below.

- innovative
- counselling
- typical
- prescribe
- hyperfocused
- creative
- atypical
- abnormal

- concentrate
- rationality
- time management
- creative
- enthusiastic
- distracted
- articulate
- assessing

- strategies
- medical doctor
- concentrate
- normal
- show
- mundane
- medication
- link

Ivan is a single parent who has fraternal twins, Siva and Sabo. Growing up, they were very calm and socially adept children. However, after their seventh birthday, Ivan began to notice some differences in their behaviours.

Siva acted as he usually did, demonstrating _____ behaviour, however, Sabo started to behave differently, demonstrating _____ behaviour. Ivan noticed that Sabo found it very difficult to _____ on the task he was doing and often acted spontaneously. For example, if Sabo and Siva were playing with their toy trains and pretending to run a railway station, after a few minutes, Sabo would throw his toy train away and start to pretend they were running a space station instead. He struggled to act with _____ and often acted hastily. Ivan also noticed that Sabo struggled with _____ as he often finished his homework much later than Siva. He also struggled emotionally as he could not _____ his feelings when Sabo and Siva got into a fight and would often walk off.

However, Ivan also noticed that Sabo began to have a more positive attitude than Siva at times. When doing a task he really enjoyed, he would find _____ ways to complete it. He also demonstrated a _____ and _____ approach to tasks while Siva would do as he was instructed. For example, when given a self-directed project to complete at school, Sabo was highly invested in his chosen topic and _____, causing him to show speedy progress. However, this behaviour was often only seen in small bursts as Sabo would get _____ easily and it would take hours for him to be focused on the task again.

Concerned about how this behaviour may affect Sabo as he enters high school, Ivan decided to take Sabo to a clinical psychologist. After _____ Sabo's behaviour, the psychologist diagnosed him with ADHD. It was recommended that Sabo and Ivan come in once a week so they can provide _____ and develop _____ for managing Sabo's ADHD. They also created a plan for high school in which Sabo would have access to the school counsellor so that he could approach them when he is facing difficulties at school. The psychologist also recommended that Sabo start taking ADHD medication but specified that he would have to see a psychiatrist for this as they are a _____ and can _____ medication.

Review activity 2: Summary table

There are many aspects that you need to consider when defining and supporting psychological development. Use this table to revise and summarise the concepts learnt in the chapter. You can write in dot points or full sentences. The first row has been filled in for you.

Lesson	Key idea	Further details
Categorising typical and atypical behaviour	Evaluation of psychological criteria	• Cultural perspectives – influence of community and culture • Social norms – society's expectations • Statistical rarity – something unusual but significant • Personal distress – self-oriented, emotional reaction • Maladaptive behaviours – impairs the ability to meet changing demands of everyday life
	Typical vs atypical behaviour	• Typical – how someone usually behaves • Atypical – unusual behaviour • Perception can change as we grow up • Focus – on individuals
Normality and neurotypicality		
Neurodiversity		
Supporting psychological developmental and mental wellbeing		

Chapter 3 test

Multiple choice

Question 1   (1 MARK)

Neurodiversity refers to

A.   individuals who display neurological and cognitive functioning in a way that is typical or expected.

B.   an activity that is consistent with how an individual usually behaves.

C.   the state of deviating from the norm, usually in a way that is undesirable.

D.   variations in neurological development and functioning.

Question 2   (1 MARK)

Why is engaging in culturally responsive practices important?

A.   To maintain the integrity of mental health professions.

B.   To ensure patients feel safe and acknowledged.

C.   Both A and B.

D.   Neither A nor B.

Question 3   (1 MARK)

Which of the following is a correct comparison of typical and atypical behaviours?

A.   Typical behaviours are activities that are inconsistent with how an individual usually behaves whereas atypical behaviours are consistent with how an individual usually behaves.

B.   Typical behaviours are activities that are consistent with how an individual usually behaves whereas atypical behaviours are activities that are inconsistent with how an individual usually behaves.

C.   Both typical and atypical behaviour are consistent with how an individual usually behaves.

D.   Both typical and atypical behaviour are inconsistent with how an individual usually behaves.

Question 4   (1 MARK)

Which of the following does not influence the perception of whether something is normal?

A.   History.

B.   Culture.

C.   Interests.

D.   Contexts.

Question 5   (1 MARK)

Which of the following is categorised under the term 'neurodiversity'?

A.   Autism.

B.   Depression.

C.   Anxiety.

D.   Obsessive-compulsive disorder.

Short answer

Question 6 (2 MARKS)

Explain one psychological criterion that is used to help categorise behaviour.

Question 7 (4 MARKS)

Using examples, explain the difference between atypical behaviour and a behaviour that is maladaptive.

Question 8 (3 MARKS)

Jerome is a person who struggles to form words correctly. He was directed to a new mental health organisation called 'Patience is key,' which aims to support children with dyslexia as well as their families and loved ones.

Describe how 'Patience is key' may support Jerome's psychological development.

Question 9 (7 MARKS)

Robin is in year eight and she is worried that she is 'behind' all her peers. On average, she takes longer than others to comprehend novels and lacks confidence in activities that she has to do in her English lessons. However, she has a really good memory and loves solving puzzles. She also tends to feel more comfortable initiating conversations but often has trouble understanding jokes that others make.

a. Identify the neurological condition that Robin may have. (1 MARK)

b. Who can officially diagnose Robin with the neurological condition identified in part a? (1 MARK)

c. Suggest one way in which Robin may differ neurologically from others and how this may impact her. (2 MARKS)

d. Identify and describe a way that Robin could be supported in her psychological development. (3 MARKS)

Question 10 (10 MARKS)

Diya is a child psychologist who has a regular client named Nami. They first started working together when Nami was four-years-old as her parents were worried about her interrupting both themselves and her five siblings whilst talking. Although her parents are considered sociable, Nami is much more talkative than them and often speaks over her siblings. As a result of her extroverted personality, Nami has many friends. Diya and Nami have been working together for the past ten years but Diya now believes that it is time for Nami to see a psychiatrist.

In terms of psychological development, discuss the following:

- how Diya's categorisation of Nami's behaviour may have changed in the time that they have been working together
- how Diya may have supported Nami
- how hereditary or environmental factors have influenced Nami
- how Diya may have applied the biopsychosocial model to Nami's behaviour
- why Diya may have referred Nami to a psychiatrist.

Unit 1 AOS 1 review

The VCE study design outlines that, upon completion of this area of study, you must be able to 'discuss the complexity of psychological development over the lifespan, and evaluate ways of understanding and representing psychological development.'

SAC assessment 1

The following task can be used as a practice SAC. This task is based on the following study design assessment type:

- analysis and evaluation of an experiment or case study

Use the following information to answer questions 1–7.

> ### The Romanian Dog Boy – Traian Caldarar
>
> In 2002, Traian Caldarar, more famously known as 'the Romanian Dog Boy' or 'Mowgli', was found naked in a cardboard box by a local shepherd in Brasov, Romania. He left home at the age of three after his mother, who was a victim of domestic violence, fled their home, leaving him with his father. Although he was found at the age of seven, he was said to be the size of a three-year-old due to a lack of proper nutrition. Traian had severe rickets (softening and weakening of bones), poor circulation, and infected wounds. It was suspected that stray dogs had helped him stay alive whilst he lived in the wild. Traian was found with the half-eaten body of a dead dog located nearby, prompting the assumption that he ate the dog as a means of staying alive.
>
> After he was taken into care, it was reported that he demonstrated very unusual and almost animalistic traits. For example, he would sleep under his bed rather than on it, and be constantly hungry. When he didn't have food, he was very irritable and often slept after eating. He also didn't speak and would run around chasing cats.
>
> In 2007, five years after being found, it was reported that Traian was doing well after being nursed back to life by his grandfather. When he was asked about his life, particularly his year three education, he said 'I like it here, colouring, playing, and learning to write and read. We have toys, cars, teddy bears, and the food is very good.'
>
> (Grant, 2015)

Question 1 (8 MARKS)

Traian's behaviour, once he was found, can be understood through the biopsychosocial model.

a. What is the biopsychosocial model? (1 MARK)

b. With explicit references to the various aspects of the biopsychosocial model, identify three factors that may have influenced Traian's behaviour. (3 MARKS)

c. Explain what is meant by hereditary and environmental factors. (2 MARKS)

d. Explain how hereditary and environmental factors may have worked to influence Traian's psychological development. (2 MARKS)

Question 2 (4 MARKS)

When comparing Traian's condition when he was first found in 2002 to his condition in 2007, explain how biopsychosocial factors may have contributed to this change.

Question 3 (5 MARKS)

Traian escaped into the wild after his mother had left their home due to domestic violence.

a. Identify the attachment style that Traian may have and justify why he may have this attachment style. (2 MARKS)

b. With reference to attachment style, suggest how Traian's early childhood may influence his adult life. (3 MARKS)

Question 4 (6 MARKS)

Traian's cognitive development is likely affected by his time spent in the wild.

a. Explain what is meant by cognitive development. (1 MARK)

b. Which stage of Piaget's theory of cognitive development would Traian have been in when he was first found? (1 MARK)

c. According to the theory of cognitive development, what key cognitive developments may have been delayed for Traian? (2 MARKS)

d. What is one limitation of applying Piaget's theory to Traian's psychological development? (2 MARKS)

Question 5 (9 MARKS)

When Traian lived in the wild, it was assumed that he was taken care of by stray dogs.

a. What is meant by social development? (1 MARK)

b. It is likely that Traian did not learn how to form relationships when he lived in the wild. How may this have affected his life after he was found? (1 MARK)

c. How may Traian's psychological development have been affected by his mother leaving him? (2 MARKS)

d. In 2007, what stage of Erik Erikson's psychosocial theory would Traian have been in? (1 MARK)

e. How would Traian progress to the next stage of Erik Erikson's psychosocial theory? (2 MARKS)

f. What are two limitations of Erik Erikson's psychosocial theory? (2 MARKS)

Question 6 (5 MARKS)

After he was found, Traian learnt how to read and write.

a. Distinguish between critical and sensitive periods. (2 MARKS)

b. Explain whether learning to read and write was a sensitive or critical period for Traian. (3 MARKS)

Question 7 (3 MARKS)

When Traian was initially found, it was reported that he didn't speak, but five years after being found, he is reported to speak in full sentences.

a. Psychologists have theorised that Traian's brain must have changed in shape as he learnt how to speak in full sentences. What is the psychological term that they may use to describe the brain's ability to change in shape? (1 MARK)

b. With reference to brain structuring, discuss whether it would have been easier or more difficult for Traian to learn how to speak at an older age. (2 MARKS)

Unit 1 AOS 1 review

SAC assessment 2

The following task can be used as a practice SAC. This task is based on the following study design assessment type:

- media analysis of one or more contemporary media texts

Instructions

1. Search for 'Love on the Spectrum Season 2 Official Trailer' (Netflix, 2021) on YouTube and watch the 1-minute and 48-second video.

2. Search for 'Michael's Most Romantic Moments From Love On The Spectrum' (Still Watching Netflix, 2021) on YouTube and watch the first 1 minute and 38 seconds of the 5-minute and 2-second video.

   Note: if you are unable to access YouTube, you can still complete this task by only completing steps 3 and 4.

3. Read the following summary of season two episode one.

4. Answer the questions, using what you have read in the summary and what you have seen in the videos.

Use the following information to answer questions 1–10.

Love on the Spectrum

Love on the Spectrum is an Australian reality TV show that follows young adults on the autism spectrum as they navigate through the world of romance and relationships. The premise of the show is to challenge the misconception that people with autism do not want to engage in romantic relationships, and rather to show that they need a little guidance on this often testing journey.

The show features many individuals and follows them on romantic experiences. Episode one of season two focuses on two cast members – Michael and Kassandra, who both go on multiple dates. The following are summaries of their experiences in the episode.

Michael's experiences

Episode one focused on Michael's experience of attending a speed dating night. As he got ready, he joked with his mum about potential outfit options, such as chinos. However, as his mother predicted, he ended up wearing his first option – a suit. He admitted to the cameraman that he signed up for the speed dating night because '[he would] like to encounter some women that are not on the spectrum' and '[he] want[ed] to see what [other people] would be like with someone who is on the spectrum but doesn't seem like it.'

During the event, Michael's thoughts about each woman he went on a speed date with were made evident through his facial expressions. For example, Michael's eyes widened and his mouth dropped when Tori revealed that she does not watch TV as she is a single mother. Michael appeared very scared and worried when Jess revealed that she loves watching horror movies, whilst his face lit up when Heather revealed that she has been to England and Germany, just like he has. With one of the women, he explained in detail that he was a 'Germanophile' (a lover of all things German) and what that entailed. He was also seen to defer eye contact after a few seconds when talking about topics that he was not comfortable speaking about, such as when Jess talked about her favourite horror movie. At the end of the night, he was told that he had been matched with Heather, who was also on the spectrum. During a catch-up with a high school friend, he revealed that '[he was] interested in asking her out' and that 'being on the spectrum [means that they would] probably understand each other better.'

Continues ▶

Love on the Spectrum – Continued

Kassandra's experiences

The episode also focused on Kassandra, who immediately acknowledged that she may look normal but reminded viewers that they 'can't see [her] brain and it's [her] brain that's different.' She shared a story about noticing that kids often sat in groups in primary school whilst she sat alone, and hating it when she tried to fit in. Kassandra revealed that it took her three and a half years to be diagnosed and that she 'felt human after [her] diagnosis.' She was also revealed to be obsessed with cosplay as '[she does not] have to be [her]. [She] can be another character and there is a lot less stress in being those characters [compared to] being [her]self.'

In the episode, Kassandra went on two dates – one with an individual who was also on the autism spectrum and another who was neurotypical. During the first date, she admitted that she was 'struggling a little bit with what to talk about.' She told the producer that she thought she was 'on the verge of a bit of a panic attack so [she] might need to take a break.' The date ended with her admitting that she 'started to have a panic attack' but accepting that 'some days there's no explanation, [her] brain just can't cope.' The next date she went on, however, was very different. She explained to her date that her 'brain processes the world differently'. For example, she was seen to be distracted by a dog barking in the background but was very honest that her brain is now stuck thinking about the dog. She appeared to be much more relaxed and revealed that her new date was 'eas[ier] to talk to', finishing the date in a happier state than her first one.

Question 1   (4 MARKS)

Being on the autism spectrum means that you are also on the neurodiversity spectrum.

a. Explain what is meant by neurodiversity. (1 MARK)

b. Having autism also means that you are neurodivergent. Explain what is meant by neurodivergent. (1 MARK)

c. Compare a way in which a neurodivergent and neurotypical person may differ. (2 MARKS)

Question 2   (4 MARKS)

Michael and Kassandra both have an autism spectrum disorder (ASD) but present this condition in different ways.

a. Explain what ASD entails. (1 MARK)

b. Suggest one way in which Michael's and Kassandra's brains may differ from neurotypical individuals. (1 MARK)

c. How may a person with ASD and a person with ADHD be similar but also different? (2 MARKS)

Question 3   (2 MARKS)

Michael was seen going on multiple speed dates.

a. What is a strength of ASD that Michael exhibited during the speed dating night? (1 MARK)

b. What is a challenge of ASD that Michael faced during the speed dating night? (1 MARK)

Question 4   (2 MARKS)

On his speed date with Tori, he learnt that she does not watch TV. With reference to typicality, suggest why Michael's eyes may have widened when she revealed this.

Question 5   (6 MARKS)

Kassandra shared her story of trying to fit in during primary school by sitting in groups with other kids.

a. Distinguish between abnormality and atypical behaviours. (2 MARKS)

b. With reference to a psychological criterion, suggest whether the other children were behaving typically or atypically. (2 MARKS)

c. Kassandra remembered being in personal distress when she attempted to fit in. Discuss an advantage and a disadvantage of using personal distress to categorise Kassandra's behaviour. (2 MARKS)

Question 6   (6 MARKS)

Kassandra revealed that it took her three and a half years to be diagnosed with ASD.

a.   Who may have diagnosed Kassandra?   (1 MARK)

b.   What are two other services that this person can offer?   (2 MARKS)

c.   What steps may Kassandra have had to take in order to be diagnosed?   (3 MARKS)

....

Question 7   (4 MARKS)

Although not explicitly stated, Kassandra may have been supported by a mental health worker.

a.   Using an example, outline what a mental health worker is.   (2 MARKS)

b.   How may a mental health worker have supported Kassandra's mental wellbeing?   (1 MARK)

c.   How may a mental health worker have supported Kassandra's psychological development?   (1 MARK)

....

Question 8   (2 MARKS)

Kassandra may have also sought assistance from a mental health organisation.

Evaluate how one of the services provided by mental health organisations would help Kassandra manage her ASD.

....

Question 9   (4 MARKS)

During her first date, Kassandra was seen to have 'a bit of a panic attack.'

a.   Explain whether Kassandra's behaviour of having to take a break was adaptive or maladaptive.   (2 MARKS)

b.   Referring to a quote from the summary, suggest whether having a panic attack on a first date may be typical for Kassandra.   (2 MARKS)

....

Question 10   (4 MARKS)

During her second date, Kassandra was distracted by a dog barking in the background while in the middle of a conversation.

a.   Would this behaviour be typical or atypical for Kassandra?   (1 MARK)

b.   Compare whether the same behaviour would be typical or atypical for a neurotypical individual.   (1 MARK)

c.   Suggest whether this behaviour is adaptive or maladaptive for Kassandra.   (2 MARKS)

UNIT 1 AOS 2

How are mental processes and behaviour influenced by the brain?

In this area of study students explore how the understanding of brain structure and function has changed over time, considering the influence of different approaches and contributions to understanding the role of the brain. They develop their understanding of how the brain enables humans to interact with the external world around them and analyse the interactions between different areas of the brain that enable the processing of complex sensory information, the initiation of voluntary movements, language, decision-making, and the regulation of emotions.

Students consider how the brain changes with age and experience, and subsequently how mental functions adapt. Students explore neuroplasticity as the result of experience and brain trauma. They investigate ways to maintain brain functioning and an opportunity is provided to investigate the impact of acquired brain injuries (ABIs), to consolidate students' understanding of brain functioning. Chronic traumatic encephalopathy (CTE) is also considered as area of contemporary research into progressive and fatal brain disease.

Outcome 2

On completion of this unit the student should be able to analyse the role of the brain in mental processes and behaviour and evaluate how brain plasticity and brain injury can change biopsychosocial functioning.

Reproduced from VCAA VCE Psychology Study Design 2023–2027

CHAPTER 4

The role of the brain in behaviour and mental processes

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

Image: GoodStudio/Shutterstock.com

4A Approaches to understanding the brain

4A	4B	4C

1.2.1.1
Introduction to psychology

1.2.1.2 Theories of the brain
- **1.2.1.2.1** Brain versus heart debate
- **1.2.1.2.2** Mind-body problem
- **1.2.1.2.3** Phrenology

1.2.1.3 First brain experiments
- **1.2.1.3.1** Ablation
- **1.2.1.3.2** Brain lesioning
- **1.2.1.3.3** Split-brain research

1.2.1.4 Neuroimaging techniques
- **1.2.1.4.1** Structural neuroimaging
- **1.2.1.4.2** Functional neuroimaging

Modern psychology provides us with an enormous amount of knowledge about the brain and human nature, but how did we get here? In this lesson, we will examine the different ways that the brain has been studied throughout history. We will also learn how these early attempts at understanding the brain have shaped the way we look at psychology today.

Introduction to psychology 1.2.1.1

Psychology is not just the clinical practice of treating patients. Psychology is a field that has provided us with a wealth of knowledge about humans, their behaviour, and their mental processes. Despite how far we have advanced, the field of psychology continues to evolve.

Theory details

Psychology is the scientific study of human mental states and behaviour. In chapter 1, you learnt about the scientific method of collecting evidence to support or reject hypotheses. However, psychology hasn't always been as scientifically sound as it is today. Our current psychological practices and understandings have been influenced by findings dating back to ancient times, in civilisations such as those in ancient Egypt, Greece, China, and India.

Psychology is a dynamic field that is constantly evolving. What once was a branch of philosophy that investigated concepts like the nature of the 'soul' is now its own independent contemporary science. Wilhelm Wundt is often regarded as the father of modern psychology, founding the first laboratory for psychological science in 1879 in Leipzig, Germany. Since then, various schools of thought have emerged in the field, each influenced by the circumstances of their times in unique ways. Today, modern psychology utilises the scientific method to study human mental processes and behaviour.

One constant in the study of psychology has been the attempt to understand the brain and its relationship with human behaviour and mental processes. Although today we have a relatively comprehensive understanding of the brain both structurally and functionally, this was not always the case. In this lesson, we will explore the different approaches throughout history that attempted to understand the brain. The historical approaches to understanding the brain that you will learn about in this lesson are presented in figure 1.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

KEY TERMS

Psychology the scientific study of human mental states and behaviour
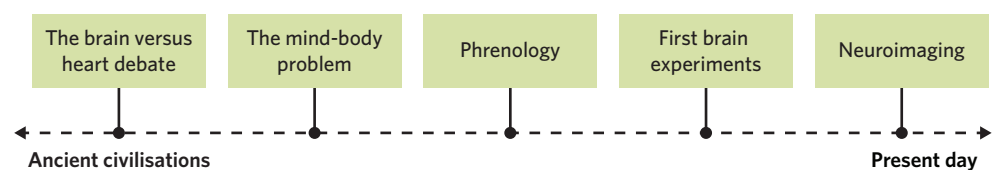
Figure 1 Timeline of approaches to understanding the brain

Theories of the brain 1.2.1.2

Throughout history, people have attempted to explain the link between the brain, behaviour, and mental processes, long before technology allowed humans to accurately view the brain and its functions.

Theory details

Throughout history, discussions, theories, and debates have been an ongoing approach to explore and develop our understanding of the brain. In this lesson, we will look at the following theories:

- The brain versus heart debate
- The mind-body problem
- Phrenology

The brain versus heart debate 1.2.1.2.1

Have you ever had a 'broken heart'? Have you used a heart-shaped emoji as a way of expressing your love to your friends? We often think of our hearts when we are speaking about emotions and feelings. Despite this association between human experiences and the heart, we understand that this is merely symbolic and that our mental processes, including emotions, take place in the brain. However, this was not always an accepted truth. The **brain versus heart debate** was a historical debate as to whether the heart or the brain is responsible for mental processes, such as thought, emotion, and behaviour. The different perspectives of the debate are outlined in table 1.

Table 1 The different perspectives of the brain versus heart debate

'Heart hypothesis'	'Brain hypothesis'
• The ancient Egyptians perceived the heart to be the primary source of human psychology and wisdom, encapsulating one's soul and mind. Therefore it was believed that all aspects of personality, logic, and emotion originated in the heart. • The heart was collectively viewed as the sacred key to the afterlife and was carefully preserved in the mummification process, whereas the brain was deemed to be a relatively useless organ and was often discarded after death.	• The ancient Greek philosophers believed that the brain was solely responsible for mental functions, including personality and logic.
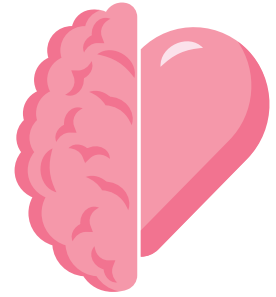
Figure 2 The brain versus heart debate is a historical debate as to whether the heart or the brain is responsible for central functions, such as thought, emotion, and behaviour

> **Brain versus heart debate**
> a historical debate as to whether the heart or the brain is responsible for mental processes, such as thought, emotion, and behaviour

WANT TO KNOW MORE?

The ancient scripture that is known today as the 'book of death' exemplifies the extent to which the ancient Egyptians worshipped the heart. The book contained spells that were believed to facilitate one's entrance into the afterlife.

The book refers to the ritual of the weighing of the heart, which involved the heart of the deceased being weighed on a scale. This weight was then compared against the feather of a Goddess named Maat. As the heart was believed to be the centre of all beings, this ceremony was said to allow deities to judge the individual based on their heart. If the heart weighed more than Maat's feather, it was believed that the deceased would not enter the afterlife and their heart would be consumed by a monster, Ammit. This example of ancient beliefs demonstrates the extent to which our understanding of the brain and human nature has evolved over time.

Figure 3 The ancient Egyptians weighed the heart of the deceased against a feather during the weighing of the heart ritual

Modern empirical scientific research has gifted us the knowledge that the brain is responsible for all human behaviour, mental processes, and emotions. Although the brain hypothesis is most supported today, the brain versus heart debate and its key figures have meaningfully contributed to modern scientific findings. For instance, ancient supporters of the heart hypothesis, such as Aristotle, significantly contributed to our current understanding of the cardiovascular system. These discussions continue to take place today and contribute to advancements in psychological research.

The mind-body problem 1.2.1.2.2

The **mind-body problem** refers to the complex philosophical question as to whether our mind is separate and distinguishable from our body, or whether they are one integrated entity. When considering this concept we are prompted to question specific aspects of the human experience:

- What distinguishes the mind from the body?
- In what ways do our minds and bodies work holistically?
- What makes us consider a process as mental as opposed to physical?
- Are our minds influenced by our bodies or are our bodies influenced by our minds?

The contemplation of such ideas has led to two opposing views of the mind-body problem; dualism and monism. **Dualism** is the belief that the human mind and body are separate and distinguishable from one another, whereas **monism** is the belief that the human mind and body are together a singular, complete entity. The details of each belief system are outlined in table 2. Although modern science tends to favour the ideologies of monism, there is still no definitive answer to the mind-body problem as our understanding of concepts, such as the workings of unconsciousness, are still incomplete. Therefore, at this point in time, neither ideology can be discounted and we can continue to gain insight from each perspective and their unique beliefs.

Table 2 Key points of dualism and monism

Dualism	Monism
• The mind and body are separate entities because they are distinguishable by their functions and substance. • The mind is non-physical whereas our body is made up of physical matter.	• The fact that our thoughts are not tangible does not inherently mean that they are not a product of physical processes. • Brain-scan technologies demonstrate that certain physiological processes take place when certain processes of the mind are used, in a consistent and predictable way.

Figure 4 Dualists believe that the human mind and body are separate and distinguishable from one another

Figure 5 Monists believe that the human mind and body are together a singular, complete entity

Phrenology 1.2.1.2.3

Phrenology is the study of the shape and size of the human skull to determine personality and mental functioning. Phrenologists believed that a human's personality, intelligence, and mental functioning could be measured by feeling the bumps, grooves, and shape of the skull.

Mind-body problem the complex philosophical question as to whether our mind is separate and distinguishable from our body or whether they are one integrated entity

Dualism the belief that the human mind and body are separate and distinguishable from one another

Monism the belief that the human mind and body are together a singular complete entity

Phrenology the study of the shape and size of the human skull to determine personality and mental functioning

The practice of phrenology was established by German physician Franz Gall in 1796. Gall suggested that the human brain was a sum of 27 'mind organs', each having a distinct physical location in the brain and its own mental function. The number of proposed mind organs increased after Gall was joined by Johann Spurzheim, the man who coined the term 'phrenology'. Together, Gall and Spurzheim established phrenological charts (maps that placed the different mind organs and identified their functions). Phrenologists of the time proposed that there was a direct correlation between the use of a particular mind organ and its relative size within the brain. If a particular function was regularly used, then it would grow. Alternatively, a lack of use would lead to a reduction in size. This proposed relationship between frequency of use and anatomical size allowed phrenologists to feel for the bumps and grooves on a person's skull to assess which mind areas are used more or less.

During the 1800s, phrenology was believed to be scientifically accurate. However, phrenology was classed as a pseudoscience (a theory or method that appears to be based in science, but is actually not) after it was discredited in the 1900s. However, like many early psychological theories, phrenology brought meaningful contributions to our current understanding of the brain.

For example, phrenology introduced the idea that certain areas of the brain are responsible for specific functions (localisation of function). Although Gall's specific phrenological model was inaccurate, in contemporary psychology we understand that different areas of the brain are responsible for specific functions. However, we also know that the different areas of the brain are constantly communicating and that most functions are an integrated process.

First brain experiments 1.2.1.3

Some of the most important experiments on the brain occurred in the 1800s and 1900s, informing much of what we now know about the brain and its functions.

Theory details

Our understanding of the brain began to change significantly once researchers began performing experiments to understand its structure and functions. We will look at a number of experimental techniques and research studies that informed our understanding of the brain. These include:

- ablation
- brain lesioning
- split-brain research.

Ablation 1.2.1.3.1

Brain **ablation** involves the surgical removal, destruction, or cutting of a region of brain tissue. Ablation is an irreversible procedure that has historically been used to treat neurological disorders and psychological disorders, as well as to help researchers determine how the brain responds to damage and make inferences about localisations of function (the idea that certain areas of the brain are responsible for specific functions).

Pierre Flourens, a French physiologist, was the first person to practice ablation in the 1820s as a way of studying the brain. Flourens is famous for conclusively 'discovering' that the 'mind' was in the organ of the brain and not the heart. He also conducted his studies at the request of the French Academy to test Gall's phrenology claims. His findings suggested that the brain is more integrated and areas are more connected than proposed by phrenology, leading to the scientific community largely discrediting the idea of distinct mind organs (Carlson et al., 2009). Furthermore, because functions could sometimes be recovered (taken over by other brain regions) after ablation, this demonstrates that the brain works as an integrated whole rather than the sum of independent parts.

Brain lesioning 1.2.1.3.2

Brain lesioning is the practice of inducing and/or studying the effects of damage to an area of the brain. Such damage can be surgically created by a researcher or can be the result of an illness or injury, such as brain damage incurred by a stroke. Similar to ablation, the study of brain lesions helps psychologists to make inferences about the functions of specific brain regions by observing how brain damage affects these functions.

Ablation the surgical removal, destruction, or cutting of a region of brain tissue

Brain lesioning the practice of inducing and/or studying the effects of damage to an area of the brain

USEFUL TIP

Ablation and brain lesioning can be hard to differentiate. It is important to remember that ablation refers to the removal of parts of the brain, whereas lesions are damages to the brain.

The historical use of brain lesions has not only provided us with valuable knowledge regarding the functions of the brain, but it has also influenced how we treat patients today. For instance, a stroke deprives the brain of oxygen. In turn, this leads to the localised death of neurons in a specific brain region, rendering that area inoperative. This damage is considered a brain lesion. Today, neurologists can determine what functional difficulties a patient has acquired based on where this damage occurred. For example, if a lesion occurred in the brain region responsible for language and speech, it would be predicted that the patient would have difficulty talking. Doctors would consequently be able to use this information to implement appropriate treatment. This is especially helpful if the patient is not yet conscious and therefore is unable to demonstrate the effects of the brain lesion through their behaviour.

Split-brain research 1.2.1.3.3

Some of the most profound studies on the brain were conducted by Roger Sperry and his student Michael Gazzaniga in the 1960s. Sperry and Gazzaniga worked with patients who had undergone 'split-brain surgery', meaning they had had their left and right brain hemispheres separated by cutting the nervous tissue that connected them, known as the corpus callosum. This surgery was conducted as a means of preventing the patients' epileptic seizures which had proven to be severe and uncontrollable by other means.

To investigate the effects of such surgery, Sperry and Gazzaniga conducted experiments in which split-brain patients were situated behind a screen with a black dot in the centre on which they focused their eyes (Gazzaniga et al., 1967). Words and objects were then projected on either the left or right side of the dot. It was known that vision is processed contralaterally, meaning that words and objects in the left visual field are sent to the right side of the brain for processing and vice versa. This is displayed in figure 6.

Left visual field   **Right visual field**

Left hemisphere ——— ——— **Right hemisphere**
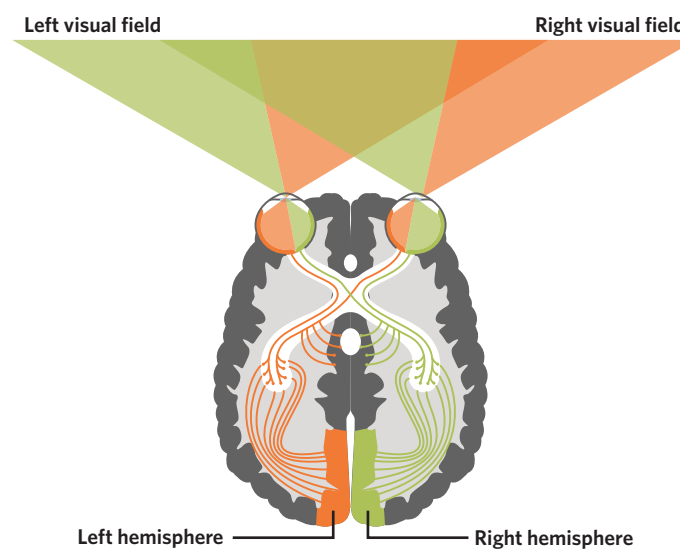
Figure 6 The contralateral processing of visual information by the brain

Sperry and Gazzaniga asked patients to describe what they saw. They found that:

- when images or words were presented to the right visual field (and therefore processed in the left hemisphere), patients were able to verbally state what they had seen.
- when words or images were presented to the left visual field (and therefore processed in the right hemisphere), patients were unable to verbally state what they had seen. However, if requested, a patient could non-verbally indicate what they saw, such as by reaching out and grabbing or using their left hand to draw an object that they had seen.

What can we infer from these findings?

- The left hemisphere is responsible for the organisation of language expression and comprehension.
- The right hemisphere is involved in language comprehension to some degree, but the left hemisphere is dominant in its expression.

How did we come to this conclusion?

- When images/words are not processed in the left hemisphere, they cannot be verbally stated in split-brained patients. This is due to the fact that the severing of the corpus callosum prevents communication between cerebral hemispheres.

This research contributed to Sperry and Gazzaniga's main finding that the left and right **cerebral hemispheres**, which are the symmetrical halves of the cerebrum in the brain, have different functions or 'specialisations'. This is evidence for **hemispheric specialisation** or brain lateralisation, which refers to the difference in functioning between the left and right hemispheres of the brain when performing a specific behaviour or task. Most notably, they found that the left hemisphere specialises in language expression and comprehension. They also confirmed that the left side of the brain controls movement and other functions for the right side of the body and vice versa.

Cerebral hemispheres
the symmetrical halves of the cerebrum in the brain

Hemispheric specialisation
the difference in functioning between the left and right hemispheres of the brain when performing a specific behaviour or task
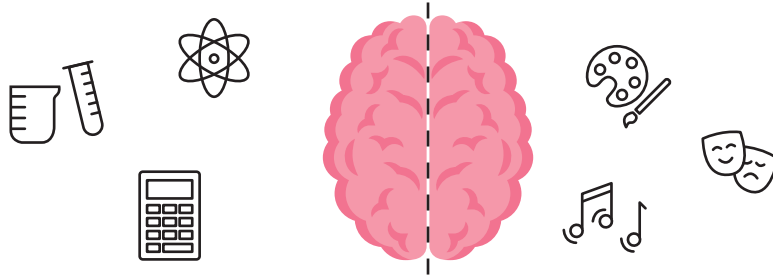
Figure 7 The left and right cerebral hemispheres have different functions

Neuroimaging techniques 1.2.1.4

Many words that relate to the brain begin with 'neuro'; neuroimaging is no different. As the name suggests, neuroimaging involves a range of techniques, all of which work to capture images of the brain. This method of examining the brain is used in research today.

Theory details

In contemporary psychology (since the late 20th century), **neuroimaging** refers to a range of techniques that are used to capture images of the brain's structure, function, and activities. Neuroimaging may be used for both medical reasons (such as for disease detection) and research. These methods are much less invasive and more precise for brain research than previous methods of studying the brain, such as split-brain research. During research, neuroimaging can be used to actively capture images of the brain as a research participant completes specific tasks or performs certain functions. This allows researchers to record brain activity as the task is being performed and see which brain areas are activated.

Neuroimaging a range of techniques used to capture images of the brain's structure, function, and activities

Neuroimaging techniques may be divided into two broad categories; structural and functional neuroimaging. Table 3 categorises the various structural and functional neuroimaging techniques that you will learn about in this lesson.
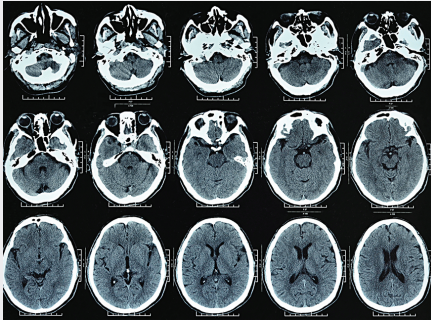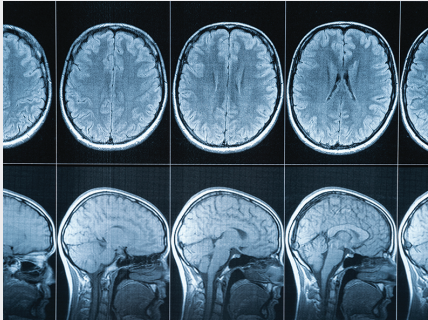
Table 3 Categorisation of structural and functional neuroimaging techniques

	Structural	Functional
Computerised tomography (CT)	✔	
Magnetic resonance imaging (MRI)	✔	
Positron emission tomography (PET)		✔
Functional magnetic resonance imaging (fMRI)		✔

Structural neuroimaging techniques 1.2.1.4.1

Structural neuroimaging techniques produce images of the brain's structure and composition. These are summarised in table 4.

Table 4 Explanation of types of structural neuroimaging techniques

	Computerised tomography (CT)	Magnetic resonance imaging (MRI)
How does it work?	• Developed in the 1970s, **computerised tomography (CT)** is a neuroimaging technique that involves taking continuous two-dimensional x-ray images of the brain which are then stacked to create a comprehensive three-dimensional image of the brain. • To get these images, an individual must first ingest a dye called 'contrast' which allows their brain to be visible in scans. The individual then enters a gantry, which is a donut-shaped device with an x-ray source, while lying horizontally on a bed. Successive x-ray images are taken in a spiralling motion as the individual in the bed moves slowly through the gantry.	• **Magnetic resonance imaging (MRI)** is a neuroimaging technique that uses magnetic and radio fields to take detailed two-dimensional and three-dimensional images of the brain. To obtain an MRI image, a person enters a chamber device that contains a big magnet. The magnetic field generated by the device causes the brain's atoms to move and organise in such a way that they send signals which can be captured as an image by a computer. • Importantly, an MRI is a device that uses a magnetic field to take its images, as opposed to a CT scanner, which uses x-ray imaging.
Primary use	Disease or disorder detection rather than for research.	Disease or disorder detection.
Benefits	• Enables the detection of haemorrhages, blood clots, cancer, and the loss of brain mass that can reflect disorders. • Do not need to be used as frequently as other kinds of neuroimaging techniques, given how comprehensive CT scans are as they develop multiple images of the entire body or brain.	• Are less hamful to patients than CT scans because MRI devices use a magnetic field rather than X-rays. • Produce more detailed, coloured images of the brain than the images produced by CT scans.
Limitations	• They can be a somewhat intrusive process for the patient. • The images are limited to black and white and aren't as detailed as images from other neuroimaging techniques. • X-rays use electromagnetic ionising radiation which, when used excessively, has the potential to have biological consequences, such as causing cancers.	• Due to relying on magnetic fields, an MRI cannot be used on a person with internal screws, pacemakers, or other similar devices.
Images	 Image: sanyanwuji/Shutterstock.com **Figure 8** CT scans use x-ray images as a way to show the structure of the brain	 Image: Jalisko/Shutterstock.com **Figure 9** MRI scans use magnetic and radio fields to take images of the brain

Computerised tomography (CT) a neuroimaging technique that involves taking continuous two-dimensional x-ray images of the brain which are then stacked to create a comprehensive three-dimensional image of the brain

Functional neuroimaging techniques 1.2.1.4.2

In addition to the neuroimaging techniques that show us the brain's structure, there are also functional neuroimaging techniques which use images to show us the brain's activity and functions.

Positron emission tomography (PET)

Positron emission tomography (PET) is a neuroimaging technique that uses a scanning device to take coloured images of the brain, showing its functional activity by tracing the levels of a radioactive substance in the brain.

The process of undergoing a PET scan involves:

- A person being injected with a special radioactive glucose substance before entering a chamber.
- This radioactive glucose solution reaches the brain via the bloodstream and then helps different areas of the brain to 'light up' when they are active. This is because when we use different parts of our brain, glucose is consumed.
- The special radioactive substance within the solution then releases emissions that help to trace the biochemical changes that accompany brain activity.
- Within this chamber, a person is then asked to perform a certain task, such as listening to music, thinking about something that makes them angry, concentrating on mathematical equations, or meditating.

A PET scan shows a range of colours and has a colour key on the side, as demonstrated in figure 10. Each colour represents a different level of activity, with red showing the most activity to purple showing the least activity. For example, if a task requires a person to listen to music in the chamber, then it would be expected that the brain areas required for processing these sounds would light up red.

Functional magnetic resonance imaging (fMRI)

Functional magnetic resonance imaging (fMRI) is a neuroimaging technique that uses magnetic and radio fields to take two and three-dimensional images of the brain and record its activity levels. fMRI was introduced in the 1990s and is another method for showing brain activity. As with PET scans, fMRI measures brain activity levels by tracing biochemical changes in the brain that are reflected using different colours and a key. However, rather than tracing glucose levels with a radioactive substance, fMRI traces oxygen levels in the brain. The more active a certain brain region is, the more oxygenated the blood will be in that area. fMRI uses the same methods as MRI to get detailed two-dimensional and three-dimensional brain scans, but has the added benefit of being able to trace brain function and activity. fMRI is now the preferred functional neuroimaging method, as it produces higher quality images of the brain's activity than PET scans and does not require the injection of a radioactive substance to trace brain activity.

Magnetic resonance imaging (MRI) a neuroimaging technique that uses magnetic and radio fields to take detailed two-dimensional and three-dimensional images of the brain

Positron emission tomography (PET) a neuroimaging technique that uses a scanning device to take coloured images of the brain, showing its functional activity by tracing the levels of a radioactive substance in the brain

Functional magnetic resonance imaging (fMRI) a neuroimaging technique that uses magnetic and radio fields to take two and three-dimensional images of the brain and record its activity levels
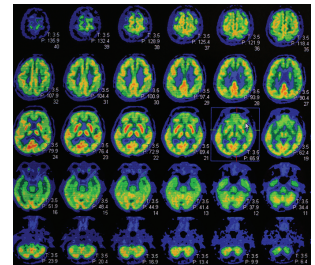
Image: Utthapon wiratepsupon/Shutterstock.com

Figure 10 PET represent levels of brain activity through the use of a colour scale
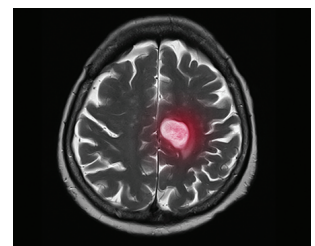
Image: Yok_onepiece/Shutterstock.com

Figure 11 fMRI scans measure brain activity by tracking oxygen levels

---

Theory summary

In this lesson, you have learnt about the history of how humans have tried to understand the brain and how these attempts have influenced our current understanding.

Theories of the brain that you learnt about included:

- the brain versus heart debate
- the mind-body problem
- phrenology.

These theories started meaningful discussions that prompted further research, allowing researchers to now be able to make definitive conclusions about the role of the brain.

The first brain experiments also provided the basis for essential psychological discoveries, such as hemispheric specialisation and the localisation of function. The first brain experiments explored in this lesson were:

- ablation
- brain lesioning
- split-brain research.

Finally we learnt about the current practices used in studying the brain: neuroimaging techniques. We learnt that these different ways to capture images of the brain were broken up into structural techniques and functional techniques.

Structural neuroimaging techniques included:

- computerised tomography (CT)
- magnetic resonance imaging (MRI).

Functional neuroimaging techniques included:

- positron emission tomography (PET)
- functional magnetic resonance imaging (fMRI).

4A Questions

Question 1

Psychology is a historical field of science in which theories are stagnant and remain unchanged over time.

A. True.

B. False.

Question 2

The brain versus heart debate was ultimately a waste of time as modern science has proven that the brain holds all human emotional functioning.

A. True.

B. False.

Question 3

Brain-scan technologies have demonstrated that certain physiological processes take place when certain cognitive functions of the mind are used. This discounts dualism and proves that monism is correct.

A. True.

B. False.

Question 4

One of the most meaningful contributions of phrenology to modern psychology was

A. the identification and naming of the different sections of the brain.

B. the introduction of the idea of that different areas of the brain were responsible for specific functions.

C. providing the first accurate dissection of human personality.

Question 5

When comparing the processes of ablation and brain-lesioning, it is evident that both **(Select all that apply)**

I. involve the surgical or accidental alteration of the brain.

II. were first discovered in the 18th century.

III. allow researchers to make inferences about the function of specific brain areas.

IV. are accidental damages incurred in the brain.

Question 6

The findings of hemispheric specialisation prove that each hemisphere of the brain works in a way that is independent of and isolated from the opposite hemisphere.

A. True.

B. False.

Question 7

Structural neuroimaging techniques involve _____, whereas functional neuroimaging techniques involve _____.

Which of the following best fills in the blank?

A. the use of structurally advanced x-ray images; the use of high-functioning coloured images

B. capturing structural properties of the brain; capturing the functional activity of the brain

Assessment skills

Perfect your phrasing

Question 8

Which of the following sentences is most correct?

A. Psychology is the scientific study of **mental processes** and **behaviour**.

B. Psychology is the scientific study of the **mind** and **brain**.

Question 9

Which of the following sentences is most correct?

A. Dualism, in reference to the mind-body problem, is the belief that the human mind and body are **individual** and **disconnected** from one another.

B. Dualism, in reference to the mind-body problem, is the belief that the human mind and body are **separate** and **distinguishable** from one another.

Question 10

Which of the following sentences is most correct?

A. Brain ablation is the surgical removal, destruction or cutting of the **tissue** of the brain.

B. Brain ablation is the surgical removal, destruction or cutting of the **neurons** of the brain.

Text analysis

The following assessment skills type reflects the study design assessment type:

- media analysis of one or more contemporary media texts

Use the following information to answer questions 11–13.

Media text 1

Are you left-brained or right-brained? This is a question that is posed to many of us through social media, books, and magazines. Perhaps you have even come across 'tips' to enhance your learning by completing activities that cater to your dominant hemisphere.

We know that the brain is broken into two hemispheres and that hemispheric specialisation gives evidence that each hemisphere contains its own dominant processes. Left-brained people are often characterised as having strong skills in maths and areas of logic, whereas right-brained people are believed to have more creative and abstract talents. It is important to note that humans can only be either left-brained or right-brained and cannot have strengths in both due to the hemispheres being completely separate from each other in their functioning.

(Cherry, 2020)

Question 11

Which of the following statements from the article are supported by scientific evidence?

A. Hemispheric specialisation gives evidence that each hemisphere has specific dominant processes.

B. Humans can only be left-brained or right-brained.

C. All of the above.

Question 12

If scientists wanted to test the theory that people were left-brained or right-brained, what method would be most appropriate?

A. Getting people to take a quiz and see which area they scored better in.

B. Creating a lesion in the predicted dominant hemisphere and monitoring their subsequent behaviour.

C. Using neuroimaging techniques to detect the frequency of activity in each hemisphere of the brain for each individual.

Question 13

If the theory that humans had a dominant hemisphere were supported, which of the following statements could be inferred to be true?

A. People that are right-brain dominant would have better coordination in their right hand.

B. People that are right-brain dominant would have better coordination in their left hand.

C. People's non-dominant hemisphere would eventually die off.

Exam-style

Remember and understand

Question 14 (1 MARK)

Which of the following is an example of a functional neuroimaging technique?

A. Magnetic resonance imaging (MRI).

B. Positron emission tomography (PET).

C. Computerised tomography (CT).

D. All of the above.

Question 15 (1 MARK)

In terms of the mind-body problem, which of the following statements would a dualist likely **not** believe?

A. The brain and the mind are the same thing.

B. Mental and physical phenomena are distinguishable.

C. Consciousness may be explained independently of physical processes.

D. The mind and body perform different functions.

Question 16 (1 MARK)

The main question posed by the brain versus heart debate is

A. 'are the brain and the heart interconnected or are they separate entities?'

B. 'is the brain or is the heart responsible for functions, such as thought, emotion, and behaviour?'

C. 'is the brain or the heart more important in keeping the human body alive?'

D. 'is the brain larger in size in comparison to the heart?'

Question 17 (1 MARK)

The belief that a person's character and mental functions can be determined by the shape and size of their skull is a feature of which historical approach to understanding the brain?

A. Monism.

B. Ablation.

C. Phrenology.

D. The brain hypothesis.

Question 18 (1 MARK)

Outline the main aim of psychology as a scientific discipline.

Apply and analyse

Use the following information to answer questions 19 and 20.

Sarah, a highschool student, recently had a severe asthma attack which led to her brain being temporarily deprived of oxygen. The doctors at the hospital Sarah visited used neuroimaging to capture images of her brain and found that her prefrontal cortex had been damaged as a result.

Question 19   (1 MARK)

What would be the correct term to describe this type of injury to the brain?

A. Accidental ablation.

B. Brain lesion.

C. Cell death.

D. Oxygen deprivation-induced neurodegeneration.

Question 20   (2 MARKS)

Identify the two neuroimaging techniques which would have been most appropriate for the doctors to have used to assess the damage to Sarah's brain.

Question 21   (2 MARKS)

Compare the theories of dualism and monism in relation to the mind-body problem.

Question 22   (2 MARKS)

Flourens used experimental ablation to ultimately identify that different areas of the brain were responsible for specific functions.

Explain one similarity and one difference between Flourens' theory of the localisation of function and the theory of phrenology.

Question 23   (4 MARKS)

Sperry and Gazzaniga's work involved patients who had undergone split-brain surgery, which is an invasive and irreversible procedure.

a. Justify why this type of research could be deemed appropriate, despite being invasive and irreversible. (1 MARK)

b. Identify a main finding of Sperry and Gazzaniga's research in relation to visual information. (1 MARK)

c. State two possible limitations of Sperry and Gazzaniga's research. (2 MARKS)

Question 24   (5 MARKS)

Pierre Flourens practised experimental ablation by removing different parts of the nervous system from certain animals and observing the effects this had on each animal.

a. State the independent and dependent variables in Flouren's research. (2 MARKS)

b. Explain how the findings of Flouren's research failed to support the theory of phrenology. (3 MARKS)

Questions from multiple lessons

Question 25   (3 MARKS)

With reference to nature versus nurture, explain how the brain can recover functions after surgical ablation.

4B Regions of the brain

4A   4B   4C

1.2.2.1	1.2.2.2	1.2.2.3	1.2.2.4
Brain	**Hindbrain**	**Midbrain**	**Forebrain**
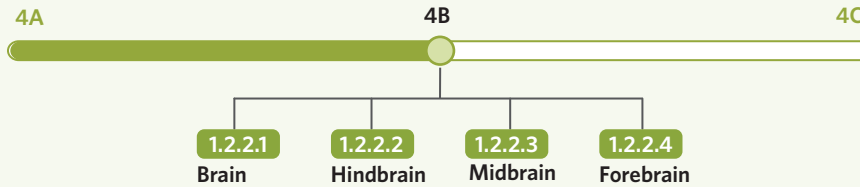
Have you ever been unable to control your laughter in an inappropriate situation, or failed to pay attention during class? You might have to blame your brain. This is because your brain is an incredibly complex organ that is responsible for your behaviour and mental processes.

In this lesson, you will learn about three regions of the brain: the hindbrain, midbrain, and forebrain. Specifically, you will learn about the roles of these brain regions in behaviour and mental processes.

Brain 1.2.2.1

Your brain is the 'control centre' of your body, enabling you to think, feel, move, speak, and perceive.

Theory details

The **brain** is a complex organ contained within the skull that coordinates mental processes and behaviour, and regulates bodily activity. It is a component of the central nervous system, which is a major division of the nervous system that is made up of the brain and spinal cord, and is composed of nervous tissue.

The brain is often considered to be the 'control centre' of the body, controlling physiological and psychological processes. For example, your brain is involved in every sensation you experience, every thought you have, every movement you make, and every memory you recall. In this way, your brain enables you to perceive, interact with, and respond to the external world around you.

Although the brain is a singular organ, it has different regions that contain different structures, each with different functions. In this way, each brain region has a distinct role in behaviour and mental processes. Although brain regions and their structures have specialised functions, it is important to remember that different brain areas do not operate in isolation. Rather, interaction occurs between different areas of the brain to enable the processing of information and the coordination of activity. One seemingly simple process may involve the integration of information from multiple areas of the brain.

The brain can be divided into three main regions: the hindbrain, midbrain, and forebrain. These three brain regions are presented in figure 1.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

KEY TERMS

Brain a complex organ contained within the skull that coordinates mental processes and behaviour, and regulates bodily activity
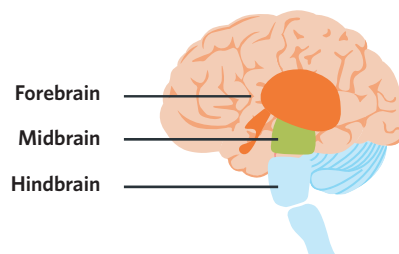
Figure 1 The three regions of the brain

The brain begins developing during gestation, which is the period of time between conception and birth. As the embryo develops in the womb, its neural tube, which is the precursor to the central nervous system, bulges to form four subdivisions, as shown in figure 2. These subdivisions then develop into the hindbrain, midbrain, forebrain, and spinal cord.
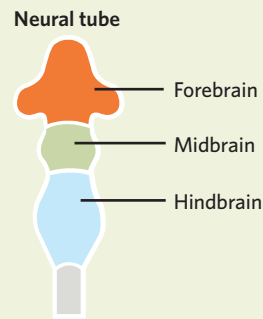
Figure 2 The three brain regions emerge as bulges from the neural tube

The brain regions increase in complexity as you move upwards from the hindbrain to the forebrain, as shown in figure 3. From an evolutionary perspective, the hindbrain contains brain structures that developed earlier, and are responsible for basic, instinctive, lower-level functions. By contrast, the forebrain contains brain structures that developed later, and is responsible for complex cognitions and higher-level functions. It is our highly developed and intricate forebrain that distinguishes our human brains from the brains of other animals.
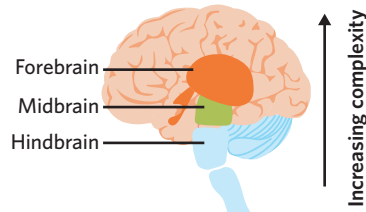
Figure 3 The brain regions increase in complexity as you move upwards from the hindbrain to the forebrain

Before exploring the three brain regions, it is important to know about the **brainstem**, which is an extension of the spinal cord that is made up of the medulla, pons, and midbrain, as shown in figure 4. In this lesson, you will learn about these brain structures that make up the brainstem.
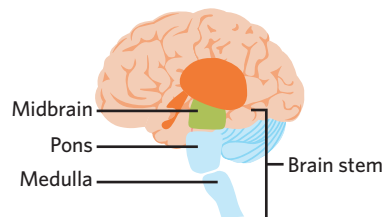
Figure 4 The medulla, pons, and midbrain are the three brain areas that make up the brainstem

Brainstem an extension of the spinal cord that is made up of the medulla, pons, and midbrain

Hindbrain 1.2.2.2

The hindbrain has an important role in coordinating basic survival functions. Without your hindbrain, it would be impossible for you to move, breathe, and simply survive.

Theory details

The **hindbrain** is a region at the base of the brain, located around and including some of the brainstem. The hindbrain is responsible for coordinating basic survival functions, including movement, breathing rate, heart rate, and digestion. In terms of evolution, the hindbrain was the first brain region to develop, due to its role in mechanisms that are fundamental to survival.

Hindbrain a region at the base of the brain, located around and including some of the brainstem

The hindbrain contains the medulla, pons, and cerebellum. These brain structures are presented in figure 5 and explained in table 1.

Figure 5 The hindbrain and its structures

Table 1 Structures of the hindbrain and their role in behaviour and mental processes

Structure	Role in behaviour and mental processes
Cerebellum	The cerebellum primarily functions to monitor and coordinate skeletal muscle movement. Firstly, the cerebellum receives information about the position of the body in space, as well as information about planned motor movements, from other brain regions. It then uses this information to calculate how to move fluidly and smoothly. Finally, the cerebellum communicates this motor information to the skeletal muscles, which carry out the motor movement. The cerebellum is also involved in maintaining balance and posture, and has an important role in controlling voluntary movement involving 'procedures' or 'sequences'. Examples of procedural or sequential movements include: • tying your shoelace • playing an instrument • riding a bicycle. These movements often come so naturally to us that it is difficult to describe them step-by-step. The cerebellum forms and consolidates procedural memories about how to perform these movements.
Medulla	The medulla is a mass of neurons that primarily functions to regulate autonomic processes, such as respiration, heart rate, blood pressure, and digestion. The medulla also has an important role in initiating reflexive actions, including coughing, sneezing, and vomiting. These processes are largely subconscious and are fundamental to survival. Furthermore, the medulla connects the brain to the spinal cord, creating a seamless pathway through which neural signals are transmitted.
Pons	The pons functions to relay information between different brain areas. This structure acts as a bridge, transmitting information between different brain areas. For example, the pons connects and relays neural messages between the medulla and the midbrain. This function is why the pons was given its name; 'pons' means 'bridge' in Latin. Furthermore, the pons has an important role in regulating the respiratory system and controlling sleeping, dreaming, and waking. The pons is also involved in various involuntary behaviours, such as blinking.

Figure 6 summarises the hindbrain and its structures, which you learnt about in this section of the lesson.
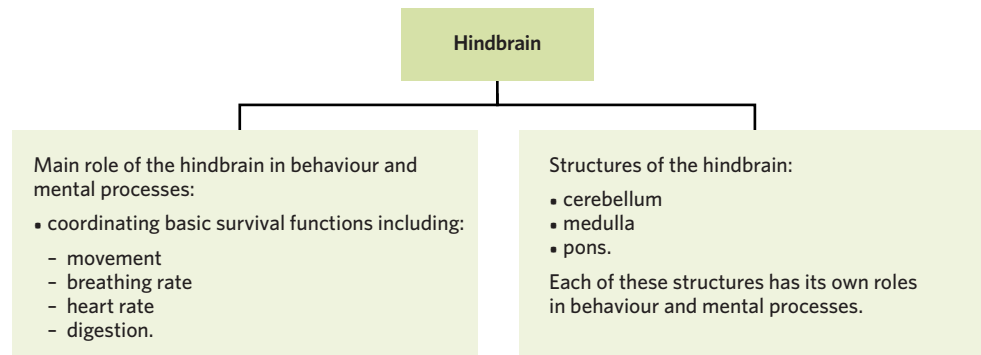
Figure 6 Summary of the hindbrain and its structures

Midbrain 1.2.2.3

The midbrain has an important role in relaying neural information between other brain regions, and between the brain and spinal cord. Without your midbrain, your brain would be unable to communicate with other brain regions or your body.

Theory details

The **midbrain** is a region at the centre of the brain, between the hindbrain and forebrain, and is part of the brainstem. The midbrain is responsible for relaying neural information between the hindbrain and the forebrain, and between structurally higher brain areas and the spinal cord. It is sometimes referred to as the 'relay station' of the brain because every sensory or motor message that is transmitted between the brain and spinal cord passes through it.

USEFUL TIP

The study design dot point for this lesson focuses on the roles of the hindbrain, midbrain, and forebrain in behaviour and mental processes. Therefore, you may wonder why the brain structures contained within these brain regions, which are not explicitly stated in the study design dot point, are discussed in this lesson. By identifying these brain structures and learning about their specific roles in behaviour and mental processes, we are able to understand the overall role of each brain region in behaviour and mental processes.

Midbrain a region at the centre of the brain, between the hindbrain and forebrain, and is part of the brainstem

---

The midbrain also has an important role in various behaviours and mental processes. For example, it is involved in:

- processing sensory information, such as auditory, visual, and tactile information.
- coordinating motor movement relating to sensory stimuli, such as eye movements.
- regulating sleep and physiological arousal.

The midbrain contains the reticular formation. This brain structure is presented in figure 7 and explained in table 2.
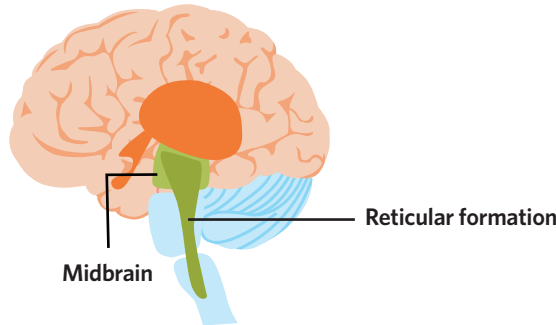
Figure 7 The midbrain and its structures

Table 2 Structures of the midbrain and their role in behaviour and mental processes

Structure	Role in behaviour and mental processes
Reticular formation	The reticular formation is a network of neurons located predominantly in the midbrain, although it is not strictly confined to this brain region and extends along the brainstem. Due to its expansive and interconnected network of neurons, the appearance of this brain structure resembles a net. The reticular formation has ascending and descending pathways that project into other brain regions, as shown in figure 8. The reticular formation functions to: • filter neural information that is travelling to the brain and direct these messages to various areas and structures of the brain. • integrate and relay neural information relating to survival and reflexive functions. • regulate sleep, wakefulness, and consciousness. • regulate physiological arousal and alertness through the reticular activating system (RAS), which is a network of pathways in the reticular formation. Information about the body's internal state and environmental stimuli is transported via ascending pathways from the spinal cord towards structurally higher brain areas. After this information is received and processed, messages instructing the body to either increase or decrease arousal and alertness are transported via descending pathways from structurally higher brain areas towards the spinal cord.
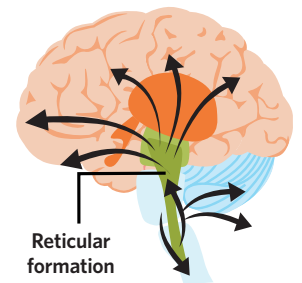
Figure 8 The reticular formation is predominantly located in (but not confined to) the midbrain because it extends along the brainstem and has pathways that project into the hindbrain and forebrain

Figure 9 summarises the midbrain and its structures, which you learnt about in this section of the lesson.

Midbrain

Main role of the midbrain in behaviour and mental processes:

• relaying neural information between the hindbrain and the forebrain, and between higher brain areas and the spinal cord.

Structures of the midbrain:

• recticular formation.

This structure has its own roles in behaviour and mental processes.
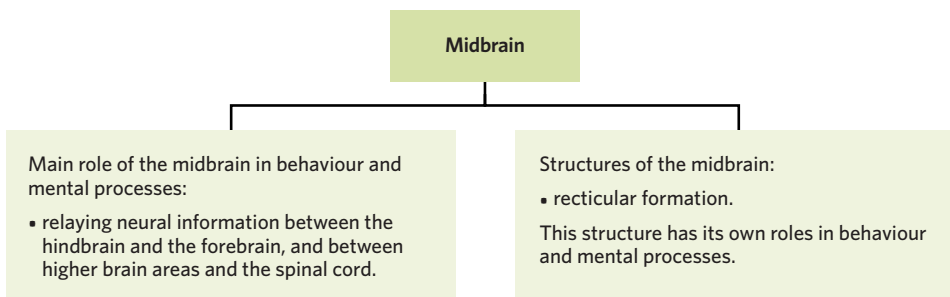
Figure 9 Summary of the midbrain and its structures

Forebrain 1.2.2.4

The forebrain has an important role in sophisticated mental processes and complex functions. Without your forebrain, it would be impossible for you to think, perceive, learn, speak, and remember.

Theory details

The **forebrain** is a large and prominent brain region that is located at the top and front of the brain. The forebrain has an important role in sophisticated mental processes, including cognition, perception, learning, language, and memory. It is responsible for the integration and coordination of information that enables us to perform complex functions, including receiving and processing sensory information, and initiating voluntary motor movement. This brain region is highly complex and contains extremely intricate neuronal networks, which enables these higher-order functions to occur.

The forebrain contains the cerebrum, thalamus, and hypothalamus. These brain structures are presented in figure 10 and explained in table 3.
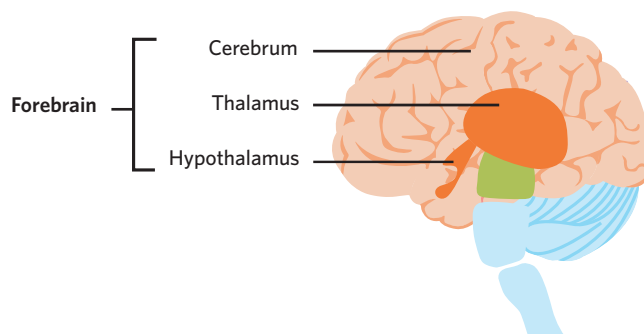
Figure 10 The forebrain and its structures

Table 3 Structures of the forebrain and their role in behaviour and mental processes

Structure	Role in behaviour and mental processes
Cerebrum	The cerebrum is a large expanse of brain matter and the largest structure in the human brain. It is divided into two cerebral hemispheres, which are connected by the corpus callosum (a bundle of nerve fibres). The cerebrum has a crucial role in various mental processes and behaviours. For example, the cerebral cortex, which is the outer layer of the cerebrum, is responsible for: • coordinating sophisticated mental processes, including cognition, perception, judgement, language, and problem-solving. • performing complex functions, including receiving and processing sensory information, and initiating voluntary motor movement. The cerebral cortex will be explored in greater detail in the next lesson.
Hypothalamus	The hypothalamus functions to maintain optimal biological functioning by regulating internal processes, including hormone levels, hunger, thirst, body temperature, and blood pressure. In this way, the hypothalamus has an important role in maintaining homeostasis, which is the balanced state that our body experiences when at rest. Furthermore, the hypothalamus is a component of the limbic system, which has an important role in functions relating to emotional and motivated behaviours. Therefore, the hypothalamus is involved when you perform pleasure-seeking or pain-averting behaviours that often relate to fulfilling needs, such as sex and feeding. Furthermore, the hypothalamus is active when you experience emotions, such as fear and anger, in response to environmental stimuli. Continues ▶

Table 3 Continued

Structure	Role in behaviour and mental processes
Thalamus	The thalamus is comprised of two oval structures located deep beneath the cerebrum and above the midbrain. The thalamus functions as a filtering system and relay centre for sensory information, excluding olfactory information, which refers to smells detected by the nose. In other words, all incoming sensory information relating to vision, hearing, taste, and touch is analysed by the thalamus, and the most important information is extracted. This filtered information is then relayed by the thalamus to various higher brain areas for further processing, as presented in figure 11. In this way, the thalamus has an important role in attention, ensuring that the most relevant sensory information is received by higher brain areas. The thalamus also relays motor signals between higher and lower brain areas involved in motor control. Due to its role in relaying both sensory and motor signals within the brain, the thalamus enables different brain areas to exchange information. Furthermore, through connections with the reticular formation, the thalamus is involved in regulating arousal, activity, and alertness.

USEFUL TIP

To understand the role of the thalamus in filtering and relaying sensory and motor signals to different brain areas, you can think of the brain as the 'post office' to which sensory and motor 'letters' are sent. Using this analogy, the thalamus acts as the 'mail sorter', ensuring that the correct departments of the post office receive the correct sensory or motor messages.

Sensory information | Thalamus | Sensory areas in the brain
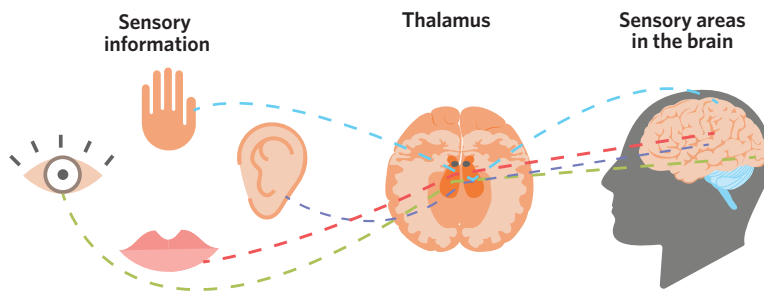
Figure 11 The thalamus primarily functions as a filtering system and relay centre, including for sensory information, excluding olfactory information

Figure 12 summarises the forebrain and its structures, which you learnt about in this section of the lesson.

Forebrain

Main role of the forebrain in behaviour and mental processes:

- coordinating sophisticated mental processes and complex functions, including:
  - cognition
  - perception
  - learning
  - language
  - memory
  - receiving and processing sensory information
  - initiating voluntary motor movement.

Structures of the forebrain:

- cerebrum
- hypothalamus
- thalamus.

Each of these structures has its own roles in behaviour and mental processes.

Figure 12 Summary of the forebrain and its structures

Theory summary

In this lesson, you have learnt about the hindbrain, midbrain, and forebrain, and the roles of these brain regions in behaviour and mental processes. Specifically, you have learnt about the brain structures contained within these brain regions, and their roles in behaviour and mental processes

4B Questions

Theory review

Question 1

The brain is divided into _____ main regions.

Which of the following best fills in the blank?

A. three

B. four

Question 2

Each brain region has a distinct role in behaviour and mental processes, functioning in isolation from other brain regions.

A. True.

B. False.

Question 3

Which of the following brain regions has a role in basic survival functions, including movement, breathing, heart rate, and digestion?

A. Hindbrain.

B. Midbrain.

C. Forebrain.

Question 4

The hindbrain contains the _____, which is responsible for calculating and coordinating skeletal muscle movement.

Which of the following best fills in the blank?

A. cerebellum

B. cerebrum

Question 5

The midbrain is responsible for **(Select all that apply)**

I. regulating sleep and physiological arousal.

II. coordinating sophisticated mental processes, including cognition and perception.

III. relaying neural information between the hindbrain and the forebrain, and between structurally higher brain areas and the spinal cord.

Question 6

The reticular formation is exclusively located in the midbrain.

A. True.

B. False.

Question 7

The forebrain contains the _____, which is responsible for filtering sensory information, excluding olfactory information, and relaying this sensory information to structurally higher brain areas.

Which of the following best fills in the blank?

A. hypothalamus

B. thalamus

Question 8

All regions of the brain are involved in motor movement.

A. True.

B. False.

Assessment skills

Perfect your phrasing

Question 9

Which of the following sentences is most correct?

A. The hindbrain is a brain region that **coordinates basic survival functions.**

B. The hindbrain is a brain region that **is involved in body functions.**

Question 10

Which of the following sentences is most correct?

A. The midbrain relays neural information within **and outside of** the brain.

B. The midbrain relays neural information within the brain, **and between structurally higher brain areas and the spinal cord.**

Question 11

Which of the following sentences is most correct?

A. The forebrain contains three brain structures: the **cerebellum,** thalamus, and hypothalamus.

B. The forebrain contains three brain structures: the **cerebrum,** thalamus, and hypothalamus.

Text analysis

The following assessment skills type reflects the study design assessment type:

- analysis and evaluation of an experiment or case study

Use the following information to answer questions 12–15.

Courtney is training for a regional athletics competition by running several times a week. Before each run, Courtney ties the shoelaces on her runners, which is a sequential motion she has completed time and time again. She leaves her house and starts running, feeling her heart beating in her chest and her breathing rate quicken. Courtney takes the same route each time she runs, which involves crossing a busy road. She stops and analyses the traffic, judging when the gap between cars is large enough for her to safely cross. After running several kilometres, Courtney has almost finished her run. She sprints a short distance from the end of her street to her house, feeling the wind blowing against her skin as she rapidly increases the pace.

Question 12

Which of the following statements best reflects a role of the cerebellum?

A. 'Courtney ties the shoelaces on her runners, which is a sequential motion she has completed time and time again'.

B. 'She stops and analyses the traffic, judging when the gap between cars is large enough for her to safely cross'.

Question 13

Which of the following statements best reflects a role of the medulla?

A. 'feeling her heart beating in her chest and her breathing rate increasing'.

B. 'She sprints a short distance from the end of her street to her house'.

Question 14

Which brain region is involved when Courtney analyses the traffic and judges when the gap between cars is large enough for her to safely cross?

A.   Hindbrain.

B.   Midbrain.

C.   Forebrain.

Question 15

The _____, which is located in the _____, is active when Courtney feels the sensation of the wind blowing against her skin, because it processes the sensory information and relays it to higher brain areas.

Which of the following best fills in the blanks?

A.   hypothalamus; midbrain

B.   thalamus; forebrain

C.   pons; hindbrain

Exam-style

Remember and understand

Question 16   (1 MARK)

Which of the following is a mental process that the forebrain does **not** have a role in?

A.   Language.

B.   Perception.

C.   Judgement.

D.   None of the above.

Question 17   (1 MARK)

Which of the following statements is correct?

A.   The thalamus has a role in filtering and relaying all sensory information that is received by sensory receptors.

B.   The cerebrum has a role in controlling voluntary movement involving 'procedures' or 'sequences', consolidating procedural memories of how to do these movements.

C.   The hypothalamus has a role in maintaining homeostasis by regulating internal processes, including hormone levels, hunger, thirst, body temperature.

D.   The pons has a role in maintaining balance and posture.

Question 18   (1 MARK)

Which of the following options correctly identifies the brain region that the medulla is located in, and a role of the medulla in behaviour and mental processes?

	Brain region	Role in behaviour and mental processes
A.	Hindbrain	Regulating autonomic processes, such as respiration, heart rate, blood pressure, and digestion.
B.	Midbrain	Monitoring and coordinating skeletal muscle movement.
C.	Hindbrain	Initiating pleasure-seeking or pain-averting behaviours that relate to fulfilling needs, such as sex and feeding.
D.	Midbrain	Initiating subconscious and reflexive actions, such as coughing, sneezing, and vomiting.

Question 19   (1 MARK)

Bridie is listening to her teacher and making notes during her psychology class. Her teacher talks about a brain structure that is a component of the limbic system. The teacher explains that this brain structure is involved when a person performs pleasure-seeking or pain-averting behaviours that relate to fulfilling needs, such as sex and feeding. However, Bridie does not hear her teacher say the name of the brain structure and which brain region it is located in because her friend distracted her.

Which of the following options correctly identifies the brain structure that Bridie's psychology teacher described and the brain region it is located in?

	Brain structure	Brain region
A.	Cerebrum	Forebrain
B.	Thalamus	Midbrain
C.	Reticular formation	Midbrain
D.	Hypothalamus	Forebrain

Question 20 (2 MARKS)

Compare the role of the hindbrain and forebrain in behaviour and mental processes.

Question 21 (4 MARKS)

a. Outline two roles of the midbrain in behaviour and mental processes. (2 MARKS)

b. Identify one brain structure that passes through the midbrain and explain one function of this brain structure. (2 MARKS)

Apply and analyse

Question 22 (1 MARK)

Harry enjoys playing backyard cricket with his cousins. Yesterday, he swung his cricket bat and hit the ball over the fence into the neighbour's garden.

Which of the following options best describes the roles of the hindbrain and its structures when Harry swings his cricket bat?

A. The pons decides which skeletal muscles should move and the medulla communicates this motor message to these skeletal muscles to initiate the motor movement of Harry swinging the cricket bat.

B. After receiving a motor command from higher brain areas, which was relayed by the pons, the cerebellum calculates how to move appropriately and communicates this to the skeletal muscles, which then carry out the motor movement of Harry swinging the cricket bat.

C. The medulla decides which skeletal muscles should move and the cerebellum communicates this motor message to these skeletal muscles to initiate the motor movement of Harry swinging the cricket bat.

D. The hindbrain and its structures are not involved when Harry swings his cricket bat.

Question 23 (3 MARKS)

Describe the role of the thalamus in attention.

Question 24 (6 MARKS)

Archie is a member of a band that is playing at a concert tonight. As the band plays their first song, Archie strums his guitar. He listens closely to the beat of the music to make sure he stays on tempo. Archie looks in the audience and sees many people clapping and cheering, causing him to feel very alert. He tries to judge how many people have come to watch his band perform, estimating that there are around two hundred people in the audience.

Identify two brain structures and the brain region that each is located in, and explain how these brain structures may have been involved when Archie was performing at the concert.

Questions from multiple lessons

Question 25 (4 MARKS)

a. Explain what a brain lesion is. (1 MARK)

b. Identify the brain region that the cerebellum is located in. (1 MARK)

c. Describe the likely impact on a person's functioning if they have a brain lesion in their cerebellum. (2 MARKS)

4C The cerebral cortex

4A   4B   4C

1.2.2.5
Cerebral cortex

- **1.2.2.5.1** Frontal lobe
- **1.2.2.5.2** Parietal lobe
- **1.2.2.5.3** Occipital lobe
- **1.2.2.5.4** Temporal lobe
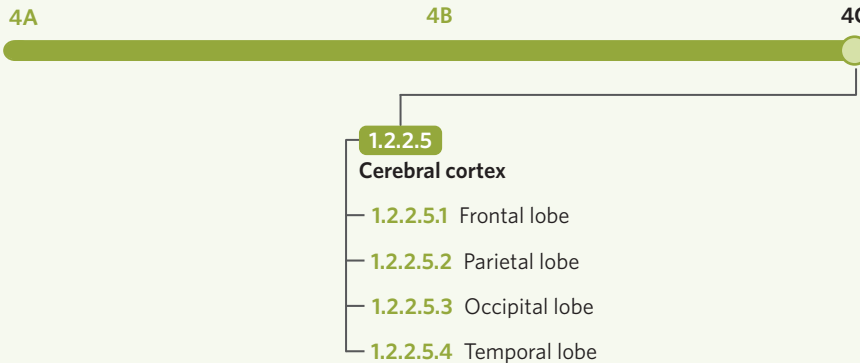
The cerebral cortex has a thickness of approximately three sheets of paper, or 2.5 mm (Sherlis, 2001). However, despite being extremely thin, the cerebral cortex has an important role in a multitude of behaviours and mental processes, including some of our most complex functions. It is difficult to believe that such a thin layer of the brain is responsible for so many sophisticated functions.

In this lesson, you will learn about the role of the cerebral cortex in behaviour and mental processes. Specifically, you will learn about the four lobes of the cerebral cortex: the frontal lobe, the parietal lobe, the occipital lobe, and the temporal lobe.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

KEY TERMS

Cerebral cortex the outer layer of the cerebrum that covers the brain

Cerebral cortex
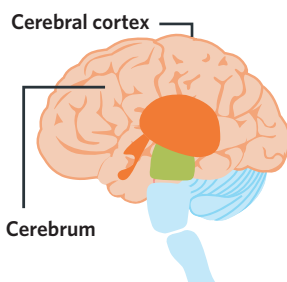
Cerebrum

Figure 1 The cerebral cortex is the outer layer of the cerebrum that covers the brain

Cerebral cortex 1.2.2.5

The cerebral cortex has an important role in behaviour and mental processes. Without your cerebral cortex, you would be unable to think, speak, sense, or move.

Theory details

The **cerebral cortex** is the outer layer of the cerebrum that covers the brain. With a thickness of approximately 2.5 millimetres, the cerebral cortex is extremely thin (Fischl & Dale, 2000). However, its folds, bulges, and grooves maximise surface area, enabling the cerebral cortex to contain around 16 billion neurons within its convoluted structure (Van Essen et al., 2018).

The cerebral cortex has multiple roles in behaviour and mental processes. It is involved in the initiation of voluntary motor movements and the processing of sensory information. Furthermore, it is involved in mental processes, including language, sensation, perception, problem-solving, judgement, and the regulation of emotions. Different regions of the cerebral cortex are responsible for these various functions. You will learn about this later in the lesson.

Specifically, the cerebral cortex is composed of three different types of functional areas, which are explained in table 1.

Table 1 Functional areas of the cerebral cortex

Area	Explanation
Motor areas	Motor areas are regions of the cerebral cortex that have functions related to initiating and executing motor movements. Motor areas are made up of motor neurons. Continues ▶

Table 1 Continued

Area	Explanation
Sensory areas	Sensory areas are regions of the cerebral cortex that have functions related to receiving and processing information from the five senses. Sensory areas are made up of sensory neurons.
Association areas	Association areas are regions of the cerebral cortex that integrate information from both motor areas and sensory areas to execute complex mental processes.

The cerebrum, and therefore the cerebral cortex, is divided into two cerebral hemispheres, which are almost symmetrical. These cerebral hemispheres are referred to as the left and right cerebral hemispheres. The corpus callosum is a bundle of nerve fibres that connects the two cerebral hemispheres, enabling them to exchange information. The longitudinal fissure is a deep groove that separates the two cerebral hemispheres, extending from the front to the back of the middle of the cerebral cortex.
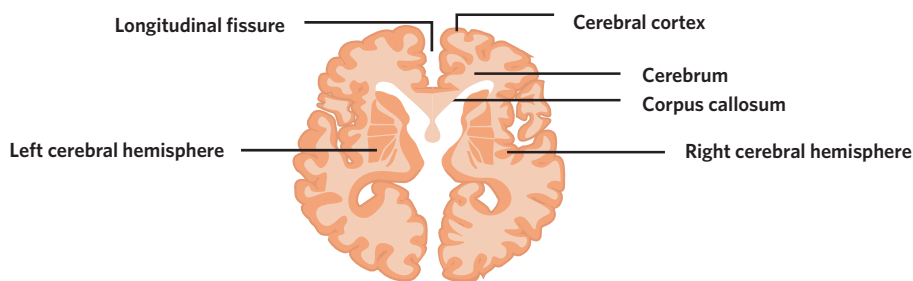
Figure 2 The two cerebral hemispheres are connected by the corpus callosum and separated by the longitudinal fissure

LESSON LINK

In lesson **4A Approaches to understanding the brain**, you were introduced to the concept of hemispheric specialisation. This relates to how the cerebral hemispheres have specialised functions. For example:

- the left cerebral hemisphere specialises in language comprehension, language expression, and logical and analytical thinking.
- the right cerebral hemisphere specialises in visual recognition of objects, spatial awareness, and creativity.

Hemispheric specialisation is an example of the localisation of function, which relates to the concept that certain areas of the brain are responsible for different functions. However, it is important to remember that despite certain hemispheres being dominant during certain mental processes, the cerebral hemispheres rarely operate in isolation, instead, they work together to execute these mental processes.

The cerebral cortex can be divided into four distinct regions, which are referred to as lobes: These are:

- the frontal lobe
- the parietal lobe
- the occipital lobe
- the temporal lobe.

USEFUL TIP

'FPOT', which may remind you of a 'flower pot', is a memory device that may help you remember the lobes of the cerebral cortex:

Frontal

Parietal

Occipital
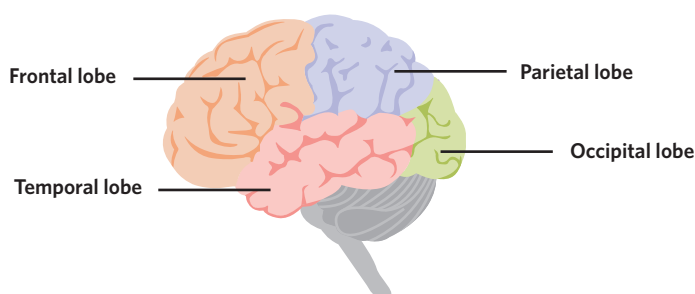
Temporal

Figure 3 The four lobes of the cerebral cortex

Each lobe contains specialised regions that have specific functions. In the following sections of the lesson, you will learn about each lobe of the cerebral cortex, including its role in behaviour and mental processes.

Frontal lobe 1.2.2.5.1

The **frontal lobe** is the largest and frontmost lobe of the cerebral cortex that is composed of motor and association areas. The frontal lobe has four distinct regions that each have specific roles in behaviour and mental processes, these are:

- prefrontal cortex
- premotor cortex
- primary motor cortex
- Broca's area.

Figure 4 displays the frontal lobe and its associated regions. Furthermore, table 2 explains the roles of these regions in behaviour and mental processes.

> **Frontal lobe** the largest and frontmost lobe of the cerebral cortex that is composed of motor and association areas
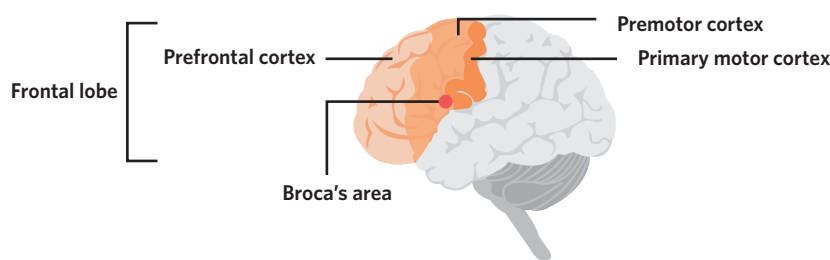
Figure 4 The frontal lobe and its associated regions; the prefrontal cortex, the premotor cortex, the primary motor cortex, and Broca's area

Table 2 The roles of the regions of the frontal lobe in behaviour and mental processes

Region of the frontal lobe	Type of functional area	Role in behaviour and mental processes
Prefrontal cortex	**Association area**	The prefrontal cortex has an important role in coordinating complex mental processes, including: • logic and reasoning • judgement • decision-making • personality • planning • problem-solving • symbolic thought • expression and regulation of emotions. These executive functions relate to thoughts, feelings, and behaviours, and demonstrate higher-order cognitive abilities. The prefrontal cortex is the last region of your brain to develop, reaching maturity at around 25 years of age. This explains why adolescents, whose prefrontal cortices are still developing, often exhibit greater behavioural immaturity and impulsivity than adults (Arain et al., 2013). Furthermore, the prefrontal cortex is involved in voluntary motor movement. Using its executive functions, such as judgement and planning, it recognises when a motor movement should be initiated and plans this motor movement. The prefrontal cortex then sends this motor information to the premotor cortex.
Premotor cortex	**Motor area**	The premotor cortex is also involved in voluntary motor movement. After receiving the planned motor movements from the prefrontal cortex, the premotor cortex processes this into an organised sequence of motions. This sequence is required for the skeletal muscles to later execute motor movements fluidly and smoothly. The premotor cortex then sends this sequence to the primary motor cortex. Continues ▶

Table 2 Continued

Region of the frontal lobe	Type of functional area	Role in behaviour and mental processes
Primary motor cortex	**Motor area**	The primary motor cortex has an important role in initiating voluntary motor movements. Firstly, it receives the sequence of motions from the premotor cortex. The primary motor cortex then signals to the cerebellum to relay this motor information to the skeletal muscles, which carry out this motor movement. In this way, the primary motor cortex is responsible for controlling skeletal muscle movements.
		The primary motor cortex is organised in such a way that the top of the primary motor cortex controls the movement in the lower regions of the body and vice versa.
		The amount of primary motor cortex devoted to different body parts is proportional to the number of motor neurons required to move them.
		• Body parts that are capable of fine (precise) motor movements, such as the hands, require more motor neurons to move and therefore take up a large proportion of the primary motor cortex.
		• Body parts that are not capable of fine motor movements, such as the legs, require less motor neurons to move and therefore take up a small proportion of the primary motor cortex.
Broca's area	**Association area**	Broca's area is responsible for the production of speech. For example, it coordinates the muscle movements required to produce fluent speech, such as tongue, lip, jaw, and vocal cord movements.
		Despite being involved in the movements required to produce speech, Broca's area is not described as having a role in motor movement in the same way that the prefrontal, premotor, and primary motor cortices are. The role of Broca's area specifically relates to language.
		Broca's area is only located in the left frontal lobe, meaning the function is localised to the left cerebral hemisphere.

Table 2 explains how the prefrontal cortex, premotor cortex, and primary motor cortex each contribute their specific function to execute voluntary motor movements. In this way, these three regions of the frontal lobe work together, as reflected in figure 5. The example of drinking a glass of water, which is described in the following steps, may further demonstrate the interaction between the prefrontal cortex, premotor cortex, and primary motor cortex.

1. The prefrontal cortex registers that the glass of water must be picked up and sends this information to the premotor cortex.
2. The premotor cortex would organises the sequence of movements required for this action, such as picking up the glass, raising the glass to the lips, and tilting the glass. It then sends this information to the primary motor cortex.
3. The primary motor cortex initiates movement by signalling the cerebellum to relay this motor information to the skeletal muscles in the arms and hands. These skeletal muscles carry out the motor movement of drinking a glass of water.
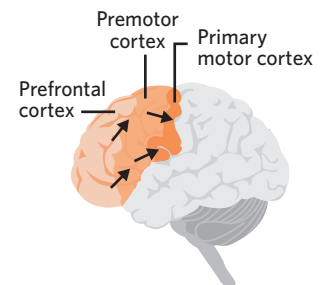
Figure 5 The prefrontal cortex, premotor cortex, and primary motor cortex work together to execute voluntary motor movements

WANT TO KNOW MORE?

Your frontal lobe has a lot to do with your personality and who you are, which is demonstrated by the famous case of Phineas Gage. In 1848, at 25 years old, Gage was in a rail-yard accident, during which a metal rod was lodged through his skull and into his frontal lobe. Gage survived, however, his life was never the same.

Prior to the accident, Gage was described as a calm and even-tempered worker. However, after his accident, Gage was observed to have experienced personality changes, becoming unreliable, ill-tempered,and impulsive.

In 1994, researchers used neuroimaging techniques and the reconstruction of Gage's skull to determine the extent of his injuries. It was found that the impact of the rod destroyed parts of Gage's prefrontal cortices and his left frontal lobe. These are areas of the brain that are now associated with emotional processing personality, and decision-making, thus explaining the bizarre personality changes that Gage experienced. As a result of Gage's accident, researchers were able to gain insight into how the brain functions, its specific regions and how the brain responds to damage.

Image: artsuvari/Shutterstock.com
Figure 6 An illustration of Gage's skull pierced by the metal rod

Parietal lobe the lobe of the cerebral cortex, located behind the frontal lobe, and is composed of sensory and association areas

Parietal lobe 1.2.2.5.2

The **parietal lobe** is the lobe of the cerebral cortex, located behind the frontal lobe, and is composed of sensory and association areas. The parietal lobe has a distinct region, the primary somatosensory cortex, which has a specific role in behaviour and mental processes.

Figure 7 displays the parietal lobe and the primary somatosensory cortex. Furthermore, table 3 explains the roles of this region in behaviour and mental processes.
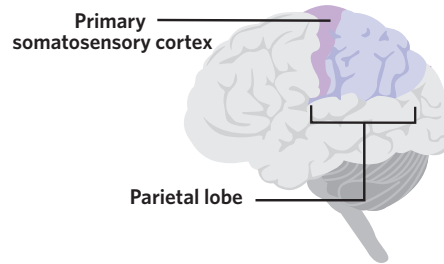
Figure 7 The parietal lobe and its associated region; the primary somatosensory cortex

Table 3 The role of the region of the parietal lobe in behaviour and mental processes

Region of the parietal lobe	Type of functional area	Role in behaviour and mental processes
Primary somatosensory cortex	**Sensory area**	The primary somatosensory cortex has an important role in receiving and processing sensory information. In this way, touch, temperature, pressure, pain, and other sensations are received and processed by the primary somatosensory cortex.
		The primary somatosensory cortex is organised in such a way that the top of the primary somatosensory received sensations from the lower regions of the body and vice versa.
		The amount of primary somatosensory cortex devoted to different body parts is proportional to the number of sensory neurons in these body parts.
		• Body parts that are more sensitive, such as the lips, have more sensory neurons and therefore take up a large proportion of the primary somatosensory cortex.
		• Body parts that are less sensitive, such as the legs, have less sensory neurons and therefore take up a small proportion of the primary somatosensory cortex.

The association area of the parietal lobe is involved attention, and in spatial awareness and reasoning. This includes being aware of the position of the body in relation to the external environment and determining where an object is located in space.

WANT TO KNOW MORE?

There are other regions of the cerebral cortex that are involved in sensation:

• The primary gustatory cortex, which is located in the parietal lobe, is responsible for receiving and processing tastes.
• The primary olfactory cortex, which is located predominantly in the frontal lobe and parts of the temporal lobe, is responsible for receiving and processing smells.

WANT TO KNOW MORE?

A cortical homunculus represents the distorted proportions of either the primary motor cortex or the primary somatosensory cortex (Nguyen & Duong, 2021). These are the two regions of the cerebral cortex where the amount of cortex devoted to different body parts is proportional to the number of neurons required for their functioning. Body parts that have greater proportions of cortex devoted to them appear enlarged on the homunculus.

A homunculus may be:

- two-dimensional or three-dimensional.
- motor (representing the primary motor cortex) or sensory (representing the primary somatosensory cortex).

Figure 8 displays the two-dimensional motor homunculus and figure 9 displays the three-dimensional sensory homunculus. Given the strange appearance of these models, it is probably a good thing that our actual bodies are not in these proportions!

Figure 8 The two-dimensional motor homunculus
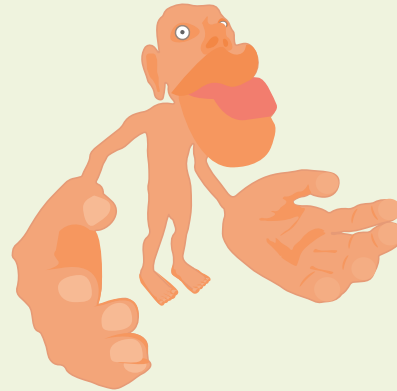
Figure 9 The three-dimensional sensory homunculus

Occipital lobe 1.2.2.5.3

The **occipital lobe** is the rearmost lobe of the cerebral cortex, located behind the parietal lobe, and is composed of sensory and association areas. The occipital lobe has a distinct region, the primary visual cortex, which has a specific role in behaviour and mental processes.

Figure 10 displays the occipital lobe and the primary visual cortex. Furthermore, table 4 explains the roles of this region in behaviour and mental processes.
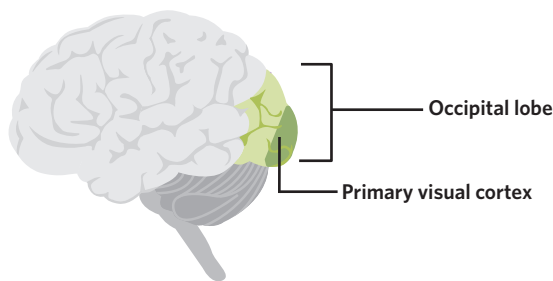
Figure 10 The occipital lobe and its associated region; the primary visual cortex

Occipital lobe
the rearmost lobe of the cerebral cortex, located behind the parietal lobe, and is composed of sensory and association areas

Table 4 The role of the region of the occipital lobe in behaviour and mental processes

Region of the occipital lobe	Type of functional area	Role in behaviour and mental processes
Primary visual cortex	**Sensory area**	The primary visual cortex has an important role in receiving and processing visual information. Sensory receptors located on the retina of the eyes receive visual information from the visual field. This visual information is sent to the primary visual cortex via the optic nerve, where it is then processed.

The association area of the occipital lobe is involved in visual perception and interpretation. After the primary visual cortex processes visual information, the association area organises and integrates it with other information, such as details from memory. This enables meaningful perception and interpretation of this visual information.

USEFUL TIP

The temporal lobe is located near the ears. This may help you remember that the temporal lobe, specifically the primary auditory cortex, is involved in auditory processing.

Temporal lobe 1.2.2.5.4

The **temporal lobe** is the lowest lobe of the cerebral cortex, located beneath the parietal lobe, and is composed of sensory and association areas. In addition to playing a role in processes, such as memory and object recognition, the temporal lobe has two distinct regions that each have specific roles in behaviour and mental processes, these regions are:

- primary auditory cortex
- Wernicke's area.

Figure 11 displays the temporal lobe and its associated regions. Furthermore, table 5 explains the roles of these regions in behaviour and mental processes.
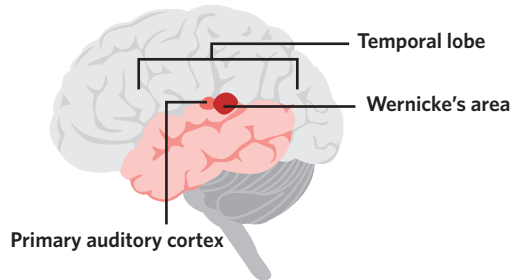
Figure 11 The temporal lobe and its associated regions; the primary auditory cortex and Wernicke's area

Table 5 The roles of the regions of the temporal lobe in behaviour and mental processes

Region of the temporal lobe	Type of functional area	Role in behaviour and mental processes
Primary auditory cortex	Sensory area	The primary auditory cortex has an important role in receiving and processing auditory information. The ears detect sounds in the environment and this auditory information is sent to the primary auditory cortex, where it is then processed. Auditory processing by the primary auditory cortex demonstrates the concept of hemispheric specialisation: • The primary auditory cortex in the left cerebral hemisphere processes verbal sounds, such as spoken words. • The primary auditory cortex in the right cerebral hemisphere processes non-verbal sounds, such as music.
Wernicke's area	Association area	Wernicke's area is responsible for the comprehension of speech, enabling the understanding of spoken language. Wernicke's area is also involved in the production of meaningful and coherent speech. Wernicke's area is only located in the left temporal lobe, meaning the function is exclusively localised to the left cerebral hemisphere.

Contralateral functions are neural functions that occur in both cerebral hemispheres, with each cerebral hemisphere controlling the opposite side of the body. By contrast, ipsilateral functions are neural functions that occur in both cerebral hemispheres, with each cerebral hemisphere controlling the same side of the body. These concepts are demonstrated in figure 12.

In the cerebral cortex, some functions are contralateral and some functions are ipsilateral. For example, the primary motor cortex functions contralaterally.

Figure 12 A visual representation of contralateral functioning and ipsilateral functioning

- The primary motor cortex in the left cerebral hemisphere initiates the motor movements of the right side of the body.
- The primary motor cortex in the right cerebral hemisphere initiates the motor movements of the left side of the body.

The primary somatosensory cortex and the primary visual cortex also function contralaterally. In comparison, the primary auditory cortex functions contralaterally and ipsilaterally.

- The primary auditory cortex in the left cerebral hemisphere receives and processes auditory information from both the left and right ears.
- The primary auditory cortex in the right cerebral hemisphere receives and processes auditory information from both the left and right ears.

The association area of the temporal lobe is involved in memory. This includes drawing upon visual information from other brain areas to recognise objects and faces. The association area of the temporal lobe is also involved in the expression of appropriate emotional responses.

Theory summary

In this lesson, you learnt about the role of the cerebral cortex in behaviour and mental processes. Specifically, you learnt about the four lobes of the cerebral cortex: the frontal lobe, the parietal lobe, the occipital lobe, and the temporal lobe. Furthermore, you learnt about the distinct regions of each lobe, and their roles in behaviour and mental processes. Figure 13 presents a summary of this lesson.

The lobes of the cerebral cortex and their associated regions have specific roles in behaviour and mental processes.
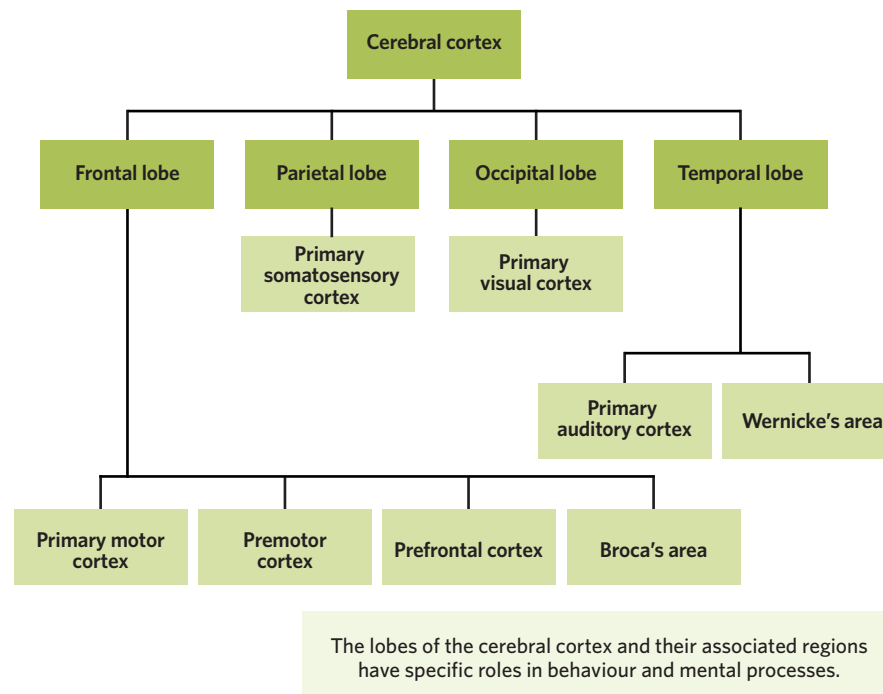
Figure 13 Summary of lesson 4C

4C Questions

Question 1

The cerebral cortex is the outer layer of the cerebellum that covers the brain.

A. True.

B. False.

Question 2

Which of the following statements about the cerebral hemispheres are correct? **(Select all that apply)**

I. The two cerebral hemispheres are separated by the reticular formation.

II. The two cerebral hemispheres are connected by the corpus callosum.

III. The two cerebral hemispheres are completely identical.

IV. The two cerebral hemispheres are often referred to as the left and right cerebral hemispheres.

Question 3

The cerebral cortex can be divided into _____ lobes.

Which of the following best fills in the blank?

A. four

B. five

Question 4

Which of the following regions are located in the frontal lobe **and** involved in motor movement?
(Select all that apply)

I. Prefrontal cortex.

II. Primary somatosensory cortex.

III. Primary motor cortex.

IV. Broca's area.

Question 5

The primary somatosensory cortex has a role in receiving and processing information from all five senses.

A. True.

B. False.

Question 6

Which of the following are **not** considered to be sensory areas? **(Select all that apply)**

I. Primary motor cortex.

II. Prefrontal cortex.

III. Wernicke's area.

IV. Primary visual cortex.

Question 7

Broca's area and Wernicke's area are located in only the _____ cerebral hemisphere.

Which of the following best fills in the blank?

A. left

B. right

Assessment skills

Text analysis

The following assessment skills type reflects the study design assessment type:

- analysis and evaluation of an experiment or case study

Use the following information to answer questions 8–11.

> In 1848, Phineas Gage, a 25-year-old railroad worker, was involved in an accident in which a metal rod penetrated his skull and caused damage to his brain. Phineas Gage miraculously survived this ordeal and quickly regained his physical strength. However, following the accident, he experienced drastic changes to his personality, with his friends describing him as 'no longer Gage'. He was transformed from a calm, polite, and easygoing worker into an unreliable, impulsive, and irritable man. However, Phineas Gage experienced no motor or speech impairments. His ability to see and hear was also unaffected by the accident.
>
> (Gearhart, 2022)

Question 8

Phineas Gage's prefrontal cortex was affected by the accident. Which of the following statements best reflects this?

A. 'He was transformed from a calm, polite, and easygoing worker into an unreliable, impulsive, irritable, and disrespectful man'.

B. 'Phineas Gage miraculously survived this ordeal and quickly regained his physical strength'.

Question 9

Which of the following statements best reflects that not all of Phineas Gage's frontal lobe was affected by the accident?

A. 'Phineas Gage experienced no motor or speech impairments'.

B. 'His ability to see and hear was also unaffected by the accident'.

Question 10

Phineas Gage's vision was unaffected by the accident, which indicates that his _____ in his _____ remained intact.

Which of the following best fills in the blanks?

A. primary visual cortex; temporal lobe

B. primary auditory cortex; occipital lobe

C. primary visual cortex; occipital lobe

D. primary auditory cortex; temporal lobe

Question 11

Based on the information provided, Phineas Gage sustained damage to his Broca's area and his Wernicke's area as a result of the accident.

A. True.

B. False.

Exam-style

Remember and understand

Question 12 (1 MARK)

Which of the following correctly identifies the lobe of the cerebral cortex that the primary somatosensory cortex is located in and its role in behaviour and mental processes?

	Lobe	Role in behaviour and mental processes
A.	Frontal lobe	Receiving and processing information from the external environment.
B.	Temporal lobe	Receiving and processing auditory information.
C.	Parietal lobe	Receiving and processing sensory information, including touch, temperature, pressure, and pain.
D.	Occipital lobe	Receiving and processing visual information.

Question 13 (1 MARK)

Which of the following correctly identifies the region of the cerebral cortex that has a role in coordinating complex mental processes, including planning and problem-solving, and the lobe of the cerebral cortex it is located in?

	Region	Lobe
A.	Prefrontal cortex	Frontal lobe
B.	Primary motor cortex	Parietal lobe
C.	Premotor cortex	Frontal lobe
D.	Wernicke's area	Temporal lobe

Question 14 (2 MARKS)

Describe the cerebral cortex.

Question 15 (2 MARKS)

Outline a similarity and a difference between the role of Broca's area and Wernicke's area in behaviour and mental processes.

Apply and analyse

Use the following information to answer questions 16–18.

On a sunny Sunday afternoon, Hugh decides to walk his dog, Louie, along the beach. After having walked a short distance, Hugh feels the hot sun beating down on his face. He decides to apply sunscreen to the exposed areas of his body to avoid becoming sunburnt. Then, Hugh enjoys the rest of his walk on the beach, watching Louie bound along the sand and hearing the waves crash upon the shore.

Question 16 (1 MARK)

The region of the cerebral cortex that would have received and processed the temperature on Hugh's skin is

A. the primary visual cortex.

B. the prefrontal cortex.

C. Wernicke's area.

D. the primary somatosensory cortex.

Question 17 (1 MARK)

Which regions of the cerebral cortex, and in what order, were involved in Hugh registering that he should apply sunscreen, organising the sequences of movements required, and initiating this sequence of movements?

A. Premotor cortex, primary motor cortex, and prefrontal cortex.

B. Prefrontal cortex, primary motor cortex, and premotor cortex.

C. Prefrontal cortex, premotor cortex, and primary motor cortex.

D. Primary motor cortex, premotor cortex, and prefrontal cortex.

Question 18 (1 MARK)

The region of the cerebral cortex that would have received and processed the sound of the waves crashing on the shore is

A. the primary visual cortex.

B. the primary auditory cortex.

C. Broca's area.

D. the primary somatosensory cortex.

Question 19 (2 MARKS)

Predict the likely impact on behaviour and mental processes if a person sustained damage to their primary visual cortex.

Questions from multiple lessons

Question 20 (1 MARK)

The primary motor cortex has a role in initiating voluntary motor movements, which are then carried out by skeletal muscles in the

A. autonomic nervous system.

B. spinal cord.

C. somatic nervous system.

D. sympathetic nervous system.

Chapter 4 review

Chapter summary

In this chapter, you learnt about the brain. Specifically, you learnt about how the brain has been studied over time and its role in behaviour and mental processes.

In lesson **4A Approaches to understanding the brain**, you learnt about the various ways in which the brain has been studied throughout history. Specifically, you learnt about:

- theories of the brain
- first brain experiments
- neuroimaging techniques
- how these approaches have contributed to our current understanding of the brain.

In lesson **4B Regions of the brain,** you learnt about three regions of the brain and their roles in behaviour and mental processes. Specifically, you learnt about:

- the three regions of the brain:
  - the hindbrain
  - the midbrain
  - the forebrain
- the structures within each region of the brain
- the roles of these structures in behaviour and mental processes.

In lesson **4C The cerebral cortex,** you learnt about the cerebral cortex and its role in behaviour and mental processes. Specifically, you learnt about:

- the lobes of the cerebral cortex:
  - the frontal lobe
  - the parietal lobe
  - the occipital lobe
  - the temporal lobe
- the regions within each lobe of the cerebral cortex
- the roles of these regions in behaviour and mental processes.

4A

Approaches to understanding the brain

Theories of the brain

Brain versus heart debate

Phrenology

Mind-body problem

First brain experiments

Brain lesioning

Ablation

Split-brain experiments

Neuroimaging techniques

Structural

Computerised tomography (CT)

Magnetic resonance imaging (MRI)

Functional

Positron emission tomography (PET)

Functional magnetic resonance imaging (fMRI)
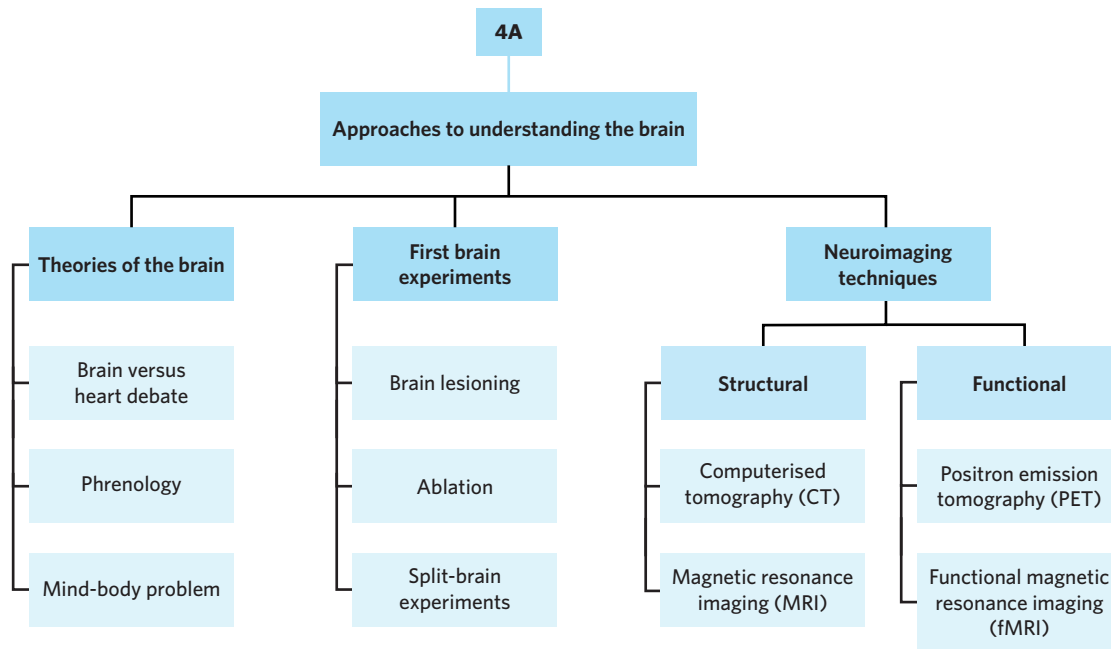
These approaches have contributed to our understanding of the brain and its role in behaviour and mental processes:

4B

Forebrain
Hypothalamus
Thalamus
Cerebrum

Midbrain
Reticular formation

Hindbrain
Pons
Medulla
Cerebellum

4C

Frontal lobe
Prefrontal cortex
Premotor cortex
Primary motor cortex
Broca's area

Temporal lobe
Primary auditory cortex
Wernicke's area

Parietal lobe
Primary somatosensory cortex

Occipital lobe
Primary visual cortex
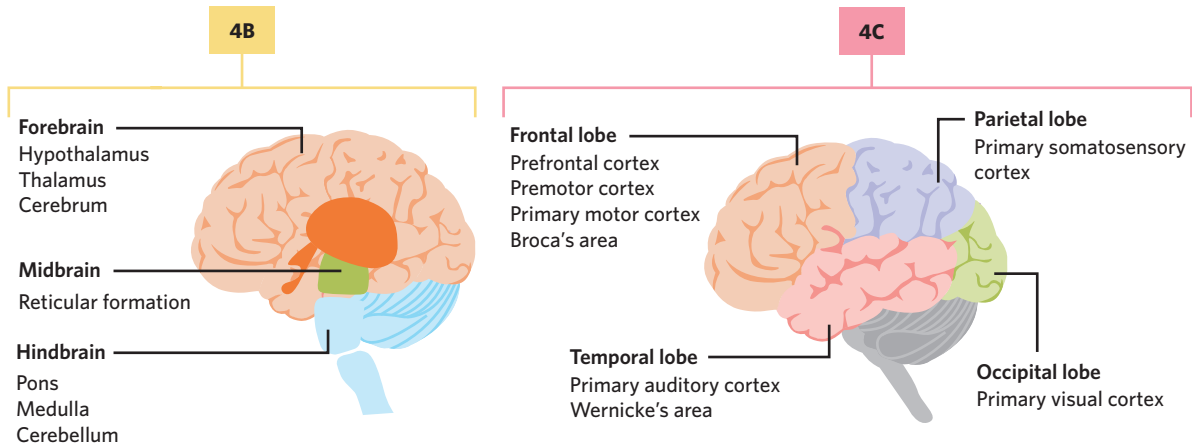
Chapter review activities

Review activity 1: Fill in the table

The table below summarises the approaches to understanding the brain that you learnt about in chapter 4.
Copy out and fill in the table.

	Approach to understanding the brain	Explanation	Contribution to our current understanding of the brain
Theories of the brain	Brain versus heart debate		
	Mind-body problem		
	Phrenology		
First brain experiments	Ablation		
	Brain lesioning		
	Split-brain experiments		
			Continues ▶

	Approach to understanding the brain	Explanation	Contribution to our current understanding of the brain
Neuroimaging techniques	Computerised tomography (CT)		
	Magnetic resonance imaging (MRI)		
	Functional magnetic resonance imaging (fMRI)		
	Positron emission technology (PET)		

Review activity 2: Fill in the diagram

In chapter 4, you learnt about the roles of the hindbrain, midbrain, and forebrain, including the cerebral cortex, in behaviour and mental processes. The diagram below summarises this knowledge. Copy into your notes and fill in the diagram.

The role of the cerebellum in behaviour and mental processes is
_____
_____

Pons

Cerebellum

[ ]

The role of the hindbrain in behaviour and mental processes is
_____
_____

Hindbrain

Reticular formation

[ ]

Brain

The role of the thalamus in behaviour and mental processes is
_____
_____

[ ]

Thalamus

Cerebrum

[ ]

It's outer layer is called...

[ ]

Frontal lobe

_____ lobe

Occipital lobe

_____ lobe

Premotor cortex

Primary somatosensory cortex

Primary visual cortex

[ ]

Primary motor cortex

Wernicke's area

[ ]

_____ area

The role of Wernicke's area in behaviour and mental processes is
_____
_____

Chapter 4 test

Multiple choice

Question 1 (1 MARK)

Phrenology

A. has not contributed to our current understanding of the brain.

B. theorises that a person's personality and mental functioning can be inferred from the shape and size of their skull.

C. is an approach to understanding the brain that is scientifically accurate and is validated by modern psychological research.

D. relates to the historical debate about whether the heart or the brain is responsible for mental processes.

Question 2 (1 MARK)

The cerebral cortex is

A. the outer layer of the cerebrum that covers the brain.

B. connected by the longitudinal fissure and separated by the corpus callosum.

C. the outer layer of the cerebellum that covers the brain.

D. a network of neurons that extends along the brainstem.

Question 3 (1 MARK)

Which of the following statements best describes the processing of auditory information in the brain?

A. The hypothalamus filters the auditory information and then relays it to the primary auditory cortex in the frontal lobe.

B. The thalamus filters the auditory information and then relays it to the primary auditory cortex in the temporal lobe.

C. The ears receive the auditory information and then relay it to the cerebral cortex.

D. The reticular formation filters the auditory information and then relays it to the temporal lobe.

Question 4 (1 MARK)

Professor Cody focuses her research on language processing in the brain. She is planning to conduct an investigation that measures the brain activity of participants while they engage in conversation. When conducting her research investigation, Professor Cody should

A. use magnetic resonance imaging (MRI) to capture structural images of the brain.

B. use a functional neuroimaging technique, such as computerised tomography (CT).

C. use brain ablation to surgically remove participants' Broca's area and Wernicke's area.

D. use a functional neuroimaging technique, such as positron emission tomography (PET).

Question 5 (1 MARK)

Pablo was playing rugby when he suffered a serious head injury and was rushed in an ambulance to the hospital. Doctors observed that, following this head injury, Pablo experienced personality changes, including increased aggression. Pablo also demonstrated a reduced ability to solve problems and make decisions. Which brain region was likely damaged when Pablo injured his head?

A. Premotor cortex.

B. Wernicke's area.

C. Prefrontal cortex.

D. Primary somatosensory cortex.

Short answer

Question 6   (2 MARKS)

Outline a role of the hypothalamus in behaviour and mental processes, and identify the brain region that it is located in.

Question 7   (3 MARKS)

Identify three regions of the cerebral cortex that are involved in motor movement.

Question 8   (2 MARKS)

Compare the role of the primary somatosensory cortex and the primary visual cortex in behaviour and mental processes.

Question 9   (4 MARKS)

Explain the difference between structural and functional neuroimaging techniques, and provide an example of each.

Question 10   (2 MARKS)

Amelie was driving along the highway when she suddenly lost control of her car and crashed into another vehicle, hitting her head on the steering wheel. Following the accident, Amelie suffered from memory loss. For example, when she ran into her friend the next day at the supermarket, Amelie struggled to recognise her friend as she approached her.

Identify the lobe of the cerebral cortex that was most likely damaged by the car accident. Justify your response.

Adapted from VCAA Psychology exam 2015 Q17

Question 11   (3 MARKS)

Sperry and Gazzaniga conducted research studies on patients who had undergone split-brain surgery, meaning that their corpus callosum was severed, preventing their cerebral hemispheres from communicating with each other.

With reference to Sperry and Gazzaniga's split-brain research, explain the likely response when a patient who has undergone split-brain surgery is asked to verbalise an image of a chicken that has been projected to their left visual field.

Adapted from VCAA Psychology exam 2016 Q8a

Question 12   (10 MARKS)

Doctor Collopy wants to investigate the role of the primary motor cortex in behaviour and mental processes. He recruits a patient at his medical clinic who had sustained damage to their primary motor cortex due to a stroke. He also recruits his friend, who has an intact primary motor cortex, to participate in his research study. Doctor Collopy plans to test the speed and accuracy of participants on various motor tasks, such as dialling phone numbers.

Using appropriate psychological terminology, evaluate the proposed design for Doctor Collopy's research study. Your evaluation should consider:

- the methods and procedures of the investigation
- the likely results of this research study and possible conclusions that may be drawn
- limitations of this research study and how they may be overcome.

CHAPTER 5

Brain plasticity and brain injury

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

Image: GoodStudio/Shutterstock.com

5A Neuroplasticity

STUDY DESIGN DOT POINT

- 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

5A   5B   5C   5D

1.2.3.1	1.2.3.2	1.2.3.3	1.2.3.4	1.2.3.5
The neuron	Neuroplasticity	Brain changes in response to experience	Brain changes in response to brain trauma	Ways to maintain brain functioning
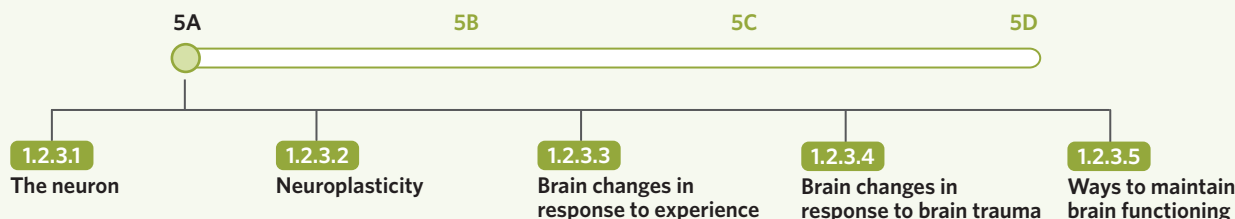
We often say that we grow in response to our experiences, but how is this actually possible? This is allowed by neuroplasticity, a characteristic of the brain that is crucial for our development. In this lesson, you will focus on neuroplasticity and learn about how our brains physically change in response to both experience and brain trauma. You will also learn about the factors that influence neuroplasticity as well as ways to maintain and maximise brain functioning.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

KEY TERMS

Neuron a nerve cell that receives and transmits neural information

USEFUL TIP

In psychological texts, you may sometimes see the words 'neural' and 'neuronal' used interchangeably. But what is the difference?

- 'Neural' refers to any type of nerve cell, as well as activity, in the nervous system.
- 'Neuronal' is specifically related to neurons and their function.

The neuron 1.2.3.1

Neurons are the building blocks of our nervous system. Without understanding what they are, we essentially cannot understand the way in which our brains are structured and how they function.

Theory details

Before learning about neuroplasticity, an understanding of neurons, which constitutes the 'neuro' aspect of neuroplasticity, is crucial. Like a house that is made up of different materials, the nervous system is made up of billions of different **neurons**, which are nerve cells that receive and transmit neural information. Neurons enable the communication of information around the body and they do this by receiving, transmitting, and processing information in the form of neuronal messages (messages which can be sent via neurons). Neuronal communication is vital in brain processing.

Structure of the neuron

There are several components of the neuron that work together to allow the transmission and reception of information across the synapse. You will need to know these components in order to fully understand the factors of neuroplasticity explored in the rest of the lesson. These areas are summarised in figure 1.

Dendrites
Receive neuronal messages

Myelin
Insulates the neuron and prevents disturbance from other neurons

Axon terminals
Sends neuronal messages to the next neuron
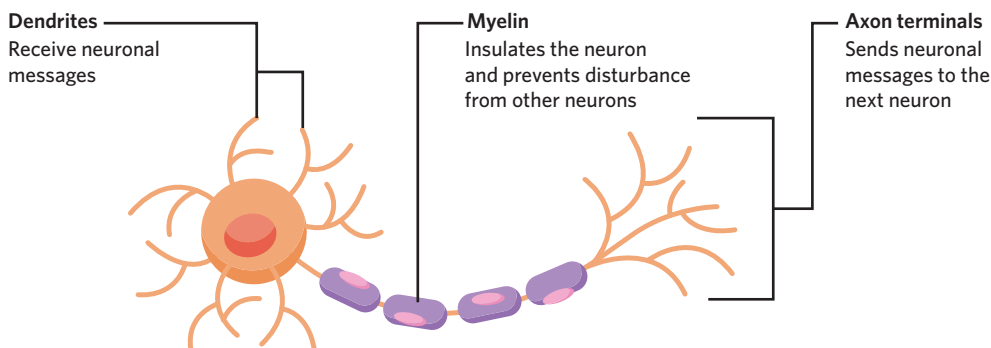
Figure 1 Parts of a neuron involved in neuroplasticity

The synaptic gap

Neuronal messages are communicated at the **synapse**, which refers to the region that includes the axon terminals of the presynaptic neuron, the synaptic gap, and the dendrites of the postsynaptic neuron. The synapse is illustrated in figure 2. When neuronal messages are being sent between neurons, they are sent across the space between the neurons, known as the synaptic gap. The neuron that fires the message into the synaptic gap is known as the presynaptic neuron (that is, the neuron that comes before the synapse) and the neuron that receives this message from the synapse is known as the postsynaptic neuron (the neuron that comes after the synapse).

> **Synapse** the region that includes the axon terminals of the presynaptic neuron, the synaptic gap, and the dendrites of the postsynaptic neuron

Presynaptic neuron   Postsynaptic neuron

Direction of transmission

Synaptic gap
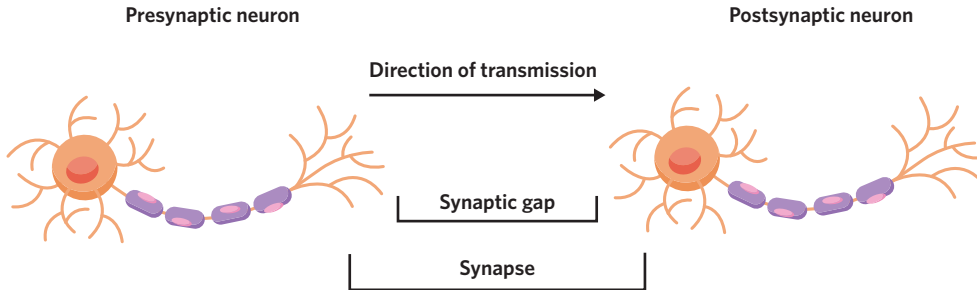
Synapse

Figure 2 The synapse

Neuroplasticity 1.2.3.2

Just like our body can change in size and weight, so can our brain. As we age, we create more brain connections, but we also eliminate some. These processes are all part of a psychological phenomenon called neuroplasticity.

Theory details

Now that you've learnt about the role of the neuron in the communication of messages throughout the body, you can learn about neuroplasticity. **Neuroplasticity** is the ability of the brain to change in response to experience or environmental stimulation. These changes occur in response to experience and activity, which can occur between just two neurons at a time. It is important to note that brain changes occur as a result of neurons communicating and creating connections, which they then later strengthen or eliminate. You will learn more about these processes later in the lesson. The process of neuroplasticity is roughly represented in figure 3.

> **Neuroplasticity** the ability of the brain to change in response to experience or environmental stimulation

LESSON LINK

In lesson **2D Critical and sensitive periods**, you learnt about the levels of plasticity during maturation. As we grow and mature, our brain can physically change due to our environmental experiences. As we learn more, our neurons increase their number of connections with other neurons and also strengthen pre-existing connections. Conversely, these connections can weaken if they are used infrequently or not at all. You will learn further about these processes in the following sections of this lesson.

1. Brain   2. Environmental interaction   3. Brain changes

Figure 3 Neuroplasticity can occur when a baby is exposed to language through their parent singing to them, causing their brain to change and incorporate this linguistic information

Neuroplasticity occurs in response to two kinds of experience, which will be explored further in the following sections, and they are:

1. in response to ageing and the learnings associated with maturation. This is known as developmental plasticity.
2. in response to a need to adapt, such as in response to brain trauma and injury. This is referred to as adaptive plasticity.

Brain changes in response to experience 1.2.3.3

How do you still remember and do things that you learnt as a child? This is possible due to changes in your brain that were induced by developmental plasticity.

Theory details

Developmental plasticity
changes in the brain that occur in response to ageing and maturation

Synaptogenesis
the formation of synapses between neurons as axon terminals and dendrites grow

Synaptic pruning
the elimination of underused synapses

Myelination
the formation and development of myelin around the axon of a neuron

As you transition from infancy to adolescence and then adulthood, it is not just your body that changes, but also your brain. **Developmental plasticity** refers to changes in the brain that occur in response to ageing and maturation.

A number of factors influence developmental plasticity. This section of the lesson will focus on three in particular: synaptogenesis, synaptic pruning, and myelination. It is also important to note that they occur throughout maturation, but don't have to occur in a precise order. These factors are outlined in table 1.

Table 1 Key factors that influence developmental plasticity

Process	Explanation
Synaptogenesis, which is the formation of synapses between neurons as axon terminals and dendrites grow.	When an individual learns something new, the axon terminals of neurons grow and form connections to nearby neurons, creating synapses to represent and retain this learning. This can occur throughout the lifespan but is most intense in infancy.
Synaptic pruning, which is the elimination of underused synapses.	Underused synapses are cut off or 'pruned' to free up space in the brain and allow for the strengthening of frequently used synapses. This occurs throughout the lifespan, but the periods which occur after infancy (ages two to three) and during adolescence are the most intense periods of synaptic pruning.
Myelination, which is the formation and development of myelin around the axon of a neuron.	The axon of a neuron becomes myelinated to facilitate more efficient communication of messages. This is done by protecting the neuron from interference from other neurons. This means that as we develop and learn new skills, communication in the brain can happen quickly and smoothly.

Infancy and adolescence

Neuroscientists have identified infancy and adolescence as two periods of significant neuronal change due to developmental plasticity. Essentially, the general trend of developmental plasticity in these periods, illustrated in figure 4, is as follows:

- In infancy, the number of neuronal connections (synapses) greatly increases through synaptogenesis. Our synaptic density is greatest from the end of infancy to early childhood.
- From late childhood and into adolescence, our neuronal connections are refined and reduce greatly in number through synaptic pruning.

1. Start of infancy   **2. End of infancy**   **3. End of adolescence**
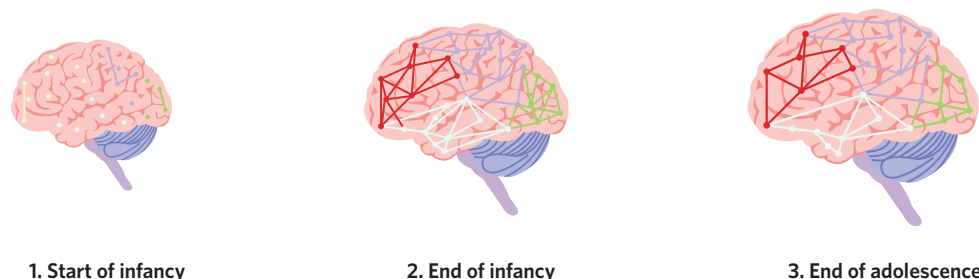
Figure 4 Although our brain continues to grow after infancy, the number of connections between neurons decreases

There are reasons for such trends, which are broken down in table 2.

Table 2 Neuroplasticity trends in infancy and adolescence

Infancy	Adolescence
In infancy, there is lots of new information to learn and incorporate into the brain. Infants, therefore, need lots of synapses as the foundation for these new memories and skills.	As we get older, individuals still learn but they do so at a slower pace as learning becomes more specific and goal-directed. As such, learning later in life is more about refining the connections within the brain as opposed to just forming lots of connections.
Myelination of neurons begins before a baby is born and is rapid (Holmes et. al, 2012) during infancy. This is so the baby can consolidate information from incoming stimuli and help to form the neuronal basis for many life skills including emotion, language and movement.	Myelination mostly occurs from infancy through to early adulthood, but does continue across the lifespan. Aside from serving as the basis for learning in infancy, myelination is also essential for the higher-order thinking we conduct in adolescence and adulthood. This complex thought requires communication across many neurons and neuronal networks. Without further myelination, this communication would be inefficient and difficult.
The number of synapses we have grows greatly until about two or three years old, after which, the brain starts pruning away unnecessary connections.	The most rapid period of synaptic pruning occurs during adolescence. For a point of comparison, two-year-olds' synaptic density is over double that of adults' in some areas of the brain (Huttenlocher, 1990). There is also some synaptic pruning just after infancy.

LESSON LINK

In lesson **2C Psychological development across the lifespan**, you learnt about the cognitive and social development that occur as we age. These developments can be linked to, and are often due to, changes in the brain.

For example, as a child moves between infancy and childhood, their cognitive development is facilitated by:

- synaptogenesis, as they would need to create synapses in order to form connections to nearby neurons and learn more skills.
- synaptic pruning, as synapses responsible for skills that are underused or no longer needed as the child develops would be cut off to strengthen synapses responsible for more used and important ones.
- myelination, as it would be highly beneficial to minimise interference from other neuronal messages so that a child can more efficiently develop many new skills.

USEFUL TIP

To remember the role of synaptic pruning, remember the saying 'use it or lose it'. Synaptic pruning is dependent on experience: if we don't use connections frequently enough, they will be lost. On the other hand, the more we use a synaptic connection, the stronger it becomes.

Brain changes in response to brain trauma 1.2.3.4

After a head injury, people may experience mood changes, such as increased aggression, or social changes, such as a reduced ability to communicate. These are all examples of brain changes that occur as a result of brain trauma.

Theory details

Brain trauma refers to damage to the brain that is caused by an external force. Examples of brain trauma include:

- falling and hitting your head
- a head assault (e.g. experiencing a severe knock to the head)
- vehicle accidents
- sporting injuries to the head.

When a brain trauma occurs, there are significant neuronal impacts. These can include:

- the death of neurons and destruction of neuronal connections, as brain trauma affects the way in which neurons are circuited and linked.
- the overstimulation of neurons, caused by excessive accumulation of neurotransmitters (brain chemicals) in the brain tissue, which can also cause neuronal death.
- damage to neurons responsible for specific tasks, resulting in the loss of mass function. For example, a specific group of neurons may be responsible for the muscles involved in moving the hand, so if that group of neurons was to be damaged, it could result in an inability to move the hand.

(Pekna and Pekny, 2012)

Brain trauma damage to the brain that is caused by an external force

Think about brain trauma like an injury occurring to a player on your favourite sports team. Each individual player is a specific region of the brain, and your team's performance is your level of functioning. If a player in a particular position is injured, then it will have a distinct impact on your team's performance on the basis of what the player's role in the team was.

For example, if an attacking player is injured, then the output of goals will likely be affected, or if a defensive player is injured, then the team is likely to concede more goals. The impact of injury to a player will have a specific effect depending on their role/position and also on the team's performance more broadly. Brain trauma is the same in the sense that injuring a specific region in the brain will have a distinct effect depending on the role of that brain region (e.g. injuring the primary motor cortex will impact voluntary movement specifically) and then also functioning more broadly, because many of our functions are interrelated and dependent on each other.

Figure 5 Brain trauma can be understood through the analogy of a soccer team, comprising of different team members, but nonetheless working together

Adaptive plasticity
the brain's ability to restore adequate neural functioning over time after sustaining injury

Sprouting a neuron's ability to develop new branches on the dendrites or axons

Rerouting a neuron's ability to form a new connection with another undamaged neuron

Adaptive plasticity refers to the brain's ability to restore adequate neural functioning over time after sustaining injury. Adaptive plasticity is affected by the factors of sprouting and rerouting, as outlined in table 3.

Table 3 Factors influencing adaptive plasticity

Factor	Explanation
Sprouting	**Sprouting** is the ability of a neuron to develop new branches on the dendrites or axons. This expands the reach of a neuron, particularly when the neuron has been damaged from the trauma, enabling new neural connections to be formed in areas of the brain where the neural activity has been prevented or depleted. **Figure 6** Sprouting can involve a damaged neuron growing branches on the axon and dendrite to enhance its ability to reach areas of the cerebral cortex that have been damaged
Rerouting	In contrast to sprouting, **rerouting** is a neuron's ability to form a new connection with another undamaged neuron. The neuron that is rerouting abandons its connection with a damaged neuron, enabling new neuronal connections to be formed after trauma and, by extension, cognitive functioning to be re-developed. **Figure 7** Rerouting involves an undamaged neuron seeking a new connection with another undamaged neuron to promote the formation of strong neural connections

The theory behind the factors influencing adaptive plasticity is often incorporated into the rehabilitation techniques of patients who suffered a brain trauma. For example, physiotherapists often work with patients who have recently suffered from a brain trauma, such as a stroke or brain surgery. By getting these patients to perform certain motor exercises in a part of the body that has been impacted by the brain trauma, they can often begin to regain control over these regions of the body. This is because the brain is demonstrating adaptive plasticity by recovering its adequate neural functioning by neurons forming new effective connections (i.e. rerouting) and repairing their physical condition by developing new branches on the dendrites or axons (i.e. sprouting). You will learn more in depth about brain trauma as a type of acquired brain injury in the next lesson, 5B Acquired brain injuries.

Ways to maintain brain functioning 1.2.3.5

Our brain and body function similarly in that they can be worn down over time, but also can be maintained and improved. Just like eating healthily and exercising regularly is beneficial for our bodies, it is also imperative for our brains. However, there are other ways that you can also maintain brain functioning.

Theory details

Without adequate brain functioning, it would be difficult to do most things. Currently, there is a lot of research being done on ways to maintain and even maximise brain functioning. It is important to note that when talking about ways to maximise brain functioning, it refers to making brain functions more efficient, rather than more complex. For example, when reading, maximising brain function would involve becoming a faster reader (ie. processing more information per minute) rather than being able to understand more complex vocabulary, which involves further learning experience. Hence, when thinking about ways to 'maximise' brain functioning, consider ways that you can 'improve' the quality and ease with which you cognitively operate.

Table 4 summarises a few ways to maintain brain functioning that have been explored in research.

Table 4 Ways to maintain brain functioning

Method	Description	How it helps maintain/maximise brain functioning
Mental stimulation	Mental stimulation refers to an activity that activates neuronal connections and involves the processing of information. For example: • doing a crossword puzzle • learning to play an instrument • meditating.	• Mental activities stimulate new neural connections and build up a resistance to future cell loss (Harvard Health Publishing, 2018). • Mental stimulation strengthens and prevents synaptic pruning of needed neuronal connections.
Diet	It is recommended that individuals have a balanced diet and eat according to the Australian Guide to Healthy Eating. For example: • 5–6 serves of vegetables and legumes a day • 2 pieces of fruit a day • 2–3 serves of meat a day etc (Health Direct, 2018).	• Leafy greens, such as kale and spinach, are rich in 'brain-healthy' nutrients, such as vitamin K, which helps slow cognitive decline (Harvard Health Publishing, 2021). • Fatty fish are abundant sources of omega-3 fatty acids which have been linked to lower blood levels of beta-amyloid, which contributes to the development of Alzheimer's disease (Harvard Health Publishing, 2021).
Physical activity	It is recommended that children and young people should be active every day, engaging in moderate to vigorous intensity physical activity for at least 60 minutes per day (Australian Government Department of Health and Aged Care, 2021). Physical activity can include: • jogging • sports • mowing the lawn.	• Physical activity forces all of the body's physiological systems (such as the respiratory system and the skeletal system) and brain areas to communicate much more closely than usual (American Psychological Association, 2020). • Physical activity increases blood supply to the brain and promotes the growth of new neurons in the hippocampus, which is an essential brain area for learning and memory (American Psychological Association, 2020).
Social support	Social support involves being part of or interacting with a group of people. For example: • going to gatherings with family and friends • being part of a community group • calling a friend once a day.	• Having someone to listen to you is associated with having greater resistance to brain damage (Salinas et al., 2021). • Interacting with people of similar interests reduces loneliness which in turn decreases the risk of cognitive decline (Salinas et al., 2021).

Theory summary

In this lesson, you have learnt about neuroplasticity. Specifically, you learnt about developmental and adaptive neuroplasticity along with their influencing factors. Finally, you learnt about ways to maintain and/or maximise brain functioning.
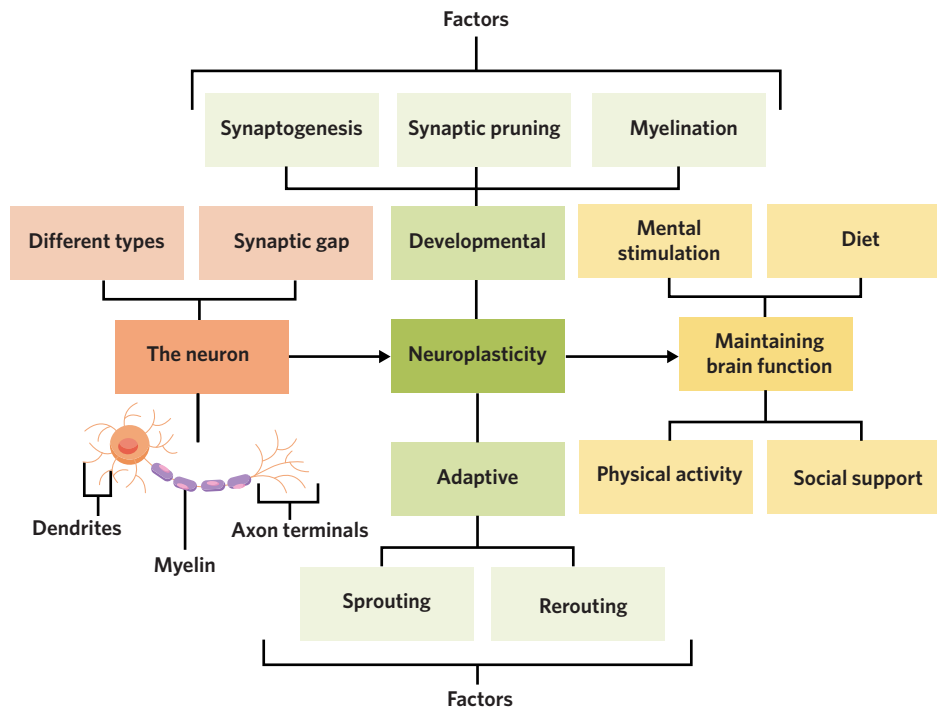
Figure 8 Summary of lesson 5A

5A Questions

Theory review

Question 1

In infancy, developmental plasticity functions mostly to _____ on their understanding of the world.

Which of the following best fills in the blanks?

A. cut

B. refine

C. build

Question 2

_____ can involve changes to the neurons and their connections while _____ ensures communication between neurons is successful and efficient by protecting neurons.

Which of the following best fills in the blanks?

A. Developmental plasticity; myelination

B. Myelination; synaptic pruning

C. Synaptic pruning; developmental plasticity

Question 3

Adaptive plasticity occurs in response to experience.

A. True.

B. False.

Question 4

Adaptive plasticity involves **(Select all that apply)**

I.   Sprouting.

II.   Recovery after brain trauma only.

III.   Rerouting.

IV.   Help from a psychologist.

Question 5

Which of the following is **not** a way to maintain brain functioning?

A.   Diet.

B.   Social support.

C.   Not colouring your hair.

Assessment skills

Perfect your phrasing

Question 6

Which of the following sentences is most correct?

A.   Synaptic pruning can help make communication in the brain more efficient by eliminating unnecessary or under-used **neurons** in the brain.

B.   Synaptic pruning can help make communication in the brain more efficient by eliminating unnecessary or under-used **synapses** in the brain.

Question 7

Which of the following sentences is most correct?

A.   Adaptive plasticity is enabled through **rerouting**, developing new branches on dendrites or axons and **sprouting** forming new neural connections.

B.   Adaptive plasticity is enabled through **sprouting**, developing new branches on dendrites or axons and **rerouting**, forming new neural connections.

Text analysis

The following assessment skills type reflects the study design assessment type:

- media analysis of one or more contemporary media texts

Use the following information to answer questions 8–10.

Game of Thrones star Emilia Clarke revealed in a recent interview that she has lost 'quite a bit' of her brain after suffering from two aneurysms. An aneurysm is an abnormal swelling in the wall of a blood vessel (Better Health, 2012) and the blood flow loss that results can lead to brain trauma. Two weeks after her first brain surgery to address the first aneurysm, she lost parts of her memory, including her own name. Her second brain surgery was complicated and resulted in some brain tissue damage. However, despite all this, she is able to 'live [her] life completely normally with absolutely no repercussions' and remarks on this ability, considering 'the amount of [her] brain that is no longer usable'.

(Iqbal, 2022)

Question 8

In terms of sprouting and rerouting, what may have occurred at a neuronal level to help Clarke's brain compensate for functions that were controlled by areas in which brain tissue was damaged?

A. Her neurons may have sprouted and developed new branches on the myelin and synaptic buttons to enable new neural connections in areas where neural activity had been prevented.

B. Her neurons may have sprouted and formed a new connection with another undamaged neuron to allow neural connections to be formed and cognitive functioning to be re-developed.

C. Her neurons may have rerouted and developed new branches on the dendrites or axons to enable new neural connections in areas where neural activity had been prevented.

D. Her neurons may have rerouted and formed a new connection with another undamaged neuron to allow neural connections to be formed and cognitive functioning to be re-developed.

Question 9

As Clarke suffered a brain trauma, she is more likely to have undergone adaptive plasticity in order to get to the stage that she is now at. Why would this be the case?

A. Clarke's brain would have needed to change to adapt to her growing up after her aneurysms.

B. Clarke's brain would have needed to change to adapt to new things that she learnt after her aneurysms.

C. Clarke's brain would have needed to adapt to neural connections that were eliminated after her aneurysms.

D. Clarke's brain would have needed to change to restore adequate neural functioning after her aneurysms.

Question 10

According to research, what is the most effective method that Clarke can use to maintain her brain functioning?

A. Have a cleaner diet to make sure that she increases brain tissue.

B. Engage in regular exercise to ensure that her brain has enough blood flow.

C. Develop a stronger social support to help her when she has another aneurysm.

D. Play a lot of mind-stimulating games to keep her brain active.

Exam-style

Remember and understand

Question 11 (1 MARK)

The change in neuronal connections and brain size due to maturation is referred to as

A. developmental plasticity.

B. adaptive plasticity.

C. synaptic pruning.

D. myelination.

Question 12 (1 MARK)

A neuroscientist who is studying the effects of learning on the structure of an adolescent brain is most likely to observe

A. a decrease in the number of neurons.

B. an increase in the number of neurons.

C. a decrease in the number of synapses.

D. an increase in the number of synapses.

Adapted from VCAA Psychology exam 2013 Q26

Question 13 (2 MARKS)

Describe the roles of myelination in developmental plasticity.

Question 14 (4 MARKS)

Identify and describe two factors influencing adaptive plasticity.

Apply and analyse

Question 15 (5 MARKS)

Martha has a newborn baby named Davey. During her pregnancy, she read a lot of baby books that taught her that, in the first few years, her baby's brain would be growing at a rate that is much faster than her own. However, the books also taught Martha that a lot of neural connections in a baby's brain would be cut down after a while.

a. Explain the factor that influences Davey's exponential brain growth in the first years of their lives. (2 MARKS)

b. Suggest a reason for why the factor identified in **part a** influences Davey's brain growth. (1 MARK)

c. What is the name for the factor in which neural connections are cut? (1 MARK)

d. Suggest a reason as to why Davey's neural connections may be cut. (1 MARK)

Question 16 (5 MARKS)

Jane is 17 years old and has been learning how to speak German. Her three-year-old brother Gerry attends a bilingual kindergarten where they teach in both German and English. Jane is jealous of the rate and ease at which Gerry seems to be learning the language compared to her.

a. In terms of developmental plasticity, explain why learning German would be easier for Gerry than Jane. (3 MARKS)

b. Explain how the process of synaptic pruning may have affected Jane's ability to learn German. (2 MARKS)

Questions from multiple lessons

Question 17 (1 MARK)

Jimmy was playing soccer with his school friends one day when he was accidentally hit in the head by the ball. His vision became blurry and he lost his balance, falling to the ground. However, a few seconds later, he was back to normal. When the school nurse came to check on him, he noticed that Jimmy's speech was slurred and he struggled to answer the nurse's questions.

Which lobe of the cerebral cortex may have been affected by Jimmy's brain trauma?

A. Frontal

B. Parietal

C. Occipital

D. Temporal

Question 18 (2 MARKS)

Identify the lobe of the cerebral cortex responsible for moderating personality and explain how it can impact social functioning when injured.

5B Acquired brain injuries

5A	5B	5C	5D

1.2.4.1
Acquired brain injury

1.2.4.2
The impact of acquired brain injury on functioning

   1.2.4.2.1 Biological functioning

   1.2.4.2.2 Psychological functioning

   1.2.4.2.3 Social functioning

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

KEY TERMS

Acquired brain injury all types of brain injury that occur after birth
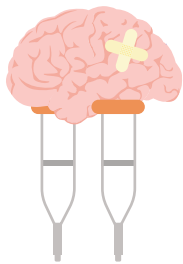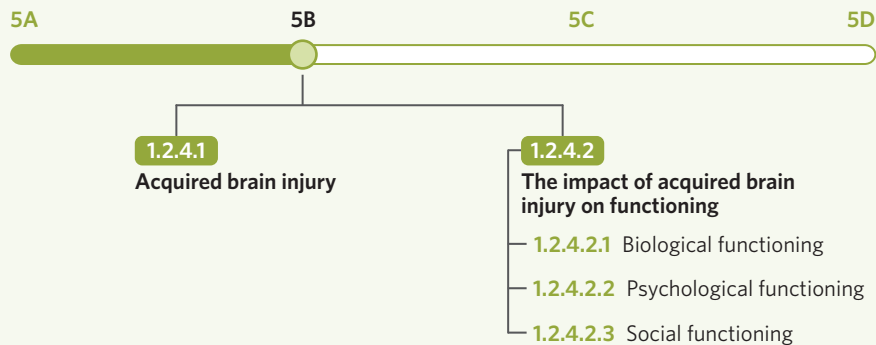
We all know that it is important to protect our head and brain from knocks and falls, but why is that? The brain is a vital organ and is responsible for much of our functioning. Any damage to the brain can have great consequences, and can sometimes be extreme and irreversible. In this lesson, you will learn about the impact of an acquired brain injury on a person's functioning, namely their biological, psychological, and social functioning.

Acquired brain injury 1.2.4.1

'Acquire' simply means to receive and therefore, an 'acquired brain injury' refers to damage that your brain receives at any time in your life. This can come in multiple forms including traumatic brain injuries and non-traumatic brain injuries.

Theory details

An **acquired brain injury** refers to all types of brain injuries that occur after birth (Queensland Health, 2022). It is an umbrella term for two types of acquired brain injuries, traumatic brain injuries and non-traumatic brain injuries, which are summarised in table 1 (Brain Injury Association of America, 2019).

Table 1 Summary of the two types of acquired brain injuries

	Traumatic brain injury	**Non-traumatic brain injury**
What is it?	Damage to the brain caused by an external force	Damage to the brain caused by internal factors, such as a lack of oxygen or a tumour
Examples	• Falls • Assaults • Vehicle accidents • Sports injuries	• Stroke • Aneurysm • Tumour • Substance abuse

It is important to understand that the effects of a brain injury and the recovery required differ between individuals, regardless of the type of injury (Queensland Health, 2022). Brain injuries may vary in the rate at which they develop, the intensity to which they present, or even the consequences that they induce. For example, persons A and B may have both had a stroke. However, while person A may have shown less severe symptoms of a stroke at a faster pace, person B may suffer more intense symptoms, from the stroke, and for a longer period of time. This is illustrated in figure 1. Impairments induced by brain injuries can either be permanent or temporary and can cause disability that is either specific or widespread. Therefore, it is difficult to generalise brain injuries and they must, instead, be viewed and treated individually.

Person A

| Faster onset of symptoms | Less severe symptoms |

Person B

| More intense symptoms | Longer duration of symptoms |
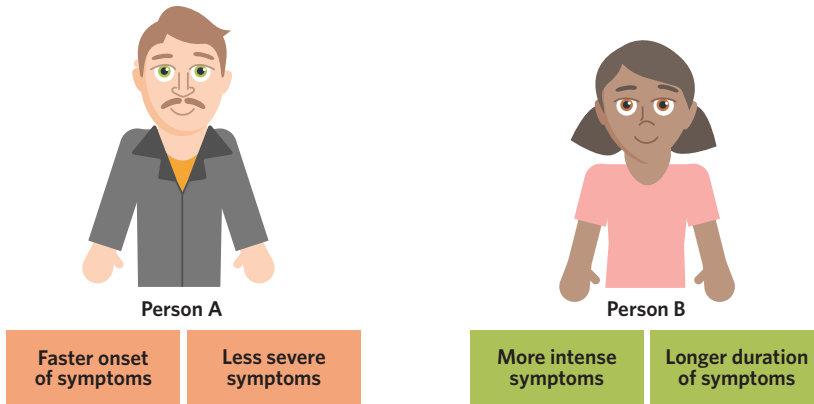
Figure 1 The symptoms of brain injury may differ in the rate at which they show and the duration for which they present

The impact of acquired brain injury on functioning 1.2.4.2

What happens when you have an acquired brain injury? Would you be able to function the same or would something change? Chances are that your functioning would be impacted, depending on the area of the brain in which damage occurred.

Theory details

As a brain injury can occur anywhere in the brain, there is a wide variety of impacts that can potentially occur. The type of impact on an individual's functioning is directly related to the area of the brain that is damaged. For example, if your occipital lobe sustained damage, it is likely your vision may be affected. Likewise, if your temporal lobe is damaged, your hearing may be impaired. More examples of the possible impacts of a brain injury are illustrated in figure 2. In the following sections of the lesson, you will learn about the impacts of acquired brain injury on biological, psychological, and social functioning.

Temporal
- Recognising your favourite song
- Hearing the fire alarm go off

Parietal lobe
- Guessing distance
- Creating a conclusion about a story

Frontal lobe
- Trouble deciding what to wear
- Mood swings

Brain stem
- Controlling heart rate
- Controlling breathing

Brain injury

Occipital lobe
- Seeing colours
- Reading traffic signs

Cerebellum
- Balancing on a bike
- Tying your shoelace
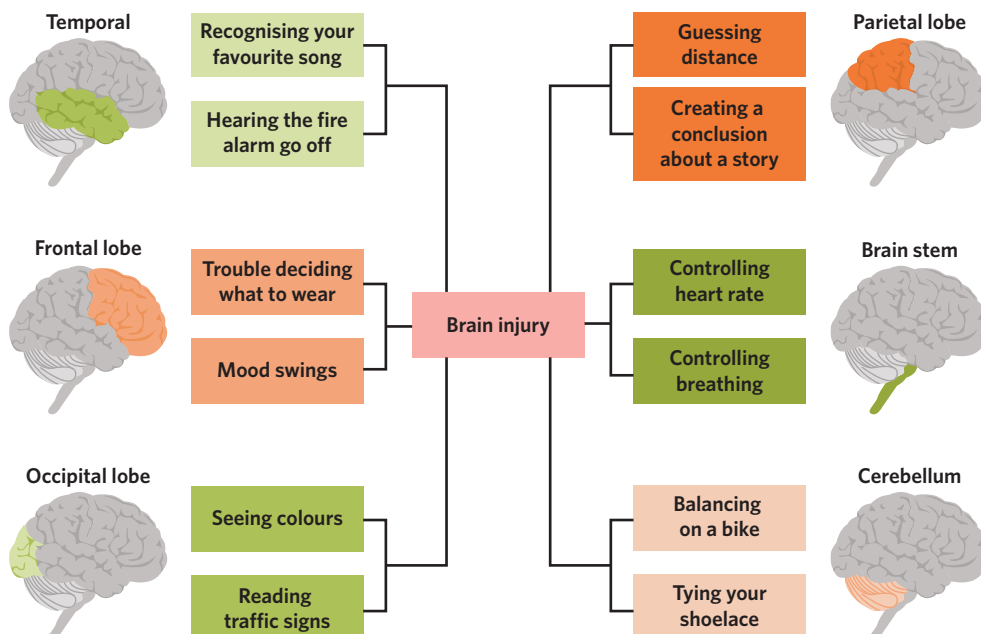
Figure 2 The area of the brain that is damaged influences the impact on functioning

Biological functioning 1.2.4.2.1

Biological functioning can be observed through changes in:

- behaviour
- organ function
- cellular and neuronal function.

Table 2 summarises a few of the ways in which biological functioning can be impacted by an acquired brain injury. Please note that this is not an exhaustive list but merely a few chosen examples.

Table 2 Impact of an acquired brain injury on biological functioning

Impact	Details
Seizures	Seizures can occur as a result of scars left by brain injury that produce a sudden abnormal electrical disturbance in the brain (Englander et al., 2014). These disturbances can occur immediately after a brain injury or even years later.
Movement impairment	Injury to any part of the brain can result in the loss of movement in different areas of the body. This is referred to as 'paralysis' and occurs because the brain is unable to send adequate motor neural messages to the body's skeletal muscles to initiate movement.
Smell (also known as olfaction) impairment	For olfactory function to occur, a non-obstructed nasal airway and unharmed neuronal pathways are needed (Howell et al., 2018). Therefore, any damage to neuronal pathways involved in the olfactory system leads to smell impairment. Impairments may include: • temporary loss of smell • permanent loss of smell • loss of some smells • increased sensitivity to certain smells.

Psychological functioning 1.2.4.2.2

Psychological functioning can be observed through changes in:

- cognition
- behaviour
- emotion.

Table 3 summarises a few of the ways in which psychological functioning can be impacted by an acquired brain injury. Please note that this is not an exhaustive list but merely a few chosen examples.

Table 3 Impact of an acquired brain injury on psychological functioning

Impact	Details
Memory loss	Memory is largely controlled by brain areas, such as the hippocampus. Therefore, if these brain areas are damaged, impairments in memory can occur. Such impairments may include: • short-term memory loss • long-term memory loss • complete amnesia.
Personality changes	Following a brain injury, alterations in an individual's emotional and behavioural regulation can occur, producing personality changes (McAllister, 2022). Such changes may include: • impulsivity • irritability • emotional instability.
Increased susceptibility to mental health disorders	Mental health disorders can be a result of dysfunction in certain areas of the brain. Therefore, brain injury can induce or exacerbate mental health disorders (Stein et al., 2019). Such disorders may include: • mood disorders • anxiety disorders • substance abuse.

War veterans experience a lot of psychological strain due to prolonged work periods, disrupted sleep schedules, and separation from family and friends. However, in recent times, greater emphasis has been put on the psychological impact that war veterans face due to traumatic brain injuries that they sustain from war.

Traumatic brain injuries are commonly referred to as the 'signature wound' as they are highly prevalent in a war environment. It is estimated that 17% of veterans, from the Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) campaigns, sustained a traumatic brain injury. Impacts that such veterans faced included:

- headaches (58%)
- memory problems (48%)
- sleep disturbance (44%)
- irritability (40%)
- balance problems or dizziness (29%)
- light sensitivity (29%).

A study by Mac Donald et al., (2017) found that soldiers who had sustained a traumatic brain injury showed greater global disability and more severe depression, post-traumatic stress disorder (PTSD) symptoms, and neurobehavioral impairment in comparison to non-traumatic brain injury, blast-exposed participants and the control group. The traumatic brain injury patients also reported significantly poorer satisfaction with life and sleep, as well as neurobehavioral and psychiatric symptoms including PTSD and depression.

(Dieter & Engel, 2019)

Social functioning 1.2.4.2.3

Social functioning can be observed through changes in:

- relationships
- interactions with the environment
- interpersonal skills.

Table 4 summarises a few of the ways in which social functioning can be impacted by an acquired brain injury. Please note that this is not an exhaustive list but merely a few chosen examples.

Table 4 Impact of an acquired brain injury on social functioning

Impact	Details
Job productivity	Having a mild traumatic brain injury has shown to result in increased unemployment rates, work limitations, and productivity loss in the long-term (Theadom et al., 2017). Impacts on job productivity can include: - reduced concentration - reduced physical mobility - increased fatigue.
Social support	Changes in social relationships following an acquired brain injury can affect a person's social functioning, which might result in them withdrawing from social gatherings or having difficulty maintaining healthy social relationships, which in turn could affect their mental health. In contrast, an individual may receive more social support during their rehabilitation in the form of visits or regular check ins.
Antisocial behaviour	Following a brain injury, individuals may demonstrate lower levels of self-esteem which may increase levels of loneliness and a tendency to engage in aggressive and/or antisocial behaviour (Tomaszewski et al., 2014).

Theory summary

In this lesson, you learnt about acquired brain injuries and the two types: traumatic and non-traumatic. You also learnt about their impact on biological, psychological, and social functioning.
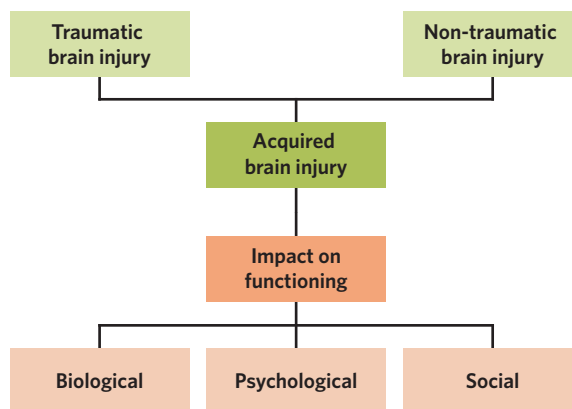
Figure 3 Summary of lesson 5B

5B Questions

Theory review

Question 1

An impact of injury to the brain on biological functioning includes

A. changes to personality.

B. mood changes.

C. loss of motor movement.

Question 2

There are two types of acquired brain injury: external and internal.

A. True.

B. False.

Question 3

Which of the following would be classified as a traumatic brain injury? **(Select all that apply)**

I. Assault.

II. Stroke.

III. Alcohol abuse.

IV. Sports injuries.

Question 4

The effects of brain injury and recovery needed afterwards are not the same for everyone.

A. True.

B. False.

Question 5

The impact of an acquired brain injury on functioning is determined by

A. the brain area that was damaged.

B. the type of brain injury acquired.

C. the frequency of brain injury acquired.

D. the duration of brain injury.

Assessment skills

Perfect your phrasing

Question 6

Which of the following sentences is the most correct?

A. An acquired brain injury refers to all types of brain injuries that occur **after** birth.

B. An acquired brain injury refers to all types of brain injuries that occur **before** birth.

Question 7

Which of the following sentences is the most correct?

A. Non-traumatic brain injury involves damage to the brain caused by **external** factors.

B. Non-traumatic brain injury involves damage to the brain caused by **internal** factors.

Text analysis

The following assessment skills type reflects the study design assessment dot point:

- analysis and evaluation of an experiment or case study

Use the following information to answer questions 8–11.

> Catherine was 20 years old when she was in a work-related motor vehicle accident. She suffered a traumatic brain injury that left her in a wheelchair, with communication and cognitive difficulties.
>
> Following her accident, her marriage broke down and she had to move back in with her mother. Although she desired to move out and live independently, she feared the reaction of her close-knit, protective family.
>
> Through the help of Synapse's Advocacy Team, Catherine and her family were supported through a slow build-up of trialled independent living. Despite numerous obstacles throughout this period, such as the COVID-19 restrictions and disagreements between support staff and Catherine's family, Catherine navigated these challenges.
>
> (Synapse, n.d.)

Question 8

How may have doctors concluded that Catherine's brain injury was a traumatic brain injury?

A. Because it was caused by the internal force of a motor vehicle accident.

B. Because it occurred after birth.

C. Because it was caused by the external force of a motor vehicle accident.

D. Because it occurred before birth.

Question 9

What was an impact on Catherine's biological functioning due to her brain injury?

A. Communication difficulties.

B. Cognitive difficulties.

C. Loss of movement.

D. Broken marriage.

Question 10

How was Catherine's social functioning affected by her brain injury?

A. Her relationship with her family became stronger as a result.

B. She had to use a wheelchair

C. Her marriage broke down.

D. She couldn't make good decisions about her life.

Question 11

Which of the following is **not** a possible impact on Catherine's psychological functioning following her brain injury?

A. Catherine may have experienced memory loss immediately after her brain injury.

B. Catherine may have become less susceptible to mental health disorders.

C. Catherine's personality may have changed.

D. Catherine may have experienced memory loss weeks after her brain injury.

Exam-style

Remember and understand

Question 12   (1 MARK)

An impact of injury to the brain on a person's biological functioning could be

A. engaging in aggressive behaviour.

B. experiencing anxiety disorders.

C. having memory loss.

D. having paralysis.

Question 13   (1 MARK)

What is an example of the impact of injury to the brain on a person's psychological functioning?

A. Having difficulty maintaining relationships with friends and family.

B. Becoming antisocial.

C. Becoming impulsive.

D. Having difficulty performing fine motor skills.

Question 14   (4 MARKS)

Using examples, explain the difference between traumatic and non-traumatic brain injury.

Apply and analyse

Question 15   (2 MARKS)

Nikitha is a year 12 student whose mother has recently experienced a stroke. While her mother was recovering in hospital, Nikitha was hit in the head by a basketball and was unconscious for a while. Upon regaining consciousness, she was told that she has to stay in the hospital as she has a brain injury just like her mother.

Describe a similarity and difference between Nikitha's and her mother's brain injuries.

Evaluate

Question 16 (4 MARKS)

Minori and Samari are identical twins who have acquired the same brain injury – they hit their heads during a BMX bike crash. After their accidents, there were some differences in how Minori and Samari reacted and recovered. Minori had suffered immediate memory loss and had sustained a physical impairment, in which she could no longer stand up for extended periods of time. Samari, on the other hand, appeared to recover well but, over time, she became more aggressive and moody. Samari also couldn't concentrate on tasks for extended periods of time, but this was only temporary.

Using examples from the scenario above, justify why doctors would have to consider Minori's and Samari's brain injuries individually.

Questions from multiple lessons

Question 17 (1 MARK)

Which of the following options correctly identifies an impact of injury to the brain on a person's social functioning and the lobe of the brain responsible for this function?

	Impact on social functioning	Brain lobe
A.	Disruptions to relationships due to mood fluctuations	Frontal
B.	Paralysis	Parietal
C.	Changes to personality	Occipital
D.	Difficulty accessing long-term memories	Temporal

Question 18 (1 MARK)

Sheila suffers a head injury that causes damage to the association area of her left occipital lobe. It is most likely that Sheila is

A. blind in her left visual field.

B. blind in her right visual field.

C. unable to recognise objects by sight in her left visual field.

D. unable to recognise objects by sight in her right visual field.

Adapted from VCAA Psychology exam 2013 Q63

Question 19 (2 MARKS)

Jona experienced brain damage as a result of an accident. The doctor concluded that Jona was suffering from damage to Broca's area. Describe two symptoms that the doctor may have found that led her to this conclusion.

Adapted from VCAA Psychology exam 2013 Q1

5C Research on neurological disorders

5A	5B	5C	5D

1.2.5.1
Neurological disorders

1.2.5.2
Contemporary research on neurological disorders

1.2.5.2.1 Machine learning

1.2.5.2.2 Gut-brain axis
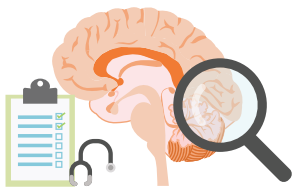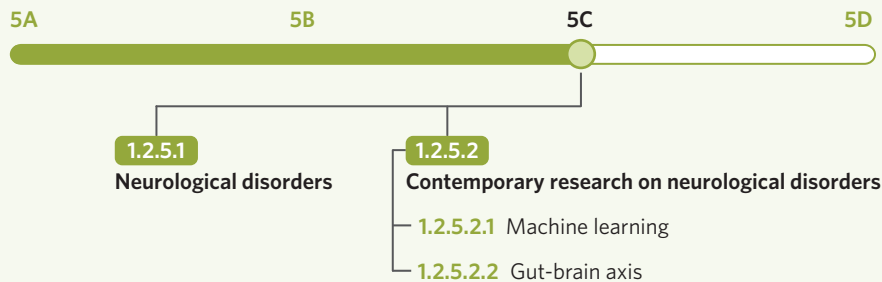
In modern psychology, understanding neurological disorders is a goal that has been difficult for researchers to achieve. Not only is the brain unique and highly complex, but our ever-changing environment means variables that potentially influence these disorders are also fleeting and dynamic. Despite this, emerging contemporary research continues to uncover new ways of understanding neurological disorders. In this lesson, you will learn about how contemporary research has contributed to our understanding of neurological disorders.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

Neurological disorders 1.2.5.1

The term 'neurological disorder' encompasses many different conditions that may affect an individual's brain and nervous system functioning. Two of the most well-known neurological disorders are Parkinson's disease and epilepsy.

Theory details

KEY TERMS

Neurological disorders diseases characterised by any damage to or malfunctioning of the nervous system

Neurological disorders are diseases characterised by any damage to or malfunctioning of the nervous system. In essence, this encapsulates any change to neural functioning that impairs the ability of a person's nervous system to function effectively. There can be many reasons why a person might experience a neurological disorder, such as through an acquired brain injury that affects functioning, exposure to toxins, genetics, or lifestyle factors.

In this lesson, we will focus on contemporary research regarding two neurological disorders, which are:

- Parkinson's disease
- epilepsy.

LESSON LINK

In **Units 3 & 4 Psychology,** you will learn more about the different components of the nervous system in the body. Most neurological disorders impact the central nervous system, which is comprised of the brain and the spinal cord.

Table 1 summarises the key aspects of Parkinson's disease and epilepsy.

Table 1 Parkinson's disease and epilepsy

	Parkinson's disease	Epilepsy
What is it?	• **Parkinson's disease** is a progressive disease of the nervous system characterised by both motor and non-motor symptoms. • Parkinson's disease is a **neurodegenerative disease**, which is a disease characterised by the progressive loss of neurons in the brain. • Neurodegeneration occurs in the part of the brain that produces **dopamine**, which is a neurotransmitter (brain chemical) that is responsible for the coordination of voluntary movement and the experience of pleasure and pain. Therefore reduced levels of dopamine in the brain lead to the symptoms that are typically associated with the condition.	• **Epilepsy** is a neurological disorder that is associated with abnormal electrical activity in the brain and is categorised by recurrent seizures. • **Seizures** are brief episodes of uncontrolled and unrestricted electrical discharging of neurons in the brain. • There are specific mechanisms that lead to the development of epilepsy. Epileptogenesis is a process during which structural and functional changes occur in the brain that create an environment that is 'supportive' for seizures to occur (Scharfman, 2007).
What are its symptoms?	• Tremors • Reduced motor control • Muscle stiffness • Problems with cognition • Fatigue • Depression and anxiety	• Recurrent and unprovoked seizures, which include: – Involuntary shaking – Loss of consciousness – Loss of awareness – An aura (sensory disturbance)

Contemporary research on neurological disorders 1.2.5.2

The nervous system is a highly complex part of the human body. Despite significant developments in the literature surrounding the nervous system and neurological disorders, contemporary and emerging research continues to strengthen our understanding of these topics.

Theory details

Conditions, such as Parkinson's and epilepsy, have been documented and studied throughout history. Epilepsy was originally considered to be the manifestation of a spirit possessing someone's body (Scharfman, 2007) whilst Parkinson's disease was classified by its symptoms, with little understanding of the mechanisms that caused its development (Goetz, 2011). These findings were likely perceived as accurate and revolutionary at the time they were established. This is why contemporary research continues to focus on topics that are seemingly already well understood. By continuing to pose questions and challenge theories, researchers are not only considering the effects of societal changes, but are also aiming to ensure that the knowledge we have is the most accurate that it can be.

Beyond this, contemporary research allows for the discovery of new treatments for a range of health conditions, including neurological disorders. These new treatments may be more effective, less invasive, or more accessible than past treatments, even though these past treatments were previously deemed adequate.

However, it is important to view most contemporary research through a critically analytical lens, as it has not yet undergone as rigorous scrutiny as research that has been around for a long time. In particular, one of the safeguards against the spread of misinformation in the medical community is the replication of studies (a different researcher conducting the same study to test its reproducibility). Often in contemporary research, such measures have not yet been fully utilised as the research has not been around for a substantial period of time. Therefore contemporary research may not always result in a definitive conclusion about a condition or treatment, but still plays an important role in building understanding and guiding future research.

Parkinson's disease a progressive disease of the nervous system characterised by both motor and non-motor symptoms

Neurodegenerative diseases a disease characterised by the progressive loss of neurons in the brain

Dopamine a neurotransmitter that is responsible for the coordination of voluntary movement and the experience of pleasure and pain

Epilepsy a neurological disorder that is associated with abnormal electrical activity in the brain and is categorised by recurrent seizures

Seizures brief episodes of uncontrolled and unrestricted electrical discharging of neurons in the brain

LESSON LINK

In lesson **1A Introduction to research,** you learnt about the scientific method. This refers to a procedure used to obtain knowledge that involves hypothesis formulation, testing, and retesting through processes of experimentation, observation, measurement, and recording. Contemporary research, such as that discussed in this lesson, relies heavily on the scientific method to ensure that meaningful conclusions can be made.

Machine learning
an element of artificial intelligence that allows software to become more accurate at predicting outcomes by mimicking the way that humans learn

In this section of the lesson, we will learn about how contemporary research has provided us with a greater understanding of and new treatments for neurological disorders. Specifically, we will explore contemporary research surrounding:

- machine learning
- the gut-brain axis.

Machine learning 1.2.5.2.1

Technological developments have allowed researchers to utilise new methods when studying neurological disorders. One of these methods is the use of **machine learning**, which is an element of artificial intelligence that allows software to become more accurate at predicting outcomes by mimicking the way that humans learn (IBM, 2020). Machine learning utilises statistics to create algorithms that can accurately classify information and make predictions.

Machine learning processes are often broken into two categories (Abbasi & Goldenholz, 2019), which are outlined in table 2.

Table 2 Supervised and unsupervised learning

Type of machine learning	What it involves	How it is utilised in terms of neurological disorders
Supervised learning	This process involves the use of labelled data to train algorithms on how to classify data or predict outcomes. For example, by presenting an algorithm with hundreds of images of typical brains and Parkinson's affected brains, labelled as such, it will eventually be able to detect the difference between the two without any human input or labelling.	Supervised learning is most often used as a way to diagnose neurological disorders in a more efficient and accurate way. This can also include the detection of which stage of a disorder an individual is in. Specifically, in progressive diseases, such as Parkinson's disease, or during the process of epileptogenesis.
Unsupervised learning	This process involves using an algorithm to identify patterns or trends within data (that are not labelled) that have not yet been discovered. For example, unsupervised machine learning may be used to analyse the demographic data of epilepsy patients to uncover trends as to which groups of people are most susceptible to the disorder.	Unsupervised learning is often used to analyse the demographics of individuals with neurological disorders or to identify biological markers that may have been previously overlooked.

PSYCHOLOGY EXPLORATION

A recent meta-analysis (Mei et al., 2021), which is a comprehensive review of many studies, explored the accuracy of machine learning in diagnosing Parkinson's disease.

The study found that the use of machine learning in analysing:

- voice recordings had an average accuracy of 90.9%
- movement data had an average accuracy of 89.1%
- MRI data had an average accuracy of 87.5%
- handwriting had an average accuracy of 87%
- more than one data type had an average accuracy of 92.6%.

In comparison, a meta-analysis that explored the accuracy of traditional clinical diagnoses of Parkinson's disease (Rizzo, et al. 2016) found that the average accuracy ranged from 73.8%–83.9%.

Gut-brain axis 1.2.5.2.2

The **gut** refers to the long flexible tube from mouth to anus that is the passageway involved in digestion. The gut is responsible for processing food, absorbing nutrients, and excreting waste (Hornbuckle et al., 2008). The gut-brain axis is a relatively new and emerging area of research. It involves looking at the connection between the gut and the brain, and how they may interact and influence each other.

Specifically, the **gut-brain axis** refers to the bidirectional connection between the gut and the brain through multiple parts of the nervous system, which is depicted in figure 1. Simply, this means that the gut and the brain are able to communicate and influence one another via complex mechanisms. The brain influences gut functioning based on psychological and physical stressors, whereas the gut may cause neurochemical and behavioural changes in the brain.

Gut the long flexible tube from mouth to anus that is the passageway involved in digestion

Gut-brain axis the bidirectional connection between the gut and the brain through multiple parts of the nervous system

Gut microbiota all of the microorganisms that live in the gut
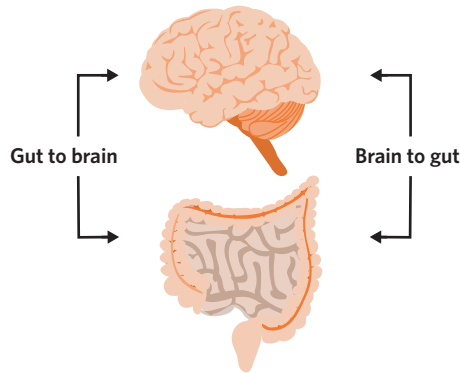
Figure 1 The bidirectional relationship between the gut and the brain

One way that this can happen is due to the influence of an individual's **gut microbiota**, which refers to all of the microorganisms that live in the gut. Research has found that imbalanced gut microbiota has the potential to lead to central nervous system disease progression, such as the progression of neurological disorders (Ma et al., 2019). There has, more recently, also been specific research undertaken on the relationship between the gut and Parkinson's disease and epilepsy. Some key findings of these studies are outlined in table 3.

Table 3 Contemporary research on the gut-brain axis in relation to Parkinson's and epilepsy

Parkinson's	Epilepsy
• Studies suggest that Parkinson's may begin in the gut and then move to the brain. One of the first symptoms displayed by mice is constipation and reduced digestive function. • Constipation occurs in 50% of patients and is a risk factor for developing Parkinson's disease. It is often the first symptom to occur in the development of the disease (Grochowska, et al. 2019). This discovery may help lead to earlier detection and prevention of disease progression. • Research shows that individuals with Parkinson's disease have decreased levels of specific gut bacteria that are associated with the prevention of neurodegeneration (Grochowska, et al. 2019). • Research also suggests that Parkinson's patients have a higher exposure to gut microbiota, resulting from their impaired intestinal functioning. This may lead to the activation of mechanisms that contribute to the neurodegeneration associated with Parkinson's disease (Grochowska, et al. 2019).	• Some studies have demonstrated that the provision of probiotics to epilepsy patients was associated with a 50% decrease in seizure frequency (Gomez-Eguilaz, et al. 2018). • Studies suggest that the gut microbiota of patients with drug-resistant and non-drug resistant epilepsy differ, and that providing the former with antibiotics (which alter gut bacteria) can significantly reduce seizure frequency. This suggests that gut microbiota has a profound impact on the severity of epilepsy symptoms (Dahlin & Prast-Nielsen, 2019). • Research has also found that the gut microbiota of individuals with epilepsy is distinctly different from those without epilepsy (Safak, et al. 2020).

In addition to contributing to our understanding of the relationship between the gut-brain axis and neurological disorders, contemporary research on this topic also provides new insights into the treatments of such disorders. Some of these are outlined in table 4.

Table 4 Treatments for Parkinson's and epilepsy that are associated with the gut-brain axis

Parkinson's	Epilepsy
Faecal microbiota transplantation (FMT) is an intervention that involves the administration of faecal matter from a healthy donor into the intestinal tract of a recipient. Studies on mice showed that when given an FMT transplant from a Parkinson's patient, mice displayed more motor symptoms associated with Parkinson's disease compared to mice who received an FMT transplant from a control patient's faeces. In addition, a similar study on mice found that mice with Parkinson's who received an FMT from a healthy mouse experienced improved motor functioning and decreased inflammation in the brain. FMT in Parkinson's patients may also lead to the increased efficacy of traditional medications (Vendrik, et al. 2020).	The ketogenic diet is used as a treatment for epilepsy in children. The diet is high in protein and fat and contains little to no carbohydrates. The ketogenic diet induces a state of ketosis in the body, during which the way in which the body metabolises food changes. This change in functioning may contribute to a decrease in the uncontrolled electrical discharging of neurons that is associated with epileptic seizures (Dahlin & Prast-Nielsen, 2019). Newer research presents the prospect that probiotic and antibiotic treatments for epilepsy may be as beneficial as traditional drug treatments. However, many of these studies have compromised study designs and therefore, further research is needed (Chatzikonstantinou, et al. 2020).

These contemporary studies rely on innovative research tools such as:

- Neuroimaging techniques, which you learnt about in the previous chapter
- Brain and body dissections
- Animal studies
- Data analysis software
- New and innovative research procedures.

Because machine learning and the gut-brain axis are both areas of contemporary research, it is important to understand that they are constantly evolving and improving, which means it is difficult to make definitive statements and draw conclusions. The nature of psychological research means that in the future, we will likely uncover new findings in these areas as our knowledge continues to grow.

Theory summary

In this lesson, you learnt about neurological disorders. Specifically, you learnt about Parkinson's disease and epilepsy. You also learnt about the importance of contemporary research. In terms of Parkinson's disease and epilepsy, you learnt about contemporary research regarding the use of machine learning and the consideration of the gut-brain axis. A summary of this lesson is outlined in figure 2.
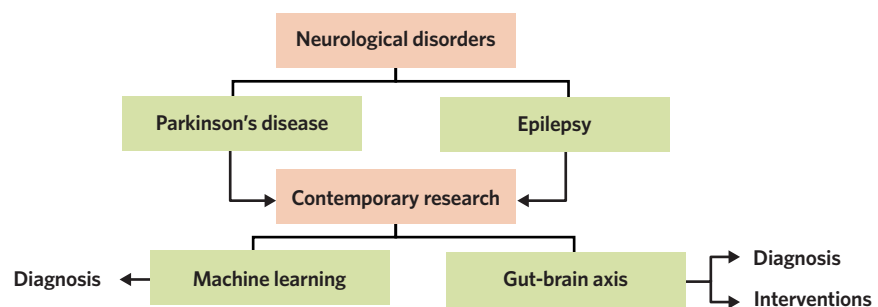
Figure 2 Summary of neurological disorders and the corresponding contemporary research

5C Questions

Theory review

Question 1

Neurological disorders

A. are brain disorders.

B. are a direct result of lifestyle factors.

C. impair nervous system functioning.

Question 2

Parkinson's disease is a disorder that is associated with

A. the nervous system.

B. young children.

C. the excessive discharging of neurons.

Question 3

In psychological research, once an experiment has been conducted and a conclusion has been drawn, the conclusions often remain unchanged.

A. True.

B. False.

Question 4

Machine learning is an effective treatment method for neurological disorders.

A. True.

B. False.

Question 5

Which of the following is **not** an example of a finding from contemporary research on the gut-brain axis?

A. Parkinson's disease may begin in the gut.

B. Individuals with epilepsy have a different gut microbiota to those who do not.

C. Providing epileptic patients with probiotics completely eradicated the occurrence of seizures.

Question 6

_____ research assists in providing new approaches to and a greater understanding of neurological disorders.

Which of the following best fits in the blank?

A. Contemporary

B. Traditional

Question 7

The diagnosis of neurological conditions has been improved through contemporary research.

A. True.

B. False.

Assessment skills

Data analysis

The following assessment skills type reflects the study design assessment type:

- a data analysis of generated primary and/or collated secondary data

Use the following information to answer questions 8–12.

Park and colleagues (2005) conducted a study in which 7,504 men were monitored over 30 years, in regards to their milk consumption and whether they developed Parkinson's disease. The results of the study are graphed below.

Rates of Parkinons's in terms of the average amount of daily milk consumption
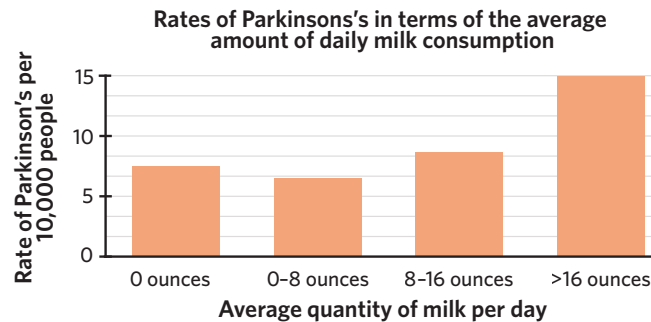
Question 8

The data for the '>16 ounces' group suggests that

A. in the sample of 10,000 people, almost 15% developed Parkinson's disease.

B. approximately 15 people in this group developed Parkinson's disease.

C. it is estimated that approximately 150,000 people in the population who consume over 16 ounces of milk daily will develop Parkinson's disease.

D. when the results were adjusted, the rate of Parkinson's in this group was approximately 15 per 10,000 people.

Question 9

The average quantity of milk consumed per day was consistently associated with an increase in the rate of Parkinson's disease.

A. True.

B. False.

Question 10

Comparing the '0 ounces' and '>16 ounces' groups demonstrates that

A. the rate of Parkinson's in the '>16 ounces' group is approximately double that of the '0 ounces' group.

B. drinking milk causes Parkinson's to develop.

C. people who have Parkinson's are more likely to drink milk.

D. there were more people in the study who drank more than 16 ounces of milk than people who drank no milk.

Question 11

This study supports which of the following concepts?

A. The development of Parkinson's is solely dependent on diet.

B. The gut-brain axis, in relation to how microbiome in the gut (which is influenced by diet) can influence the progression of neurological disorders.

C. Cow's milk is harmful to humans.

Question 12

Using only men in the sample of this study means that

A. The results cannot be generalised to the wider population.

B. The study is not valid.

C. The study is not reliable.

Remember and understand

Question 13 (1 MARK)

Dopamine deficiency in Parkinson's disease can be attributed to

A. excessive functioning of the substantia nigra.

B. uncontrolled and unrestricted electrical discharging of neurons.

C. issues in motor functioning.

D. a loss of dopamine-producing neurons.

Question 14 (1 MARK)

What type of changes occur during epileptogenesis?

A. Structural.

B. Functional.

C. Physiological.

D. All of the above.

Question 15 (1 MARK)

Which of the following is **not** true regarding machine learning?

A. Supervised machine learning involves using unlabelled data.

B. Machine learning mimics the way that humans learn.

C. It uses algorithms to classify information and make predictions.

D. It is an element of artificial intelligence.

Question 16 (1 MARK)

Research on the gut-brain axis suggests that

A. The gut and the brain have a unidirectional method of communication.

B. An imbalance in gut microbiota may lead to the progression of neurological disorders.

C. The brain can influence gut functioning based on neurochemical and behavioural changes.

D. Neurological disorders, such as Parkinson's and epilepsy, are directly caused by an imbalance in gut microbiota.

Question 17 (3 MARKS)

Outline what is meant by machine learning and identify one similarity and one difference between supervised and unsupervised learning.

Apply and analyse

Use the following information to answer questions 18–20.

For the last few years, Eric has been experiencing a range of unusual symptoms. He feels mentally fatigued and often struggles with his decision-making and memory. In addition to this, he often finds himself shaking uncontrollably, finds movements difficult, such as walking, and finds that he loses his balance very quickly. These symptoms cause Eric to go and get assessed by a doctor.

Question 18 (1 MARK)

What is the doctor likely to diagnose Eric with?

A. Parkinson's disease.

B. Epileptogenesis.

C. Epilepsy.

D. A non-epileptic seizure.

Question 19 (1 MARK)

According to contemporary research, which of his symptoms was Eric likely to have experienced first?

A. Issues in memory.

B. Uncontrollable shaking.

C. Difficulty with movement.

D. Constipation.

Question 20 (2 MARKS)

In terms of contemporary research, identify and explain one treatment that may be applicable to Eric's condition.

Evaluate

Question 21 (3 MARKS)

Evaluate the usefulness of contemporary research in regard to neurological disorders.

Questions from multiple lessons

Question 22 (1 MARK)

Epileptogenesis is an example of

A. neuroplasticity.

B. the influence of psychological factors on development.

C. neurodegeneration.

D. an acquired brain injury.

5D Chronic traumatic encephalopathy

5A	5B	5C	5D

1.2.6.1
Chronic traumatic encephalopathy
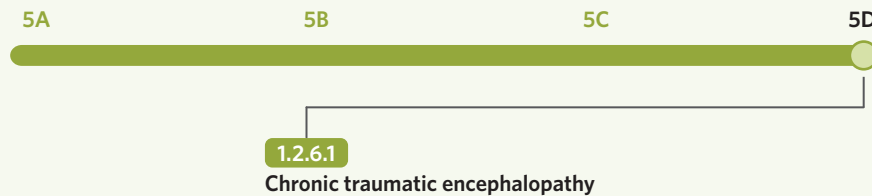
The words 'injuries' and 'concussions' are frequently discussed in association with contact sports. In fact, concussions were the most common sports injury in Australian Rules Football in 2018–19 (Ractliffe et al., 2021). Emerging research indicates that repeated concussions can impair cognitive functioning and contribute to the development of a detrimental brain disease known as chronic traumatic encephalopathy. In this lesson, you will learn about chronic traumatic encephalopathy (CTE) as an example of emerging research into progressive and fatal brain diseases.
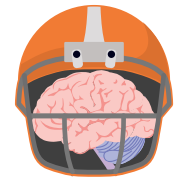
Chronic traumatic encephalopathy 1.2.6.1

Concussions and head injuries are very prevalent issues in contact sports. Over the past eight years, there were 8905 concussions reported from community football in Australia (Ractliffe et al., 2021). Concussions are a pressing concern as emerging research shows that repeated episodes of concussions can contribute to the development of chronic traumatic encephalopathy.

Theory details

Chronic traumatic encephalopathy (CTE) is a progressive and fatal brain disease associated with repeated head injuries and concussions. The development of CTE is typically associated with repeated **concussions,** which are mild traumatic brain injuries that temporarily disrupt brain function, that arise from contact sports (such as boxing or football), combat, head banging, and intimate partner violence. However, research suggests that CTE can also arise from a single severe traumatic brain injury from an incident, such as a motor vehicle accident (Shively et al., 2021).

Despite this, the effects of CTE do not occur immediately following a concussion or head injury. Instead, CTE is considered to be an example of a **neurodegenerative disease,** which is a disease characterised by the progressive loss of neurons in the brain. CTE is a neurodegenerative disease because damage to neurons occurs over time and brain functioning progressively worsens as a result. As the disease worsens, CTE can become fatal as the brain reaches a point of degeneration in which it is difficult to function and sustain life.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

KEY TERMS

Chronic traumatic encephalopathy (CTE) a progressive and fatal brain disease associated with repeated head injuries and concussions

Concussion a mild traumatic brain injury that temporarily disrupts brain function

Neurodegenerative disease a disease characterised by the progressive loss of neurons in the brain

USEFUL TIP

To help understand what chronic traumatic encephalopathy is, it is helpful to break down the term. In a medical sense, the word chronic refers to conditions that are long-lasting. The word traumatic can be used to describe conditions that are associated with body wounds or shock produced by sudden physical injury, such as from an accident or collision. Additionally, the word encephalopathy is a broad term used to describe damage or disease that affects the brain. Therefore, chronic traumatic encephalopathy is a long-lasting brain disease that worsens over time and is associated with repeated, sudden physical injuries that impact the brain, specifically head injuries and concussions.

Symptoms of CTE

Symptoms of CTE typically appear in older, retired athletes, sports players, and war veterans, and usually appear 8 to 10 years after the experience of repetitive concussions (McKee et al., 2013). Symptoms include:

- impairments in executive functions, such as reasoning and decision-making
- memory loss
- depression
- difficulties with attention and concentration
- disturbances in behaviour
- anxiety and paranoia
- mood impairments, such as increased aggression and emotional outbursts.

WANT TO KNOW MORE?

McKee et al. (2013) suggest that there are four stages of CTE, which start with mild symptoms, such as headaches and loss of attention, and then progress to much more severe symptoms. Table 1 outlines the symptoms that characterise each stage of CTE.

Table 1 The four stages of CTE

Stage	Symptoms
Stage I (very mild)	• Headaches • Loss of attention and concentration
Stage II (mild)	• Depression • Mood swings • Short-term memory loss • Irritation, impulsivity, and emotional outbursts
Stage III (moderate)	• Executive dysfunction, such as impairments in decision-making, problem-solving, and forming judgements • Memory loss • Difficulties with attention and concentration • Depression and mood impairments • Visuospatial difficulties
Stage IV (severe)	• Dementia • Profound loss of attention and concentration • Language difficulties • Aggression • Paranoia • Difficulties with walking (gait difficulties) • Visuospatial problems, including difficulties interpreting spatial relationships and navigating movements • Suicidal thoughts

Figure 1 depicts the brain degeneration that occurs across the 4 stages.

stage 1   stage 2   stage 3   stage 4
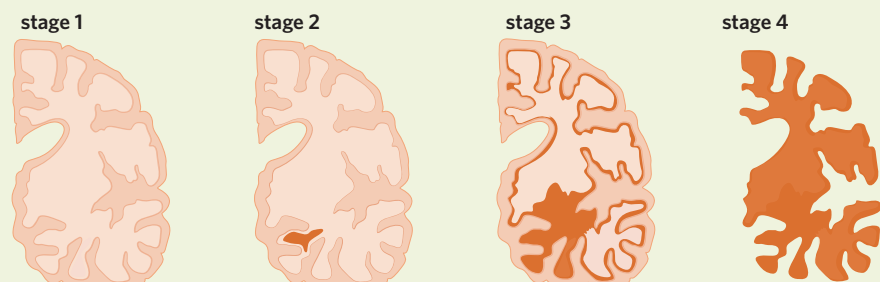
Figure 1 Brain degeneration across the four stages

Diagnosing CTE

Despite the presentation of symptoms, a conclusive diagnosis of CTE can only be made through a post-mortem examination, as brain scans do not have the capacity to detect the brain changes that characterise this disease. A **post-mortem examination** is an assessment of a dead body that occurs to determine the cause of death. From a post-mortem examination, abnormalities in the brain can be detected. In particular, CTE is associated with the widespread build up of a particular protein substance (p-tau) in brain regions, such as the brainstem, hippocampus, and cerebral cortex, particularly the frontal lobe and temporal lobe (Alosco et al., 2019; McKee et al., 2013). This accumulation of the protein tau forms **neurofibrillary tangles**, which are insoluble tangles within neurons, which then inhibit the transportation of essential substances and eventually kill the neuron entirely. Figure 2 shows the difference between a normal brain and a brain with advanced CTE.

accumulation of p-tau,
which forms neurofibrillary tangles

Normal brain ┊ **CTE brain**
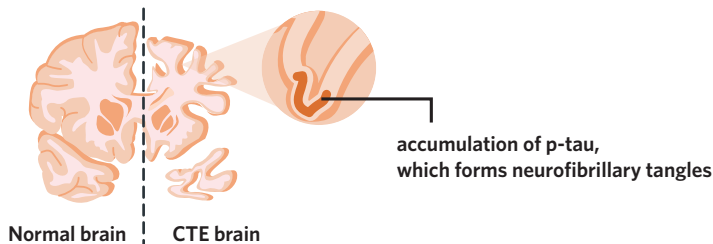
Figure 2 Normal brain in comparison to a brain with advanced CTE

> **LESSON LINK**
>
> In **Units 3 & 4 Psychology**, you will learn about Alzheimer's disease, which is another type of neurodegenerative disease. While Alzheimer's disease and CTE are different diseases, they do share some similarities. Like CTE, Alzheimer's disease leads to cognitive impairments, in particular memory loss and dementia. Additionally, Alzheimer's disease and CTE can only be diagnosed by a post-mortem examination in which neurofibrillary tangles and other abnormalities are detected. However, it is important to understand that CTE is produced by repeated concussions and head injuries, whereas the causes of Alzheimer's disease can vary and remain unknown.

Response to CTE

Currently, there is no cure for CTE. Barr et al. (2020) suggest that education and behavioural therapies have been effective in preventing and treating persistent post-concussion symptoms. Research surrounding CTE has also informed sporting regulations, such as the use of helmets and the implementation of concussion protocols, in order to protect athletes. However, as this is still a relatively new field of research, it is likely that these regulations and the response to concussions will evolve as new research emerges.

> **PSYCHOLOGY EXPLORATION**
>
> Australian Football League (AFL) is a high-contact sport in which players are susceptible to repeated concussions and head injuries. Following research surrounding CTE in retired AFL players, the AFL have implemented measures in order to protect current players from the development of CTE. These include the following:
>
> - On-field concussion assessments by doctors have improved.
> - The AFL has tightened and updated its guidelines regarding the process to be followed for players who have been concussed, which includes a period of rest, symptom-limited activity, gradual increase in physical activity, and medical clearance prior to full-contact training.
> - As of 2021, if a player is medically diagnosed as suffering from a concussion, they are automatically sidelined for 12 days. The AFL is also considering implementing a pre-grand final bye beyond 2021 to ensure that players who may suffer an ill-timed concussion in a preliminary final have enough time to recover and an opportunity to play in a grand final.
> - The AFL released the HeadCheck app in order to help local community clubs, who do not have access to professional doctors, make assessments of players with a concussion and ensure the safety of players.
>
> The AFL's response to CTE is a good example of how emerging psychological research can be applied in real-life settings, and inform regulations and processes.
>
> (Marshall, 2021)

Post-mortem examination an assessment of a dead body that occurs to determine the cause of death

Neurofibrillary tangles an accumulation of the protein tau that forms insoluble tangles within neurons, which then inhibit the transportation of essential substances and eventually kill the neuron entirely

> **LESSON LINK**
>
> In lesson **4C The cerebral cortex**, you learnt about the structures of the cerebral cortex, including the roles of the four lobes (frontal, parietal, temporal, and occipital) in behaviour and mental processes. While brain damage for patients with CTE is widespread, neurofibrillary tangles can be found to accumulate largely in the frontal lobe, which is the region of the brain responsible for complex mental processes and executive functioning. Therefore, as the damage occurs to neurons in this area, these higher-order processes, such as concentration, are impaired. However, it is important to understand that neural degeneration is widespread and affects other areas of the brain which account for other symptoms, such as depression, mood swings, and memory loss.

History of CTE research

CTE is considered to be an area of emerging research as there is still so much that remains unknown about CTE. It has increasingly become the topic of conversation in response to severe sporting injuries and research is continually being conducted to expand our knowledge. Despite this, the first research surrounding CTE dates back to 1928. Figure 3 provides a brief history of CTE from 1928 to now.

1928 — **'Punch drunk syndrome'**
Martland (1928) used the term 'punch drunk syndrome' to describe boxers who showed impaired cognitive functioning and signs of being dazed and disoriented from repeated blows to the head. Studies of diseased brains of boxers found abnormal brain pathology that was diagnosed under the description dementia pugilistica. In the following 75 years, several researchers found similar findings in boxers, however at this point in time, fewer than 50 cases were confirmed.

2005 — **First case in American football**
American football player, Mike Webster, died at 50 years old after experiencing severe memory problems and depression following his retirement from football. A post-mortem examination of his brain revealed a pattern of abnormalities that was quite unusual for his age and had only been seen in the brains of deceased boxers or in older individuals with neurodegenerative diseases, such as Alzheimer's disease (Omalu et al., 2005). Following this case, research on the brains of other deceased football players, athletes, and war veterans commenced.

2008 — **The VA-BU-CLF Brain Bank was established**
The Concussion Legacy Foundation partnered with Boston University and the U.S. Department of Veterans Affairs to establish the VA-BU-CLF Brain Bank. Over 1000 brains were donated to the VA-BU-CLF Brain Bank and an astonishing two-thirds were found to have CTE (The Concussion Legacy Foundation, n.d.). The VA-BU-CLF Brain Bank is continuing to do research into CTE.

2018 — **The Australian Sports Brain Bank (ASBB) was established**
Closer to home, the Australian Sports Brain Bank (ASBB) was established to support the study of CTE in Australia. Research from the ASBB has discovered cases of CTE in AFL and NRL players along with other athletes (Suter et al., 2022).

Current — **Research continues**
Research is constantly evolving and expanding. For example, research is being conducted into cases of CTE among victims of domestic violence and self-harm.

Figure 3 Timeline of CTE research

Theory summary

In this lesson, you learnt about chronic traumatic encephalopathy (CTE) as an example of emerging research into progressive and fatal brain diseases. Specifically, you learnt about the symptoms, diagnosis, and history of CTE research. Table 2 provides a summary of the lesson.

Table 2 Summary of CTE

Key features	Details
What is CTE?	• A progressive and fatal neurodegenerative disease associated with repeated blows to the head and concussions. • Found primarily in athletes who play contact sports, particularly boxers and football players, and war veterans. • Can only be diagnosed in a post-mortem examination.
What symptoms are involved with CTE?	• Loss of attention and concentration. • Depression and anxiety. • Impairments in executive functioning, such as decision-making.
How does CTE present in the brain?	• Widespread build up of p-tau results in neurofibrillary tangles that disrupt neuronal functioning and eventually lead to the death of neurons.

5D Questions

Theory review

Question 1

The effects of CTE occur immediately after a concussion.

A. True.

B. False.

Question 2

CTE is typically associated with _____.

Which of the following best fills in the blank?

A. old age

B. contact sports

Question 3

Which of the following is a symptom of CTE? **(Select all that apply)**

I. Impaired cognitive functioning.

II. Depression.

III. Muscle sprains.

Question 4

Research about CTE is

A. ongoing and continues to emerge.

B. completed and no longer being conducted.

Assessment skills

Perfect your phrasing

Question 5

Which of the following sentences is most correct?

A. Chronic traumatic encephalopathy (CTE) is a **continuous** and **deadly** brain disease associated with repeated blows to the head and concussions.

B. Chronic traumatic encephalopathy (CTE) is a **progressive** and **fatal** brain disease associated with repeated blows to the head and concussions.

Text analysis

The following assessment skills type reflects the study design assessment dot point:

- analysis and evaluation of an experiment or case study

Use the following information to answer questions 6–9.

Shane Tuck was a professional AFL player who played 173 matches for the Richmond Football Club. In 2020, Shane Tuck committed suicide at the age of 38. After his death, his brain was donated to the Australian Sports Brain Bank and he was diagnosed with severe CTE. Neuropathologist, Michael Buckland, commented that it was the youngest and worst case of CTE he's seen so far amongst Australian footballers. He stated that 'once [he] got the tau stains back, it was the first time [he] didn't need a microscope to make the diagnosis because there was so much tau'. Tuck's family revealed that prior to his death, he knew there was something wrong with his brain and that they noticed signs of depression and changes in mood and personality.

(Baum, 2021)

Question 6

CTE can only be diagnosed through a post-mortem examination. Which of the following statements best reflects this?

A. 'After his death, his brain was donated to the Australian Sports Brain Bank and he was diagnosed with severe CTE. '

B. 'Tuck's family revealed that prior to his death, he knew there was something wrong with his brain.'

Question 7

Tuck's family noticed signs of depression and changes in mood and personality. What other symptoms may he have experienced? **(Select all the apply)**

I. Difficulties concentrating.

II. Muscle sprains.

III. Impaired decision-making.

IV. Blindness.

V. Aggression.

Question 8

Neuropathologist Michael Buckland stated that 'once [he] got the tau stains back, it was the first time [he] didn't need a microscope to make the diagnosis because there was so much tau.' This indicates that

A. Shane Tuck's brain had shrunk.

B. there was a widespread build up of p-tau found in his brain.

C. his brain did not have any abnormal brain pathology.

Question 9

Shane Tuck was a professional AFL player. This means that

A. he was definitely going to develop CTE.

B. he suffered from multiple head injuries.

C. he may have been exposed to repeated concussions as a result of playing contact sport.

Exam-style

Remember and understand

Question 10   (1 MARK)

CTE is commonly associated with

A. old people, military veterans, and retired athletes.

B. boxers, football players, and swimmers.

C. football players, military veterans, and boxers.

D. males, young people, and football players.

Question 11   (1 MARK)

Which of the following is **not** true regarding CTE?

A. CTE research was initially conducted on boxers.

B. CTE can be diagnosed at any time.

C. CTE is a neurodegenerative disease.

D. CTE impairs cognitive functioning.

Question 12   (3 MARKS)

Outline what is meant by chronic traumatic encephalopathy (CTE) and identify two associated symptoms.

Apply and analyse

Use the following information to answer questions 13 and 14.

Dr Chim works at the Australian Sports Brain Bank. Dr Chim is analysing the brain of a retired football player who showed symptoms of depression, anxiety, and memory loss prior to his death. Dr Chim diagnosed the football player with CTE following a post-mortem examination.

Question 13   (1 MARK)

Which of the following is true regarding the Australian Sports Brain Bank, as one of the prominent researchers of CTE in Australia?

A.   The Australian Sports Brain Bank conducts research on CTE using donated brains of only boxers.

B.   The Australian Sports Brain Bank conducts research on living football players.

C.   The Australian Sports Brain Bank conducts research on CTE using donated brains of Australian athletes.

D.   The Australian Sports Brain Bank is the only institution conducting research on CTE.

Question 14   (1 MARK)

Dr Chim's post-mortem examination of the football player's brain likely revealed

A.   neural degeneration in every brain region.

B.   p-tau neurofibrillary tangles in the cerebral cortex.

C.   a widespread build up of p-tau neurofibrillary tangles across multiple brain regions.

D.   no neural damage or degeneration.

Question 15   (4 MARKS)

Desmond is a war veteran. During his time as a soldier, he was involved in combat and attacks. Desmond's wife, Marli, has begun to notice changes in his behaviour, such as erratic decision-making, impulsivity, and mood changes. After researching online, Marli believes that Desmond may be suffering from CTE.

a.   Why might Marli believe that Desmond is suffering from CTE?   (2 MARKS)

b.   Can Desmond be diagnosed with CTE? Justify your answer.   (2 MARKS)

Evaluate

Question 16   (10 MARKS)

> **Longitudinal trajectory of depression symptom severity and the influence of concussion history and physical function over a 19-year period among former National Football League (NFL) players: An NFL-LONG Study (Abstract)**
>
> Objective: This study investigated the longitudinal course of depressive symptom severity over 19 years in former American football players and the influence of concussion history, contact sport participation, and physical function on observed trajectories.
>
> Methods: Former American football players completed a general health questionnaire involving demographic information, medical/psychiatric history, concussion/football history and validated measures of depression and physical function at three time points (2001, 2010, and 2019).
>
> Results: Among the 333 participants (mean age (SD), 48.95 (9.37) at enrolment), there was a statistically significant, but small increase in depressive symptom severity from 2001 to 2019. Those with greater concussion history endorsed greater overall depressive symptom severity. Concussion history and years of participation were not associated with the rate of change over 19 years. Greater decline in physical function was predictive of a faster growth rate (ie, steeper increase) of depression symptom endorsement over time.
>
> Conclusions: Concussion history, not years of participation, was associated with greater depressive symptom severity. Neither factor was predictive of changes over a 19-year period. Decline in physical function was a significant predictor of a steeper trajectory of increased depressive symptoms, independent of concussion effects. This represents one viable target for preventative intervention to mitigate long-term neuropsychiatric difficulties associated with concussion across subsequent decades of life.
>
> (Brett et al., 2022)

a. Is the sample of American football players appropriate for investigating the impact of concussions? Justify your answer. (2 MARKS)

b. Outline what is meant by a longitudinal study and evaluate the appropriateness of this type of investigation for this study. (4 MARKS)

c. Can you make a conclusion about CTE from the results of this study? Justify your response. (2 MARKS)

d. How might the results of this study contribute to our understanding of CTE? (2 MARKS)

Questions from multiple lessons

Question 17   (3 MARKS)

The symptoms of acquired brain injuries differ depending on the part of the brain affected.

a. Identify the four lobes of the cerebral cortex (1 MARK)

b. Research shows an abnormal distribution of p-tau in the frontal lobe in brains with CTE. With reference to the prefrontal cortex, outline how the presence of p-tau may affect functioning. (2 MARKS)

Chapter 5 review

Chapter summary

This chapter was all about brain plasticity and brain injury. You learnt about the different types of neuroplasticity and brain injuries as well as emerging research on neurological disorders, with a specific focus on chronic traumatic encephalopathy (CTE).

In lesson **5A Neuroplasticity**, you learnt about the capacity of the brain to change. In particular, you learnt about:

- neuroplasticity, including
  - brain changes in response to experience through developmental plasticity
  - brain changes in response to trauma through adaptive plasticity.
- ways to maintain brain functioning.

In lesson **5B Acquired brain injuries**, you learnt about the impact of an acquired brain injury. In particular, you learnt about:

- the impact of acquired brain injury on functioning, including
  - biological functioning
  - psychological functioning
  - social functioning.

In lesson **5C Research on neurological disorders**, you learnt about the contribution of contemporary research to the understanding of neurological disorders. In particular, you learnt about:

- neurological disorders, including
  - Parkinson's disease
  - epilepsy.
- contemporary research on neurological disorders, including
  - machine learning
  - gut-brain axis.

In lesson **5D Chronic traumatic encephalopathy**, you learnt about chronic traumatic encephalopathy (CTE) as an example of emerging research into progressive and fatal brain disease.

5A

```
                              ┌──────────┐
                              │ Neurons  │
                              └────┬─────┘
                                   │
                                   ▼
                          ┌─────────────────┐
                          │ Neuroplasticity │
                          └────────┬────────┘
            ┌──────────────────────┼────────────────────┬──────────────────┐
   ┌────────────────┐                           ┌──────────────┐  ┌─────────────────────┐
   │  Developmental │                           │   Adaptive   │  │  Ways to maintain   │
   │   plasticity   │                           │  plasticity  │  │  brain functioning  │
   └───────┬────────┘                           └──────┬───────┘  └─────────────────────┘
     ┌─────┼──────┐                              ┌──────┼───────┐
┌──────────┐ ┌──────────┐ ┌────────────┐  ┌──────────┐ ┌──────────┐ ┌─────────────┐
│Synapto-  │ │ Synaptic │ │ Myelination│  │ Sprouting│ │ Rerouting│ │ Brain trauma│
│genesis   │ │ pruning  │ │            │  │          │ │          │ │             │
└──────────┘ └──────────┘ └────────────┘  └──────────┘ └──────────┘ └─────────────┘
```

5B

```
                          ┌──────────────┐
                          │  Acquired    │
                          │ brain injury │
                          └──────┬───────┘
            ┌──────────────────────┼────────────────────┐
   ┌────────────────┐    ┌────────────────┐    ┌──────────────┐
   │   Traumatic    │    │ Non-traumatic  │    │    Impact    │
   │  brain injury  │    │  brain injury  │    │              │
   └────────────────┘    └────────────────┘    └──────┬───────┘
                                          ┌───────────┼───────────┐
                                   ┌──────────┐ ┌──────────────┐ ┌──────────┐
                                   │Biological│ │Psychological │ │  Social  │
                                   │functioning││ functioning  │ │functioning│
                                   └──────────┘ └──────────────┘ └──────────┘
```

5C

```
                          ┌──────────────┐
                          │ Neurological │
                          │  disorders   │
                          └──────┬───────┘
            ┌──────────────────────┼────────────────────┐
   ┌────────────────┐    ┌────────────────┐    ┌──────────────┐
   │    Epilepsy    │    │  Parkinson's   │    │ Contemporary │
   │                │    │    disease     │    │   research   │
   └───────┬────────┘    └────────────────┘    └──────┬───────┘
           │                                   ┌───────┼───────┐
can occur after...                      ┌──────────┐      ┌──────────┐
   ┌────────────────┐                    │ Machine  │      │Gut-brain │
   │   Seizures     │                    │ learning │      │   axis   │
   └────────────────┘                    └──────────┘      └──────────┘
```

5D

```
                          ┌──────────────────────┐
                          │ Chronic traumatic    │
                          │   encephalopathy     │
                          └──────────────────────┘
```

Chapter review activities

Review activity 1: Summary table

There is a lot to remember in this chapter about the ways in which the brain can be damaged, as well as research on brain conditions. Copy out and use this table to revise and summarise the concepts of the chapter, including what happens and how this happens within each of the concepts. The first example has been filled in for you.

What?	Main ideas	Specific details
Developmental plasticity	• Your brain changes in response to ageing and maturation	• Synaptogenesis – the formation of synapses • Synaptic pruning – the elimination of underused synapses • Myelination – the formation and development of myelin
Adaptive plasticity		
Acquired brain injury		
Parkinson's disease		
Epilepsy		
Machine learning		
Gut-brain axis		
Chronic traumatic encephalopathy (CTE)		

Review activity 2: Watch a video and answer questions

Type the URL ted.com/talks into your browser and search for 'Chris Nowinski'. Watch the 11-minute and 11-second video called 'Can I have your brain? The quest for truth on concussions and CTE' (Nowinski, 2018) and answer the following questions. You may choose to write in dot points or full sentences.

1. 'I got kicked in the head by my colleague Bubba Ray Dudley' (0:55). Using your knowledge of brain injuries, list what you can deduce about the injury that Nowinksi sustained.
2. 'But shockingly, even when the first two cases came in positive, there was never a national news story about this, what's going on in football with these cases of CTE' (2:28). Using your knowledge of CTE, suggest why this was the case.
3. Look at the image shown at 5:55. Using your knowledge of neuroplasticity, write down some possible reasons why the 'normal' and 'severe' CTE brains look different.
4. Using your knowledge of CTE as an emerging area of research on neurological conditions, evaluate the need for Nowinski's work and justify why he is focused on treating the disease.

Chapter 5 test

Multiple choice

Question 1 (1 MARK)

Neuroplasticity refers to the brain's ability to

A. change in response to experience and the environment.

B. grow in response to injury.

C. shrink in response to learning new things.

D. develop new lobes and functions.

Question 2 (1 MARK)

Which of the following does **not** accurately describe and provide an example of a type of acquired brain injury?

	Type of acquired brain injury	Example
A.	Traumatic	Head collision
B.	Non-traumatic	Aneurysm
C.	Non-traumatic	Stroke
D.	Traumatic	Substance abuse

Question 3 (1 MARK)

Parkinson's disease is a

A. neurodevelopmental disorder.

B. neurodegenerative disease.

C. degenerative disorder.

D. type of brain infection.

Question 4 (1 MARK)

Fiona is looking to base her PhD on the diagnosis of new neurological disorders that may occur in humans. Which of the following accurately suggests a viable method that Fiona may use?

A. Gut-brain axis, as it suggests a bidirectional connection between the gut and the brain that may be useful to understand neurological disorders.

B. Machine learning, as it can create algorithms that can accurately classify information and make predictions about new neurological disorders.

C. Gut-brain axis, as it can accurately identify disorders.

D. Machine learning, as it provides an explanation for emerging neurological disorders.

Question 5 (1 MARK)

Which of the following is true about CTE?

A. CTE is not fatal as many sports players keep playing after they get a concussion.

B. CTE is not fatal because you can treat it with medication.

C. CTE can become fatal if the brain reaches a point of degeneration.

D. CTE can become fatal as it leads to concussions which can cause irreparable damage to functioning.

Short answer

Question 6   (2 MARKS)

Compare the two types of neuroplasticity.

Question 7   (3 MARKS)

Explain how CTE can occur from an acquired brain injury.

Question 8   (5 MARKS)

Austin had recently noticed that his father, Allen, had become really shaky and struggled with his balance. Austin became worried that his father may have Parkinson's disease so they went to the doctor who officially diagnosed Allen. Soon after the diagnosis, Allen's symptoms worsened.

Adapted from VCAA Psychology exam 2019 Q2

a.   Suggest why Austin worried that his father may have Parkinson's disease. (1 MARK)

b.   Parkinson's disease is a neurodegenerative condition and involves the deficiency of dopamine production, due to the neurodegeneration of neurons in the substantia nigra. With reference to factors influencing adaptive plasticity, how may the process of adaptive plasticity differ for Allen compared to people with acquired brain injuries. (2 MARKS)

c.   With reference to contemporary research, how may Allen's Parkinson's disease progression be tracked? (2 MARKS)

Question 9   (7 MARKS)

Jackson is a retired soccer athlete who is suspected of having CTE. He shows symptoms like memory loss, disturbances in behaviour, and difficulty with job productivity.

a.   Suggest why Jackson may be suspected of having CTE. (1 MARK)

b.   How would the suspicion of Jackson having CTE be confirmed? (1 MARK)

c.   How may having CTE impact Jackson's biological, psychological, and social functioning? (3 MARKS)

d.   How could Jackson maintain and/or maximise his brain functioning? (2 MARKS)

Question 10   (10 MARKS)

As a child, Elizabeth was involved in many contact sports, such as footy and soccer. One day, at a karate competition, Elizabeth was accidentally kicked in the head but nothing happened and she was okay. However, in the months following, Elizabeth experienced many random seizures and her parents became worried so they took her to the hospital to check if she was okay. The hospital that they went to had brand-new state-of-the-art facilities that the doctors used to check if Elizabeth had epilepsy.

In terms of brain plasticity and brain injury, discuss the following:

- the brain injury Elizabeth sustained and its possible impacts
- causes and symptoms of epilepsy that Elizabeth may have displayed
- how the doctors may screen for and try to treat epilepsy if Elizabeth does indeed have the neurological condition
- the likelihood of Elizabeth developing CTE
- how Elizabeth's brain may try to overcome changes following her injury.

Unit 1 AOS 2 review

The VCE study design outlines that, upon completion of this area of study, you must be able to 'analyse the role of the brain in mental processes and behaviour and evaluate how brain plasticity and brain injury can change biopsychosocial functioning'.

SAC assessment 1

The following task can be used as a practice SAC. This task is based on the following study design assessment type:

- a modelling or simulation activity

Question 1   (9 MARKS)

Fill in the blanks in the flowchart.

Number the approaches to understanding the brain in order from earliest in history (1) to most recent (4):

___   ___   ___   ___

The mind-body problem is
_____
_____
_____
_____

This idea can be split into the two views of:

_____   _____

If an individual believes that their heart rate can be a direct product of their thoughts, they are likely to believe in _____, which holds the view that
_____
_____
_____

The brain versus heart debate is
_____
_____
_____
_____

Neuroimaging techniques

An example of a structural neuroimaging technique is
_____

An example of a functional neuroimaging technique is
_____

Phrenology is
_____
_____
_____

Phrenology has contributed to our modern understanding of the brain through the belief that
_____
_____
_____
_____

Question 2   (8 MARKS)

a.   Label each of the lobes of the cerebral cortex and their regions depicted in the diagram. (5 MARKS)

- Frontal lobe
- Parietal lobe
- Temporal lobe
- Occipital lobe

- Broca's area
- Wernicke's area
- Primary motor cortex
- Primary somatosensory cortex

- Primary visual cortex
- Primary auditory cortex
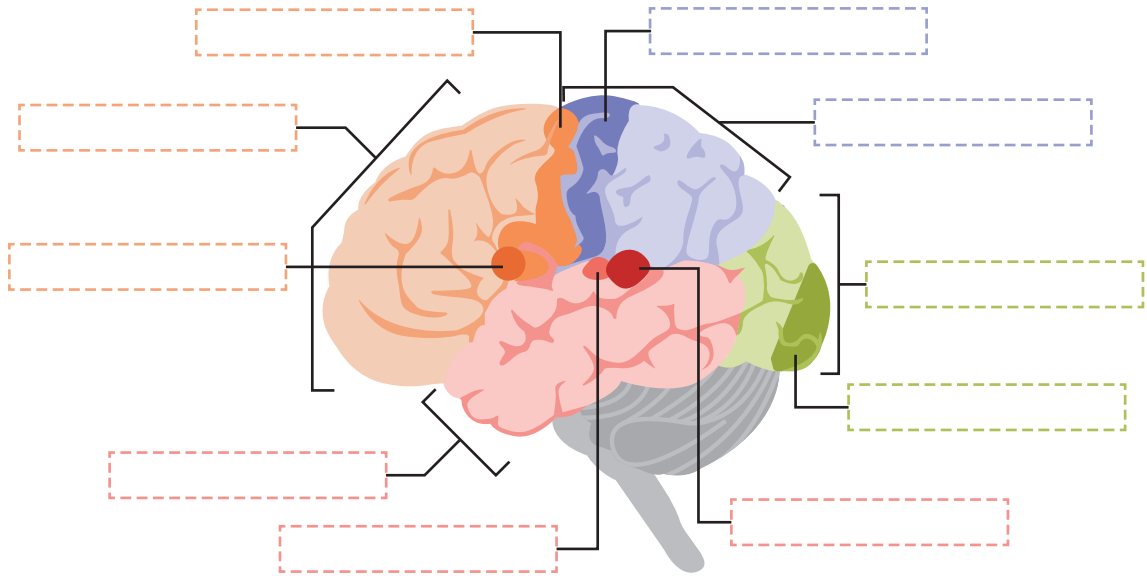
b.   Identify one region of the frontal lobe not labelled in the completed diagram. (1 MARK)

c.   For the region identified in **part b**, outline which type of functional area it is (motor, sensory or association), and its role in behaviour and mental processes. (2 MARKS)

Question 3   (15 MARKS)

Lukas recently had a major stroke, and the resulting damage to his brain led to the development of severe epilepsy. To treat his epilepsy, a surgeon removed a small part of Lukas' brain. Afterwards, his functioning takes some time to return to normal levels and he struggles to complete some tasks. After several months, however, Lukas could once again live a normal and healthy life.

a.   Fill in the blanks in the timeline of Lukas' experience. (10 MARKS)

Lukas' stroke caused a _____ type of acquired brain injury.

→

As a result, he developed epilepsy, which is a type of neurological disorder. These disorders can be described as _____ _____ _____ _____

→

Using neuroimaging techniques a doctor found that the damage was located in Lukas' frontal lobe. The doctor decided this part of the brain needed to be removed.

↓

As a result, we can predict that the likely region of Lukas' brain that was removed is _____.

←

After this region of Lukas' brain was removed, he found that he had difficulty speaking. He was able to understand and interpret speech, but struggled to produce sentences.

←

To remove the damaged region of Lukas' frontal lobe, the surgeon would have used a method also known as the experimental technique of _____.

↓

After some time, Lukas began to recover his ability to speak. This may be due to _____, which is _____ _____ _____ _____

→

Specifically, the type of neuroplasticity Lukas experienced was _____, which allowed his brain to _____ _____ _____ _____

→

Two processes influenced Lukas' plasticity, these were sprouting, which refers to _____ _____ _____

and rerouting, which refers to _____ _____

b. Identify a neuroimaging technique the doctor could have used to examine Lukas, and explain how it could have allowed the doctor to locate the damaged part of Lukas' brain. (2 MARKS)

c. Suggest an impact of Lukas' acquired brain injury on his biological, psychological, and social functioning. (3 MARKS)

Question 4 (8 MARKS)

a. Label the three regions of the brain in the diagram. (3 MARKS)
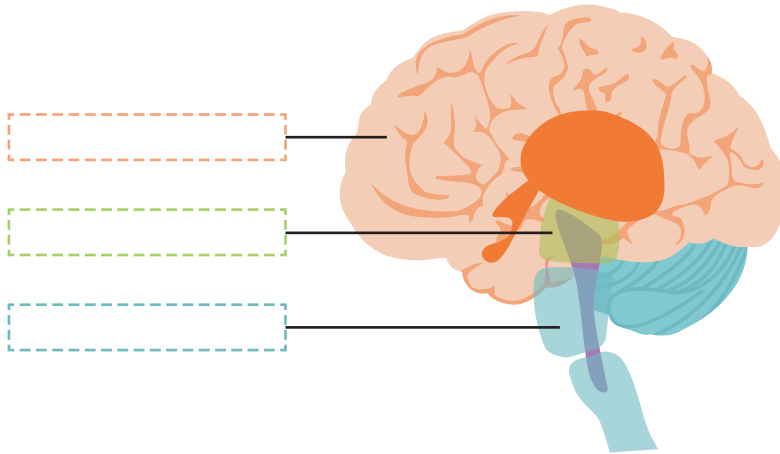
b. The brain regions increase in complexity as you move between them. In the box to the right of the diagram, draw an arrow showing the direction of the brain regions' increasing complexity. (1 MARK)
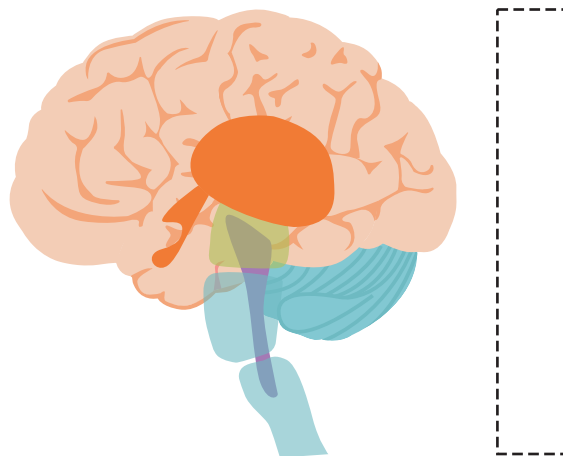
c. Label the missing structures within each brain region. (3 MARKS)

Cerebrum

Thalamus

Cerebellum

Medulla
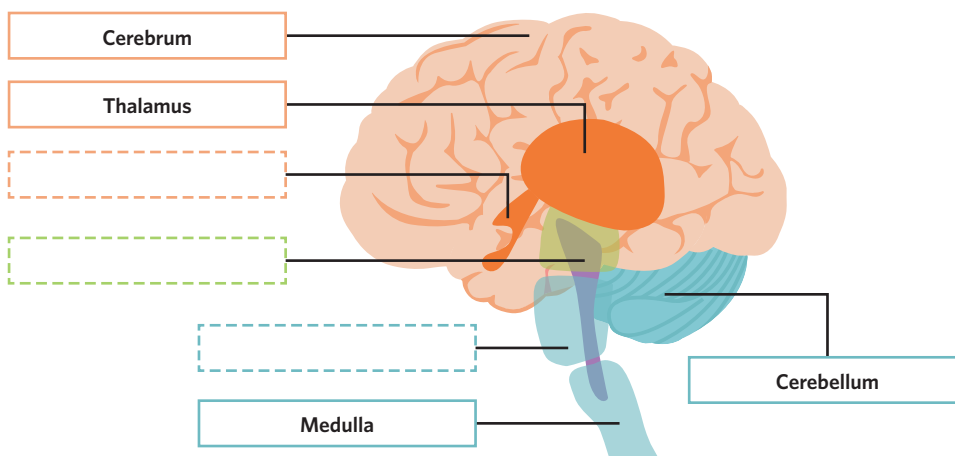
d. Explain the role of one structure of the hindbrain in behaviour and mental processes. (1 MARK)

Unit 1 AOS 2 review

SAC assessment 2

The following task can be used as a practice SAC. This task is based on the following study design assessment type:

- a literature review

Note: VCAA has outlined that a literature review involves 'the collation and analysis of secondary data related to other people's scientific findings and/or viewpoints in order to answer a question or provide background information to help explain observed events, or as preparation for an investigation to generate primary data.'

Use the following sources to answer questions 1–9.

Read the following three sources relating to neurodegenerative diseases and chronic traumatic encephalopathy (CTE), and answer the following questions. The questions reflect the elements of a literature review.

Source 1

Traumatic brain injury (TBI) in collision sports: Possible mechanisms of transformation into chronic traumatic encephalopathy (CTE)

Review

Traumatic brain injury (TBI) can significantly increase the risk of developing conditions including Parkinson's disease (Goldman et al., 2006) and chronic traumatic encephalopathy (CTE; Turner et al., 2013). CTE is a progressive neurodegenerative disease that is typically caused by repeated head trauma. Occasionally, it can occur after even one moderate to severe TBI. During the years following the TBI, the brain can undergo changes that are currently near impossible to detect in living patients (Abner et al., 2014). Therefore, CTE was said to be only diagnosable by a post-mortem examination of the brain tissue (McKee et al., 2016).

A meeting was held in 2016 to develop CTE's diagnostic criteria, and a report on the conclusions of the meeting was prepared by McKee and colleagues (2016). In this meeting, CTE was defined as being characterised by the abnormal accumulation of the hyperphosphorylated protein tau (p-tau) in neurons and other brain structures, leading to neurodegeneration. The hyperphosphorylated p-tau led to features found in CTE that included the presence of neurofibrillary tangles in the outer layers of the cerebral cortex.

(VanItallie, 2019)

Source 2

Clinicopathological Evaluation of Chronic Traumatic Encephalopathy in Players of American Football

Research question

What features can be observed in a series of deceased American football players who have been neuropathologically diagnosed with chronic traumatic encephalopathy (CTE)?

Sample

A convenience sample of 202 deceased former football players who had donated their brains for research.

Findings

This study wanted to determine the clinical and neuropathological features of football players with CTE that are deceased. Of the 202 football players involved in the study, 87% were diagnosed with CTE (86% displaying a severe case). Of the 111 former National Football League (NFL) players in the sample, 110 (99%) were diagnosed with CTE.

Focusing on the 27 patients with mild CTE, 26 (96%) displayed behavioural or mood symptoms, such as depression, anxiety, and physical violence. Parkinson's disease was found in 1 (4%) players. Cognitive symptoms, such as issues with memory, executive function, or attention, were found in 23 (85%) of players with mild CTE.

(Mez et al., 2017)

> **Source 3**
>
> **Head Injury and Parkinson's Disease Risk in Twins**
>
> **Research question**
>
> Does head injury increase the risk of Parkinson's disease (PD)?
>
> **Sample**
>
> 93 pairs of twins that displayed different levels of PD (including those where one displayed PD and the other did not) from the National Academy of Sciences/National Research Council World War II Veteran Twins Cohort.
>
> **Findings**
>
> A head injury that resulted in a loss of consciousness or amnesia was associated with an increased risk of PD. Having two or more head injuries, or more severe head injuries were associated with a greater risk of developing PD than having only one or a mild head injury. This may be because trauma to the brain can accelerate processes in the regions of the brain that cause PD.
>
> For identical twins, there was a higher risk of developing PD following a head injury than for non-identical twins. This suggests a causal relationship, as identical twins share genetics and many environmental factors, whereas non-identical twins tend to have less in common regarding their genetics and environment.
>
> (Goldman et al., 2006)

Question 1   (6 MARKS)

All three sources mention a type of neurodegenerative disease.

a.   Distinguish between neurodegenerative diseases and neurological disorders.   (2 MARKS)

b.   Identify two neurodegenerative diseases mentioned in the sources, and explain why each disease can be classified as neurodegenerative.   (4 MARKS)

Question 2   (3 MARKS)

Considering the findings presented in the three sources, formulate a potential hypothesis that could be used to test the impact of acquired brain injury on neurodegenerative diseases.

Question 3   (3 MARKS)

In scientific research, journal articles can consist of a combination of both primary and secondary data.

Distinguish between primary and secondary data, and identify which of the three sources predominantly consists of secondary data.

Question 4   (8 MARKS)

Source 1 outlines that CTE can only be diagnosed following a post-mortem examination of the brain.

a.   What is a post-mortem examination?   (1 MARK)

b.   Using your own knowledge and information from the sources provided, describe what a post-mortem examination on somebody with CTE would expect to find, as well as a brain area where this abnormality might occur.   (3 MARKS)

c.   Explain why a post-mortem examination is required to diagnose someone with CTE.   (2 MARKS)

d.   Suggest one ethical consideration that is upheld by only inspecting the brains of potential CTE patients post-mortem, and explain how it is relevant.   (2 MARKS)

Question 5 (7 MARKS)

Source 3 investigated if head injuries were associated with an increased risk of Parkinson's disease.

a. Using the information provided in one of the sources, propose a factor that could increase the risk of developing Parkinson's disease. (2 MARKS)

b. Parkinson's disease can result in the loss of voluntary movement. Suggest one brain structure that plays a role in voluntary movement. (1 MARK)

c. Symptoms of Parkinson's disease can involve problems with cognition. Identify two ways a person with Parkinson's disease may attempt to maintain or maximise their remaining brain functioning, and describe how they could be helpful. (4 MARKS)

Question 6 (2 MARKS)

Using your knowledge of the neuron, briefly describe the way the brain communicates between its different regions, and explain a possible effect of acquired brain trauma on the ability of neurons to communicate as they normally would.

Question 7 (4 MARKS)

Source 2 determined some of the features of deceased football players with CTE.

a. With reference to the role of the frontal lobe in behaviour and decision-making as well as data and findings from source 2, suggest a potential relationship between the frontal lobe and CTE that future research may wish to investigate. (3 MARKS)

b. Explain how the sampling method from Mez and colleagues' (2017) study (source 2) presents a potential limitation. (1 MARK)

Question 8 (2 MARKS)

Suggest a potential extraneous variable when studying non-identical twins that is evident in source 3, and identify the type of extraneous variable it is.

Question 9 (5 MARKS)

With reference to your own knowledge of the symptoms of CTE and information from one of the sources, evaluate whether CTE has a greater impact on biological functioning or psychological functioning.

UNIT 1 AOS 3

Student-directed research investigation guide

STUDY DESIGN DOT POINTS

Scientific evidence

- the distinction between primary and secondary data
- the nature of evidence and information: distinction between opinion, anecdote and evidence, and between scientific and non-scientific ideas
- the quality of evidence, including uncertainty, validity and authority of data and sources of possible errors or bias
- methods of organising, analysing and evaluating secondary data
- the use of a logbook to authenticate collated secondary data

Scientific communication

- psychological concepts specific to the investigation: definitions of key terms; and use of appropriate psychological terminology, conventions and representations
- the characteristics of effective science communication: accuracy of psychological information; clarity of explanation of scientific concepts, ideas and models; contextual clarity with reference to importance and implications of findings; conciseness and coherence; and appropriateness for purpose and audience
- the use of data representations, models and theories in organising and explaining observed phenomena and psychological concepts, and their limitations
- the influence of sociocultural, economic, legal and political factors, and application of ethical understanding to science as a human endeavour
- conventions for referencing and acknowledging sources of information

Analysis and evaluation of psychological research

- characteristics of repeatable and reproducible psychological research and the consideration of uncertainty
- criteria used to evaluate the validity of psychological research

Image: GoodStudio/Shutterstock.com

The Area of Study 3 component of Unit 1 requires you to conduct a research investigation. A research investigation involves a thorough analysis of a research question, with a focus on evaluating existing psychological research. There are multiple ways in which you can present this investigation, including a digital presentation, an oral presentation, or a written report.

To conduct this research investigation, you will need to use the skills you have learnt in **Chapter 1 Key science skills**. You will also be learning new skills to help you conduct your own independent research investigation. This guide will provide the steps you will need to accurately carry out your investigation, as well as examples to help support your understanding of this task.
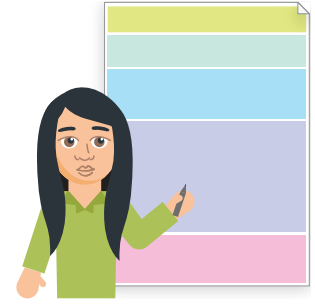
A step-by-step guide on research investigations

This assessment task guide will involve a range of steps that need to be carried out in a research investigation. To help you approach this task, this guide will break down and provide examples of each of the steps for you.

A step-by-step guide on research investigations

Research skills

- Effective science communication
- Nature of evidence and the use of opinions
- Quality and validity of evidence
- Influence of sociocultural, economic, legal, and political factors and application of ethical understanding

Planning and presenting your investigation

- Step 1 – Create a logbook
- Step 2 – Formulate your research question
- Step 3 – Start researching
- Step 4 – Collate the information you have found
- Step 5 – Design your presentation
- Step 6 – Present your work

Figure 1 A mindmap of what will be covered in this guide

The research investigation will involve a response to contemporary psychological research. The investigation could, therefore, focus on a recent discovery, finding, innovation, issue, advance, or case study in contemporary psychological research which is relevant to the content that you have already learnt throughout Unit 1 of VCE Psychology. After completing your investigation of scientific evidence, you will present your findings. In this presentation, you will explain relevant psychological theories and concepts, communicate your findings from contemporary research, and present your conclusions.

The research question you investigate can be developed in a group or individually, depending on what your teacher prefers. During this task, you will not be collecting your own data (primary data), but instead, you will be analysing and synthesising secondary data (data collected from other researchers) when looking at existing scientific research.

(VCAA, 2022)

During this investigation, you will:

- analyse the scientific evidence related to the question.
- define key terms and explain psychological concepts.
- outline contemporary research.
- present conclusions based on evidence.

Research skills

Before you start your investigation, you need to make sure that you understand all of the concepts and skills you will need to use. You have already learnt about many of these concepts in **Chapter 1 Key science skills**, including validity and reliability, accuracy, the use of data, and errors. However, there are other key knowledge points that you may not have come across until now. Make sure you learn about these research skills, which are introduced and explained below, before starting your investigation.

Figure 2 In this section of the guide, you will learn about research skills

Effective scientific communication

For this assessment, it is important to consider who the target audience is. This will most likely be either your teacher if you complete a written report, or your teacher and class members if you are presenting your work as an oral or digital presentation. Your target audience will drastically impact what information you include in your assessment, as well as how you present this information. For example, if you have to write a report for your teacher, it is important that you use formal language. However, if you have to present a digital presentation, such as a PowerPoint for your class, your tone could be less formal, and you need to ensure that your slides are engaging.

To ensure that you effectively communicate your findings, it is important to also consider the following questions. It may be helpful to use these questions as a checklist before you finalise your presentation or report.

- Is the information I'm presenting accurate? Where have I sourced this information from?
- Have I defined the key terms and explained them clearly?
- Have I supported my claims with strong evidence?
- Would it be helpful to include models or diagrams in my presentation or report?
- How do these findings or psychological concepts apply to real life? Should I refer to these implications in my report/presentation?
- Have I presented my information in a clear and concise way? Is this information easy to read and understand?
- Have I presented data in an accurate and appropriate way?
- Is the information appropriately presented for my target audience?
- Is the information appropriately presented for the purpose of my task?

Nature of evidence and the use of opinions

How do you know which resources to trust? Which resources have strong evidence? Is Wikipedia a reliable source of information? These are all questions you need to consider before starting this assessment.

Evidence involves information that either supports or rejects claims, beliefs, or ideas.
When looking at the strength of a source of evidence, there are many things you need to consider.
These include:

- What form of evidence is it?
- Do I trust where the information came from? Is it a reputable source?
- Is the evidence scientific or non-scientific?
- Is the information biased in any way?
- Are there any errors in the information?

There are three common forms of evidence that you should be familiar with before starting
this assessment. These are opinions (particularly expert opinions), anecdotal evidence,
and psychological research studies.

LESSON LINK

In lesson **1A Introduction to research**, you learnt about scientific and non-scientific ideas, as well as
about anecdotes and opinions. A summary of these concepts is outlined in table 1.

Table 1 Scientific versus non-scientific ideas

	Explanation
Scientific ideas	Scientific ideas generally aim to be objective, utilise empirical evidence, and are formed using the scientific method.
Non-scientific ideas	Non-scientific ideas may be non-objective, unempirical, imprecise, and do not use the scientific method. Non-scientific ideas may be formed on the basis of: • anecdote: stories based on personal experience • opinion: the view or perspective of someone not necessarily based on evidence.

PSYCHOLOGY EXPLORATION

If you choose to study psychology at university, you will most likely hear of **peer-reviewed studies/
research**. In the field of psychology, this usually involves research articles that are published in
journals that have been peer-reviewed. This means that before being published, the research article
has been scrutinised and analysed by multiple experts on the relevant research topic. This usually
involves multiple rounds of back-and-forth feedback between the experts conducting the peer-
review and the researcher/s until the journal article is finalised and published.

In such a way, articles that are peer-reviewed are said to generally have strong evidence as well as
scientific reliability and validity.

If we were to place these three forms of evidence on a hierarchy based on the strongest
to weakest evidence, it would look like the pyramid used in figure 3.

Figure 3 Simple pyramid of evidence

To understand why the forms of evidence are ordered as they are in figure 3, you need to understand what these sources of evidence are. In chapter 1, you learnt about anecdotes and opinions as examples of non-scientific ideas. Here are some further explanations of these types of evidence, as well as psychological research studies.

- **Psychological research studies:** academic research investigations published in scientific journals. These psychological research studies are also often known as journal articles and are the strongest form of evidence due to using the scientific method which provides a rigorous form of evidence.

  - There are multiple forms of research methodologies, with some forms (such as experiments) being stronger than others (such as observational studies and case studies).

- **Expert opinion:** an opinion held by an individual who has specialised knowledge or training in a relevant field. Expert opinions can provide educated predictions or explanations about phenomena that may not have been scientifically tested.

  - Expert opinions differ from normal opinions and are more valuable and reliable. If an individual, who is not educated on a topic, gives an opinion, then that form of evidence would be considered significantly weaker.

- **Anecdotal evidence:** a personal recount of an event or experience. This can help to provide insights into events or experiences which cannot be examined through scientific investigations.

When conducting research for your investigation, you can use a variety of different types of evidence to provide different pieces of information. It is also important to consider whether ideas are scientific or non-scientific. As you learnt in chapter 1, scientific ideas are developed using the scientific method and involve more rigorous testing than non-scientific ideas. Due to this, scientific ideas are more highly regarded by researchers and are more likely to provide strong evidence for your investigation.

There are some other things to look at when considering the quality of evidence a source presents, including:

- **when** the source was published. Typically, more recent research, particularly when examining contemporary psychological research, provides better evidence. If the source is 10 or more years old, there is a risk that the information presented may have since developed in the field of psychology.

- **where** the source was published. You have learnt that psychological research studies are typically published in scientific journals, which are highly esteemed. As such, if you use a psychological research study that has been published in a scientific journal in your investigation, the source is likely to be high-quality evidence.

Quality and validity of evidence

You have already learnt about the concepts of validity, uncertainty, repeatability, reproducibility, and sources of error and bias in studies in chapter 1. When conducting your research and drawing conclusions from information, it is important to consider whether these studies are valid and reliable, in conjunction with any errors they may have.

LESSON LINK

To evaluate psychological research you will need to draw upon multiple concepts that you learnt about in lesson **1F Evaluating research**. Table 2 outlines these concepts. You can also go back to this lesson if you need a refresher on them.

Table 2 Concepts outlined in chapter 1 relating to evaluating research

Concept	Definition
Uncertainty	The lack of exact knowledge relating to something being measured, due to potential sources of variation in knowledge.
Validity	The extent to which psychological tools, findings, and investigations truly support their findings or conclusions.
Repeatability	The extent to which successive measurements or studies produce the same results when carried out under identical conditions within a short period of time (e.g. same procedure, observer, instrument, instructions, and setting).
Reproducibility	The extent to which successive measurements or studies produce the same results when repeated under different conditions (e.g. different participants, time, observer, and/or environmental conditions).

Psychological research is repeatable and reproducible if it has been carried out in a way that means it can be carried out in the future (either under the same or changed conditions) and attain similar, or the same, results. Psychological research studies which are repeatable and reproducible have certain characteristics, such as having:

- standardised instructions and procedures
- valid measurements
- operationalised variables
- a clear method, including detailed explanations about how to carry out the study and how to carry out data analysis.

There are also different ways in which you can evaluate the validity of psychological research. This can include asking the following questions when you are evaluating a research source.

- Does the study measure what it intends to measure?
- Do changes in the independent variable explain the changes in the dependent variable? Could these changes be explained by extraneous or confounding variables? If so, how could the researchers have controlled for these variables?
- Can the results of the investigation be generalised to the research population? Is the setting in which the study was conducted appropriate for the research question? Was the sample size and sampling technique adequate to attain a representative sample?

When evaluating psychological research sources, you also need to consider sources of possible error or bias. In lesson **1D Preventing error and bias**, you learnt about the following sources of error and/or bias:

- participant-related variables
- order effects
- placebo effects
- experimenter effects
- situational variables
- non-standardised instructions and procedures
- demand characteristics.

When looking at psychological research, you should consider whether any of the listed sources of error or bias are present. If so, you should consider what the researcher/s could have done to prevent these.

Influence of sociocultural, economic, legal, and political factors and application of ethical understanding

When looking at psychological research studies, or even when conducting your own research investigation, it is important to consider any factors which may have influenced the study, as well as the research question formulated. The most common factors you need to consider are listed below.

- **Sociocultural factors:** the environmental conditions that impact the practices, beliefs, social norms, and expectations of individuals or groups. These factors include family support, education history and opportunity, and availability of healthcare.

  – The unique sociocultural conditions of a researcher may create biases as they may record or report data subjectively or incorrectly due to their education or family history, or own beliefs.

  – There may also be individual differences among different participants which may negatively affect the results of a study. For example, participants may greatly vary in their educational attainments. Where possible, individual participant differences should be identified and controlled for.

  – Intelligence tests measure intelligence based on a Western view and understanding of intelligence and have been suggested to neglect an understanding of other forms of learning and intelligence, such as Aboriginal and Torres Strait Islander peoples knowledge systems and ways of learning. Therefore, the intelligence levels of Aboriginal and Torres Strait Islander peoples may not be accurately represented by intelligence tests developed in Western settings.

Figure 4 Education outcomes are an example of a sociocultural factor

Figure 5 How much funding a study receives and who provides this funding is an economic factor

Figure 6 The laws governing human research are an example of a legal factor

Figure 7 The research funding governments provide is an example of a political factor

WANT TO KNOW MORE?

When considering the influence of factors on psychological research studies, it is particularly important that we consider cultural biases and representations. It is particularly important to consider whether psychological studies use research methodologies and data interpretations that represent the perspectives, knowledge, voices, and ideas of other cultures. When conducting research for your investigation, it may be a good idea to consider whether the study contains any cultural biases and is representative of other cultures, such as Aboriginal and Torres Strait Islander peoples.

- **Economic factors:** financial factors, such as the income of each participant, as well as financial characteristics of a study, such as the funding of the research.
  - There can often be conflicts of interest in research, with certain brands providing researchers with funds to conduct a study in which they want particular results. When considering economic factors, it is useful to investigate who is funding the research and whether a conflict of interest may exist. A useful question to explore this may be 'does the funding body benefit from particular results in this study?'
- **Legal factors:** factors relating to how the law and legal systems influence individuals, groups, and organisations, such as the legal requirements of certain types of research.
  - There are certain laws that must be followed when conducting research. For example, the National Health and Medical Research Council (NHMRC, 2022) stipulates that researchers must abide by the 1988 Privacy Act. In relation to human research studies, the Privacy Act states that information must be de-identified and researchers must seek permission from a Human Research Ethics Committee if they are using personal information, which the individuals have not consented to provide. This can occur when researchers use data from large databases, such as hospital data collection systems.
  - It is important to consider any legal factors when evaluating research. For example, when considering whether a psychological study is missing information that would be useful to understand a concept, you should consider whether it would be appropriate according to the laws of a country for the researcher to collect, use, and disclose that personal information.
- **Political factors:** environmental conditions that impact the beliefs and actions of groups and individuals, including political climate, government policies and decisions, and international relations.
  - Political factors can often influence what is being researched. For example, many governments provide funding to certain studies depending on what policies they pass or are wishing to pass.

When looking at psychological studies, it is important to consider the influence of possible factors on how the study was conducted, as this could affect the reliability and validity of the results of the study.

It is also important to consider how ethical considerations may have influenced psychological research studies. You should consider:

- Does the research meet ethical guidelines? If not, which ethical considerations have they neglected?
- If ethical considerations have not been met in a study, is this consistent across all studies relevant to this particular concept? If so, why might this be and what does this say about the concept or theory?
- Could the study implement better ethical practices?

WANT TO KNOW MORE?

In the past, most psychological research used samples made up of Western, educated, industrialised, rich, and democratic (WEIRD) societies. This acronym has been used in the field of psychology to highlight that psychological research studies are rarely representative of the broader population, and typically under-represent many population groups, such as Aboriginal and Torres Strait Islander peoples. To counteract this, many contemporary psychological studies have reproduced historical studies to examine whether samples that represent different population groups have the same findings and subsequently demonstrate the external validity of the original research.

Planning and presenting your investigation

We will now go through the steps required to undertake a research investigation. Each step provides guidelines and advice on what is typically included in each section.

A step-by-step guide on research investigations

Research skills

Planning and presenting your investigation

Step 1 – Create a logbook

Step 2 – Formulate your research question

Step 3 – Start researching

Step 4 – Collate the information you have found

Step 5 – Design your presentation

Step 6 – Present your work
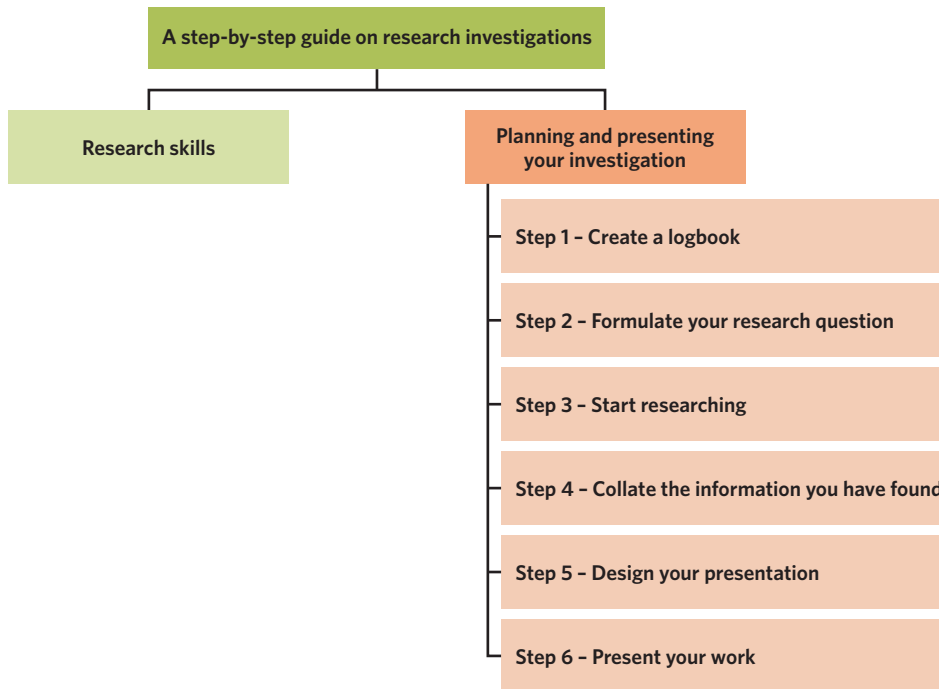
Figure 8 In this section of the guide, you will learn about planning and presenting your investigation

STEP 1 ▸ Create a logbook

You will need to use a logbook when completing this investigation. The exact structure and content of your logbook will vary depending on what your teacher expects, so make sure you check with them before starting this step.

The purpose of the logbook is to authenticate the work you complete in collating your secondary data. It can also be used to keep track of all the work you complete, which can then be compiled when you present your investigation.

STEP 2 ▸ Formulate your research question

Before starting your research investigation, you first need to know what to investigate. In psychological research studies, researchers often formulate a research question by investigating existing theories and studies and then finding a 'gap' in the literature that needs to be examined. They then use this to create a research question.

For your assessment, your teacher will most likely instruct you on whether you need to form your research question individually, or in a group with other students. VCAA specifies that your research question needs to focus on a recent discovery, finding, innovation, issue, advance, or case study in contemporary psychological research. It also needs to be relevant to the content you have learnt about in Unit 1 of VCE Psychology.

To develop your research question, VCAA (2022) has suggested that you can take inspiration from the following sources:

- contemporary research, such as announcements of recent psychological research
- an expert's published point of view
- a TED Talk
- a YouTube presentation
- a report from a community program
- an article from a scientific publication.

STEP 3 — Start researching

After deciding on a research question, you need to start finding research sources that you can refer to in your investigation. It is important to remember that you should be focusing on contemporary psychological research. When looking for sources, keep in mind everything you have learnt about the influence of different factors on research, validity and reliability, biases, and the strength of evidence. You need to critically analyse each source by applying all of these concepts, such as evaluating whether the source is reliable.

On top of the sources relating to contemporary psychological research, you may need a few other sources which provide an in-depth explanation of the key terms and concepts referred to in these studies. For example, you may need to look at an older scientific landmark journal to explain the context of the contemporary research. This will vary depending on the research question you have chosen.

WANT TO KNOW MORE?

What constitutes 'contemporary research' varies depending on the topic, as well as the opinions of different researchers. Some believe that contemporary research needs to have been published in the past 10 years, while others think 15 or 20. It is important to consider when the research was published as sociocultural, economic, political, and legal factors vary greatly over time. If these factors were drastically different in a study, it is necessary to acknowledge how this may lead to different results in research conducted today. In such a way, contemporary research is believed to reflect current circumstances and it is, therefore, most likely to accurately inform our hypotheses and results. Hence, it is important to ask your teacher what they accept to be contemporary research and use this as a guideline when conducting your investigation.

USEFUL TIP

How do you know if the contemporary psychological studies you have found are a reliable source of evidence? To make sure that you are finding reliable sources, it is a good idea to use a database. This can include a specific database that your school library may have, or use a database like Google Scholar. Google Scholar is a platform that provides links to scholarly sources, including psychological journal articles. The sources provided by Google Scholar are more reliable to use than those provided from a standard Google search as Google Scholar is limited to academic sources, but it is still important to see if the sources provide strong evidence. You should also check to see if the source is peer-reviewed.

STEP 4 — Collate the information you have found

Now that you have completed your research, you need to collate and synthesise (bring together) this information. By collating your research, you can ensure that you find the main points to answer your research question, and write your findings in your own words. One easy way to do this is to write out your main research findings in dot-point form or summarise them into small paragraphs.

During this process, some questions you may want to consider include:

- What is the main message of each source you have looked at?
- What information is relevant to include in your presentation? Does the information answer the research question you set out to investigate?
- What are the similarities and differences between what each source says about your research topic?
- Do the sources provide strong evidence?
- Which factors have influenced the study? How may these have affected the results of the study?
- Is there any further research that needs to be done to comprehensively answer your research question?

USEFUL TIP

If you choose to use journal articles as one of your sources, it is useful to start by reading the **abstract** of the article. The abstract provides a summary of the journal article, including an outline of the study's research question, aim, hypothesis, method, and results. By reading this summary, you can quickly assess whether it is a relevant source for your research or not.

USEFUL TIP

You have most likely heard of **plagiarism** before, which involves claiming someone's work as your own. It is important that you present your own ideas in your investigation and always refer to someone else's work to avoid plagiarism. This is one reason why it is important to summarise the main points of your findings in your own words. Later on, we will look at referencing, which is an important convention of psychological reporting to ensure that anyone's work that you use is cited, therefore avoiding plagiarism.

STEP 5 Design your presentation

After completing your research and collating the information you have found, it is time to design your presentation. Your teacher may have chosen a specific presentation format for you to use, or you may be able to choose one. Some examples of presentation formats include digital presentations (such as a PowerPoint presentation), oral presentations, scientific posters, and written reports.

Once you decide on the presentation method, you need to plan out what information you will present and the order in which you will present your information. Figure 9 presents a funnel that demonstrates the order in which you could present your information.

Introduce the topic

Define key terms

Explain psychological concepts

Outline contemporary research and refer to studies

Conclusion
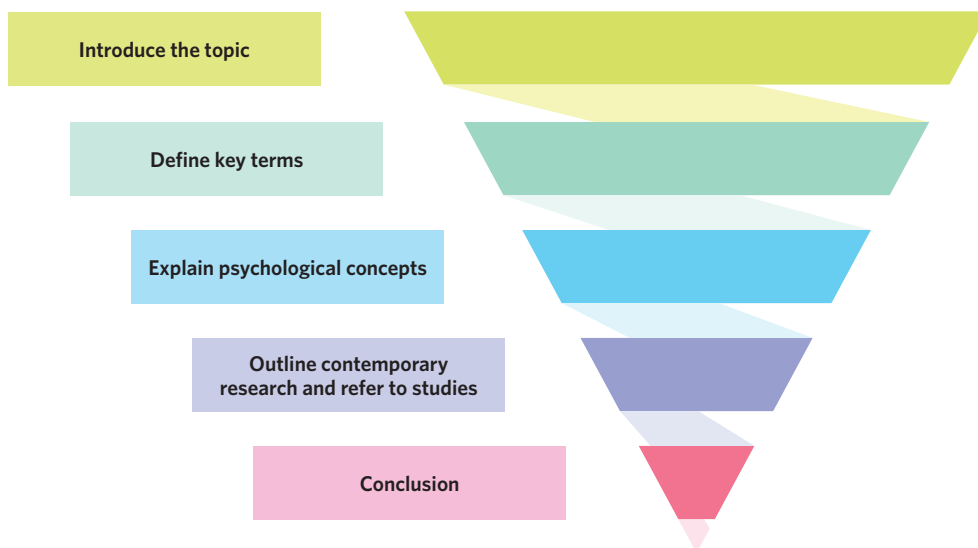
Figure 9 The 'funnel' method of presentation

The funnel method is a helpful tool you can use to guide the order of your presentation. The funnel goes from the most to least broad, with the widest band (Introduce the topic) providing a broad overall picture of the topic. The bottom and most narrow band (Conclusion) provides more specific information about the topic.

We will now work through these components of the presentation.

Introduce the topic

When introducing the topic, it is important to provide a brief overview of the context and the history of the research question. The purpose of the introduction is to provide a small amount of background information that may be needed before introducing the key terms, psychological concepts, and contemporary research. The purpose is to situate the topic for the reader in the context of broader society.

This introduction should be a small paragraph with no more than five or six sentences. If you have chosen the format of a written report, it is also a good idea to introduce what you will talk about in your report.

Throughout this guide, we will work through the research question 'How do nature and nurture contribute to the development of attention-deficit/hyperactivity disorder (ADHD)?' in order to provide you with examples of how to write and structure your investigation. Refer to the example below of what the first two sentences for a topic introduction could look like.

Figure 10 The first, and the broadest, section of the 'funnel' method of presentation involves introducing the topic

The paragraph below is an example of how you could introduce a topic. However, it is important to note that this example is not a full introductory paragraph. After the example, it would be best to give a small explanation of what you will talk about in your report/presentation.

Example

Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental condition characterised by persistent inattention or hyperactivity (Sellers et al., 2019). Researchers have previously outlined that ADHD is a heritable condition that may be more likely to occur in adverse family environments and upbringing (Agnew-Blais et al., 2022). However, the extent to which nature and nurture contribute to the onset and development of ADHD is still debatable and undergoing examination. This report will cover...

Define key terms

Now that you have introduced the topic, it is important to now provide definitions for the main key terms. These key terms should be the main psychological concepts related to your research question, which need to be defined for your audience to understand your subsequent explanations. You are most likely to have around three or so key terms for your research question, although this may vary depending on the topic you have chosen.

For the example research question, the key term of attention-deficit/hyperactivity disorder (ADHD) needs to be defined. You would also need to define other key terms, such as the nature versus nurture debate.

Example

The definition of 'attention-deficit/hyperactivity disorder (ADHD)' according to Sellers et al. (2019) is 'a neurodevelopmental condition characterised by persistent inattention or hyperactivity'.

Figure 11 The second section of the 'funnel' method of presentation involves defining key terms

Explain psychological concepts

It is important to explain any psychological concepts related to the research question in further detail. These concepts often build on the key terms you have defined, as well as any additional information related to these key terms or the research topic at hand. This is to ensure that your audience has an understanding of these concepts before you outline your contemporary research findings on these concepts.

Although the key term 'ADHD' has already been defined, this concept needs to be further explained so that the audience/reader has a greater understanding of the concept. This will then help the audience/reader be fully informed so that they can apply their knowledge to contemporary psychological studies.

Example

ADHD onset typically occurs in childhood, when children can experience difficulties in regulating emotions, managing time, and maintaining concentration (Sellers et al., 2019). These difficulties often carry through to adulthood. Individuals diagnosed with ADHD also experience certain strengths, such as having greater levels of creativity and innovation, as well as the ability to hyperfocus on particular tasks (Tistarelli et al., 2020). Individuals with ADHD are considered to be neurodivergent, as their neurological development and functioning vary from the norm.

Figure 12 The third section of the 'funnel' method of presentation involves explaining psychological concepts

USEFUL TIP

There are two ways in which you can structure these two sections (defining key terms and explaining psychological concepts).

1. You can define all your key terms or definitions first, and then explain them in the following paragraphs (where you explain the psychological concepts). When all your key terms are linked, this can sometimes work best.

   OR

2. You can combine this section with the key terms section if that makes the most sense. This may involve outlining the definition of one term, and then immediately following this with a more in-depth explanation of the psychological concept.

Outline contemporary research

It is now time to outline what you have found from your examination of contemporary psychological studies.

This section of your presentation/report should be where you focus most of your time and attention. In outlining your findings, you should evaluate and analyse the evidence presented by the studies or research techniques. This will most likely involve describing the research methods of each source, discussing the strengths and limitations of each contemporary research source, as well as evaluating whether these sources are valid and reliable. Often, this evaluation of weaknesses may link to ideas for future studies.

Figure 13 The fourth section of the 'funnel' method of presentation involves outlining contemporary research

As part of your presentation/report, you will discuss multiple pieces of evidence from your investigation of contemporary research. Below is an example of how you could discuss and then evaluate your findings on one piece of evidence from a contemporary research source you have found. In such a way, it is important to remember that this is not a complete example section, but only a paragraph to outline one piece of evidence from one source. The length of your descriptions and evaluations of evidence will vary, based on the complexity of each piece of evidence. Remember, for this assessment task, you need to research and evaluate at least two sources of information, and so this section will comprise at least two paragraphs depending on how many sources you used.

Example

The study conducted by Agnew-Blais et al. (2022) relied on the longitudinal measurement of ADHD symptoms across childhood to examine the interaction between nature and nurture. During the study, household chaos was measured by research workers at each time stage of the study and genetic predisposition was collected via survey responses from the participant mothers. The findings of the study suggest that children who grew up in homes that were more chaotic were more likely to display more profound ADHD symptoms (Agnew-Blais et al., 2022). However, after examining the gene-environment correlation, it was suggested that the hereditary factor of genetic predisposition heightened the correlation between chaotic households and ADHD symptom presentation. As such, the interaction between the home environment (nurture) and genetic predisposition (nature) was demonstrated. Although this discovery contributes to the existing body of knowledge, the researchers solely focused on reports and genetic predispositions of mothers, neglecting the contribution of fathers to their children's development both from a nature and nurture perspective. For this reason, this study would benefit from being reproduced with an examination of the contribution of both mothers and fathers.

Outline your conclusions

In lesson **1F Evaluating research**, you learnt that a conclusion is a statement that summarises the findings of a study, including whether the hypothesis was supported or rejected. In psychological research studies, a conclusion is usually one or two sentences. This is different to what your conclusion should look like as part of this investigation. Rather, your conclusion should be a small paragraph that provides an answer to your research question. In such a way, it is not focused on stating whether a hypothesis is supported or not, but rather presents a summary of what your overall findings were from your research. You may also find that it is necessary to mention that further research needs to be done to provide consistent evidence to answer a part, or all of, your research question.

Figure 14 The final section of the 'funnel' method of presentation involves outlining your conclusions

This example shows you how to write a conclusion for your investigation. As you will notice, findings from multiple psychological research studies have been synthesised.

Example

Findings from this investigation suggest that nature and nurture interact to contribute to the development of ADHD. Contemporary research supports historical theories that nature, particularly genetic predisposition, contributes to the existence of ADHD symptoms (Agnew-Blais et al., 2022; Sellers et al., 2019; Tistarelli et al., 2020). However, contemporary research also acknowledges the contribution of nurture, with a chaotic family home heightening the likelihood that children with a genetic predisposition will display ADHD symptoms (Agnew-Blais et al., 2022). Extending upon these findings, Tistrarelli et al.'s (2020) study suggests that the influence of nature, as shown through the heritability of ADHD, has the most impact during childhood, and less of an impact during adulthood. Future research should endeavour to ensure the contribution of fathers to the development of ADHD development in children, both from a nature and nurture perspective, is equally represented in psychological research.

References and acknowledgements

You will have to include a bibliography or reference list in your presentation/report. There are multiple ways in which you can do this, and it is a good idea to ask your teacher what type of bibliography or reference list style they would prefer. No matter which style you use, there are some components that should always be included. These are:

- the name of the author of the source
- the year (and potentially the full date) of the source
- the title of the journal article/newspaper article/video/book/interview etc.
- the weblink of any online source.

It is also important that you list the references alphabetically according to the last name of each author.

The references below outline one way in which you could present a reference list. This example reference list uses APA 7th style referencing. It is important to ask how your teacher wants you to set out your reference list/bibliography as it may be different to this example.

Example

Agnew-Blais, J. C., Wertz, J., Arseneault, L., Belsky, D. W., Danese, A., Pingault, J. B., Polanczyk, G. V., Sugden, K., Williams, B., & Moffitt, T. E. (2022). Mother's and children's ADHD genetic risk, household chaos and children's ADHD symptoms: A gene-environment correlation study. *Journal of Child Psychology and Psychiatry*. *63*(10), 1153–1163. https://doi.org/10.1111/jcpp.13659

Sellers, R., Harold, G. T., Smith, A. F., Neiderhiser, J. M., Reiss, D., Shaw, D., Natsuaki, M. N., Thapar, A., & Leve, L. D. (2019). Disentangling nature from nurture in examining the interplay between parent-child relationships, ADHD, and early academic attainment. *Psychological Medicine, 51*(4), 645–652. https://doi.org/10.1017/S0033291719003593

Tistarelli, N., Fagnani, C., Troianiello, M., Stazi, M. A., & Adriani, W. (2020). The nature and nurture of ADHD and its comorbidities: A narrative review on twin studies. *Neuroscience & Biobehavioral Reviews, 109*, 63–77. https://doi.org/10.1016/j.neubiorev.2019.12.017

WANT TO KNOW MORE?

If you are instructed to use the APA 7th referencing style, you can go to the APA style website for help on how to format these references. More specifically, you can look at the 'Reference Guide for Journal Articles, Books, and Edited Book Chapters' by typing this URL into your browser apastyle.apa.org/instructional-aids/reference-guide.pdf.

STEP 6 ▸ **Present your work**

Your work could be presented in multiple formats. No matter which format you choose to present your work in, it is important to ensure that the presentation of your work has been considered and includes the use of effective scientific communication. It is also important to consider whether your presentation is appropriate for your target audience, which is most likely your teacher, or your teacher and your class members.

LESSON LINK

In your presentation, you may synthesise psychological research you have found by presenting data, or by organising information in models. You may also refer to different psychological theories to explain the context of your research question. You learnt about models and theories in lesson **1A Introduction to research** and how to present data in lesson **1E Organising and interpreting data**. If you need a refresher on these concepts while organising your investigation presentation you can return to these lessons.

Refer to figures 15 and 16 for an example of one PowerPoint slide that effectively communicates key terms, and another PowerPoint slide that ineffectively communicates key terms.

Definitions	
ADHD and nature versus nurture explained	• **ADHD** refers to a neurodevelopmental condition characterised by persistent inattention or hyperactivity
	• The **nature versus nurture debate** involves questions regarding the contribution of hereditary and environmental factors to development
	• **Hereditary factors** are genetically passed down from biological parents to their offspring
	• **Environmental factors** arise from an individual's physical and social surroundings
	(American Psychological Association, 2022; Sellers et al., 2019)

Figure 15 A PowerPoint slide with effective communication

Definitions	
ADHD and nature versus nurture explained	• **ADHD** refers to a neurodevelopmental condition characterised by persistent inattention or hyperactivity. ADHD onset typically occurs in childhood, where children can experience difficulties in regulating emotions, managing time, and maintaining concentration. Individuals with ADHD can be considered as neurodivergent individuals, as their neurological development and functioning varies from the norm
	• The **nature versus nurture debate** involves questions regarding the contribution of hereditary and environmental factors to development. Although historically separated into separate schools of thought, most psychologists now emphasise the interaction between both nature and nurture on an individual's development
	• **Hereditary factors** are genetically passed down from biological parents to their offspring, also known as the nature side of the nature versus nurture debate. Typically, researchers have outlined temperament to be an example of a hereditary factor
	• **Environmental factors** arise from an individual's physical and social surroundings, also known as the nurture side of the nature versus nurture debate
	(American Psychological Association, 2022; Sellers et al., 2019)

Figure 16 A PowerPoint slide with ineffective communication

When comparing figure 15 with figure 16 there are some clear differences that impact their communication effectiveness. These include:

• figure 16 is harder to read than figure 15 due to having a smaller font size and using cursive writing. Figure 16 also has a big chunk of text, making it much more confusing and requiring more effort to read than the slide in figure 15.

• figure 15 only includes a brief outline of each relevant definition, which effectively introduces the audience to the topic and provides them with an understanding of the three key terms so that the speaker can elaborate and provide more information in the next slides. This aligns with the funnel-shaped guide for presentations outlined in figure 9.

If you have chosen to present your work as a written report, refer to figure 17 which presents a general guide on how to structure your report. This guide focuses on the proportion of each section of your report. Remember that this is only a guide and this proportion may change depending on your research question.

Introduce the topic

Define key terms

Explain psychological concepts

Outline contemporary research and refer to studies

Conclusion

Figure 17 A guide on how much information you should include for each section of your report

Use of psychological terminology, conventions, and representations

Psychological terminology

When writing up your investigation, it is important that you use accurate and appropriate psychological terminology and representations. It is also essential that you use terminology in the correct context of the scientific investigation. Some terminology can have different meanings in everyday life compared to within a scientific investigation.

For example, the term 'organisation' in the real world may be applied to someone who constantly keeps lists of all the tasks they need to complete. By contrast, the term 'organisation' in the context of an investigation on perception refers to the process of regrouping selected features of sensory stimuli in order to form a cohesive and meaningful understanding.

Standard abbreviations and units of measurement

There are certain standard abbreviations that can be used in psychological investigations. For example, it is common to use the abbreviation DSM-5 when referring to the Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition. Similarly, certain units of measurement, including measures of weight, time, and temperature are consistently used in write-ups of scientific reports. These include:

- cm (centimetre)
- kg (kilogram)
- min (minute).

These abbreviations and units of measurement may be particularly helpful in your presentations of data, such as in a graph.

Now that you have learnt about all the steps to conduct your own research investigation, you can conduct your own investigation. You can use the logbook activities to help guide you through this investigation.

UNIT 2

How do internal and external factors influence behaviour and mental processes

In this unit students evaluate the role social cognition plays in a person's attitudes, perception of themselves and relationships with others. Students explore a variety of factors and contexts that can influence the behaviour of individuals and groups, recognising that different cultural groups have different experiences and values. Students are encouraged to consider Aboriginal and Torres Strait Islander people's experiences within Australian society and how these experiences may affect psychological functioning.

Students examine the contribution that classical and contemporary research has made to the understandings of human perception and why individuals and groups behave in specific ways. Students investigate how perception of stimuli enables a person to interact with the world around them and how their perception of stimuli can be distorted.

Reproduced from VCAA VCE Psychology Study Design 2023–2027

UNIT 2 AOS 1

How are people influenced to behave in particular ways?

In this area of study students explore the interplay of psychological and social factors that shape the identity and behaviour of individuals and groups. Students consider how factors such as person perception, attributions, attitudes and stereotypes can be used to explain the cause and dynamics of individual and group behaviours. Students explore how cognitive biases may assist with the avoidance of cognitive dissonance. They also consider the important role that heuristics have in problem-solving and decision-making.

Students are given an opportunity to explore the psychological impact of stereotypes, prejudice, discrimination and stigma on individuals and groups in Australian society, including on Aboriginal and Torres Strait Islander peoples. They investigate strategies to reduce prejudice, discrimination and stigma.

Students evaluate the findings of classical and contemporary research when considering impacts of social groups and culture on individual behaviour, including obedience and conformity. They explore the positive and negative influences of different media sources on an individual's mental wellbeing and group behaviour. They also consider mechanisms to understand group processes and biases that may assist in decision-making and the critical evaluation of people they encounter in life.

Outcome 1

On completion of this unit the student should be able to analyse how social cognition influences individuals to behave in specific ways and evaluate factors that influence individual and group behaviour.

Reproduced from VCAA VCE Psychology Study Design 2023–2027

CHAPTER 6

Social cognition

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

Image: GoodStudio/Shutterstock.com

6A Judging and perceiving others

STUDY DESIGN DOT POINT

- 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

6A	6B	6C	6D

2.1.1.1 Person perception

2.1.1.2 Attributions

2.1.1.3 Attitudes

   2.1.1.3.1 Tri-component model of attitudes

   2.1.1.3.2 Stereotypes
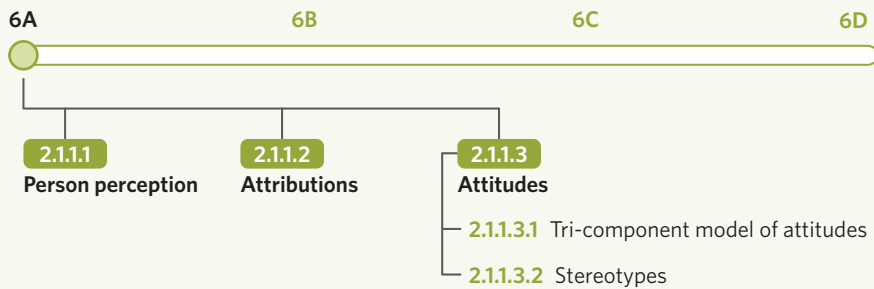
You may have heard the phrase 'don't judge a book by its cover'. Despite this, you may have found it near impossible not to judge from time to time. As humans, we are constantly making judgments and forming impressions in order to make sense of our social world.

In this lesson, we will look at the formation of beliefs, attitudes, and stereotypes about people and objects around us. We often make judgments about the causes of our own or other people's behaviour. The way these judgements guide our decisions and interpersonal interactions is key to understanding the social world.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

Person perception 2.1.1.1

Imagine if a new student walked through the door. What would you first notice about them? Would you look at their facial expression, hairstyle, or clothing? We live in a social world where the ways we perceive other people, or are perceived ourselves, can greatly impact our lives. In this section of the lesson, you will learn about person perception.

Theory details

KEY TERMS

Person perception the different mental processes used to understand and form impressions of other people

Person perception refers to the different mental processes used to understand and form impressions of other people. Whether we like it or not, we make all sorts of judgements about others when we first encounter them. Information that determines our person perception can be provided in two ways.

1. Directly: provided from the person we are judging, for example through observing them or interacting with them.
2. Indirectly: through hearing about the person we are judging from another person or source, for example through a friend or reading about someone online.

Our impressions are determined by our existing attitudes, which you will learn about later in this lesson. Importantly, the social cognitive processes within person perception are often subject to fallibility and bias and therefore can be inaccurate.

First impressions

When we meet someone new, we sometimes might think 'I hope I never see them again' or conversely 'they're someone I'd love to be friends with'. When we first meet someone, we make a snap judgement about them in less than a second, based on easily accessible perceptual information. This readily available information tends to be superficial, such as body language or appearance. These judgements, called first impressions, are a type of direct person perception that can have a lasting impact on the way we feel about and behave toward a certain person. This is why it's often recommended to dress professionally and look your best for a job interview.

As a form of person perception, first impressions can impact the processes of:

- decision-making. Person perception acts as a source of information when making choices, such as whether to see someone again.
- interpersonal interactions. First impressions last, and we tend to trust these 'gut' feelings and can treat people accordingly.

Attributions 2.1.1.2

When we interact with others in our social world, we are constantly observing behaviours and thinking about their causes. In this section of the lesson, you will learn about the common patterns in the way we judge the causes of behaviour. In particular, you will learn about different types of attributions, attributional styles, and the fundamental attribution error.

Theory details

An **attribution** is an evaluation made about the causes of behaviour and the process of making this evaluation. We can say we have made an attribution once we have decided on a potential cause for our own or someone else's actions. Different people may judge the same situation differently due to their own internal biases.

Attribution an evaluation made about the causes of behaviour and the process of making this evaluation

Cognitive process

The cognitive process of attribution follows three distinct steps, as outlined in table 1.

Table 1 Steps in the cognitive process of attribution

	Description	Example
Step 1	Observation of an outward act of behaviour.	A person sees someone running down a busy street.
Step 2	Conscious determination or acknowledgement of the behaviour.	A person actively decides the behaviour they observed was someone running down a busy street.
Step 3	Attribute causes to this observed behaviour.	A person infers that the cause of the other person running down the busy street is that they are disorganised and running late.

Internal versus external attributions

The attributions we make are generally categorised into two types: internal (also known as personal) and external (also known as situational) attributions. These attributions are outlined in table 2.

Table 2 Internal and external attributions

Attribution type	Explanation	Examples
Internal attribution occurs when we judge behaviour as being caused by something personal within an individual.	Internal attributions include judging behaviour as the result of someone's: • psychological state • age • gender • intellect • motivation • ability • desire • past behaviour.	• Believing you have done badly on a test because you are stupid, rather than because you did not have enough time to learn the material. • Assuming someone is running late because they have poor time management, rather than because their car broke down on the way. Continues ▶

Internal attribution (also known as personal attribution) when we judge behaviour as being caused by something personal within an individual

External attribution (also known as situational attribution) when we determine the cause of a behaviour as resulting from situational factors occurring outside the individual

Fundamental attribution error our tendency to explain other people's behaviour in terms of internal factors, while ignoring possible external factors

Table 2 Continued

Attribution type	Explanation	Examples
External attribution occurs when we determine the cause of a behaviour as resulting from situational factors occurring outside the individual.	Situational factors include: • the environment a person is in when they produce a behaviour (e.g. at home or at a concert). • events that the individual has experienced beyond their control (ranging from things like emergencies to the actions of another person).	• Attributing someone falling off their bike to the icy and slippery road they were travelling on that caused them to lose control. • Blaming the trains running behind schedule for being late for work.

From birth, people begin making constant internal attributions about the way we act. The parents of a newborn baby have to make all kinds of inferences: is the baby crying because they are hungry, sleepy, or are they in pain? As we age, the attributions made about us become more complex: are we not working because we are lazy, or do we not believe in ourselves? Is he crying because something terrible happened, or is he being too sensitive?

Fundamental attribution error

Have you ever called your sibling lazy for leaving the kitchen a mess, and then were caught red-handed a few days later causing the same mess yourself? We often overemphasise someone else's responsibility for their actions more than we do for ourselves. We assume that their nature always dictates their behaviour, whilst making excuses for ourselves based upon external factors. This is the basis of the **fundamental attribution error**, which refers to our tendency to explain other people's behaviour in terms of internal factors, while ignoring possible external factors. Research suggests that this phenomenon arises because the most salient (noticeable) physical feature when perceiving another's behaviour is the person themselves, rather than the situation they are in. This can have implications for how we perceive that individual overall. This concept is an example of a cognitive bias. You will learn more about these later in this chapter.

Figure 1 One situation can be evaluated in multiple different ways, as a result of how we weigh internal and external attributions when judging the situation
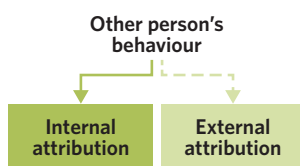
Figure 2 The fundamental attribution error is a function of internal and external attributions

Effects of attribution on future actions

The type of attributions we make can have significant impacts on our future behaviour towards ourselves and other people. This often depends on whether we have used an internal or external attribution. The following examples present different types of attributions and how they can influence future actions.

• We might attribute a person being late several days in a row to them being disinterested in the job, when actually they have had several family emergencies. We may then be more likely to perceive them negatively, and treat them accordingly, such as excluding them from social discussions.

• The way we attribute our own successes or failures can determine the way we respond to similar tasks in the future. This is seen in the way students respond to the adversity of academic failure and challenge, as outlined in figure 3.
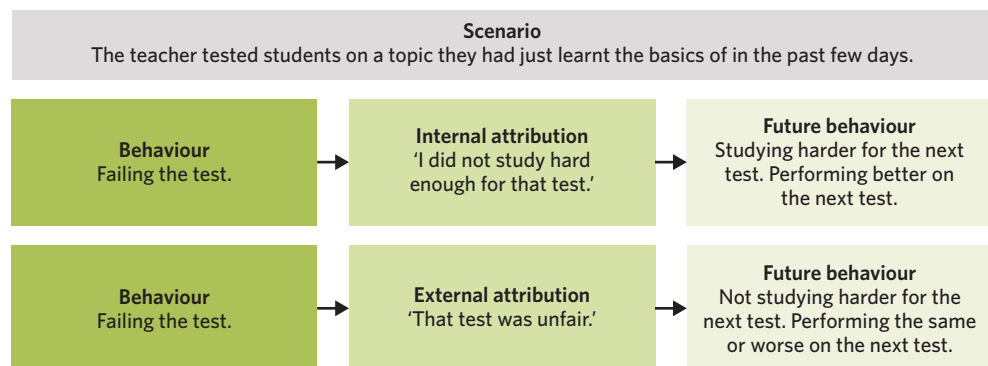
Figure 3 How different types of attribution can determine future behaviour

Attributional style tendencies and repeated patterns in the way someone makes attributions

In general, the tendencies and repeated patterns in the way someone makes attributions are referred to as their **attributional style**. For example, someone who regularly attributes behaviour to negative causes might be labelled as having a pessimistic attributional style.

Research in educational psychology has shown that the type of attributional style students use can determine future academic performance and self-belief. As shown in figure 3, a student who attributes failure to an external cause will likely not consider what they can do to improve in the future. Because the student believes the cause of the failure is beyond their control, they will not make a concerted effort to improve in the future.

Alternatively, a student that attributes failure to an unstable and internal cause (something that is able to be changed) is more likely to actively try to modify their behaviour in the future due to feelings of internal control. This is because they take responsibility for the failure and can also see that the reason for it is able to be modified in future. The opposite of this is learned helplessness, a feeling we get when we continually attribute failures to a stable (unchanging and fixed), internal inability to do a certain task. As shown in figure 3, we can also experience learned helplessness due to an external factor beyond our control. Constantly attributing failure in this way then makes us 'learn' that we are 'helpless', even when this is not the case.

PSYCHOLOGY EXPLORATION

Attributional style can affect test scores

Learned helplessness has been found to occur in situations where failure is out of the individual's control (Gernigon et al., 2000). Additionally, research has found people who attribute their failure to internal causes are more likely to give up on the task (Stiensmieier-Pelster & Schürmann, 1989).

In a study by Firmin et al. (2004), learned helplessness was shown to negatively affect scores on a test conducted as part of an experiment. They gave students one of the following two tests:

- Test 1, where the beginning of the test had extremely challenging questions.
- Test 2, where the beginning of the test had easy questions.

They found that students who took test 1 quickly became more frustrated than those who took test 2, and may have begun to doubt their intellectual abilities. As a result, they missed the easy questions later on in the test, compared to the students that took test 2. Therefore, perceiving your own failure (whether real or imagined) can cause you to give up on a test where you otherwise may have performed better than expected.

Remember this the next time you want to give up after opening a test paper, and do not let learned helplessness stop you from achieving a better grade!

Attributions can impact:

- decision-making. For example, somebody with an external attributional style may not change their behaviour when approaching a task they have previously failed at, due to perceiving it as beyond their control.
- interpersonal interactions. Someone who frequently demonstrates the fundamental attribution error may often find themself in conflict.

Attitudes 2.1.1.3

So far in this lesson we have discussed the perceptions and attributions that influence how we feel about people. These feelings tend to be attached to attitudes towards someone or something relative to that person. In this section of the lesson, you will learn about attitudes. The relationships between attitude components will be explored through the tri-component model of attitudes.

Theory details

Attitudes refer to an evaluation of something, such as a person, object, event, or idea. Attitudes can vary in strength and people may hold different attitudes towards certain items. For example, you may feel strongly about pineapple on pizza, whereas someone else may care less about their pizza toppings. The attitudes we hold and their relative strength are informed by a range of factors, including our prior knowledge and unique experiences.

> **Attitude** an evaluation of something, such as a person, object, event, or idea

The criteria for attitude formation

For something to be considered an established attitude there are three criteria that must be met. These are that the attitude is:

1. an evaluation of something
2. settled and stable
3. learnt through experience.

This criteria is further elaborated below.

1. An evaluation of something

As mentioned, attitudes inherently involve an evaluation of something. This means that they involve an assessment. For example, you might be able to place an attitude towards something along a continuum, ranging from negative, to neutral, to positive.
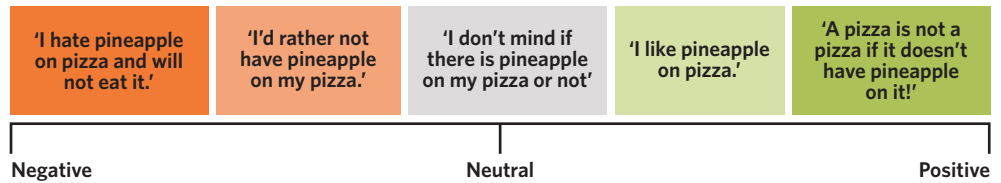
Figure 4 Attitudes involve an evaluation of something, involving an assessment of something along the scale from negative to positive

2. Settled and stable

Furthermore, attitudes are relatively settled and stable. This does not mean that our attitudes can't change, but just that they are often relatively permanent. For example, liking pineapple on pizza would generally be a stable positive evaluation. The stronger our attitude is, the harder it is to change.

3. Learnt through experience

As with many processes of social cognition, holding an attitude is something that we mostly learn through experience. For example, whether we believe it is okay to eat rats or dogs is informed by our unique sociocultural experiences. Once learnt, our attitudes help us navigate through our social world. By holding a point of view about the stimuli in our environment, we are able to make decisions about beneficial, safe, and appropriate ways for us to respond. For example, if we have had the experience of tasting pineapple on pizza and found it dreadful, we would have developed a negative attitude to this flavour combination, allowing us to avoid future encounters with this type of pizza.

Judgements that are not attitudes do not necessarily require an active evaluation process, nor do they have to be as stable or learnt as attitudes are. For example, we may believe that Huskies are an energetic dog breed, but this is not an attitude as an evaluation has not been made (therefore it has not met all three criteria). In contrast, believing that huskies are the best dog breed (as outlined in figure 5) would be an attitude as it does meet these criteria.
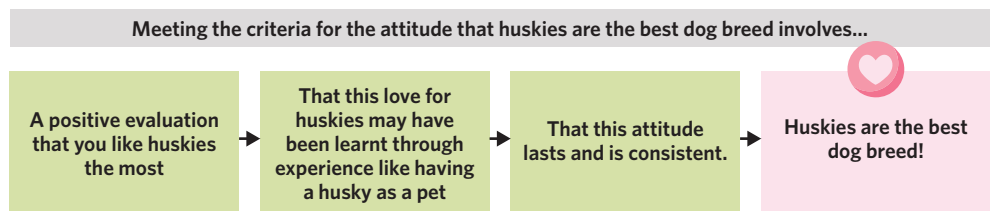
Figure 5 The criteria for an attitude involves an evaluation (whether it is positive or negative), the attitude being settled and stable, and that the attitude is learnt through experience

The tri-component model of attitudes 2.1.1.3.1

The **tri-component model of attitudes** illustrates the relationship between the affective, behavioural, and cognitive components of our attitudes. Aside from the attitude criteria outlined earlier in this lesson, the tri-component model dictates that all three of the affective, behavioural, and cognitive components must exist for an attitude to truly be present. Importantly, the three components all interact and contribute to the attitude held. These components are broken down in more detail in table 3.

> **Tri-component model of attitudes (also known as the 'A-B-C' or 'tripartite' model)**
> a model which illustrates the relationship between the affective, behavioural, and cognitive components of our attitudes
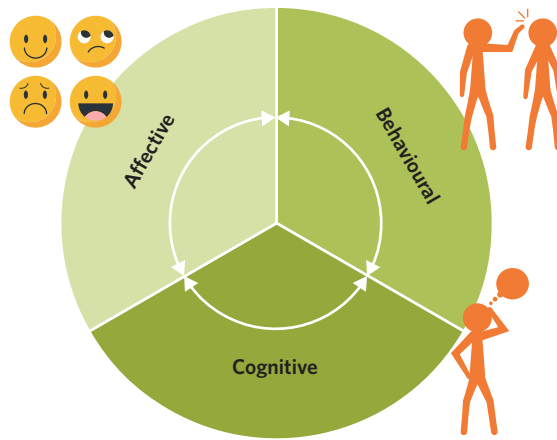
Figure 6 The tri-component model of attitudes

Table 3 Unpacking components of the tri-component model of attitudes

Tri-component model component	Explanation	Examples
The **affective component** refers to our emotions and intuitive feelings towards something, reflected in our attitude.	You can think of the affective component as the automatic feeling you get when presented with something. As mentioned, these feelings can range across a continuum with positive, neutral, or negative feelings.	You can think of the affective component as being verbally expressed by statements such as: • I love pineapple on pizza. • I hate salami. • I couldn't care less about whether we wear uniforms or not.
The **behavioural component** describes our outward and observable actions that reflect our point of view about something.	When we hold an attitude we can often act in accordance with that attitude. However our behaviour is not always consistent with our feelings and thoughts. This will be explored with the limitations of the model later in this lesson.	• If someone is saddened by the treatment of animals in the meat industry and believes eating them is wrong, they might reflect this attitude through the behaviour of not eating meat. • If someone thinks recorded music is fake and that live music is more authentic, they may go to more concerts.
The **cognitive component** involves our thoughts and beliefs towards something.	This component is often separated from the affective component on the basis that it comprises the more matter-of-fact, emotion-free, and objective thoughts about something.	You can think of the cognitive component as being verbally expressed by statements such as: • I think wearing uniforms is practical (because it saves time in the morning). • I believe pineapple doesn't belong on pizza (because it is sweet and pizza is savoury). Notice that all these statements reflect beliefs and thoughts that sound more separated from emotion.

Often, our cognitions are able to be followed up with a 'because' statement, allowing us to justify our thoughts with reasoning. Although affect and cognition are separated in the model and are clearly different, in reality, our cognitions are often influenced subconsciously by our more automatic affect (Haidt, 2012). For example, we may have automatic feelings towards a person we know (love, hatred), and then in our head, justify these with rationalisations (cognitions). Although these rationalisations might seem objective, they are likely interacting with and influenced by our emotions.

USEFUL TIP

Remember the tri-component model is also called the A-B-C model. This mnemonic can help you to remember what each component is referring to.

Affective (I feel affected emotionally)

Behavioural (I behave in accordance with the attitude)

Cognitive (I cognitively consider the facts about the object of my attitude)

Affective component our emotions and intuitive feelings towards something, reflected in our attitude

Behavioural component our outward and observable actions that reflect our point of view about something

Cognitive component our thoughts and beliefs towards something

If all three components of attitudes are consistent, then an example of an attitude might be represented like this:

The person has a positive affect towards pineapple on pizza.

The person eats and enjoys pineapple on pizza.

Affective
'I love pineapple on pizza.'

Behavioural

Cognitive
Pineapple complements the flavour of cheese and tomato on pizza

The person believes pineapple tastes nice on pizza.
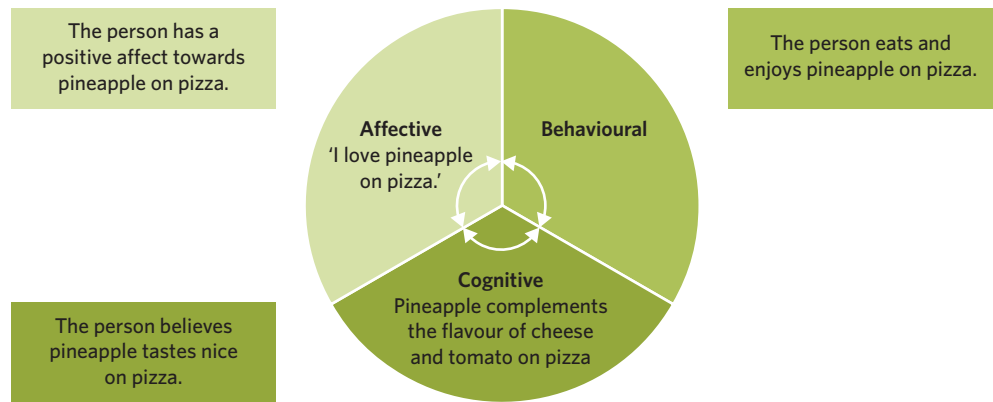
Figure 7 A worked example of how a positive attitude towards pineapple and pizza might be expressed via the tri-component model of attitudes

Although the tri-component model is the most common model to explain attitudes, it does have some significant shortcomings. A key criticism concerns the behavioural component. Many psychologists suggest that only the affective and cognitive components need to be present for an attitude to exist. They argue that this is due to there being many circumstances in which a person's behaviour does not or cannot reflect their attitudes.

Affective Behavioural

Cognitive

VS

Affective
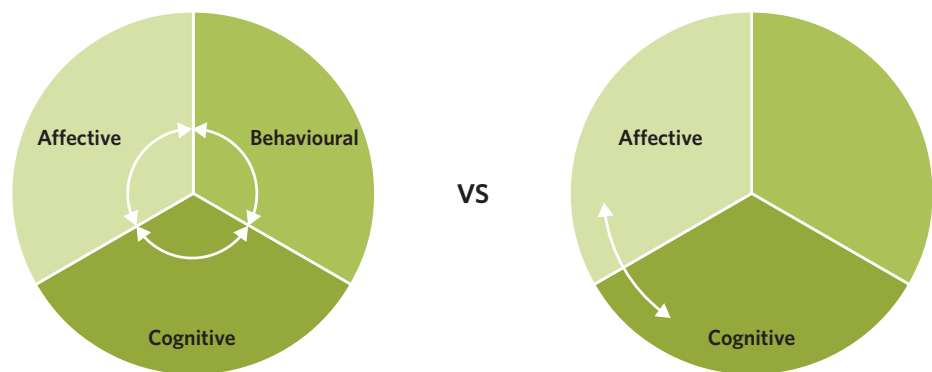
Cognitive

Figure 8 Many psychologists suggest that an attitude only requires the interaction of our affective and cognitive components

Can you think of any examples in which you held an attitude but were not able to perform a behaviour that reflected that attitude? For example, you might hold the feeling (affect) and belief (cognition) that a child in your extended family is unbearably annoying. However, out of respect for their parents, you may act as though you find them fun and adorable (behaviour). Psychologists use the term cognitive dissonance to refer to occurrences when our thoughts, feelings, and/or behaviour don't align with our overall attitude. You will learn more about this later in this chapter.

Attitudes can impact the processes of:

- decision-making. Attitudes can inform choices from which clothes we wear to what food we eat (e.g. choosing a pizza that does not have pineapple on it).
- interpersonal interactions. For example, if we have a positive attitude towards our job, we may be more bubbly and form bonds with more people at the workplace.

PSYCHOLOGY EXPLORATION

Do opposites really attract? In one study almost 80% of people reported they believe they do (McCutcheon, 1991). In rigorous scientific research, however, quite the opposite appears to be the case.

This phenomenon has been investigated using the 'phantom stranger' technique (Byrne, 1961). First, participants fill out a questionnaire on their attitudes towards a range of things. Next, they complete the 'person-perception' phase, where they evaluate a made-up person based on their answers to the same questions.

By altering how similar the made-up person's attitudes are to the participant's, results showed that people reported being more attracted to similar others. As the similarity between attitudes got higher, so did the amount they liked this fake person.

Stereotypes 2.1.1.3.2

What type of person do you see in your head when you think of a CEO, a nurse, or a teacher? A **stereotype** is a widely held belief and generalisation about a group, such as people, animals or objects. They allow us to perceive others and make sense of the social world by applying simplified characteristics to all members of a group or category of people. Because they are a belief, they form the cognitive component of our attitudes towards other people.

Some common stereotypes include:

- Men are strong, task-focused beings and do not get very emotional.
- Women are socially-oriented beings and are highly sensitive.
- Old people are frail, slow, and unfit to engage in physical activity.
- Poor people are lazy and unintelligent.
- Americans are stupid.
- Vegan food tastes weird.
- Melburnians love coffee.

As stereotypes are generalisations about groups, they often lead to oversimplified and inaccurate judgements of individual people within those groups. If we believe, for example, that scientists are nerdy men who wear glasses and stay in the laboratory all day, we may discount a female in a field setting as being a 'true' scientist because she does not conform to our mental image. Although there are positive stereotypes, such as that women are nurturing, stereotypes can often cause us to overlook the unique characteristics of individuals and pay attention only to their features that conform to a stereotype.

Stereotypes can impact:

- decision-making. Stereotypes can set personal parameters for our goals, because if we believe we stereotypically fit the role for something, we may make more decisions aligning us with that goal (e.g. choosing a course at university in that field).
- interpersonal interactions. Stereotypes influence who we choose to interact with, and how we choose to interact with them.

> **Stereotype** a widely held belief and generalisation about a group, such as people, animals or objects
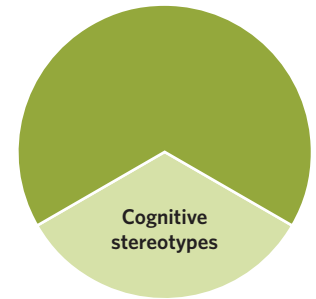
Figure 9 Stereotypes correspond to the cognitive component of our attitudes

---

Theory summary

In this lesson, you have learnt about person perception and forming first impressions. You have also learnt about attributions, including external and internal attributions and how these appear with the fundamental attribution error. Additionally, you have been introduced to attitudes and the tri-component model of attitudes. You also learnt about stereotypes as a cognitive component of attitudes. These concepts have also been examined through the lens of decision-making and interpersonal relationships and are summarised in figure 10.
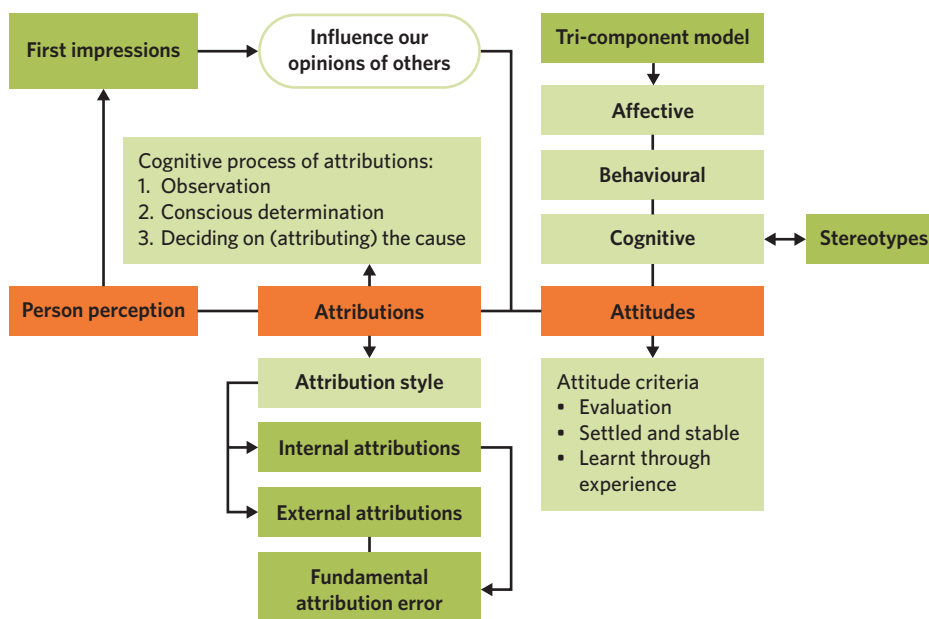
Figure 10 Theory summary of lesson 6A

6A Questions

Question 1

Person perception is influenced by affective, behavioural, and cognitive components and includes when we

A. make a snap judgement based on someone's ethnicity and gender.

B. judge someone based on stories we've heard about them.

C. both options A and B.

Question 2

In social psychology, attribution refers to

A. the judgement we make about the cause of a person's behaviour.

B. the process of determining the causes of a person's behaviour.

C. both options A and B.

Question 3

Attributing someone's behaviour to their psychological state is an example of an

A. internal attribution.

B. external attribution.

Question 4

The tendency for someone to attribute behaviour to stable, internal causes may be referred to as

A. an attributional style.

B. the fundamental attribution error.

Question 5

For a belief to be an attitude, it must be **(Select all that apply)**

I. an evaluation.

II. positive.

III. fairly stable.

IV. known from birth.

Question 6

Which of the following statements reflect an affective component of an attitude? **(Select all that apply)**

I. Not going outside because you are scared.

II. Feeling scared of the outside world.

III. Being mad at someone for betraying your trust over many years.

IV. Thinking that a law is unfair because it doesn't consider a major group of people in society.

V. Choosing to vote because you believe it is important to have your say.

Question 7

According to the tri-component model of attitudes, someone who drinks their auntie's lemonade even though they think it tastes bad and it makes them feel sick holds an attitude of their auntie's lemonade.

A. True.

B. False.

Question 8

Which of the following statements are stereotypes? **(Select all that apply)**

I. Hot coffee tastes better when it is cold outside.

II. Homeless people are lazy.

III. Teenagers are obsessed with TikTok.

IV. A lot of people consider yellow to be a happy colour.

V. People who wear glasses love to read.

Assessment skills

Perfect your phrasing

Question 9

Which of the following sentences is most correct?

A. In the tri-component model of attitudes, the cognitive component involves our **thoughts and beliefs** towards something, whereas the affective component refers to our emotions and intuitive feelings towards something.

B. In the tri-component model of attitudes, the cognitive component involves **cognition about how we feel** towards something, whereas the affective component refers to our emotions and intuitive feelings towards something.

Question 10

Which of the following sentences is most correct?

A. A stereotype is a widely held generalised **belief about all** members of a group of people.

B. A stereotype is a widely held generalised **attitude towards some** members of a group of people.

Text analysis

The following assessment skills type reflects the study design assessment type:

- media analysis of one of more contemporary media texts

Use the following information to answer questions 11 and 12.

> **Bad Rap for Pit bulls: A Display of Social Cognition**
>
> Pit bulls and associated dogs have an infamous reputation for nabbing babies from their prams, biting strangers, and attacking children in the playground… but how true is this really? People have such strong negative attitudes towards pit bulls that there have been targeted breed bans on owning and breeding pit bulls in places such as Ontario, Canada (Dog Owner's Liability Act, 1990).
>
> A researcher's survey of 56 adults from Michigan (Iliopoulou et al., 2019) asked for their opinions on pit bulls and associated breeds.
>
> The researchers point out that in the U.S. there is a rather low incidence of fatal dog attacks on children, lower than deaths related to balloons (Bradley, 2005). Once prized as gentle, family dogs, they are now perceived as vicious killers by much of the general population. The researchers also point out that pit bull is not a well-defined breed, with many dog breeds being generalised to the label, and that compared to other breeds, pit bulls do not display higher rates of aggressive behaviour. This reputation's emergence could be linked back to a focus on pit bull attacks in the media and associating them with dogfighting.
>
> The survey asked participants to write as many terms that came to mind when thinking 'pit bulls'. 68% of people related them to violence, danger, and unpredictability. 57% described them to have a scary physical appearance, and 55% to being a symbol of status for violent individuals like gang members.
>
> (Rogers, 2020)

Question 11

The stereotype that all pit bulls are unpredictable and dangerous is best exemplified through the finding that

A. '68% of people related them to violence, danger, and unpredictability.'

B. there are generalisations that all dog breeds that resemble pit bulls are dangerous.

C. 'there is a rather low incidence of fatal dog attacks on children, lower than deaths related to balloons.'

D. pit bulls cause a lot of people to feel scared.

Question 12

Many survey participants related pit bulls to violence. Using the tri-component model of attitudes, the different components of their attitudes towards pit bulls could be:

	Affective	Behavioural	Cognitive
A.	Believing pit bulls are scary.	Disliking pit bulls.	Hating pit bulls when you see them.
B.	Fear of pit bulls.	Believing pit bulls are dangerous.	Thinking about pit bulls.
C.	Fear of pit bulls.	Running away from pit bulls.	Thinking pit bulls are dangerous.
D.	Feeling like nobody should own a pit bull as a pet.	Being scared when you see a pit bull.	Attributing their violent behaviour to their genetics.

Exam-style

Remember and understand

Question 13 (1 MARK)

The three primary steps in attribution in order are

A. attribution, determination of behaviour, attitude.

B. observation, determination of behaviour, attribution.

C. determination of behaviour, attribution, behaviour.

D. observation, attribution, determination of behaviour.

Question 14 (1 MARK)

Solomon is the first male to join his school poetry club. When he first arrived, he felt worried that his peers would judge him as unmasculine and too sensitive. How might stereotypes have contributed to Solomon's worries?

A. Stereotypes that only some men can be sensitive and still be 'masculine' mean that Solomon has a chance of being perceived as feminine and weak.

B. Solomon worries some of the other boys at school will pick on him for joining the poetry club before them because they are jealous.

C. People already believe Solomon is overly-sensitive compared to the other people in his year level, so emotional poetry-writing would add to their negative attitudes towards him as an individual.

D. Stereotypes of men needing to have interests that aren't emotional, and poetry being emotionally sensitive, may have led Solomon to worry that he will be perceived as feminine and weak.

Question 15 (1 MARK)

Josh continuously fails his chemistry assessments. He repeatedly blames his own inability to do well in chemistry, believing it is out of his control to do well and that there is no point in changing his behaviour. Josh best demonstrates which of the following attributional styles?

A. Pessimistic attributional style

B. Optimistic attributional style.

C. Learned helplessness.

D. Mixed attributional style.

Question 16 (2 MARKS)

Using an example, outline a limitation of the tri-component model of attitudes.

Question 17 (2 MARKS)

Provide an example of how person perception can influence decision-making and interpersonal interactions.

Question 18 (5 MARKS)

William hates English class because he feels as though his brain is better suited to mathematical thinking and that he is not good at English due to having difficulty completing the class work. Because of this, he doesn't pay attention in English class anymore or try on his tests as he finds it too hard to study for them.

a. Identify William's behaviour and the attribution he is making. (2 MARKS)

b. Explain how an alternative attribution could influence William's attitude and future behaviour. (3 MARKS)

Apply and analyse

Use the following information for questions 19 and 20.

Jess was moving house and was waiting for the removalist to arrive. Her mother had warned her that removalists were famous for their unpunctuality. The removalist was already over four hours late and they were missing her calls. Extremely angry, Jess attempted to call them one more time, and this time they picked up. They said they were very sorry, and that someone had stolen the truck along with all their belongings, but that the police had just recovered it. After hearing this, Jess let go of all anger towards the removalist, and instead felt sorry for them.

Question 19 (1 MARK)

Jess' assumption that it was the removalists' unpunctuality causing them to be late, rather than guessing that something unexpected may have happened, is an example of _____. Her mother's belief about the removalists was based upon _____.

Which of the following best fills in the blank?

A. an internal attribution, an external attribution

B. a stereotype, a negative attitude towards removalists

C. the fundamental attribution error, a stereotype

D. direct person perception, indirect person perception

Question 20 (3 MARKS)

Before the last time Jess called the removalist, she angrily decided that she hated all removalists. Referencing the criteria for attitude formation, provide two reasons why this might be classified as an attitude, and one reason for why it might not be classified as an attitude.

Questions from multiple lessons

Question 21 (5 MARKS)

Achmad hates sour lollies and doesn't understand how his friends enjoy them. His friends play a game to see how many sour lollies they can put on their tongue at once, but Achmad refuses to put even one.

a. With reference to one component of the tri-component model of attitudes, explain how one biological factor may have influenced Achmad's negative attitude towards the taste of sour lollies. (3 MARKS)

b. Imagine Achmad decided to join in, placing a sour lolly on his tongue despite his attitude. Explain how this may demonstrate a limitation of the tri-component model of attitudes. (2 MARKS)

6B Cognitive dissonance and cognitive biases

6A   6B   6C   6D

2.1.2.1 Cognitive dissonance   **2.1.2.2** Cognitive biases
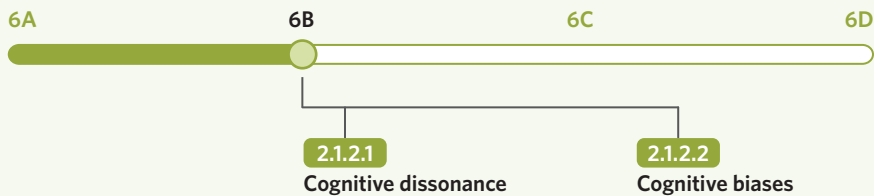
Although we may believe that lying is bad, we are all guilty of telling a lie every once in a while. When we lie, we may feel uncomfortable about our behaviour as it is inconsistent with this belief. In order to avoid this uncomfortable feeling, we may change the way we perceive and justify our lies, such as by blaming it on circumstances rather than admitting that we behaved wrongly. In this lesson, you will learn about cognitive dissonance and how it can be avoided or reduced through the use of different cognitive biases.

Cognitive dissonance 2.1.2.1

In our everyday lives, we want to achieve a comfortable state of mind in which our thoughts, feelings, and behaviours are consistent with one another. When we don't have this consistency, we can experience psychological tension that is known as cognitive dissonance.

Theory details

Cognitive dissonance is the psychological tension that occurs when our thoughts, feelings, and/or behaviours do not align with one another. Cognitive dissonance often occurs when we act in a way that contradicts our beliefs. For example, a person who knows smoking cigarettes is bad for them (thought) might still smoke at a party (behaviour). Smoking at the party might lead to feelings of psychological tension (cognitive dissonance), as when they consciously think about their behaviour, they are aware that it does not align with their thoughts and what they know about smoking.

It is important to realise that inconsistencies (misalignment) between thoughts, feelings, and behaviours only produce cognitive dissonance under certain circumstances, such as:

- if you were aware of the potential consequences and the inconsistency of your behaviour when you decided to undertake the behaviour.
- if you cannot sufficiently justify why you performed the behaviour.

For example, maybe you were saving up for a car but decided to buy a new, expensive jacket instead. If you bought the jacket because it was your birthday, then you may not feel cognitive dissonance as you can adequately justify your behaviour. However, if you bought the new jacket for no adequate reason and you were aware of the potential financial consequences of buying the jacket, then you are more likely to experience cognitive dissonance.

Cognitive dissonance can also arise when there is an inconsistency between the amount of effort you put into something and the outcome. For example, imagine you spend a large amount of time stressing and studying for a test, but when you go to do it there are only easy multiple-choice questions. You'll likely feel discomfort as your thoughts about the test after completing it (that it was easy and didn't require studying) do not align with your behaviour before completing it (stressing and studying for a large amount of time). Therefore, you may find it difficult to justify the amount of effort you put into the relatively easy test, leading to psychological tension.

Thoughts

Behaviours

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

KEY TERMS

Cognitive dissonance the psychological tension that occurs when our thoughts, feelings, and/or behaviours do not align with one another

USEFUL TIP

To help understand what cognitive dissonance is, it is useful to know what dissonance means. The word dissonance can be used to describe a lack of agreement between people or things. In music, dissonance refers to a lack of harmony between music notes. Therefore, the term cognitive dissonance indicates there is a lack of agreement and harmony within one's mind.

When we experience cognitive dissonance, we are motivated to reduce this feeling of tension and misalignment. Since cognitive dissonance is most commonly related to an individual's thoughts and behaviour, cognitive dissonance is sometimes reduced or avoided by:

- changing your thoughts to align with your behaviour.
- changing your behaviour to align with your thoughts.

Figure 1 provides an example of how this may occur.
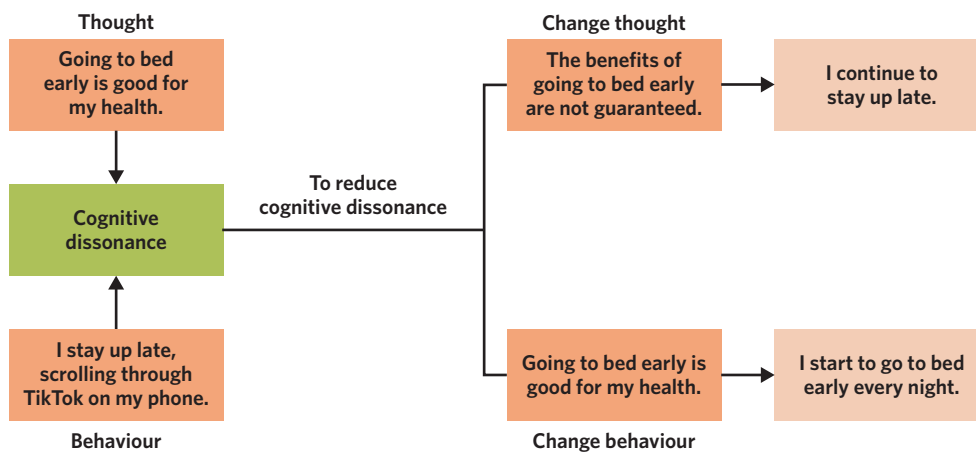
Figure 1 Cognitive dissonance can be reduced by changing your thoughts or behaviour

Sometimes, for whatever reason, we cannot align our thoughts, feelings and behaviour. Instead of living with this unavoidable cognitive dissonance, our minds have developed interesting ways to nonetheless reduce it. In these situations, cognitive dissonance may be reduced through the use of different cognitive biases which will be explored in the next section of this lesson.

Cognitive biases 2.1.2.2

When we experience cognitive dissonance, we might not feel comfortable or happy with ourselves and our thoughts, feelings, or actions. In order to make ourselves feel better and reduce cognitive dissonance, we employ cognitive biases to alter the way we think about certain situations.

Theory details

Cognitive biases are unconscious, systematic tendencies to interpret information in a way that is neither rational nor based on objective reality. Instead of following logic, individuals distort information to think about it in a way that is preferable to them, thereby avoiding or reducing cognitive dissonance. There are multiple types of cognitive biases, and some of these are depicted in figure 2 and explained in table 1.

Cognitive biases
unconscious, systematic tendencies to interpret information in a way that is neither rational nor based on objective reality

Figure 2 Different types of cognitive biases

Confirmation bias
the tendency to search for and accept information that supports our prior beliefs or behaviours and ignore contradictory information

Actor-observer bias
the tendency to attribute our own actions to external factors and situational causes while attributing other people's actions to internal factors

Self-serving bias
the tendency to attribute positive success to our internal character and actions and attribute our failures to external factors or situational causes

LESSON LINK

In lesson **6A Judging and perceiving others**, you learnt about internal and external attributions. Internal attribution occurs when we judge behaviour as being caused by something personal within an individual, whereas external attribution occurs when we determine the cause of a behaviour as resulting from situational factors outside the individual's control. In the case of the self-serving bias, we tend to make internal attributions about our successes and external attributions about our failures.

Table 1 Descriptions of different cognitive biases

Cognitive bias	Explanation	Example
Confirmation bias	The tendency to search for and accept information that supports our prior beliefs or behaviours and ignore contradictory information.	Ida may refuse to receive a vaccine as she holds the belief that they are dangerous to her health. However, if research shows the positive effects of vaccines, then her initial thoughts may be challenged. To avoid cognitive dissonance, she is likely to seek out more information that supports her initial beliefs, such as rare cases of negative vaccine side effects, and ignore information that supports the safety of vaccines. This information may justify her behaviour of not getting vaccinated, which can assist in avoiding cognitive dissonance.
Actor-observer bias	The tendency to attribute our own actions to external factors and situational causes while attributing other people's actions to internal factors.	Hassan holds a belief that he is generally a calm person. However, on a night out, he gets into a fight with another person. Hassan feels psychological tension as this behaviour is inconsistent with his self-beliefs. To reduce this discomfort, he attributes his behaviour to external factors, such as that the other person instigated it and it was self-defence, not that he was the violent one. He also attributes the other person's behaviour to internal factors, such as that they were crazy or rude. This justification may reduce cognitive dissonance as Hassan may feel better about himself and his contradictory behaviour.
Self-serving bias	The tendency to attribute positive success to our internal character and actions and attribute our failures to external factors or situational causes.	Giovani puts in a lot of effort studying for their psychology test, yet still fails the test. To avoid cognitive dissonance about the misalignment between the amount of effort they put into studying and the outcome, they attribute their failure to situational causes, such as the test was hard, as opposed to internal causes, such as their lack of knowledge. On the other hand, Giovani did not study for their maths test (when they knew they should have), yet still passed the test. They try to avoid cognitive dissonance by attributing their success to their own character, such as by believing that they are naturally smart.

Table 1 Continued

Cognitive bias	Explanation	Example
False-consensus bias	The tendency to overestimate the degree to which other people share the same ideas and attitudes as we do.	Mei is passionate about saving the environment and tries to live sustainably. Despite this, Mei thinks her individual actions and behaviours are not enough of a difference. To make her feel better about her individual actions, she reasons that all other young people also care about the environment and are working towards the same goal, meaning her self-perceived insignificant actions are actually contributing to a greater cause and having a collective impact. In this way, Mei can reduce her cognitive dissonance by assuming that all other people care about the same issue.
Halo effect	The tendency for the impression we form about one quality of a person to influence our overall beliefs about the person in other respects.	Beth starts dating a boy named Fitz who was really funny when they first met. Because Fitz was funny, Beth believes that he is also adventurous, outgoing, and kind. If Beth believes Fitz has negative traits, then this may cause discomfort for Beth as these beliefs do not align with her first impression of him being funny. Therefore, although Fitz has not displayed these positive qualities, Beth's assumptions help to avoid cognitive dissonance as they are consistent with her first impression.

False-consensus bias
the tendency to overestimate the degree to which other people share the same ideas and attitudes as we do

Halo effect
the tendency for the impression we form about one quality of a person to influence our overall beliefs about the person in other respects

Theory summary

In this lesson, you learnt about cognitive dissonance. In particular, you learnt about how cognitive dissonance can be avoided and reduced through cognitive biases. Figure 3 summarises the types of biases.
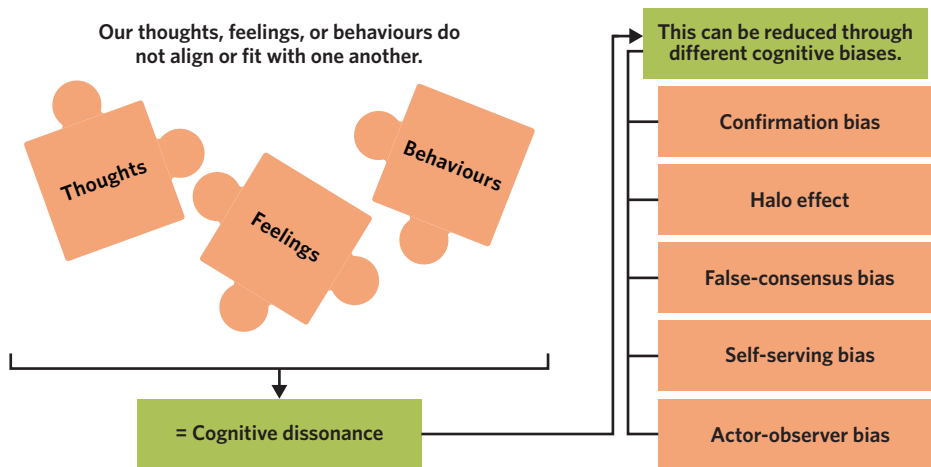
Figure 3 Summary of lesson 6B

6B Questions

Question 1

Cognitive dissonance occurs when there is consistency between thoughts, feelings, and/or behaviours.

A. True.

B. False.

Question 2

Cognitive dissonance involves psychological _____.

Which of the following best fills in the blank?

A. tension

B. harmony

Question 3

Individuals will always experience cognitive dissonance if their thoughts, feelings, and/or behaviours do not align.

A. True.

B. False.

Question 4

If individuals experience cognitive dissonance, they cannot do anything to alleviate it.

A. True.

B. False.

Question 5

Which of the following is an example of a cognitive bias? **(Select all that apply)**

I. Confirmation bias.

II. Actor-audience bias.

III. Self-serving bias.

IV. False-consensus bias.

V. Angel effect.

Assessment skills

Perfect your phrasing

Question 6

Which of the following sentences is most correct?

A. Cognitive dissonance is the psychological **tension** that occurs when either our thoughts, feelings, and/or behaviours do not **align** with one another.

B. Cognitive dissonance is the psychological **strain** that occurs when either our thoughts, feelings, and/or behaviours do not **cooperate** with one another.

Text analysis

The following assessment skills type reflects the study design assessment type:

- analysis and evaluation of an experiment or case study

Use the following information to answer questions 7–9.

Smoking and cognitive dissonance

The majority of people can agree that smoking does pose serious risks to health, however, some people continue to smoke. Smokers tend to endorse information that supports their behaviour, such as that smoking reduces stress or that the health risks of smoking are not as serious as most people think. Smokers use this information to justify their behaviour and change their beliefs in ways that helps rationalise their continued behaviour of smoking, thus reducing psychological tension.

(Fotuhi et al., 2013)

Question 7

Which of the following statements best reflects why smokers may experience cognitive dissonance?

A. 'The majority of people can agree that smoking does pose serious risks to health, however, some people continue to smoke.'

B. 'Smokers tend to endorse information that supports their behaviour.'

Question 8

Smokers tend to endorse information that supports their behaviour, such as that smoking reduces stress or that the health risks of smoking are not as serious. This reflects the

A. self-serving bias.

B. false-consensus bias.

C. confirmation bias.

Question 9

According to Fotuhi et al. (2013), smokers try to reduce cognitive dissonance by

A. modifying their behaviour and quitting smoking, thus supporting their belief that smoking may be bad for their health.

B. modifying their beliefs that the health effects are not all bad, thus justifying their behaviour of smoking.

Exam-style

Remember and understand

Question 10 (1 MARK)

Outline what is meant by cognitive dissonance.

Question 11 (1 MARK)

The false-consensus bias is

A. the tendency to falsely attribute our actions to the majority.

B. the tendency to underestimate the degree to which other people share the same ideas and attitudes that we do.

C. the tendency to overestimate the degree to which other people share the same ideas and attitude that do.

D. the tendency to falsely attribute other people's ideas and attitudes to external factors.

Use the following information to answer questions 12 and 13.

Benji has spent months organising a fundraiser. He had put a lot of effort in by staying late after school to plan and set up things. On the day of the fundraiser it rains and barely any people show up and they do not make as much money as they planned to. Benji feels psychological tension about the inconsistency between the amount of effort he put in and the outcome. Benji tries to attribute his failure to external factors by saying that the rain was the reason no one showed up, not the fact that he was a bad organiser.

Question 12 (1 MARK)

After the failure of the fundraiser, Benji is experiencing

A.   cognitive biases.

B.   cognitive dissonance.

C.   cognitive harmony.

D.   cognitive-behavioural change.

Question 13 (1 MARK)

Benji tries to attribute his failure to external factors by saying that the rain was the reason no one showed up, not the fact that he was a bad organiser. This is an example of the

A.   actor-observer bias.

B.   self-serving bias.

C.   false-consensus bias.

D.   failure bias.

Question 14 (2 MARKS)

Using an example, explain how confirmation bias can reduce cognitive dissonance.

Apply and analyse

Use the following information to answer questions 15–18.

Mercedes is saving up for her first car. She believes that she should spend $20,000 on her first car. However, when Mercedes goes to buy a car, she falls in love with a Mercedes-Benz that is above her budget. Regardless of this, she buys it as she wants a cool car. After her purchase, Mercedes feels uncomfortable with her decision as she is now in debt. Mercedes finds articles that suggest that her car is worth the price as it has good safety features and will last a long time. She also attributes her failure to spend within her budget on the rising cost of cars as opposed to her own desire for the car.

Question 15 (1 MARK)

Mercedes is experiencing cognitive dissonance. This is because

A.   Mercedes' behaviour of buying the car does not align with her belief that the car is a good car.

B.   Mercedes feels psychological tension about buying the car because it was in her price range.

C.   Mercedes feels psychological tension about buying the expensive car as this conflicts with her belief that she should have spent less.

D.   Mercedes' love for the car aligns with her behaviour of buying the car.

Question 16 (1 MARK)

Mercedes used the confirmation bias to justify her behaviour by finding information that

A.   suggested the car was worth the money she spent.

B.   suggested the car was overpriced and not worth the money she spent.

C.   implied she should have spent $20,000 on her car.

D.   indicated she failed to make a smart purchase.

Question 17 (1 MARK)

Mercedes comes across an article that says that her car is a rip-off and overpriced. To reduce cognitive dissonance, what is she likely to do with this information?

A. Mercedes is likely to seek out more articles with this information as it supports her behaviour of buying the car.

B. Mercedes is likely to ignore this information as it conflicts with her behaviour of buying the car.

C. Mercedes is likely to ignore this information as the information makes her feel better about her behaviour.

D. Mercedes is likely to seek out more articles with this information as it makes her feel upset and uncomfortable about her behaviour.

Question 18 (1 MARK)

To reduce cognitive dissonance, Mercedes used the

A. actor-observer bias, as she attributed her behaviour of buying the car to internal factors, such as her desire for a cool car.

B. self-serving bias, as she attributed her success of buying a car to her smart decision-making.

C. self-serving bias, as she attributed her failure of sticking to her budget to her own inability to stick to a budget.

D. self-serving bias, as she attributed her failure of sticking to her budget to situational factors, such as the rising cost of cars.

Question 19 (5 MARKS)

Every day, Sadie and Niamh sit together at lunch. As of recently, a new girl Ruth has started to sit with them. Niamh doesn't like Ruth as she believes she's very loud and outspoken. Due to this first impression, Niamh also believes that Ruth is rude, annoying, and very dramatic. She seeks out information that confirms this, such as when Ruth got told off in class for distracting others. Niamh decides she no longer wants to associate with Ruth and decides to sit somewhere else at lunch so Ruth won't find them. Sadie believes that it is bad to exclude people and feels uncomfortable when she follows Niamh and sits elsewhere.

a. Identify and describe Niamh's use of a cognitive bias. (2 MARKS)

b. Describe Sadie's experience of cognitive dissonance and suggest how she might use the actor-observer bias to reduce it. (3 MARKS)

Questions from multiple lessons

Question 20 (5 MARKS)

Mr Jenshel is running late for his psychology class. One of his students remarks that he is always so disorganised, while another student comments that she thinks it's because there is not enough time to get from one class to another.

a. Outline what is meant by attribution. (1 MARK)

b. With reference to the scenario, distinguish between internal and external attribution. (2 MARKS)

c. Compare the fundamental attribution error and the actor-observer bias. (2 MARKS)

6C Heuristics

Fast

Unconscious

Automatic

Error prone
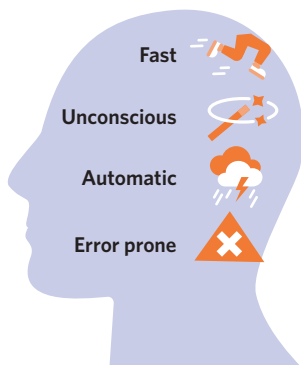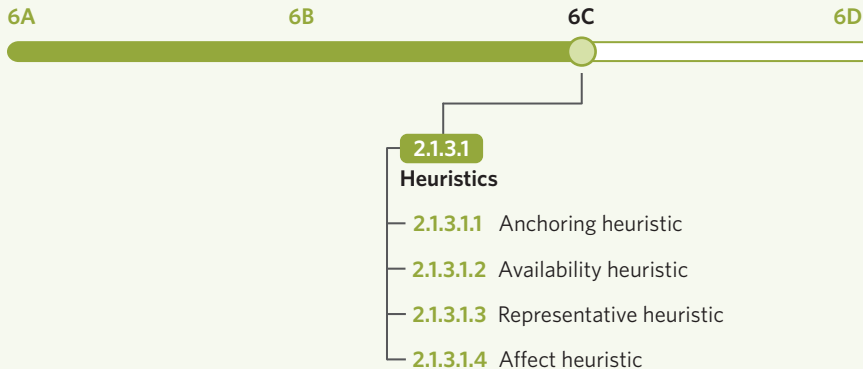
Imagine you are at a train station late at night. The platform is empty aside from one other person who looks dishevelled and is frustratedly searching for something in the bin. They call out to you for help. What do you do? You might make a quick judgement that they are dangerous and decide to avoid them. But what if you then found out that they were simply looking for their phone because they lost it at the station earlier in the day? This scenario highlights how we use heuristics in our everyday lives to make quick, automatic decisions and solve problems.

In this lesson, you will learn about heuristics and how they can have both positive and negative influences on your decision-making and problem-solving abilities. In particular, you will learn about the anchoring, availability, representative, and affect heuristics.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

Heuristics 2.1.3.1

It might be difficult to think about how you solve problems or make certain decisions. This is because these strategies, which are known as heuristics, are generally very quick and automatic. This section of the lesson will outline what heuristics are and provide some examples of how different types of heuristics may influence our decision-making and problem-solving abilities.

Theory details

KEY TERMS

Heuristics information-processing strategies or 'mental shortcuts' that enable individuals to form judgements, make decisions, and solve problems quickly and efficiently

Heuristics are information-processing strategies or 'mental shortcuts' that enable individuals to form judgements, make decisions, and solve problems quickly and efficiently. Heuristics are considered to be intuitive, rapid, and automatic processes that develop over time as a result of experience and learning. Therefore, individuals are often unaware of the heuristics they use in their day-to-day lives.

Heuristics can help explain why we make certain decisions or solve problems the way we do. In social psychology, they can also help explain how we make judgements about other people. There is a wide breadth of research regarding how heuristics can be applied in different occupational fields, such as economics, healthcare, law, and business. This research provides evidence of the positive and negative effects heuristics can have on decision-making and problem-solving. Typically, heuristics are useful and necessary to help us make decisions in our everyday lives. However, they may sometimes lead to biases and incorrect judgements.

An overview of the positive and negative influences of heuristics on decision-making and problem-solving are presented in table 1. To help further explain these influences, we are going to delve into the different types of heuristics later in this lesson.

Table 1 Positive and negative influences of heuristics on decision-making and problem-solving

Positive influences of heuristics	Negative influences of heuristics
• Heuristics save time when making decisions and solving problems. • The use of heuristics sometimes results in accurate decision-making and efficient problem-solving. • Heuristics can be adaptive and protect an individual from dangerous situations.	• Decisions are made quickly which makes them prone to error. • The **base-rate fallacy** is a type of bias in which decisions, social perceptions, and judgements are influenced more by vivid memories and experiences than statistical fact. – The base-rate fallacy is not a heuristic itself, but rather a bias that results from using some heuristics. It leads us to rely on prior experience (not necessarily logic or facts that challenge our ideas) when making decisions and solving problems. The base-rate fallacy as it applies to different heuristics will be discussed in the following sections of the lesson.

> **Base-rate fallacy** a type of bias in which decisions, social perceptions, and judgements are influenced more by vivid memories and experiences than statistical fact

WANT TO KNOW MORE?

In cognitive psychology, heuristics are often compared to algorithms. Algorithms are systematic mental procedures that always provide a correct solution to a particular problem. In comparison, heuristics are mental shortcuts that provide a solution to a particular problem, however, they are not systematic or always correct. Figure 1 provides an example of this difference and highlights that, whilst using heuristics is faster than using algorithms, they may be prone to error.

Situation: Finding orange juice in the supermarket.

Algorithm

Using an algorithm, you would systematically search every single shelf in the supermarket to find the orange juice. This method would take you quite a bit of time, however, there would be no chance you would miss finding the orange juice if they placed it in the wrong aisle.

Heuristic

Using a heuristic, you would most likely go straight to the juice section. This is because you know that orange juice is generally placed in this aisle. This will save you time in comparison to systematically checking every shelf. However, if for some reason the orange juice was placed in the milk fridge, then this heuristic would result in error as you will not find the orange juice.

Figure 1 The difference between using an algorithm and a heuristic when solving a problem

There are many different types of heuristics that are studied in psychology. Figure 2 depicts some of the heuristics we will explore throughout this lesson.

```
                        ┌──────────────┐
                        │  Heuristics  │
                        └──────┬───────┘
        ┌─────────────┬────────┴────────┬─────────────┐
┌───────────────┐ ┌───────────────┐ ┌───────────────┐ ┌───────────────┐
│   Anchoring   │ │  Availability │ │Representative │ │    Affect     │
│   heuristic   │ │   heuristic   │ │   heuristic   │ │   heuristic   │
└───────────────┘ └───────────────┘ └───────────────┘ └───────────────┘
```
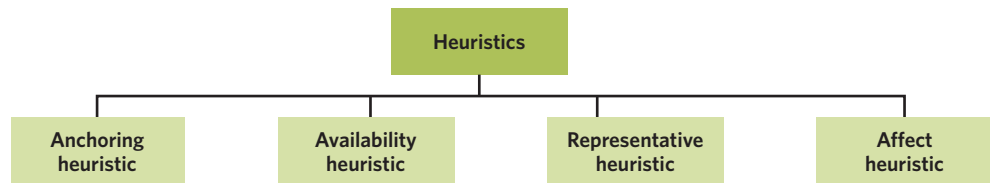
Figure 2 Different types of heuristics

Anchoring heuristic 2.1.3.1.1

> **Anchoring (adjustment) heuristic** an information-processing strategy that involves forming judgements based on the first information received about an idea or concept

The **anchoring (adjustment) heuristic** is an information-processing strategy that involves forming judgements based on the first information received about an idea or concept. The initial information we receive about an idea or concept acts as a 'mental anchor' and future judgements relating to the idea or concept are influenced by this anchor.

The anchoring heuristic can be applied to many different situations in everyday life. For example, you may think that it is reasonable to spend $40 on a t-shirt. When shopping one day, you may see a t-shirt that is worth $100. As you continue browsing, you may see a similar t-shirt that is worth $50. Even though it is a little more than you think you ought to pay, you are likely to evaluate the second t-shirt as being cheap. This is because the price of the first t-shirt is the first information you received and acts as an anchor that influences your future judgements about the price of similar t-shirts. Contrastingly, if you had seen a t-shirt advertised for $25 first, you would likely judge the $50 t-shirt as being too expensive.

Influences on decision-making and problem-solving

According to Tversky and Kahneman (1974), the anchoring heuristic influences decision-making by leading individuals to make decisions that are biased towards an initially presented value or idea. Typically, those who are exposed to a higher anchor make insufficient adjustments downwards and those exposed to a lower anchor make insufficient adjustments upwards. This can be very common in sales and business negotiations and may lead to inaccurate evaluations about the price of an item. For example, if someone gives you a price of $1,000,000 for a house, you will most likely end up paying something similar to that amount, even if the fair and reasonable price could actually be lower. This is because an initial price offer typically serves as an anchor, with buyers assessing the value of the house and basing their final decision on this anchor.

This heuristic can also impact problem-solving as initially presented information can provide guidance on 'where to begin' when solving problems. This may enable you to solve problems quickly and efficiently. For example, let's say that a manager needs to recruit people to work on a project. They don't yet know how long the project will take, but they do know that last year the company successfully finished a similar project, and the team had eight people. Instead of wasting time figuring out exactly how long the project may take, the manager may hire a similar number of people as the previous anchor of eight people assists them in making accurate hiring estimates.

LESSON LINK

In lesson **6A Judging and perceiving others**, you learnt about first impressions, which are snap judgements we make about people in less than a second. They often say that first impressions of people are difficult to change. This is because individuals overemphasise the initial beliefs they hold about another person's abilities, traits, or performance, which anchor future judgements and perceptions of that person (Morrow, 2002). For example, if your first impression of someone is that they are rude, then you may be hesitant to fully adjust your impression of them away from this anchor, even if they are later kind to you.

Availability heuristic 2.1.3.1.2

> **Availability heuristic** an information-processing strategy that enables individuals to form a judgement, solve a problem, or make a decision based on information that is easily accessible

The **availability heuristic** is an information-processing strategy that enables individuals to form a judgement, solve a problem, or make a decision based on information that is easily accessible. In short, individuals base decisions and judgements on information readily available to them. This information might come from their memories and past experiences, or information that they're exposed to in the present moment. In this way, the availability heuristic involves the base-rate fallacy.

For example, an individual may be asked whether they believe more people die from cancer or a stroke. If this individual knows someone in their social network that has died from cancer or has recently seen a cancer story on the news, they are more likely to say cancer, as they may draw upon this available information to make the judgement. This has the potential to lead to biased judgements as individuals may rely on information available to them that does not necessarily reflect the reality of the situation, or in this case, the true mortality rate of cancer.

The media's coverage of events may also contribute to the use of the availability heuristic. Following exposure to these media stories, individuals may ignore statistical evidence, which reflects the base-rate fallacy. For example, you may vividly remember coverage of the Malaysia Airlines disappearance in 2014, as plane crashes and disappearances are always covered by the media. In comparison, car crashes, which kill more people than plane crashes, are not always covered by the media. Due to this disproportionate media coverage, individuals may be more likely to develop a fear of flying, as opposed to driving, due to the availability of information in the media regarding plane crashes. In the case of the Malaysia Airlines disappearance, media coverage impacted individuals' decision-making to fly with Malaysia Airlines, which resulted in the airline suffering a 59% loss in profits in 2014 (Kedmey, 2014).

Influences on decision-making and problem-solving

Individuals may make decisions using the availability heuristic. Figure 3 shows some examples of how people use the availability heuristic to make decisions.

April watches the film Jaws. The next day, April goes to the beach with her friends.	April decides that swimming in the water is a high-risk activity as she fears she is going to be attacked by a shark, like in Jaws. April makes this decision regardless of the fact that there have been no recordings of shark attacks at this beach.
Anya's father recently received the flu vaccine and was extremely sick afterwards. Anya also has to get the vaccine for work.	Anya decides to not receive the flu vaccine as she is scared she will have side effects like her father did, even though statistics show that these side effects are rare.
Abram burns his hand on the stove. Abram vividly remembers that when his mum burnt her hand whilst cooking, she immediately ran it under cold water.	Abram immediately decides to run his hand under running cold water from the tap.

Figure 3 Examples of how the availability heuristic can influence decision-making

Individuals can also use available information to solve problems and make decisions quickly. For example, doctors need to make immediate evaluations based on patient symptoms, history, and context. This allows them to run tests that are likely to lead to a diagnosis, rather than testing for every disease or illness that has similar symptoms. This is why Australian doctors do not usually test for Zika virus in patients who have never left Australia, even though they might present with some of its symptoms, such as fever and body rash. Zika virus has no record of being transmitted in Australia, so the travel context of the patient rules out this as a possible diagnosis. Using the availability heuristic in this context may save lives by enabling disease or illness to be quickly identified and treated.

Representative heuristic 2.1.3.1.3

The **representative heuristic** is an information-processing strategy that involves making a categorical judgement about an idea, event, or person, based on their similarity to other items in that category. In social psychology, individuals categorise people based on the information they know about them. In essence, we are forming judgements about people based on the characteristics they present. Although these snap judgements may be broadly accurate, they are biased and may lead to error as we do not necessarily know the reality of the situation. Once again, the base-rate fallacy may occur as we are likely to overlook the statistics provided and make a judgement based on the information that categorises the individual.

> **Representative heuristic**
> an information-processing strategy that involves making a categorical judgement about an idea, event, or person based on their similarity to other items in that category

For example, an individual may encounter a female who is pushing a pram down the street. With this information, they may categorise them as a mother of the baby in the pram. However, they could easily be a babysitter or another relative, not necessarily the mother themselves.

Influences on decision-making and problem-solving

The representative heuristic can impact our judgements about other people and thus impact our decisions about who we interact with and how we treat others. Figure 4 provides an example of how the representative heuristic can influence decision-making.

Affect heuristic
an information-processing strategy that involves using emotions to make a judgement or decision

Imagine someone is being interviewed for a manager position at a corporate company. The candidate may appear young and have a quirky sense of fashion. The employer may take in these physical attributes and decide that the candidate lacks the experience and is too young or naive for the role, despite the qualifications and skills the candidate has.

He doesn't look like he will take the job seriously.

He looks too young and inexperienced for the responsibility.

I have five years of experience managing a marketing team...

Figure 4 The representative heuristic can influence decision-making in the hiring process

The representative heuristic may also influence problem-solving. For example, if you are looking in a library for a certain book but cannot find it, you are unlikely to ask a random stranger. Instead, you will look for someone who displays the characteristics of a librarian and ask them, even if you are unsure if they actually work there.

Affect heuristic 2.1.3.1.4

The **affect heuristic** is an information-processing strategy that involves using emotions to make a judgement or decision. An individual's current state of emotions (which could be fear, happiness, surprise, or anger) can guide and influence their decision-making. For example, in response to the statement 'smoking can cause death' an individual may feel a sense of dread, which could in turn influence their decision not to smoke. You may think of this as a 'gut feeling' as it allows us to make quick decisions about certain ideas, events, or people.

Influences on decision-making and problem-solving

The affect heuristic has a major influence on our assessment of risks and our decisions to engage in certain activities. If we are afraid or apprehensive about a certain activity or situation, we may be more likely to view it as high-risk. This may be useful as it could potentially keep us safe by reducing the likelihood of participating in dangerous activities. For example, if you are scared of heights, you may avoid activities, such as high ropes or bungee jumping. This decision could potentially protect you from injury. However, at the same time, it may also restrict you from taking risks that may be beneficial. For example, you may have an intense feeling of nervousness and dread when applying for a job, and these emotions may lead you to avoid applying and consequently miss out on an opportunity that could advance your career. The affect heuristic can also influence problem-solving. For example, if your friend is upset at something you did, you might feel guilty. This feeling may prompt you to address the issue and have a conversation with your friend to solve the problem.

Theory summary

In this lesson, you learnt about heuristics. In particular, you learnt about the anchoring, availability, representative, and affect heuristics, and how these heuristics influence decision-making and problem-solving. Figure 5 provides a summary of the types of heuristics, and positive and negative influences of heuristics.
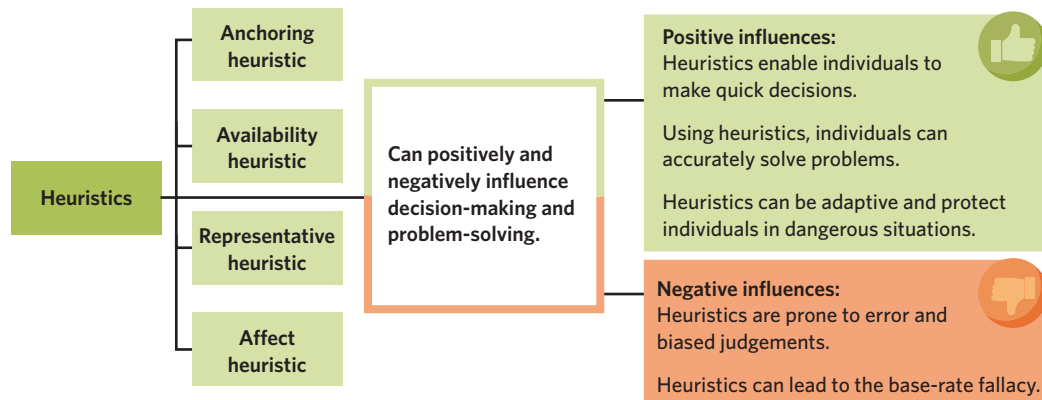
Figure 5 Summary of lesson 6C

6C Questions

Theory review

Question 1

Heuristics are slow, complex strategies that help us make decisions and solve problems.

A. True.

B. False.

Question 2

Which of the following are examples of a heuristic? **(Select all the apply)**

I. Anchoring heuristic.

II. Stereotypical heuristic.

III. Availability heuristic.

IV. Emotional heuristic.

Question 3

The anchoring heuristic suggests that we tend to only slightly adjust our initial evaluation of an event, idea, or person.

A. True.

B. False.

Question 4

The availability heuristic is fast as we rely on information readily brought to mind to make decisions and solve problems.

A. True.

B. False.

Question 5

When we use the representative heuristic, we always incorrectly categorise people.

A. True.

B. False.

Question 6

Which of the following statements about the affect heuristic is correct?

A. The affect heuristic involves using cognitive strategies to make decisions.

B. The affect heuristic involves using learned behaviours to make decisions.

C. The affect heuristic involves using emotions to make decisions.

Assessment skills

Text analysis

The following assessment skills type reflects the study design assessment type:

- media analysis of one or more contemporary media texts

Use the following information to answer questions 7–9.

Media text 1

An Australian government COVID-19 awareness advertisement released in July 2021 has been criticised by Dr Kaufman for using scare tactics and fear. The advertisement depicted a young woman who had contracted COVID-19 gasping for air in a hospital bed. The tagline for the advertisement was: 'Stay home. Get tested. Book your vaccine.' The advertisement urged young people to get a COVID-19 vaccination.

(Wahlquist, 2021)

Media text 2

A study revealed that catching COVID-19 is linked to a 33-fold increase in the risk of developing a potentially fatal blood clot on the lung in the 30 days after contracting the disease. Comparatively, the health risks associated with the COVID-19 vaccines are very low. Dr Ho suggested that 'the degree of complications associated with COVID-19 is much stronger and lasts for much longer than what we might be getting after vaccination.'

(Geddes, 2022)

Question 7

The advertisement campaign discussed in media text 1 used fear tactics to promote the COVID-19 vaccination. The use of fear tactics best reflects the concept of

A. the representative heuristic, as individuals may categorise the young woman in the advertisement as a COVID-19 patient.

B. the affect heuristic, as the induced feeling of fear or dread can influence an individual to make the decision to get the vaccination.

C. the anchoring heuristic, as individuals may believe that the probability of contracting COVID-19 is high.

Question 8

How might the advertisement campaign discussed in media text 1 impact decision-making through the availability heuristic?

A. The advertisement may impact an individual's decision-making as information about COVID-19 vaccinations will be available to them.

B. The advertisement may impact an individual's decision-making as the image of a young person gasping for air after contracting COVID-19 is scary.

C. The advertisement may impact an individual's decision-making as the image of a young person gasping for air after contracting COVID-19 may be readily available after viewing the advertisement, promoting them to avoid COVID-19 by getting vaccinated.

Question 9

Media text 2 states that catching COVID-19 is linked to a 33-fold increase in risk of potentially fatal blood clots. This may influence an individual's judgement of the risk of COVID-19 through

A. the anchoring heuristic, as individuals are likely to base their judgements on this high figure and adjust future judgements using it as an anchor.

B. the representative heuristic, as individuals are likely to believe a large number of people have potentially fatal blood clots.

C. the availability heuristic, as individuals are likely to want to find out more information about potentially fatal blood clots.

Exam-style

Remember and understand

Question 10 (1 MARK)

Which of the following best describes a heuristic?

A. A strategy that enables individuals to make unconscious decisions that result in error.

B. A strategy that allows people to make complex decisions after a long period of time.

C. A strategy that enables individuals to form judgements, make decisions, and solve problems quickly and efficiently.

D. A strategy that involves systematic procedures to provide solutions to problems.

Question 11 (1 MARK)

The anchoring heuristic implies that

A. individuals are likely to fully adjust an initial judgement as they have a tendency to base judgements on information received prior.

B. individuals are unlikely to fully adjust an initial judgement as they have a tendency to base judgements on information received prior.

C. individuals will always fully adjust an initial judgement as they have a tendency to base judgements on information received prior.

D. individuals will never fully adjust an initial judgement as they have a tendency to base judgements on information received prior.

Question 12 (1 MARK)

Outline what is meant by the affect heuristic.

Question 13 (2 MARKS)

Using an example, describe how the availability heuristic can influence an individual's decision-making and problem-solving.

Apply and analyse

Use the following information to answer questions 14–17.

Charitha is afraid of snakes. Charitha's younger brother, Ishaan, loves to make fun of her fear. Charitha is going on a school camp. The night before the camp, Ishaan tells Charitha stories about people getting attacked by snakes when camping. Ishaan also tells her that there's a 70% chance of getting bitten by a venomous snake when camping. Charitha decides to research and finds out that the likelihood of getting bitten by a venomous snake is less than 70%. She also discovers that there is only a 2% chance of seeing a snake due to the season they are camping in. Nevertheless, Charitha still believes that there is a 60% chance she will be attacked by a snake and is filled with dread, so she decides not to go.

Question 14 (1 MARK)

Charitha is filled with dread and decides not to go to camp. This best reflects the

A. anchoring heuristic.

B. affect heuristic.

C. availability heuristic.

D. representative heuristic.

Question 15   (1 MARK)

Charitha still believes there is a 60% chance of being attacked by a snake, even though her research suggests that there is only a 2% chance of seeing a snake, not 70% like her brother said. This is an example of the

A. anchoring heuristic.

B. availability heuristic.

C. representative heuristic.

D. affect heuristic.

Question 16   (1 MARK)

The night before the camp, Ishaan tells Charitha stories about people getting attacked by snakes when camping. This might influence Charitha's decision to not go to camp through the

A. anchoring heuristic, as she is likely to believe that 70% of people get attacked by snakes when camping.

B. availability heuristic, as the stories Ishaan tells her about the attacks are likely to be readily available to her and encourage her to avoid going to camp.

C. representative heuristic, as she is likely to believe that all campers get attacked by snakes.

D. availability heuristic, as information about the camp is readily available to her.

Question 17   (1 MARK)

Charitha still believes there is a high chance she will be attacked by a snake despite the statistics that there is a 2% chance of seeing a snake. This best reflects the concept of the

A. affect heuristic.

B. base-rate fallacy.

C. error-prone nature of heuristics.

D. availability heuristic.

Question 18   (4 MARKS)

Connell works at a law firm and is looking to hire a new law associate. Mary is a potential applicant for the role. Mary scored in the top 2% of law students on the Law School Admission Test (LSAT). Mary is quite young and has a quirky sense of fashion. She loves to wear coloured tights and patterned skirts. Mary also has bright red hair and a dagger tattoo on her forearm. When Connell interviews Mary, he thinks she is too eccentric and won't take the role seriously. He doesn't think that she is a good fit for the corporate position and therefore decides not to hire her.

a. Explain how Connell uses the representative heuristic to guide his decision-making and problem-solving. (2 MARKS)

b. Explain how the base-rate fallacy may have negatively influenced Connell's decision-making and problem-solving. (2 MARKS)

Evaluate

Question 19   (5 MARKS)

Bianca is out at a bar with her friends. Bianca is feeling unwell and goes outside to get some fresh air. A man notices that Bianca is unwell and offers to give her a ride home or call somebody to pick her up. Bianca vividly remembers a recent news story about a girl who was murdered after accepting help from a stranger on a night out. As she remembers this story, she decides to decline the offer. She returns to the bar where she continues to feel very ill.

Evaluate the positive and negative influence of the availability heuristic on Bianca's decision-making and problem-solving.

Questions from multiple lessons

Question 20   (3 MARKS)

Using an example, explain the relationship between stereotypes and the representative heuristic.

6D Prejudice, discrimination, and stigma

6A	6B	6C	6D

2.1.4.1	2.1.4.2	2.1.4.3	2.1.4.4	2.1.4.5
Prejudice	Discrimination	Stigma	Influence on mental wellbeing	Reducing prejudice, discrimination, and stigma

— **2.1.4.4.1** Influence on personal mental wellbeing

— **2.1.4.4.2** Influence on group mental wellbeing
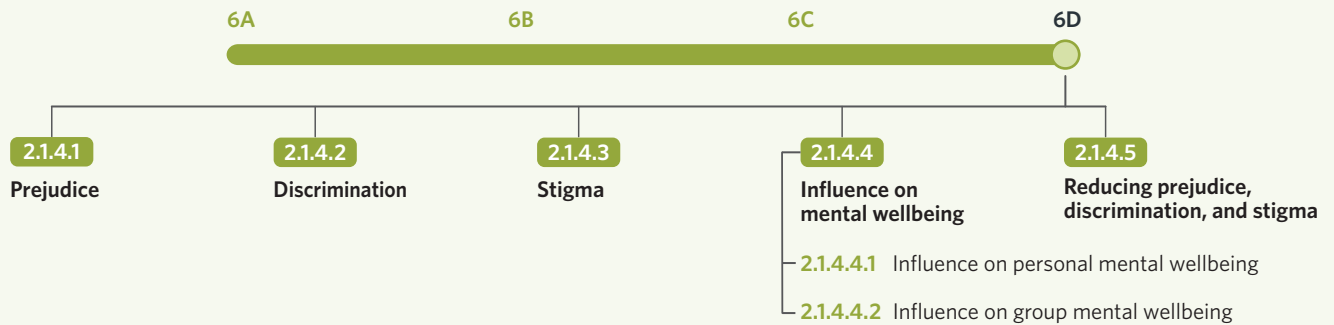
When you think of people with schizophrenia, do you feel scared, unsafe, or nervous? These feelings reflect a stigma that you hold and can result in prejudice and discrimination. In this lesson, you will explore the relationship between stigma, discrimination, and prejudice. In particular, you will learn about how these things influence the wellbeing of individuals and groups.

Prejudice 2.1.4.1

So far in this chapter you have learnt about several ways we navigate our social worlds, including those related to person perception. Although some of these shortcuts are helpful, sometimes they lead to negative social perceptions. In social psychology, this is known as prejudice.

Theory details

In social psychology, **prejudice** is an often negative preconception held against people within a certain group or social category. The word prejudice is made up of two parts: 'pre', which means 'before', and 'judice', which means 'judgement'. Therefore, prejudice is a prejudgment that you make about others before interacting with them, and it happens when stereotypes become beliefs. More often than not, prejudice is unfounded and stems from emotion as opposed to reason. Prejudice can often be unconscious, meaning you may not even realise that you have one.

You can think of prejudice as being the affective component of stereotypes in the tri-component model of attitudes, which you learnt about in 6A Judging and perceiving others. In this sense, stereotypes are the thoughts we have about people (cognitive), while prejudices are the more reflexive feelings that result from stereotypes towards them (affective). For example, if someone is aware of the stereotype that rich people are ungenerous and exploitative, they may feel anger towards anyone they perceive as privileged. Some key areas of prejudice include sex, gender, age, race, sexuality, and class.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

KEY TERMS

Prejudice an often negative preconception held against people within a certain group or social category

Stereotype	Prejudice
'All Asians are good at maths'	'I feel annoyed that my Asian friends may get better grades than me on the maths SAC'
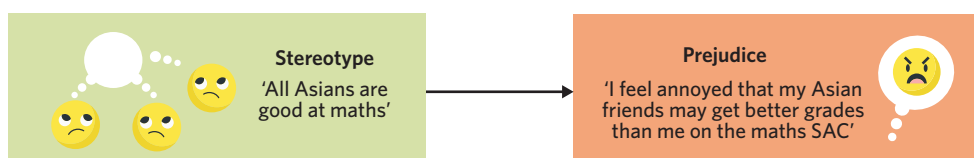
Figure 1 Prejudices are influenced by stereotypes

Discrimination the unjust treatment of people due to their membership within a certain social category

Figure 4 Prejudice and discrimination as components of the tri-component model of attitudes

WANT TO KNOW MORE?

Prejudice can take different forms. A common distinction is made between old-fashioned prejudice and modern prejudice. Old-fashioned prejudice takes the form of overt (direct) and obvious views held against minority groups, leading to acts of direct discrimination, like abuse. On the other hand, modern prejudice takes a more covert (indirect) form, involving more silent thoughts that are not openly or obviously expressed to minority groups, yet are still held and expressed in more hidden ways. Modern prejudice is much more common in the 21st century, with society, laws, and rhetoric now disfavouring open attitudes that disadvantage minority groups. This can be quite dangerous as the covert nature can make identifying and combatting prejudice difficult as it is not as obvious as it once was.

Discrimination 2.1.4.2

Stereotypes and prejudice are like snow on a mountain. As the snow builds up, there is a higher chance of an avalanche. Similarly, as stereotypes and prejudices build up, they are more likely to be acted upon, and this is known as discrimination.

Theory details

When prejudice and negative attitudes escalate or are strongly held it can lead to **discrimination,** which is the unjust treatment of people due to their membership within a certain social category. Discriminatory behaviour involves excluding or treating people differently based on their social group. As such, it is the behavioural component of the tri-component model of attitudes. Stereotypes and prejudice can lead to discrimination, as seen in figure 2 which expands upon figure 1, however, while stereotypes and prejudice are sometimes reflexive and involuntary, discrimination is not.
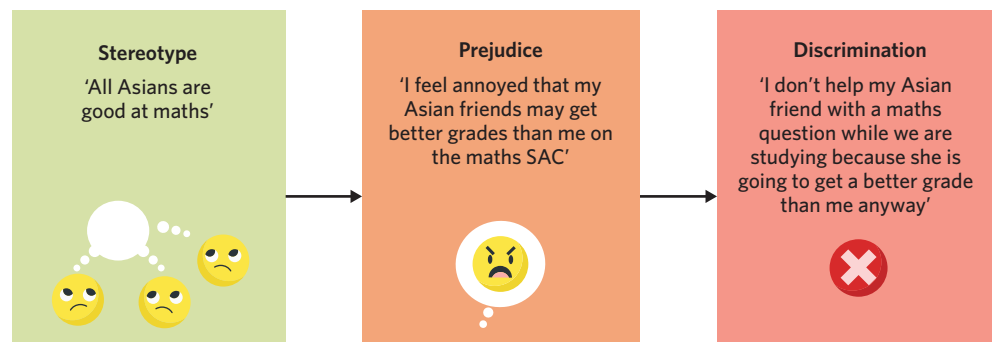
Figure 2 Prejudices and stereotypes can lead to discriminatory behaviour

There are two different kinds of discrimination.

- Direct discrimination is when someone is treated unfairly because of their association with a particular group. For example, not hiring someone as they are an immigrant and you assume that they don't speak English fluently.
- On the other hand, indirect discrimination occurs when a practice or rule applies to all people and unfairly disadvantages a group. For example, having only stair access to classrooms at a school disadvantages people with a physical disability.
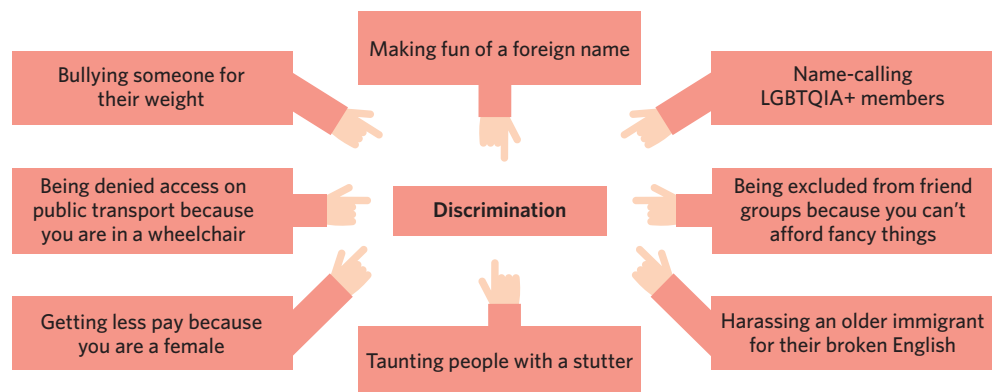
Figure 3 The many forms of discrimination

Stigma 2.1.4.3

Have you ever faced discriminatory behaviour? How did that make you feel? If you have experienced this, you may have been exposed to stigma. Stigma is often fuelled by prejudices and stereotypes and leads people to enact discriminatory behaviour.

Theory details

Stigma is the feeling of shame or disgrace experienced by an individual for a characteristic that differentiates them from others. It is closely linked to stereotypes, as stereotypes are often what cause widespread stigma. These views may negatively affect the relationships and interactions people with a mental disorder have with others, causing feelings of isolation and societal exclusion, and often preventing them from seeking the help they need.

Some common examples of stereotypes that lead to stigmas include:

- it was dangerous to be homosexual due to the prevalence of HIV/AIDS (more prevalent in the 1970s)
- women are too emotional and lack resilience, and therefore have no place as CEOs of companies
- people with stutters are nervous and too shy to talk
- having a mental disorder means that you are always unstable and are unable to think logically.

There are two kinds of stigma.

- Social stigma is largely characterised by negative stereotypes as they come to define people and prevent them from being seen as an individual (Haddad, 2015), leading to widespread discrimination. For example, due to the stigma that Indigenous men tend to be alcoholics, the police may be less likely to believe them if they report a crime and may instead be suspicious of them.
- Self-stigma is the result of the internalisation of negative stereotypes and can lead to poor self-efficacy and low self-esteem. For example, a child with a disability may believe that they can't play basketball, causing them to avoid the sport completely or even their friends who play, for the fear that they will be made fun of.

> **Stigma** the feeling of shame or disgrace experienced by an individual for a characteristic that differentiates them from others

Influence on mental wellbeing 2.1.4.4

Just like an avalanche, the longer prejudice, discrimination, and stigma are present, the greater their impacts are. As such, these phenomena can combine and have a detrimental impact on both personal and group wellbeing.

Theory details

Mental wellbeing is an individual's current psychological state, involving their ability to think, process information, and regulate emotions. A person experiencing optimal mental wellbeing:

- is able to make decisions
- is able to use logic
- has high levels of self-esteem
- has high levels of self-confidence and optimism
- has low levels of stress and anxiety.

These characteristics enable people experiencing optimal mental wellbeing to function more effectively in their daily lives than a person experiencing poor mental wellbeing.

Mental wellbeing can be positively and negatively influenced by many factors in our everyday lives. Positive influences include:

- adequate nutrition and hydration
- appropriate amounts of exercise
- healthy and functional relationships with family and friends.

> **Mental wellbeing** an individual's current psychological state, involving their ability to think, process information, and regulate emotions

Some negative influences include:

- rumination, which refers to dwelling on negative thoughts
- substance abuse
- conflict within relationships with family and friends.

More often than not, prejudice, discrimination, and stigma have a negative influence on both personal mental wellbeing and group mental wellbeing.

Influence on personal mental wellbeing 2.1.4.4.1

Think about a time when you were excluded. How did you feel? Chances are that you felt lonely, less confident in yourself, and vulnerable. The impacts of prejudice, discrimination, and stigma can often accumulate, leading to poor personal mental wellbeing.

Experiencing prejudice, discrimination, and stigma can cause individuals to feel alienated and excluded from society. If such phenomena persist, there can be detrimental impacts on an individual's personal mental wellbeing. Some of these impacts may include:

- damaged or worsened self-image and self-confidence
- heightened experience of stress
- increased likelihood of rumination
- increased susceptibility to mental health problems or disorders, such as anxiety and depression.

Please note that these are just a few examples of the influence of prejudice, discrimination, and stigma on personal mental wellbeing and it can differ among individuals.

WANT TO KNOW MORE?

SANE Australia is a national mental health charity working to support four million Australians affected by complex mental disorders. SANE's work includes providing mental health awareness, online peer support and information, stigma reduction, specialist helpline support, research and advocacy.

SANE AUSTRALIA

Type the URL www.sane.org into your browser to learn more about the charity.

Influence on group mental wellbeing 2.1.4.4.2

The mental wellbeing of a group can also be influenced by prejudice, discrimination, and stigma. The influence is similar to that of personal wellbeing, just on a larger scale. Some impacts on targeted groups may include:

- higher prevalence of mental health disorders
- feeling socially isolated from other communities and groups
- increased levels of substance abuse
- feeling anxiety when going out for fear of becoming victims of hate crimes
- barriers to accessing treatment as a result of negative labels and stigma.

It is important to note that these are just a few examples of the influence of prejudice, discrimination, and stigma on group wellbeing and may not apply to all targeted groups.

Reducing prejudice, discrimination, and stigma 2.1.4.5

Despite the prevalence of prejudice, discrimination, and stigma in the world, there are many ways to reduce the influence that they have on wellbeing.

Theory details

Although prejudice, discrimination, and stigma are challenging to fight against, there are ways that you can attempt to reduce their prevalence and impact. These ways are outlined in table 1.

Table 1 Approaches to reducing prejudice, discrimination, and stigma

Approach	Explanation	Examples
Education	Providing knowledge and information about the unknown is a great way to correct, or at least begin to identify, misinformation and assumptions that people may have about others.	• Attend Chinese-led workshops and sessions to better understand their traditions and customs to combat the racism that Chinese individuals may have faced during the COVID-19 period. • Read articles or journals to better understand how mental disorders affect people. • Attend religious events, such as the Hindu festival Holi, to gain a new perspective on differing values.
Inter-group contact	The impact of stigma and prejudice can be reduced through conversations. By having open discussions, asking respectful questions, and taking the time to listen, you can better understand others' experiences and avoid engaging in offensive behaviours or mindsets.	• Spend time with a classmate from a different culture or religion to learn more about their experiences and views. • Organise a school picnic in which students are encouraged to bring food from their culture and try out other cuisines.
Social media	Social media can also be a useful tool in raising awareness and calling out prejudice or discrimination. The impact of these attempts is usually more widespread and better realised due to a variety of people from different parts of the world being active on these platforms.	• In 2016, Mila Kunis wrote an open letter in A Plus Magazine about the gender discrimination she faces in her career. • Mindy Kaling shared her experiences of not being listed as a producer in shows she's contributed to due to being a woman of colour.
Laws	Having laws in place to prevent discrimination can also reduce the negative impact it has on wellbeing, as these laws may help protect and give a voice to minority groups.	• The Age Discrimination Act 2004. • The Sex Discrimination Act 1984. • The Abolition of the White Australia Policy.

It is important to note that these approaches may not apply in all circumstances and that there are many other ways of reducing the influence of prejudice, discrimination, and stigma on wellbeing.

Theory summary

In this lesson, you learnt about prejudice, discrimination, and stigma and how they influence wellbeing. You should now be able to recognise when these occur and identify ways to reduce them in order to make our society a better place to live in.
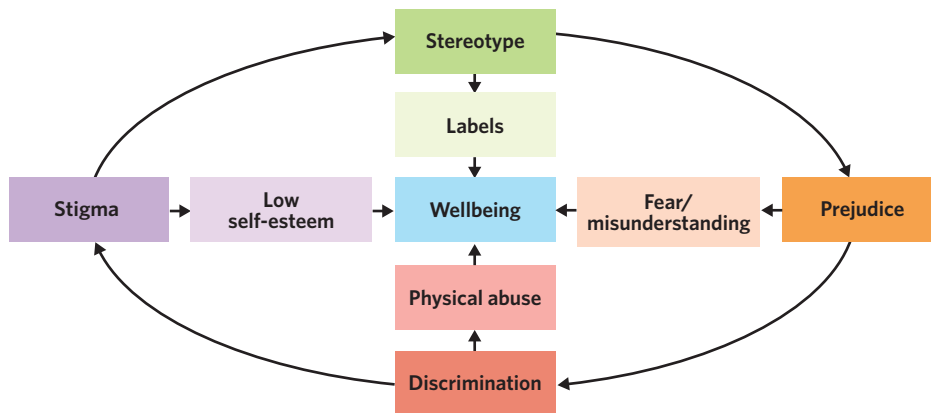
Figure 5 Prejudice, discrimination, and stigma influence wellbeing in an interrelated matter

6D Questions

Question 1

Stigma stems from _____ and can lead to _____.

Which of the following best fills in the blanks?

A.   prejudice; discrimination

B.   discrimination; prejudice

Question 2

Prejudice involves negative behaviours against others.

A.   True.

B.   False.

Question 3

Feeling nervous around a person with a darker skin colour is an example of

A.   stigma.

B.   prejudice.

Question 4

Prejudice, discrimination, and stigma only impact group mental wellbeing.

A.   True.

B.   False.

Assessment skills

Perfect your phrasing

Question 5

Which of the following sentences is the most correct?

A.   Stigma refers to the embarrassment experienced by an individual for **being different.**

B.   Stigma refers to the embarrassment experienced by an individual for **a characteristic that distinguishes them from others.**

Question 6

Which of the following sentences is the most correct?

A.   Prejudice, discrimination, and stigma **are** reduced through conversation, education, and laws.

B.   Prejudice, discrimination, and stigma **can be** reduced through conversation, education, and laws.

Text analysis

The following assessment skills type reflects the study design assessment type:

- analysis and evaluation of an experiment or case study

Use the following information to answer questions 7–9.

The gender pay gap is a phenomenon that has been heavily criticised with more and more individuals stepping up and voicing their unfortunate stories. The following is a case study conducted by the Human Resources Director on a female employee's seven-year quest to gain equal pay as her male co-workers.

This employee works in the healthcare industry where health professionals are paid according to their enterprise agreement and qualifications. After becoming the department manager, she discovered many discrepancies between male and female workers that resulted in a gender pay gap. These included:

- senior male clinicians 'being paid significantly above the rate for his classification.'
- male technicians being incorrectly classified as clinicians and as result being paid much more than they should be.
- male workers 'receiving an annual salary well in excess of her own.'

This employee made several approaches to negotiate a more fair salary for herself but failed multiple times. In 2019, she took her case to the Victorian Civil and Administrative Tribunal (VCAT), arguing that her employer has violated the state's Equal Opportunity Act 2010 by discriminating against her age and sex.

However, the VCAT dismissed her application as 'it was a complaint of systemic discrimination, and could not be reduced to a few isolated interactions with specific individuals.' Instead, the court has ordered the employer to 'undertake a workplace gender audit and prepare a gender equality action plan,' and ordered the case to be heard and decided again in the VCAT at a later date.

(Tamaray, 2022)

Question 7

The case study outlines the gender pay gap that is prevalent in Australia. Which type of discrimination is this an example of?

A. Direct discrimination.

B. Indirect discrimination.

Question 8

How has this female employee attempted to reduce the discrimination that she faces?

A. Through conversations with the media.

B. By appealing to the law.

C. Through gaining knowledge on the discrimination she experiences.

D. Through inter-group contact with her male co-workers.

Question 9

As a result of being dismissed by the VCAT, what are some potential impacts on the female employee's personal wellbeing?

A. Decreased self-esteem.

B. Accentuated self-doubt.

C. Heightened experience of stress.

D. All of the above.

Exam-style

Remember and understand

Question 10 (1 MARK)

Which of the following is **not** an example of direct discrimination?

A. You do not assign a leadership role to a female team member but rather to a less qualified male team member.

B. You do not allow your child to wear gender-neutral uniforms because it is not in the school dress code.

C. You reject a job application on the basis that the individual's disability will require them to take a lot of time off.

D. You do not give a promotion to an employee because they are pregnant.

Question 11 (1 MARK)

Luka is frightened of Hispanic men because he has seen many American movies that portray them as violent and threatening. Luka's fear is an example of

A. prejudice.

B. stereotype.

C. discriminatory behaviour.

D. first impression.

Question 12 (2 MARKS)

Compare stigma and prejudice.

Question 13 (3 MARKS)

Using an example, explain what discrimination is and outline one way to reduce it.

Apply and analyse

Use the following information to answer questions 14 and 15.

Chris is a local celebrity who has started using his platform to call out the discrimination that the LGBTQIA+ community is facing. He has started an online blog in which he shares his experiences of coming out to family and friends and shares the accounts of other people who are also willing to share their journeys on his Instagram story at least once a week.

Question 14 (1 MARK)

Chris actively tries to reduce prejudice, discrimination, and stigma by

A. running an education program at a local high school.

B. having a conversation with victims of discrimination.

C. raising awareness by sharing stories on social media.

D. establishing anti-discriminatory laws.

Question 15 (2 MARKS)

Explain how Chris' approach could be effective in reducing the influence of prejudice and discrimination on the LGBTQIA+ community.

Use the following information to answer questions 16 and 17.

Masie is a young girl who has anxiety and she avoids public speaking because she believes that people will attribute her nerves to her mental disorder.

Question 16 (1 MARK)

Masie's avoidance is an example of

A. self-stigma.

B. prejudice.

C. discrimination.

D. social stigma.

Question 17 (2 MARKS)

Outline and explain another way in which Masie's mental wellbeing could be impacted by the stigma she experiences.

Question 18 (4 MARKS)

Using examples, explain the difference between direct and indirect discrimination.

Questions from multiple lessons

Question 19 (4 MARKS)

Using the tri-component model of attitudes, comment on the difference between prejudice and a stereotype. Use examples to justify your response.

Question 20 (2 MARKS)

Using an example, explain how the representative heuristic can lead to prejudice.

Chapter 6 review

Chapter summary

This chapter was all about social cognition. You learnt that there are a range of cognitive processes that people use to make sense of others and interpret their social world.

In lesson **6A Judging and perceiving others**, you learnt about how we form judgements and perceptions about others. In particular, you learnt about:

- person perception, including first impressions
- attributions, including internal and external attributions
- the formation of attitudes as described by the tri-component model of attitudes.

In lesson **6B Cognitive dissonance and cognitive biases**, you learnt about cognitive dissonance and how it can be reduced through the use of different cognitive biases. In particular, you learnt about:

- cognitive dissonance
- cognitive biases, including:
    - confirmation bias
    - actor-observer bias
    - self-serving bias
    - false-consensus bias
    - halo effect.

In lesson **6C Heuristics**, you learnt about the positive and negative influences of heuristics on decision-making and problem-solving. In particular, you learnt about the:

- anchoring heuristic
- availability heuristic
- representative heuristic
- affect heuristic.

In lesson **6D Prejudice, discrimination, and stigma**, you learnt about how prejudice, discrimination, and stigma interact. In particular, you learnt about:

- the influence of prejudice, discrimination, and stigma on mental wellbeing of:
    - individuals
    - groups.
- how prejudice, discrimination, and stigma can be reduced.

6A

Attributions	influence our → **Person perception**	influences our → **Attitudes**

- Internal
- External

The tri-component model of attitudes consists of...

Affective   **Behavioural**   **Cognitive**

When these components do not align with one another, we may experience...

6B

Cognitive dissonance

can be reduced through...

Cognitive biases

Stereotypes

Prejudice   **Discrimination**   **Stigma**

6D

Impact the mental wellbeing of groups and individuals

We can form judgements, make decisions, and solve our social world through...

Heuristics

6C

Anchoring heuristic   Availability heuristic   Representative heuristic   Affect heuristic

Chapter review activities

Review activity 1: Fill in the blanks

Fill in the blanks with the following terms.

- first impression
- stereotype
- prejudice
- attitude
- affective
- external attribution
- attribution style
- mental wellbeing
- discrimination
- personal factor

Hannah has worked in an aged care facility for 15 years. When she was a young girl, she was very close with her grandfather and loved to visit and cook for him most days after school. When he died, she realised how much she missed taking care of him, which was a/an _____ that led her to seek a career in aged care. Hannah has a positive _____ towards old people, and loves how wise and selfless many of them seem compared to people her own age. This feeling she has is a/an _____ component of her attitude towards the elderly.

One of Hannah's many roles at the aged care facility is to welcome the new people that come to live at the home. Whenever she meets someone new, she makes a quick judgement of their state, known as a _____, which helps Hannah to decide the kind of care they will require.

Because Hannah is so experienced, she does not believe the _____ that all old people are frail and sick. In fact, even if one of the people living at her home has a rough day or is sick, she is more likely to make an _____ and consider how the care provided at her facility has affected the resident, rather than simply thinking it's due to old age. As Hannah consistently makes this type of attribution, it can be said that she has a particular _____. Whenever a co-worker attributes a resident's health to old age and doesn't help them, Hannah believes their behaviour is a form of _____ and that their lack of care is informed by a _____ held against the elderly. When this happens, Hannah notices that it negatively affects the _____ of the residents as they feel isolated. She does her best to address these situations when she sees them happen.

Review activity 2: Fill in the table

The following table summarises the cognitive biases and heuristics that you learnt about in chapter 6. Fill in the table by identifying the concept, providing an explanation, or writing an example. The first row has been done for you.

Concept	Explanation	Example
Cognitive dissonance	The psychological tension that occurs when our thoughts, feelings, and/or behaviours do not align with one another.	Emily believes that child labour is unethical and wrong. When shopping online, she sees a scarf that is advertised for $8 from a brand that is known to have unethical child labour practices. Emily decides to purchase the scarf, despite her stance on child labour. This produces psychological tension as there is a misalignment between her thoughts and behaviours.
Confirmation bias		Tony believes that African-Americans are dangerous. Tony may search for and read information that supports his belief, such as news articles on African gang crimes. He may also ignore positive news stories about African-Americans.
	The tendency to attribute our own actions to external factors and situational causes while attributing other people's actions to internal factors.	
Self-serving bias		Lina wins a short-story competition. Lina attributes her success to her internal character by stating that she is a creative and talented writer. However, when Lina loses a photography competition at school, she attributes her failure to external factors, such as that her camera was faulty.
False-consensus bias	The tendency to overestimate the degree to which other people share the same ideas and attitudes as we do.	
	The tendency for the impression we form about one quality of a person to influence our overall beliefs about the person in other respects.	Björn interviews Benny to play guitar for his band and discovers that he is talented and adept at playing the guitar. Because he is talented, Björn also believes Benny is creative and confident.
	An information-processing strategy that involves forming judgements based on the first information received about an idea or concept.	
		Depinder recently suffered from food poisoning after eating at a Vietnamese restaurant. The next time she goes out for dinner, she avoids Vietnamese cuisine because this recent experience is easily accessible and informs her decision-making.
Representative heuristic	An information-processing strategy that involves making a categorical judgement about an idea, event, or person based on their similarity to other items in that category.	
	An information-processing strategy that involves using emotions to make a judgement or decision.	

Chapter 6 test

Multiple choice

Question 1 (1 MARK)

The self-serving bias involves the tendency to

A. attribute our positive successes to internal factors and attribute our failures to external factors.

B. attribute our positive successes to external factors and attribute our failures to internal factors.

C. attribute our positive successes to internal factors and attribute our failures to internal factors.

D. attribute our positive successes to external factors and attribute our failures to external factors.

Use the following information to answer questions 2–4.

Luca comes from an Italian family and he and all of his cousins are good at soccer. He believes that all Italians are naturally skilled at the game. One day at his soccer club, he saw that an Italian boy named Steven Lunardi was joining his team. Although he hadn't met Steven, he believed he would be an athletic and skilled soccer player.

Question 2 (1 MARK)

Luca forming the first impression of Steven as someone who is athletic and skilled at soccer is an example of

A. direct person perception.

B. indirect person perception.

C. a negative prejudice.

D. a positive prejudice.

Question 3 (1 MARK)

What is Luca's belief that all Italians are naturally skilled at soccer an example of?

A. Prejudice.

B. Discrimination.

C. Person perception.

D. Stereotyping.

Question 4 (1 MARK)

When Luca and Steven started playing together, Luca was surprised to see that Steven was actually terrible at soccer. He felt annoyed with Steven for letting the team down and disappointed because he didn't meet his expectations.

Luca feeling annoyed and disappointed is an example of

A. an affective component of his attitude towards soccer.

B. an affective component of his attitude towards Steven.

C. a prejudice towards soccer players.

D. a stereotype towards Italians.

Question 5 (1 MARK)

Cara is buying a new coffee machine for her kitchen. She plans to spend a maximum of $500 for the machine. When she goes to the shops, the first coffee machine Cara notices is $650. As she continues shopping, Cara sees a similar coffee machine that is worth $450. Cara appraises the second machine as being cheap. This is because

A. the first price of $650 acts as an anchor that influenced her prior judgments about the price of coffee machines.

B. the second coffee machine is in Cara's budget.

C. the second coffee machine is similar to the first coffee machine.

D. the first price of $650 acts as an anchor that influenced her future judgments about the price of coffee machines.

Short answer

Question 6   (2 MARKS)

Outline what is meant by the term discrimination using an example.

Question 7   (3 MARKS)

Scarlett is a pretty, young girl who studies marine biology at university and works in a bar to pay her rent. One day, she overheard researchers discussing an intern position for their project about sea turtles while she was working at the bar. Scarlett decided to approach them and told them that she is a marine biology student and would like to be involved in their research. The researchers dismissed Scarlett by smiling condescendingly and asking what a pretty, young bartender could possibly know about sea turtles. Scarlett became very angry at the researchers and decided to overcharge them for their drinks.

a.   Describe how the researchers used the representative heuristic to form a judgement about Scarlett. (1 MARK)

b.   Outline the affect heuristic and discuss how Scarlett used it to guide her decision-making. (2 MARKS)

Question 8   (4 MARKS)

Using an example, discuss how prejudice against a certain group could influence the way someone makes attributions about this group's behaviour.

Question 9   (3 MARKS)

A researcher wants to investigate whether outsiders' exposure to certain ethnic groups reduces previously-held prejudices towards them. Write a research hypothesis for this investigation.

Question 10   (4 MARKS)

Anna loves a punk-rock band called Septic Splitends and believes they are the best band in the world. Anna loves listening to their music and believes that they get better with each song they release. However, when Anna sees them in concert, she is disappointed as they did not sound the same live and never engaged with the audience. She feels as though she wasted her money and no longer listens to them after the concert.

Using the criteria for attitude formation, evaluate whether Anna has an established attitude towards the band Septic Splitends.

Question 11   (10 MARKS)

During a P.E. class, Ash is team captain and has to select seven members for his netball team. Ash is good friends with his classmate Adam, who is overweight. Ash believes that overweight people are unfit and therefore, believes that Adam would be bad at netball. Because of this, Ash doesn't select Adam to be on his team. The other team captain also doesn't select Adam to be on the team and Adam misses out on playing the game. Ash feels bad about Adam missing out and experiences psychological tension about his decision to exclude him from the team.

Analyse Ash's experience of cognitive dissonance and discuss how this could be reduced through cognitive biases. In your response, refer to the tricomponent model of attitudes and the concepts of stereotypes and discrimination. Include a brief discussion on how Adam's mental wellbeing may be impacted in this scenario.

CHAPTER 7

Factors that influence behaviour

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

Image: GoodStudio/Shutterstock.com

7A Social groups and culture

STUDY DESIGN DOT POINT

- the influence of social groups and culture on individual behaviour

7A	7B	7C	7D

2.1.5.1
Factors influencing individual behaviour
- **2.1.5.1.1** Social groups
- **2.1.5.1.2** Culture

As humans, we are intrinsically social creatures. We spend lots of time surrounded by friends and family, and contributing to our community and broader society. Therefore, it should not be surprising that our social groups, and social and cultural identities, influence the ways in which we behave. In this lesson, you will learn about how social groups and culture can influence individual behaviour.

Factors influencing individual behaviour 2.1.5.1

We may like to think that our behaviour and the choices we make are solely our own. However, there are many factors that influence what we do and how we choose to do it. In this lesson, we will learn about the influence of social groups and culture, and how they impact our individual behaviour.

Theory details

Our choices and behaviours shape who we are and how we are perceived by others. For example, a person constantly telling jokes is likely to be viewed as funny. Likewise, a person always giving advice is likely to be perceived as caring. Therefore, it is important to understand the environmental factors that have the ability to influence these daily behavioural choices. If you existed in complete isolation or if you were born in another country, your behaviours would likely be drastically different to how they are now. In this lesson, we will explore how the social groups and the cultures to which you belong can influence your behaviour.

Social groups 2.1.5.1.1

Are you part of any groups? Maybe your sporting team or a group of people that you work with? How would you actually define a group? Are two people waiting silently at a bus stop considered a group? The term 'group' is often difficult to conceptualise due to the multifaceted and dynamic nature of what we perceive to be a group. However, in psychology, a **group** refers to two or more people who interact and influence each other and share a common objective. The formal definition of a group requires four conditions to be met. The requirements for a collection of people to be considered a group are:

1. There must be two or more individuals or 'members'; one person alone cannot be classified as a group.
2. The members must interact with each other.
3. The members need to influence each other, such as influencing a member's thoughts or behaviour.
4. There needs to be a common goal or purpose shared by the group members. Examples could include winning a game of volleyball, working together to land a major sale with a client, or a collective goal to create bonds and socialise.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

KEY TERMS

Group two or more people who interact and influence each other and share a common objective

By belonging to a group, a divide is created between individuals in the form of in-groups and out-groups. An **in-group** is a group that an individual belongs to or identifies with. Contrastingly, an **out-group** is a group that an individual does not belong to or identify with. An individual may often have multiple in-groups and out-groups. For example, an in-group you may identify with could be the students of your particular school, therefore making students from other schools part of the out-group. However, within your school, you may have an in-group consisting of people who play a particular sport, with the out-group being those students who do not play that sport. This example is depicted in figure 1.
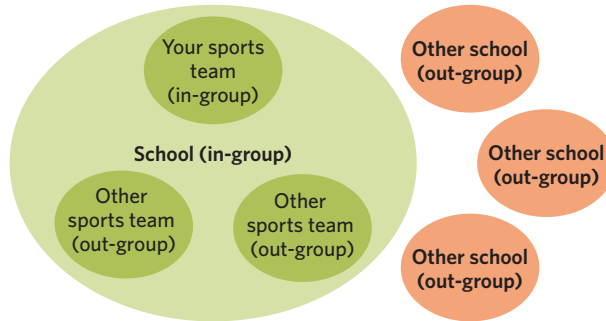
Figure 1 It is common to be a part of multiple in-groups and out-groups at the same time

However, belonging to a specific group does not in itself influence an individual's behaviour. Instead, there are specific factors associated with belonging to a group that may influence behaviour. In this lesson, we will explore how individual behaviour is impacted by:

- group norms
- social loafing
- social identity theory.

Group norms

A **norm** is a standard, value, or rule that outlines an appropriate behaviour or experience. This can be contained within a society, or it can be exclusive to a smaller group. Within a group, norms can be both formal and informal. Formal group norms are explicitly outlined rules or regulations. For example, if you belong to a sports team, a formal norm may be that you are required to show up to every practice, which was outlined when you signed up. Informal group norms, however, are often not explicitly outlined and are, instead, inferred, often through consequences. For example, an informal group norm may be that within your friendship group, you each take turns paying for meals. If you refuse to do this, you may be met with hostility or negative social consequences.

Group norms exist in almost all groups, whether intentionally or not. As a result, they tend to largely impact individual behaviour as individuals would often rather comply with group norms than be excluded from a group. This is not necessarily a negative thing, as often the groups to which individuals belong align with their own values, and group norms are often harmless. However, if you were to join a group for reasons other than shared interests or values, you may be inclined to engage in behaviours that lead to cognitive dissonance.

Examples of group norms and their impacts on individual behaviour are outlined in table 1.

Norm a standard, value, or rule that outlines an appropriate behaviour or experience

Table 1 Examples of group norms and their impacts on individual behaviour

Group	Norm	Type of norm	Possible consequences
School	Wearing the correct uniform	Formal	If the norm is upheld, the individual may be sacrificing their personal style but will avoid negative consequences from the group. If the norm is not upheld, an individual may be punished by group members (teachers) or may even be removed from the group if the behaviour continues (such as being expelled). Continues ▶

Table 1 Continued

Group	Norm	Type of norm	Possible consequences
Friendship group	Sitting together at lunchtime	Informal	If the norm is upheld, the individual is likely to feel closer to and bond with the group. If the norm is not upheld, there may be group conflict and the individual may be removed from the group.
Workplace	Arriving to work on time	Formal	If the norm is upheld, the individual may be praised by members of the group (co-workers) and is more likely to feel accepted within the group. If the norm is not upheld, the individual may face consequences (such as warnings from their boss) or may be excluded from the group (fired).
Family	Not entering the rooms of other family members without permission	Informal	If the norm is upheld, group conflict is avoided. If the norm is not upheld, there is likely to be both group conflict and punishment by other members of the group (parents).

Social identity theory
the tendency for people to favour their in-group over an out-group in order to enhance their sense of self-esteem

Social loafing
an individual's reduction in effort when work is performed in a group as compared to individually, due to the belief that others will put in the effort

Social identity theory

It is clear that we are inclined to uphold group norms in order to maintain our membership to a particular group, but why is membership to a group so important to us? In addition to the fact that humans are inherently social beings, belonging to a group can make us feel intrinsically better about ourselves. Belonging to a social group can enhance an individual's sense of self, contributing to their social belonging and providing them with a strong concept of who they are. The **social identity theory** outlines the tendency for people to favour their in-group over an out-group in order to enhance their sense of self-esteem. For example, you may believe that your class is smarter than other classes, without any evidence of this being true.

However, this has the potential to negatively influence an individual's behaviour by encouraging prejudice against those who are not in the 'in-group'. As membership to a group upholds one's self-esteem, individuals are inclined to protect their in-group against out-groups they perceive as a threat (Tajfel et al., 1979). This can often conflict with the ways in which an individual would behave if they were on their own. For example, you may consider yourself to be a kind and respectful person. However, when you are playing a game of football, you may find yourself hurling insults at, and looking down upon, the opposing team.

Extreme cases of in-group favouritism and out-group discrimination can lead to instances of racism, homophobia, or sexism which may not have occurred if the individual was not a member of a particular group.

Social loafing

Have you ever completed a group assignment or activity where you felt as though none of your group members put in any effort? Alternatively, maybe you rely on others when in a group? Another way in which an individual's behaviour can be influenced within a group is demonstrated via the phenomenon of social loafing. **Social loafing** refers to an individual's reduction in effort when work is performed in a group as compared to individually, due to the belief that others will put in the effort.

Social loafing can occur in all group settings, such as whilst playing a team sport or completing a group project at school. Social loafing, however, occurs most commonly when individual efforts cannot be identified. You may consider yourself to be a responsible and proactive student, however, when completing a group task, your behaviour may no longer reflect these attributes.

However, the occurrence of social loafing in group tasks is not guaranteed. There are many factors that promote or prevent social loafing. These are outlined in table 2 (Simms & Nichols, 2014).

Table 2 Factors influencing social loafing

Factors that promote social loafing	Factors that prevent social loafing
• The ease of the task. Individuals are more likely to loaf whilst completing group tasks that they consider to be easy, as compared to more difficult tasks. • Meaningfulness of the task. Individuals are more likely to engage in social loafing if they don't personally identify with the task. For example, you may be more likely to loaf in a subject that you have no interest in, as compared to your favourite subject.	• Clear indications of individual efforts within a group. For example, having to write your name next to the section of work you completed for a school assignment. • Group interaction. The more that a group interacts during task completion, the less likely individuals are to loaf.

Culture 2.1.5.1.2

Beyond the smaller groups with which we identify, we all belong to a much larger collection of people that are connected through a shared culture. **Culture** outlines the customs, behaviours, and values of a particular group in society. Culture can be linked to an individual's ethnicity, religious beliefs, nationality, or even the area in which they live. Similarly to in-groups and out-groups, an individual may identify with more than one culture at once.

Although cultures are often complex and are rooted in meaningful historical events and traditions, they can be categorised into one of two types of cultures: individualist cultures or collectivist cultures. The category to which a culture belongs will dictate its norms and, therefore, influences the individual behaviours of those within that culture.

Types of cultures

Western societies, such as Australia and America, tend to perceive the world as being comprised of unique and separate individuals. These are considered to be **individualist cultures**, which are cultures that prioritise the needs and goals of individuals and value independence.

In contrast, many Eastern societies, such as Korea and Japan, tend to place more societal emphasis on flourishing as a group, with an individual's actions being of lesser importance than the group's. These cultures are known as **collectivist cultures**, which are cultures that prioritise the needs and goals of groups.

The main differences between individualist and collectivist cultures are outlined in figure 2.

> **Culture** the customs, behaviours, and values of a particular group in society
>
> **Individualist culture** a culture that prioritises the needs and goals of individuals and values independence
>
> **Collectivist culture** a culture that prioritises the needs and goals of groups
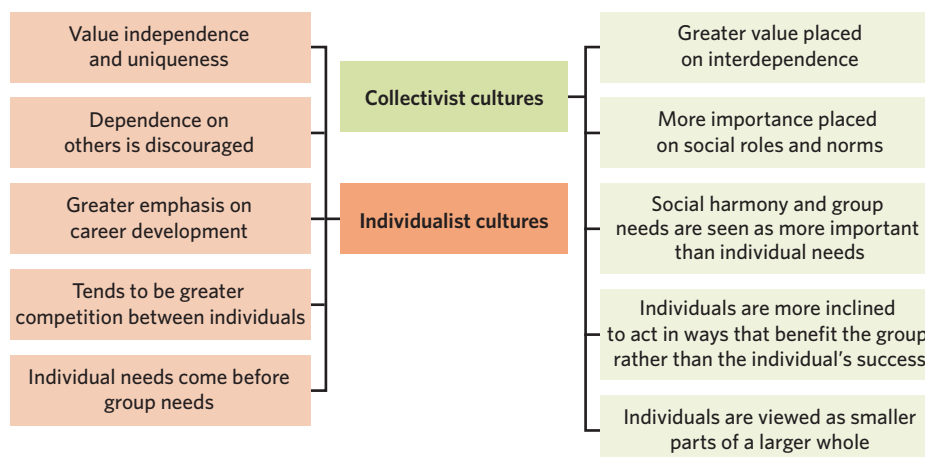
Figure 2 Comparison of individualist and collectivist cultures

As you have learnt, individuals tend to adhere to group norms in order to maintain their membership to that group. Therefore, the culture to which an individual belongs, and its associated norms, have a significant influence on their behaviour. Some examples of the ways in which collectivist and individualist cultural norms can influence individual behaviour are outlined in table 3.

Table 3 Influence of individualist and collectivist cultures on individual behaviour

Area	Culture	Norm	Behaviour
Work	Individualist	Personal success should be the priority	• Sacrificing needs of others to progress in career. • Being more likely to act in the interest of personal success rather than the success of the company. • For example, if an individual is offered a better-paying job at a different company, they may be more likely to take up this offer even if it disrupts their current company.
	Collectivist	Working is a way to provide for one's family and benefit society	• Choosing jobs that increase one's ability to provide for their family as opposed to personal success. • Being more likely to act in the interests of the company as a whole. • For example, if an individual is offered a better-paying job at a different company, they may be more likely to reject this offer and work to establish a more beneficial agreement with their current company, in order to minimise disruption.
Family	Individualist	The concept of family extends only to one's immediate family	• Time and resources are spent benefitting only oneself and one's immediate family. • People within a family act as individuals when in society. • For example, individualist societies more frequently utilise old-age care services so that other family members have the ability to focus on their own priorities.
	Collectivist	The concept of family extends to one's wider social community	• Generosity and resources are extended to the wider community. • When in society, members of a family are still viewed as an extension of their family. • For example, individuals from collectivist societies are more likely to directly care for elderly family members due to a sense of family responsibility.

When an individual is raised within a consistent culture, these norms and expectations are often not upheld consciously or for fear of consequence. Instead, these cultural norms become ingrained in an individual and often reflect their own beliefs and values. However, these values and behaviours tend to be congruent as a result of the influence of culture shaping their values throughout one's life, rather than an individual adhering to cultural norms because they happen to align with their personal values.

WANT TO KNOW MORE?

Although the concept of cultures being either individualist or collectivist is widely accepted, it is still quite broad and, therefore, may not be entirely accurate when analysing something as complex as culture.

Hofstede's cultural dimensions is a more in-depth tool that can be used to categorise cultures (Hofstede, 1984). This model rates a culture on six unique dimensions, which are explored in table 4.

Table 4 Hofstede's cultural dimensions

Individualism versus collectivism	Refers to how a culture would be rated on a spectrum of individualist to collectivist.
Power distance	Refers to the degree to which individuals with low levels of power in a society accept that power will be distributed unequally. For example, parents in a culture with high levels of power distance would be more likely to expect obedience from their child.
Uncertainty avoidance	Describes a culture's tolerance for ambiguity. For example, cultures with a low tolerance for ambiguity often have stricter penalties for law-breaking and tend to worry about the future more. Cultures with a high tolerance often have more flexible laws and tend to switch employers more frequently.

Continues ▶

Table 4 Continued

Masculinity versus femininity	Cultures are rated on a spectrum from masculine to feminine. Masculine cultures are driven by competition, achievements, and success. Whereas, feminine cultures are driven by quality of life, cooperation, and caring for others.
Long-term versus short-term orientation	The goals and values of a culture are rated on a spectrum from long-term to short-term. Long-term orientation involves directing time towards improving future circumstances through perseverance and innovation. Whereas, short-term orientation places a greater emphasis on the present and on tradition and stability.
Indulgence versus restraint	Refers to a culture allowing individuals to act freely in ways that allow for gratification. Whereas, restraint refers to a culture regulating these behaviours through strict social norms.

Theory summary

In this lesson, you learnt about the ways in which social groups and culture can influence individual behaviour. Figure 3 depicts the content of this lesson in greater detail.
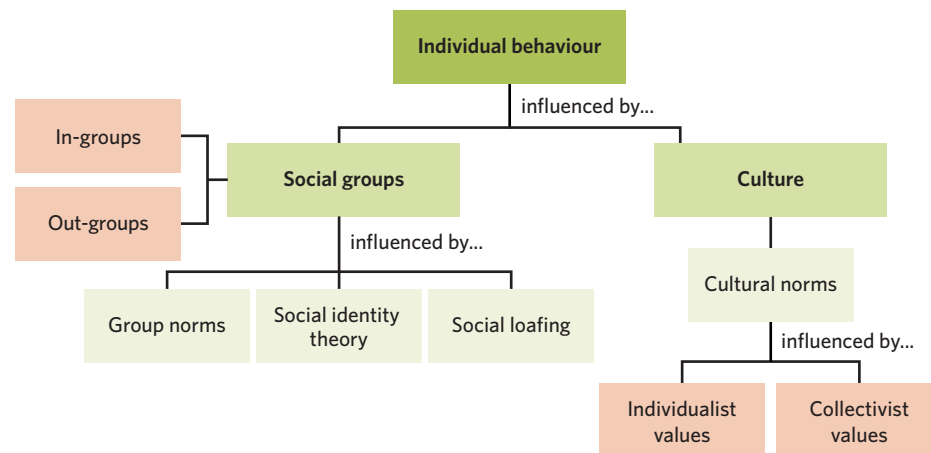
Figure 3 Summary of lesson 7A

7A Questions

Theory review

Question 1

Environmental or social influences have little influence on individual behaviour.

A. True.

B. False.

Question 2

Which of the following statements about in-groups and out-groups is most correct?

A. Individuals do not favour one over the other.

B. An in-group must consist of more than two people.

C. It is common to have multiple in-groups and out-groups.

Question 3

Which of the following words is **not** commonly used to describe a norm?

A. Inappropriate.

B. Informal.

C. Formal.

Question 4

The social identity theory suggests that individuals will favour their in-group in order to

A. increase their chance of survival.

B. enhance their sense of self-esteem.

C. gain power over members of their in-group.

Question 5

Social loafing suggests that when in a group, individuals tend to work harder.

A. True.

B. False.

Question 6

_____ cultures prioritise the needs and goals of a singular person as opposed to a group.

Which of the following best fits in the blank?

A. Individualist

B. Collectivist

Assessment skills

Perfect your phrasing

Question 7

Which of the following sentences is most correct?

A. A group consists of two or more people who **interact** and **influence** each other and share a common objective.

B. A group consists of two or more people who **socialise** and **impact** each other and share a common objective.

Question 8

Which of the following sentences is most correct?

A. Social identity theory is the tendency for people to **choose** their in-group over an out-group in order to enhance their sense of **confidence**.

B. Social identity theory is the tendency for people to **favour** their in-group over an out-group in order to enhance their sense of **self-esteem.**

Question 9

Which of the following sentences is most correct?

A. Culture refers to the **rules**, behaviours, and values of a particular **collective** in society.

B. Culture refers to the **customs**, behaviours, and values of a particular **group** in society.

Data analysis

The following assessment skills type reflects the study design assessment type:

- a data analysis of generated primary and/or collated secondary data

Use the following information to answer questions 10–13.

The difference in social behaviours between individualist and collectivist cultures

Pfundmair et al. (2015) conducted a study in which they explored the relationship between culture (specifically through the measure of individualism and collectivism) and individuals' behaviours when being excluded from a social group. Specifically, the researchers were interested in whether social exclusion leads to anti-social or pro-social behaviours in each culture.

Participants consisted of 47 individuals whose cultural identity was first categorised as either collectivist or individualist through the use of a questionnaire. Following this, participants were assigned to either the 'inclusion' or 'exclusion' group. Each group was asked to visualise and write an essay about an experience in their life in which this instance had occurred and to then complete a questionnaire about this experience.

Behavioural intention between collectivist and individualist cultures

The results are depicted in the graph provided.

Note: behavioural intention refers to whether the behaviours outlined by the participants can be categorised as anti-social or pro-social. For example, talking to a friend about the experience would be considered to have a pro-social behavioural intention, whereas, choosing to avoid confrontation would be considered to have an anti-social behavioural intention.
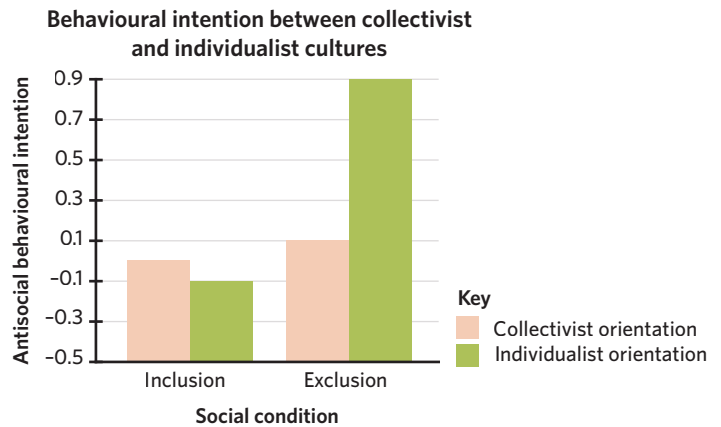
Question 10

The vertical axis of the graph depicts

A. the independent variable.

B. the number of participants displaying anti-social behaviour.

C. the dependent variable.

Question 11

The data relating to participants with collectivist values demonstrates that

A. there was little difference in anti-social behaviours between the inclusion and exclusion groups.

B. social exclusion led to a decrease in anti-social behaviours.

C. social inclusion led to an increase in anti-social behaviours.

Question 12

Compared to individuals with collectivist values, individuals with individualist values

A. made up the total sample.

B. demonstrated more anti-social behaviours during social exclusion.

C. demonstrated less anti-social behaviours during social exclusion.

Question 13

The results of the study may support the notion that **(Select all that apply)**

I. the culture of an individual may impact individual behaviour.

II. collectivist cultures value social connection more than individualist cultures, as these participants displayed more negative anti-social behaviours during social exclusion.

III. individualist cultures view group harmony as important, as these participants were less likely to avoid confrontation during social exclusion.

IV. collectivist cultures view themselves as part of a larger whole and place less value on individual importance, as these participants were less likely to engage in negative anti-social behaviour during social exclusion than individualist participants.

Exam-style

Remember and understand

Question 14   (1 MARK)

Which of the following does **not** represent a group?

A. Three strangers on a bus who are all travelling to the same destination.

B. A romantic couple.

C. Coworkers within a workplace.

D. A sports team.

Question 15   (1 MARK)

Belonging to a group can influence individual behaviour through

A. group norms, social dependence, and self-esteem.

B. group norms, social loafing, and social identity theory.

C. cultural norms, social loafing, and self-esteem.

D. cultural norms, group norms, and social dependence.

Question 16   (1 MARK)

Which of the following is an example of an informal group norm?

A. Showing up to team practice for a sport.

B. Completing homework for school.

C. Filling in your availability for work.

D. Buying a birthday present for people in your friendship group.

Question 17   (1 MARK)

Social loafing can be prevented by

A. ensuring that individual efforts can be clearly identified.

B. ensuring that the task is easy.

C. limiting the amount of group interaction.

D. socially excluding those who demonstrate social loafing.

Question 18   (2 MARKS)

Provide an example of what could be considered a culture and an example of something which would not be considered a culture.

Apply and analyse

Use the following information to answer questions 19 and 20.

Amelie recently joined her school's football team. This means that Amelie now has to play against her childhood best friend who plays in a different school's football team. Amelie has noticed that she has begun to view her friend more negatively and decides to spend more time with the girls in her school's team instead of her old friend.

Question 19 (1 MARK)

Amelie's football team is an example of

A. a culture.

B. an in-group.

C. an out-group.

D. social identity.

Question 20 (1 MARK)

Amelie's new-found animosity towards her friend is an example of

A. the social identity theory as she views her friend as a part of an out-group that is a threat to her in-group.

B. the social identity theory as she views her football team as an out-group that is a threat to her in-group consisting of her and her friend.

C. social loafing as she has reduced her efforts in her friendship after becoming part of a group.

D. social loafing as she has increased her efforts in her friendship after becoming part of a group.

Question 21 (2 MARKS)

Outline one similarity and one difference between the terms 'individualist' and 'collectivist'.

Question 22 (3 MARKS)

Rakim has recently started hanging out with a new group of friends after moving to a new school. Every day after school, his friends go to the train station to graffiti the walls and he now feels as though he has to join them. Rakim complies but often feels guilty when he gets home as he does not agree with what they are doing.

a. Outline what is meant by a group norm and identify whether graffitiing the train station is a formal or informal norm. (2 MARKS)

b. Provide an explanation as to why Rakim may uphold this norm even though it does not align with his personal beliefs. (1 MARK)

Questions from multiple lessons

Question 23 (2 MARKS)

In terms of the social identity theory, is discriminating against an out-group a form of direct or indirect discrimination? Justify your response.

Question 24 (2 MARKS)

Marlin grew up in an individualist culture. He views personal success as extremely important and is used to being assertive and competitive in the workplace. He recently got a job in China, where there is a collectivist culture, and has noticed that his coworkers find his behaviour rude and inappropriate.

Is Marlin displaying atypical behaviour? Justify your response.

7B The influence of obedience and conformity on behaviour

7A	7B	7C	7D

2.1.6.1
Obedience
— **2.1.6.1.1** Milgram's obedience experiment
— **2.1.6.1.2** Contemporary research on obedience

2.1.6.2
Conformity
— **2.1.6.2.1** Asch's conformity study
— **2.1.6.2.2** Contemporary research on conformity
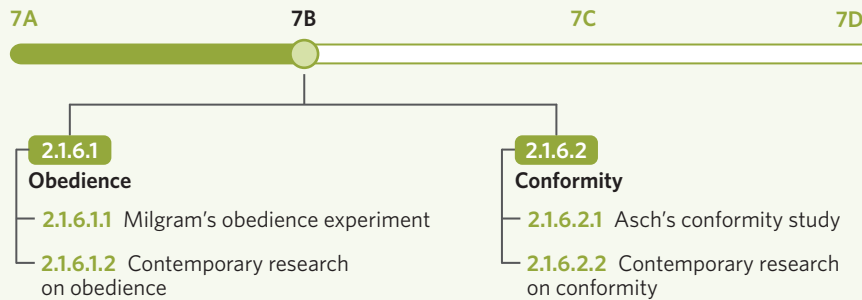
Why do you listen to what others say? Why do you do as others do? We may think that we have control over our own behaviours, but sometimes we can be influenced by external factors. In this lesson, you will learn about the external factors of obedience and conformity. You will also learn about Milgram and Asch's experiments which put these concepts into action, as well as explore more contemporary research on these factors.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

Obedience 2.1.6.1

Why do we listen to a police officer and do as they say? Conversely, why don't we always listen to our parents and rather turn against them? This psychological phenomenon is called obedience, and it influences our individual behaviour in many ways and to different extents.
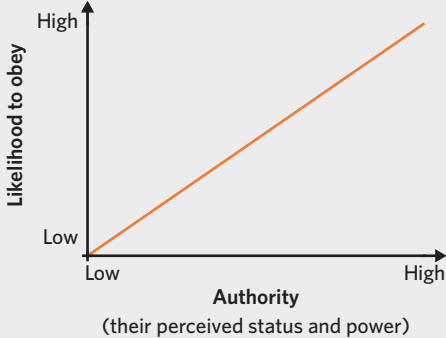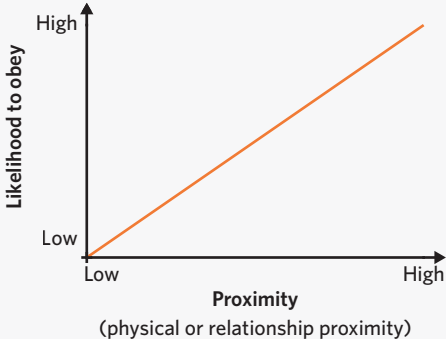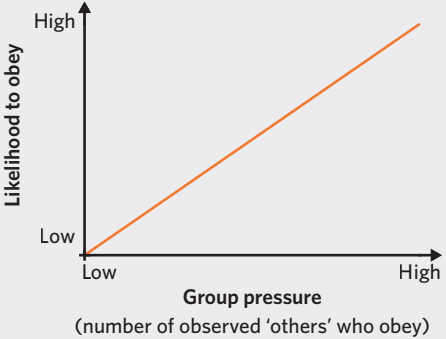
Theory details

When you get pulled over by a police officer and they ask to see your licence, do you show them? Do you listen to your teacher when they tell you to be quiet? Listening to and doing as others say is a demonstration of **obedience**, which involves complying with commands which are often given by a source of authority. There are many factors that affect obedience and how individuals behave in response to a command. These factors are outlined in table 1, but it is important to note that the table below is a non-exhaustive list and that there are more factors that affect obedience.

KEY TERMS

Obedience complying with commands which are often given by a source of authority

Table 1 Factors that affect obedience and how they influence individual behaviour

Factor	How it affects obedience	How it influences individual behaviour
Status of authority figure	Greater status or power of authority increases the extent of obedience. **Figure 1** The greater the perceived status and power of an authority, the more likely that someone is to obey	Individuals are more likely to obey the commands of those they perceive to have status or power. For example, an individual might be more likely to show their licence to a police officer (who they may perceive to have high status or power) than their sibling (who they may perceive to have low status or power).
Proximity	Greater physical proximity (physical closeness) or greater relationship proximity (emotional closeness) between an individual and someone who made a command increases the likelihood of obedience. **Figure 2** The higher the proximity (physical or relationship) to the authority figure, the higher the likelihood that someone will obey	Individuals are more likely to obey the commands of those to whom they are physically close. For example, a student may be more likely to respond to a teacher if they are standing right next to them, rather than on the other side of the room. Individuals are also more likely to obey someone who they have a closer relationship with. For example, a student may be more likely to listen to a teacher they have been taught by before and know than a teacher who they have just met.
Group pressure	Tendency to obey increases as the number of 'others' who also obey increases. **Figure 3** The greater the group pressure is, the more likely that someone is to obey	Individuals are more likely to obey commands when they observe others obeying the commands. For example, if students observe a majority of their class sitting down as their teacher commanded, they are more likely to also sit down.

The likelihood of obedience increases according to the status, authority and/or power of a person, which can be identified through symbols and uniforms. These can include:

- military leaders wearing badges
- police officers wearing a navy blue police uniform
- bosses displaying their degrees and other certificates in an office.

badge

handcuffs

Figure 4 Police officers display many symbols of authority, including a navy blue uniform, wearing badges, and holding observable objects, such as guns and handcuffs

Obedience is not inherently bad and can help to ensure a functioning society. It can guide individuals and inform them of how to behave in certain situations. However, obedience can also be manipulated, a notion seen in Milgram's obedience experiment, which will be explored in the next section of the lesson.

Milgram's obedience experiment 2.1.6.1.1

Milgram's (1963) obedience experiment sought to determine if people would obey the demands of a person they perceived to have authority. Participants believed they were harming another individual by administering electric shocks (which were actually fake) when instructed by an authority figure. The voltage (intensity of the electric shock) served as the measure of obedience level. To the researchers' surprise, despite believing that they were harming another person, many participants administered shocks to extremely intense and potentially lethal levels.

The aim of Milgram's experiment was to measure the extent to which individuals would obey the commands of an authority figure, even when those commands required inflicting pain and suffering on another individual. Participants and materials included:

- 40 male participants, ranging from around 20 to 50 years of age, who had a range of different jobs.
- Participants responded to advertisements in the newspaper or mail sent directly to them, which informed them that the study was examining processes involved in learning and memory.
- Participants' role was to be a 'teacher' in the study and administer shocks from an electric shock machine when their 'student' got the answer wrong in a memory test.
- The 'student' in the study was actually a confederate (a person who pretends to be a participant by fulfilling a role outlined by the researcher, but without the real participant knowing).
  – The confederate's role: to be strapped to an electric chair, and pretend to be in pain when the real participant, in a teacher role, administered what they believed to be real (but were fake) electric shocks.

The procedure of Milgram's experiment is outlined in table 2.

Table 2 Procedure of Milgram's experiment

Step	Details
1	The participant entered the room and met the experimenter and the confederate 'student'.
2	The participant and the confederate drew their names from a hat to determine their role in the study – either student or teacher. • This was rigged to ensure that the participant would always be assigned the teacher role and the confederate to the student role.
3	The student was then taken into a separate room and placed in an electric chair. They were not actually connected to the electric chair but were trained to give specific fake responses of pain at certain times, which was unknown to the real participant. • The student was separated by a wall from the participant and the experimenter, meaning that the participant could only hear the student but not see them. The participant was told by the experimenter that the shocks from the electric chair were painful but not dangerous. The setup of the experiment is represented in figure 5. **Experimenter** **Teacher (participant)** **Student (confederate)** **Figure 5** In Milgram's study, the participant who plays the role of the teacher is in a room with the experimenter, with the student sitting in an electric chair on the opposite side of a wall
4	Before starting the experiment, the experimenter demonstrated that the shocks are real by administering the participant (teacher) with a small electric shock (45 volts). • Receiving this shock was to ensure that the participant believed that the shocks the student was receiving were legitimate.
5	The learning test then began and the confederate student had to answer the participant's questions by pressing one of the four options. When the student answered the questions incorrectly, the participant was asked by the experimenter to administer electric shocks to the student. • A representation of the electric shock machine is outlined in figure 6, with the higher voltages labelled with 'Danger' and 'XXX' to emphasise that these shocks were unsafe. The electric shocks became incrementally more intense (increasing in voltage) with each incorrect answer from the student. The experimenter instructed the participant (teacher) to announce the voltage of each shock before administering it to the student. **Volts** 15 Slight shock · 75 Moderate shock · 135 Strong shock · 195 Very strong shock · 255 Intense shock · 315 Extreme Intensity shock · 375 DANGER: Severe shock · 435 450 XXX **Figure 6** The labels on the electric shock machine used in Milgram's experiment
6	The student gave fake responses and protested when they received certain voltages, yelling at each of the shocks the teachers administered. Specific responses included (Burger, 2009): • the student pleading to be released from the chair at 150 volts. This led to most participants (teachers) turning to face the experimenter in uncertainty. The experimenter told the participant (teacher) 'the experiment requires you continue' (Burger, 2009). • the student loudly banging on the wall which separates the student and participant (teacher) at 300 volts. • after 300 volts, the student no longer answers any questions. The experimenter informed the participants to treat no answer as the wrong answer and to continue administering electric shocks.
7	At the conclusion of the study (with participants either obeying the experimenter to 450 volts or disobeying before this), the student returned to the room. The student and experimenter informed the participant that the student did not actually get shocked and that the screams were fake. The participant (teacher) was invited to shake hands with the student to further assure them that they did not inflict any harm on them.
8	The participant was interviewed and received further information about the nature of the study (debriefing).

During the study, many of the participants had similar responses. After 300 volts, which was when the student stopped responding to the questions, many of the participants sought guidance from the experimenter and were concerned. In fact, it was common for participants to display signs of distress when they were told to continue administering shocks.

So what were the results of the study? Were these results as expected? Before conducting the study, Milgram asked 14 Yale senior psychology students to predict how many of the participants would obey until the end of the experiment. On average, these students predicted that around 1.2% of participants would continue to administer the maximum 450 volts of electric shock to the student. Results from the experiment are as below:

- Only five of the 40 participants stopped administering electric shocks at 300 volts (when the student violently protested by kicking the wall and screaming, and then stopped responding to questions).
- Overall, 14 of the 40 participants refused to administer a certain level of voltage to the student.
  - Therefore 35% of participants demonstrated disobedience.
- Although many participants clearly displayed extreme distress when administering shocks, 26 of the 40 participants (65%) continued until the maximum 450 volts (Burger, 2009).
  - This was particularly surprising as the participants believed that this voltage was extremely dangerous and had the potential to kill the student.

The voltage participants stopped at during Milgram's experiment
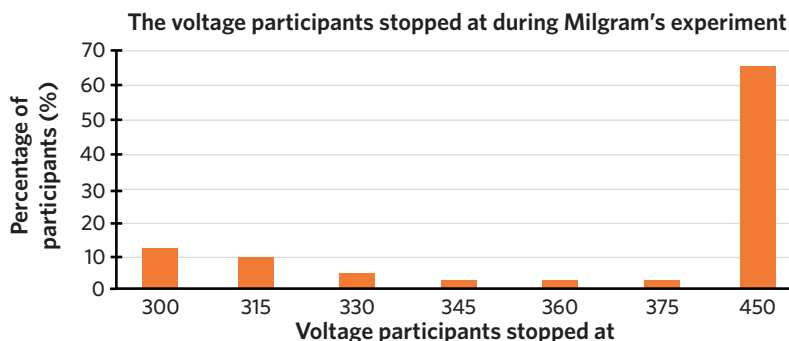
Figure 7 The percentage of participants who stopped administering electric shocks at particular voltages

From the results, Milgram concluded that people have a tendency to obey individuals who are perceived to have authority. More specifically, individuals are likely to obey authority figures even if it involves inflicting harm on another person.

As the study was conducted in the mid-20th century, there are many ethical concerns that would arise if it was repeated today. In lesson 1G Ethical considerations, you learnt about the numerous ethical guidelines that must be upheld and adhered to in psychological practice. Table 3 explores some of the ethical considerations that were violated in Milgram's obedience experiment.

Table 3 Some of the ethical guidelines violated in Milgram's obedience experiment

Ethical guideline	How it was breached in Milgram's obedience experiment

No-harm principle	Pain was inflicted on participants, including:
	 • psychological pain as participants were led to believe that they had inflicted extreme pain on another individual, with many believing that their actions of administering electrical shock had killed someone (Burger, 2009).
	   – Additionally, even when participants showed excessive levels of distress, such as sweating, trembling, and stuttering, Milgram did not stop the experiment.
	 • physical pain as each participant was shocked with 45 volts of electricity at the start of the experiment.
	   – Although this voltage is mild, it still may have inflicted physical pain and could have led to more significant impacts on those with underlying health issues (Burger, 2009).
	
	 Continues ▶

Table 3 Continued

Ethical guideline	How it was breached in Milgram's obedience experiment
Withdrawal rights	Although the participants were informed that they would receive compensation of $4.50 for simply coming to the study no matter what, it is likely that participants may have still felt obliged to cooperate and obey the demands of the experimenter due to this payment (Burger, 2009). Furthermore, participants were never explicitly told that they could leave the study at any time, which is now an ethical standard in psychological studies. Additionally, many participants verbally stated their desire to leave the experiment. In response, the experimenter outlined a range of statements including 'the experiment requires that you continue' and 'you have no other choice, you must go on' (Burger, 2009).
Deception and debriefing	Deception was used as participants were told that they were participating in a study examining learning and memory, not a study about obedience and also led to believe that they were administering real shocks to the student, when they were actually fake. Milgram (1963) outlined that participants were not displaying signs of distress when they left. Further participants met with and spoke to the student at the end of the experiment to assure them that they had not suffered harm. However, the extent to which this method of debriefing adequately ensured participants left without any lasting harm is uncertain.

PSYCHOLOGY EXPLORATION

What inspired Milgram to conduct his obedience study? Milgram conducted this study a few decades after the atrocities of the Holocaust occurred in Europe. During this time, many innocent individuals were tortured or murdered by everyday normal people who claimed to be simply obeying orders. Milgram wanted to investigate the extent to which individuals would follow orders from perceived authority figures, which led to his study (Milgram, 1963).

Milgram also conducted multiple follow-up studies after conducting his original study in 1963. These studies involved multiple variations, including the experimenter delivering instructions to the participant (teacher) over the phone, among others. Type the URL https://journals.sagepub.com/doi/abs/10.1177/001872676501800105 into your browser to read 'Some Conditions of Obedience and Disobedience to Authority', which describes another Milgram study that was conducted in 1965.

Contemporary research on obedience 2.1.6.1.2

Milgram's studies on obedience have faced criticisms from other researchers. These criticisms include:

- accusations that non-standardised instructions and procedures occurred during the studies, with some experimenters not following the standardised script when the participants (teachers) protested (Romm, 2015).
- uncertainty about interpretations of the study's results. Many researchers have disagreed with Milgram's notion of complete obedience or disobedience and suggest that participants who protested and vocalised their desire to not continue administering the shocks should be considered to have displayed some level of disobedience as well (Romm, 2015).
- suggestions that the study's conclusion has been oversimplified, with different results likely to occur in different settings (Romm, 2015).

Following these accusations, more modern and ethical replications of Milgram's experiment have been attempted. One of these replications was conducted by cognitive neuroscientists at University College London. Table 4 outlines the key details and findings of Caspar et al.'s (2016) experiment.

Table 4 Key details and findings of Caspar et al.'s (2016) obedience experiment

Section	Key details and findings
Aim	To examine people's 'sense of agency', which is the unconscious feeling that they were in control of their own actions when obeying cruel commands.

Participants	• This study used 40 female participants.
	  – All participants were volunteers who were given £20 ($35.45) for their participation.
	  – Participants were completely aware of the experiment's aims and knowingly inflicted real pain.

Procedure	1. Participants took a pre-test to determine the level of electric shock that they should start with, as people have different tolerances to pain.
	2. Participants sat, in pairs, facing each other with a keyboard between them.
	3. One participant was designated the 'agent' and could press one of two keys.
	  – One button did nothing whilst the other would deliver a painful but bearable electric shock to the other participant, who was designated the 'victim.'
	4. In one condition, an experimenter stood next to the agent and told the participant which key to press. In another condition, the experimenter looked away and gave the agent a free choice about which key to press.
	5. To test the participants' 'sense of agency,' a tone was sounded after a few hundred milliseconds of pressing either key and both participants were asked to judge the length of this interval.
	  – It has been established that the interval between an action and its outcome is perceived as shorter when it's of free will but longer when the action is passive.

Findings	It was found that when participants were ordered to press a key, they seemed to judge their action as more passive than when they had free choice. Therefore, they perceived the time to the tone as longer. It was also unexpectedly found that being ordered to press the key was enough to cause a difference in the participant's judgement of time, even when no physical harm was caused. It was suggested that an individual's sense of responsibility is reduced whenever they are ordered to do something, regardless of what they are told to do, making them more likely to obey.
Possible implications	Companies can create or avoid a feeling of personal responsibility among their employees based on the orders that they give them, in order to influence levels of obedience within the workplace.

Therefore, individual behaviour can be highly influenced by obedience, particularly if a person with perceived authority is involved. In a similar manner, individual behaviour is also influenced by conformity, which will be discussed in the next section of the lesson.

Conformity 2.1.6.2

Have you ever walked around and noticed that everyone walked on the left side of the path so you did too? Adjusting your behaviour to match others is an example of conformity. There are many examples of conformity in everyday life and they all impact our individual behaviour.

Theory details

We have an innate desire to belong. Due to this desire, we often act in ways that allow us to fit in with others. This process is known as conformity. **Conformity** involves adjusting one's thoughts, feelings, or behaviours to match those of others, a social group, or a social situation. An example of this would be an individual buying new clothes after being told that their clothes are unusual. In this situation, when someone has been clearly singled out and made to feel different from others, they are likely to feel uncomfortable and may feel embarrassed or distressed. Due to wanting to alleviate (relieve or resolve) these negative feelings, one would often choose to conform.

Conformity adjusting one's thoughts, feelings, or behaviours to match those of others, a social group, or a social situation

Figure 8 The uncomfortable feeling of not fitting in can lead to individuals aligning their behaviour, thoughts, or feelings to conform with others

There are many factors that affect conformity and how individuals behave. These factors and responses are further outlined in table 5.

Table 5 Factors that affect conformity and influence individual behaviour

Factor	How it affects conformity	How it influences individual behaviour
Social norms, which are society's unofficial rules and expectations regarding how individuals should act.	Social norms can provide a more subtle and covert (hidden, unobservable) pressure for individuals to conform to society's expectations.	Individuals may be more likely to conform so that they don't appear abnormal for not following social norms. For example, someone looking for a new job may feel obliged to shake hands with their interviewer to avoid being perceived as abnormal. This is due to a social norm in Western cultures that you shake hands when first meeting someone new, particularly in formal settings.
Groupthink, which is a psychological phenomenon in which assumed group unanimity overrules individuals' realistic appraisal of consequences.	A greater extent of groupthink results in a greater extent of conformity.	Individuals are more likely to conform if there is a greater extent of groupthink, as the greater perceived unanimity overrules their judgement. For example, a student may disagree with their teacher's suggestion of how to spend their free time, but if they perceive that all of their peers unanimously agree with their teacher, they are more likely to conform. In contrast, if they perceive that only a minority of their peers agree with their teacher, they are less likely to conform.
Group shift, which refers to a condition in which the influence of the group causes an individual to adopt a more extreme position.	The more influential a group is, the greater the change of conformity.	Individuals are more likely to conform (due to group shift) if the group in which they are in is highly influential to them. For example, an individual is more likely to conform and adopt the political views of their boss and co-workers (who they may perceive to be highly influential) than their siblings (who they may perceive as less influential).
Deindividuation, which refers to the tendency for individuals to lose their sense of identity and individuality within a group.	The more deindividualised people feel, the greater the chance of conformity.	Individuals are more likely to conform if they believe that their behaviours, thoughts, and feelings are invisible or anonymous. In group settings, this can often lead to individuals behaving in ways that they would not when alone, as there is a diffusion of accountability and responsibility. For example, if an individual is at a crowded community pool and someone is drowning but no one else is doing anything, they may conform and not help as they feel invisible and not responsible.

Social norms society's unofficial rules and expectations regarding how individuals should act

Groupthink a psychological phenomenon in which assumed group unanimity overrules individuals' realistic appraisal of consequences

Group shift a condition in which the influence of the group causes an individual to adopt a more extreme position

Deindividuation the tendency for individuals to lose their sense of identity and individuality within a group

Like obedience, conformity is also not inherently bad and can help to ensure a functioning society. It can guide individuals and inform them of how to behave in certain situations, such as waiting for passengers to leave a train carriage before getting on, which leads to smoother and safer train journeys. However, conformity can also be manipulated. This manipulation was seen in Asch's conformity experiment, which will be explored in the next section of the lesson.

Asch's conformity study 2.1.6.2.1

Solomon Asch's experiment on conformity was first conducted in 1951, and aimed to investigate whether individuals would conform to a group and the extent to which people conformed. The study involved a line judgement task, in which participants matched lines together based on their similarity in length.

- The experiment was conducted in a group setting, so each participant could hear the responses of one another.
- There was only one true participant in each group – the other group members were all confederates (part of the experiment) who purposefully gave unanimous, but clearly wrong, responses to the experimenter's questions.
- The level of conformity was measured by the extent to which participants aligned their responses with the incorrect responses of the confederates.
- Many of the participants succumbed (gave into) to the group pressure by conforming to their answers, with many of the participants conforming to the group at least once in the study.

The aim of the study was to measure the extent to which individuals would conform to a majority group. Participants and materials included:

- 50 male first-year university students who believed that they were participating in a study examining visual perception.
- The participants were accompanied by confederates (people who fulfil a role outlined by the researcher but pretend to be a participant).
- An external experimenter, not Asch, was also present in the room.

PSYCHOLOGY EXPLORATION

As the use of social media platforms to communicate becomes more popular, online hate is proving to be an apparent social problem. It has been suggested that this occurs due to deindividuation, as individuals often identify as part of online groups and lose their sense of individuality.

When part of a group identity, deindividuation can induce self-stereotyping. Self-stereotyping involves perceiving oneself as 'identical' to other group members, causing their behaviour to be driven by group norms. This can then also cause individuals to conform and engage in online hate, contributing to the issue at hand.

(Kaakinen et al., 2020)

The procedure of Asch's experiment is outlined in table 6.

Table 6 Procedure of Asch's experiment

Step	What happened
Prior to the experiment	Asch informed the confederates to give unanimous responses which were clearly incorrect for 12 of the 18 trials.
1	The participant entered the room and was told to sit behind a long table, with seven other people (the confederates) sitting alongside them in a row. • The participant was always seated at the second last seat of the table.
2	The experimenter told the group of eight (one participant, seven confederates) to match the length of line X with one of the three lines (line A, B or C) that best matched it in length. • These lines were presented on two separate presentation cards, the setup of which is displayed in figure 9. • To answer, each individual had to announce their answer to the group out loud for each trial by stating the line they believed best matched line X, e.g. 'Line A'. • There were 18 trials. Figure 9 A representation of the presentation cards used in Asch's experiment
3	After the experiment was completed, the participant was debriefed. This involved informing the participant of the true nature and purpose of the study, including the use of deception; i.e., that confederates were used in the study and the consent sheet outlined an incorrect and misleading aim. The participants were then interviewed about their experience during the experiment.

WANT TO KNOW MORE?

Asch went on to repeat his experiment but with different variations. Through this, he found that different factors affect conformity, a few of which are outlined in table 7.

Table 7 Factors that affect conformity

Factor	Asch's finding
Group size	He discovered that the likelihood to conform increased as group size increased, but only up to a group size of four. In a greater group size, the likelihood to conform stayed around the same regardless of how many confederates were added.
Unanimity (complete agreement within a group)	He found that having even just one of the confederates not act unanimously within the group significantly decreased the participant's conformity within the experiment.

As mentioned, the participant was consistently faced with the other seven group members giving a unanimous, yet obviously incorrect answer. Asch decided to have the seven confederates give these incorrect answers for 12 of the 18 trials during the study to examine whether they would influence the participants' responses. The results were as follows:

- 74% of the participants conformed to a clearly incorrect answer at least once during the study.
- 24% of the participants did not conform at any point during the study, and continuously gave answers which were inconsistent with the unanimous answers of the group.

All participants, even those who did not conform to the group, stated during the interview that they felt confused and doubted their responses during the study. This level of doubt differed among participants, with some being only slightly uncertain of their own responses, while others were completely perplexed and unsettled with the responses of the group, making them more likely to conform.

From the results, Asch concluded that people were willing to ignore reality and give an incorrect answer in order to conform to the rest of the group.

Contemporary research on conformity 2.1.6.2.2

Since Asch's experiment, which was conducted in 1952, more modern experiments testing conformity have been carried out. One of these modern experiments was conducted by Sun and Yu (2016) in which conformity among young children was explored. It found that, regardless of who an experiment is conducted on, individuals are likely to conform to the thoughts, behaviours, and feelings of their peers or another group of people. Table 8 outlines the key details and findings of Sun and Yu's (2016) experiment.

Table 8 Key details and findings of Sun and Yu's (2016) conformity experiment

Section	Key details and findings
Aim	To investigate both short-term and sustained conforming behaviours among children in situations of relatively low social pressure.
Participants	- Forty-one Han Chinese kindergarten children. – All participants were informed of their right to discontinue participation at any time and parental informed consent was obtained for each child who participated. – After completing the experiment, the children were rewarded with chocolate candies for their participation, regardless of their performance. - An experimenter was present throughout the whole experiment.

Procedure	The experiment was split into two experimental sessions.
	1. In the first session, participants were shown a photograph of a female face and an 8-point Likert scale with a stack of corresponding numbers of stars below. Then they were required to indicate how attractive they perceived each female face to be, by oral report.
	2. The experimenter then input the chosen number by clicking the mouse based on the rating provided by the child.
	3. The participant's initial rating was presented for 1 second and then it reappeared, along with a fake group rating from the peers for 3 seconds.
	  – In 30% of trials, the fake group ratings agreed with the participant's ratings.
	  – In the remaining 70% of trials, the fake group ratings were either greater or less than participants' ratings by 1, 2 or 3 points.
	4. Participants were then instructed to rate the faces again.
	  – This was done to test whether participants would change their answers after they knew how their peers had rated the same photo.
	5. During the second session, the same faces were presented in a new randomised order without any display of the group ratings.
	  – This was done to confirm whether participants had conformed or mistook the photo for another.

Findings	It was found that older participants (those around the age of six) tended to conform to their peers when group ratings differed from their own ratings, while younger participants did not.
Possible implications	It is suggested that six-year-old children spontaneously change their private opinions under implicit social influence from peers.

In 1996, Rod Bond and Peter B Smith conducted a meta-analysis of 113 studies, done in 17 different countries, that replicated Asch's conformity experiment. They categorised the countries in terms of the degree to which they could be considered 'collectivist' or 'individualist':

- Collectivist cultures refer to cultures that prioritise the needs and goals of groups.
- Individualist cultures refer to cultures that prioritise the needs and goals of individuals and value independence.

They found a significant relationship between the type of culture and levels of conformity. Conformity was greater in more collectivist than in individualist cultures. Therefore, Bond and Smith (1996) suggest that people from collectivist backgrounds are more likely to conform than those from individualist cultures.

Theory summary

In this lesson, you learnt about the concepts of obedience and conformity and how they influence individual behaviour. In particular, you learnt about these concepts in action, through Milgram's obedience experiment and Asch's conformity experiment. You also learnt about contemporary research on both of these concepts. The similarities and differences between obedience and conformity are summarised in figure 10.

Obedience

- Involves complying with commands, often those issued by an authority.
- Affected by:
  – status of authority figure
  – proximity (physical and relationship)
  – group pressure.

Similarities

- Influence individual behaviour.
- Seen in everyday life. For example, a student may obey what their teacher says and conform to their expectations.

Conformity

- Involves adjusting one's thoughts, feelings, or behaviours to match those of others, a social group or a social situation.
- Affected by:
  – social norms
  – groupthink
  – group shift
  – deindividualisation.

Figure 10 Similarities and differences between obedience and conformity

7B Questions

Theory review

Question 1

Conformity involves an individual _____ their thoughts, feelings or behaviours to be _____ with the thoughts, feelings, or behaviours of an individual, group or societal expectations.

Which of the following best fills in the blanks?

A. maintaining; consistent

B. maintaining; inconsistent

C. aligning; consistent

Question 2

Obedience refers to _____ the demands of a/an _____.

Which of the following best fills in the blanks?

A. conforming to; authority figure

B. complying with; authority figure

C. conforming to; group

D. complying with; group

Question 3

The main difference between obedience and conformity is that obedience involves indirect prompting whilst conformity involves direct commands.

A. True.

B. False.

Question 4

Obedience is not inherently bad and can help to ensure a functioning society.

A. True.

B. False.

Assessment skills

Perfect your phrasing

Question 5

Which of the following sentences is most correct?

A. Conformity only involves individuals aligning their **behaviour** to **fit in** with other individuals, groups, or social norms.

B. Conformity involves individuals aligning their **thoughts, feelings, or behaviour** to **be consistent** with other individuals, groups, or social norms.

Question 6

Which of the following sentences is most correct?

A. Obedience involves following the commands of **an authority figure**.

B. Obedience involves following the commands of **someone in charge**.

Text analysis

The following assessment skills type reflects the study design assessment type:

- media analysis of one or more contemporary media texts

Use the following information to answer questions 7–11.

The impact of a virtual reality experience on conformity and obedience

Inspired by Milgram (1963), Neyret et al. (2020) conducted a study in which they aimed to explore whether embodiment through virtual reality (VR) can decrease conformity due to group pressure. In particular, they wanted to see whether men who partake in a VR experience as a female victim of sexual harassment will be less likely to surrender to group pressure on a VR variation of the Milgram paradigm a week later.

In the experiment, there were 60 male participants who were, on average, 24 years of age, and they took part in a VR bar scenario. Participants were split evenly into two conditions. Participants in the control group experienced a VR scenario in the same bar but without any events, whilst participants in the experimental group condition embodied a male character amongst a group of other men that persistently harassed a lone woman by aggressively asking her to join their table. Participants in the experimental group condition were then split into a further two groups, one in which participants relived the VR bar scenario as another man in the group and the other in which participants relived the scenario as the woman being harassed.

A week later, all participants took part in a VR variation of the Milgram experiment. Like the original study, the virtual scenario was disguised as a memory learning experiment, and participants were asked to administer electric shocks to a stranger for every wrong answer they gave. In the current study, participants were guided along by three virtual characters who were identical to the men from the virtual bar scenario they had witnessed the week prior, and the character being shocked was a female avatar. Participants were repeatedly urged by the male characters to continue administering shocks of increasing severity, despite the female character's pleas to stop.

The results found were as follows:

- 14 of those who experienced the VR scenario only from the male perspective delivered a high number of shocks (more than 12 shocks).
- only 7 of those who experienced the additional perspective of the female being harassed administered more than 12 shocks.
- the results from control subjects fell somewhere in between.

(Neyret et al., 2020)

Question 7

What concept/s were explored in Neyret et al.'s (2020) experiment?

A. Obedience.
B. Conformity.
C. Both obedience and conformity.
D. Neither obedience nor conformity.

Question 8

Which of the following options most accurately describes the similarities and differences between Milgram's (1963) and Neyret et al.'s (2020) experiments?

	Similarity	Difference
A.	Both tested both conformity and obedience.	Only Milgram (1963) involved administering electric shocks.
B.	Both tested obedience.	Neyret et al. (2020) also tested conformity.
C.	Both involved a VR scenario.	All participants were males.
D.	Both involved administering electric shocks.	Milgram (1963) only tested obedience.

Question 9

What factors could have contributed to participants conforming to the virtual bar scenario a week later?
(Select all that apply)

I. Group pressure.

II. The character they initially played.

III. Physical proximity.

Question 10

Which ethical consideration that was breached in Milgram's (1963) experiment did Neyret et al. (2020) adjust?

A. Voluntary participation, by recruiting participants who wanted to join the study.

B. Confidentiality, by not releasing participants' names or results.

C. Informed consent, by making participants aware of all the risks and benefits of the study.

D. No-harm principle, by getting participants to administer an electric shock to a VR character, rather than another participant.

Question 11

What can be concluded from Neyret et al.'s (2020) experiment?

A. The number of electric shocks that participants gave varied depending on the embodiment condition in the VR bar scenario.

B. The number of electric shocks that participants gave was because the character being shocked was a female avatar.

C. The number of electric shocks that participants gave were higher if you didn't embody the man harassing a female character first.

D. The number of electric shocks that participants gave were the same for everyone.

Exam-style

Remember and understand

Question 12   (1 MARK)

Which of the following is a factor that affects obedience?

A. Groupthink.

B. Status of authority figure.

C. Social norms.

D. Group shift.

Question 13   (1 MARK)

Conformity can take many forms. Which of the following is **not** something that involves conformity?

A. Following unspoken train rules.

B. Showing table manners.

C. Following commands from an authority figure.

D. Sharing the political opinions of a group.

Question 14 (1 MARK)

Which of the following is correct regarding the factors that affect conformity?

	Factor	How it affects conformity
A.	Groupthink	In a group setting, if an individual thinks that they will not be held responsible they are more likely to conform.
B.	Social norms	Provides subtle and covert pressure for individuals to adjust their thoughts, feelings, or behaviours to match others.
C.	Group shift	The more unanimous a group is, the more likely an individual is to conform.
D.	Deindividuation	The more influential people that an individual surrounds themselves with, the more likely they are to conform.

Question 15 (1 MARK)

Which of the following correctly outlines the difference between obedience and conformity?

A. Conformity involves complying with the instructions of an authority figure, while obedience involves aligning oneself with others.

B. Conformity involves aligning oneself to others or social expectations, while obedience involves following the instructions of an authority figure.

C. Not conforming has greater social consequences when compared to not obeying the commands of authority figures.

D. Individuals are more likely to conform to others than to comply with authority figures.

Question 16 (2 MARKS)

How does deindividuation influence individual behaviour?

Apply and analyse

Question 17 (1 MARK)

Sheron was really nervous for her daughter Eva on her first day of year seven. She knew Eva was very shy but told her to try and make friends. At lunchtime on her first day, Eva was sitting and eating by herself. After about ten minutes, her homegroup teacher came by and asked her if she was okay. Eva told her teacher that she was feeling very nervous to talk to the other girls and needed some time. However, despite this, once her teacher told her to approach the other girls, she felt less nervous, approached them, and became a part of their friendship group. How did Eva demonstrate obedience on her first day of year seven?

A. Eva listened to her mother and tried to make friends.

B. Eva listened to the other girls and joined their group.

C. Eva listened to her homegroup teacher and made friends.

D. Eva did not demonstrate obedience.

Use the following information to answer questions 18 and 19.

Shone, Sona, Alvina, and Stebin all work together for an education start-up business. Over the eight months that they have worked together, they have spent time with each other but it was only Sona and Alvina who formed a friendship. Due to her previous experience as a teacher, Sona is often looked up to by the others and asked for advice. One day, Sona became highly stressed due to the deadlines for their project coming up very soon. In the peak of her stress, she commanded Shone, Alvina, and Stebin to stop slacking off and pick up the workload. Shone complained saying that he had too much to do already, while Alvina immediately did as Sona asked and Stebin offered to pick up another task.

Question 18 (1 MARK)

Which of the following correctly identifies the authority figure and a person who demonstrates obedience in the scenario?

	Authority figure	Person who demonstrates obedience
A.	Sona	Shone
B.	Shone	Stebin
C.	Sona	Alvina
D.	Alvina	Stebin

Question 19 (2 MARKS)

With reference to a factor that affects obedience, explain why Alvina may have immediately done as Sona asked.

Evaluate

Question 20 (6 MARKS)

Milgram's (1963) experiment is a famous research study on obedience.

a. With reference to a psychological ethical consideration, evaluate whether Milgram's experiment would be approved by an ethics committee. (2 MARKS)

b. Discuss two ways in which the original experiment can be adjusted to meet current ethical considerations. (4 MARKS)

Questions from multiple lessons

Question 21 (1 MARK)

Which type of culture is more likely to conform?

A. Collectivist.

B. Individualist.

C. Both collectivist and individualist.

D. Neither collectivist or individualist.

Question 22 (2 MARKS)

Describe a situation in which conforming would be an adaptive behaviour.

7C Media and behaviour

| 7A | 7B | 7C | 7D |

| 2.1.7.1 | 2.1.7.2 | 2.1.7.3 | 2.1.7.4 | 2.1.7.5 |
| Media sources | Social connections | Social comparison | Addictive behaviours | Information access |
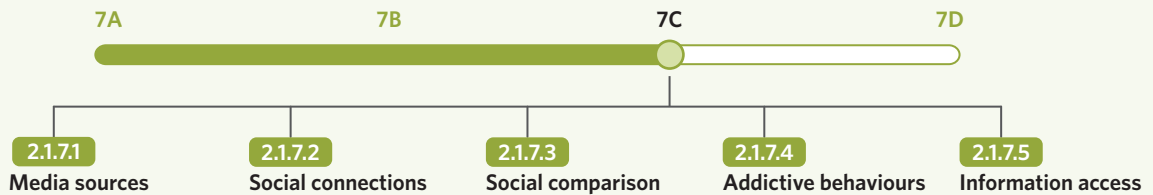
Media is an inescapable part of our lives. From when we wake up to when we go to sleep, we are constantly consuming different types of media. You may have checked your social media or watched your favourite TV show right before reading this. With media dominating our conscious experiences, it is impossible to ignore its potential to impact our behaviour. In this lesson, you will learn about both the positive and negative influences of different types of media on individual and group behaviour.

Media sources 2.1.7.1

To understand how media influences behaviour, it is necessary to first understand what media actually is.

Theory details

Media refers to the forms in which information is communicated and spread throughout society. There are many forms of media that you might be familiar with; these include advertising, television, video games, and social media. These media forms can be broken down into categories of print media and digital media. The difference between these two types of media are presented in table 1.

Table 1 The difference between print and digital media

	Print media	Digital media
Description	Print media refers to media that is displayed in full on a physical surface.	Digital media refers to media that is designed to be projected onto an electronic device.
Examples	• Newspapers • Magazines • The mail	• Social media • Video games • Television

We cannot escape media in our lives, even if we try. You will probably notice advertisements in shopfronts and streets during your daily commute. Even if you choose not to have a media source at home, like a television, you will still be exposed to media every day. It is inescapable in this respect. Media is so integrated into our everyday lives that it is inevitable that our behaviour will change because of it, regardless of whether we are conscious of this or not.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

KEY TERMS

Media the forms in which information is communicated and spread throughout society

The idea that media causes changes in behaviour relates to the concept of technological determinism. This theory proposes that technology unavoidably determines cultural and social change. According to this theory, the type of media is more important than the content of the media itself in causing changes in behaviour. For example, while one distinct television program may not drastically change individual and group behaviour, television as a medium will. The structure of your day may change to account for your favourite television program; your family may even time events like dinner around certain shows. It is impossible to ignore how individual and group behaviours have changed in response to the emergence of prominent media forms, such as television and smartphones. These influences can be either positive or negative, depending on a range of factors that will be discussed throughout this lesson.

Social connections 2.1.7.2

Now that we have discussed what constitutes media, we will examine its effects on individual and group behaviour in detail, starting with its influence on social connections.

Theory details
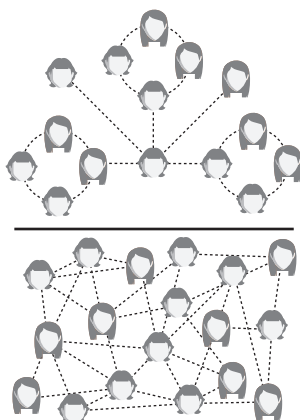
Social connections refer to the network of people available to someone for support and engagement. This can include friends, family members, work colleagues, or your teachers. Social connections are important because they ensure that we can reach out to the people who we know for support when we need it and have meaningful experiences with others, such as engaging in activities with someone who shares a common interest. School demonstrates the importance of social connections in this respect. There are times during school when a certain theory from a subject may not immediately make sense to you. In times like these, you may need to consult some of your social connections for help, perhaps your teacher, or a friend who you have in that subject. That tricky concept will then hopefully start to make sense to you with this additional support.

In the past, social connections were bound by the limits of space. You could only correspond with people who shared physical spaces with you, such as your home or school. Now, since the emergence of digital technologies, and in particular since the emergence of the smartphone and social media, social connections have been expanded to reach those who we might otherwise not share the same physical spaces with. It is true that social connections are still significantly shaped by those who we see in person on a regular basis, but they no longer just stop there. For example, you may correspond most frequently with people who you go to school with, but also be connected to friends and family who you don't see on a regular basis, such as those who live in another city or country.

We have established that social connections have expanded with the rise of media in general and digital technologies in particular. But how does this change individual and group behaviour, and are these changes positive or negative? The changing nature of social connections as a positive and negative influence of media on individual and group behaviour are detailed in table 2.

Social connections
the network of people available to someone for support and engagement

Figure 1 With social media platforms like Twitter, Facebook, and Instagram, social connections have been expanded to reach those who we may not frequently see in person

Table 2 The changing nature of social connections as a positive and negative influence of media on individual and group behaviour

	Positive influences	Negative influences
Influences on individual behaviour	• Increased ability to access support. For example, online education or mental health support. • Increased social connections that are not limited by physical proximity, enabling people to stay in touch.	• Increased pressure to stay connected and respond in real-time, leading to social fatigue and burnout. • Social connections are more numerous but potentially more shallow, leading to people only feeling connected to others in principle, in an abstract online space, but not so much in practice, and therefore ultimately feeling isolated. • Social connections may be false as people can lie about who they are, leading to potentially unsafe relationships being facilitated online.
Influences on group behaviour	• Increased scope to form communities and mobilise large groups. For example, around 300,000 Australians gathered together on the 20th of September 2019 to make a social statement about climate change (ABC, 2019). This climate strike was largely organised using social media platforms like Facebook and Twitter.	• Increases potential conformity, including people being more likely to participate in online bullying to match the behaviour of other people within a social group (e.g. friends in a group chat).

Determining if digital media has had a positive or negative influence on social connections will depend on your own perspective. Do you feel as though media has increased your social connections in a meaningful way or do you think that media has changed our understanding of social connections for the worse?

Social comparison 2.1.7.3

The influence of media on individual and group behaviour can also be considered in relation to the psychological concept of social comparison.

Theory details

Social comparison is a proposal that humans measure their self-worth in relation to the people around them, playing a significant role in mental wellbeing. Leon Festinger (1954) first coined the term, describing it as 'subjective judgements of correct or incorrect opinion and subjectively accurate assessments of one's ability depends upon how one compares with other persons' (p.119). According to this concept, our subjective understanding of the self is shaped by other people in our environment.

Media can influence social comparison, which causes positive and negative effects on behaviour in turn. Some of these positive and negative influences on behaviour are detailed in table 3.

Social comparison
a proposal that humans measure their self-worth in relation to the people around them, playing a significant role in mental wellbeing

Table 3 Social comparison as a positive and negative influence of media on individual and group behaviour

	Positive influences	Negative influences
Influences on individual behaviour	High self-esteem at an individual level can occur when someone who is experienced at a particular skill compares themselves to someone who is just beginning to learn the same skill. For example, if you are an experienced cook, skateboarder, or hiker, you may feel more confident about your skill level when you see other people begin learning these skills on social media. This positive experience of social comparison relies on sharing hobbies with other people on social media, so it will only be experienced by some, not all.	Curated social media profiles can enable unrealistic social comparisons. Social media is based on the principle of staying connected to others. However, many social media platforms allow us to curate our profiles to present the best possible versions of ourselves, which are not always the most realistic kinds of representations. This could involve using filters and phone applications to visually manipulate a photo in order to conceal any natural blemishes. According to the principle of social comparison, this means that some individual social media users could be experiencing low self-esteem when comparing themselves to their peers online.
Influences on group behaviour	Group behaviour can be influenced when somebody with a large following uses social media to share personal experiences. For example, if somebody who is admired by thousands of people online shares information about their personal experience going sober, their followers may compare their own experiences with the influencer and feel inspired to be more like them. This can impact group behaviour by encouraging followers to lower alcohol and drug consumption or trial sobriety themselves.	Unrealistic social comparisons to images of models in advertisements can project unrealistic beauty standards. It is extremely difficult to avoid being exposed to unrealistic beauty ideals in advertisements displayed on billboards, shop-fronts, and even bus stops. In extreme circumstances, these kinds of comparisons can be so distressing that they can significantly impact our functioning, discouraging us from wanting to be around other people. Dittmar & Howard (2004) conducted a study that investigated how the representation of body size in advertisements affected the mental health of women. Their study found that the use of thin models in advertisements caused body-image related anxiety, particularly in groups of susceptible women, despite not increasing the advertisement's efficacy (i.e. how much it increases willingness to buy the advertised product). Therefore, it could act as a risk factor for experiencing body-image anxiety for some population groups.

Addictive behaviours 2.1.7.4

A common criticism levelled at users of popular forms of media, such as social media and video games, is that these forms of media are addictive. This assessment of media is not yet unanimous in the field of psychology, yet it is important to consider the potentially negative influence of addictive media on individual and group behaviour.

Theory details

Addictive behaviours
behaviours that are associated with a dependence upon a particular stimulus, despite negative consequences

There are lots of different stimuli in our lives that can become addictive to engage with. Often we think of these stimuli as being substances, but it is also possible to be addicted to other kinds of stimuli, such as different forms of media. **Addictive behaviours** are behaviours that are associated with a dependence upon a particular stimulus, despite negative consequences. This means that the person experiencing addiction will keep engaging with these stimuli, even if it impacts their functioning, such as by causing pain, taking up too much of their time, or distracting them from being able to complete other daily tasks. For example, this could include continuing to play online video games during class, regardless of being directed not to by teachers or falling behind in class.

A significant indicator of addiction is the presence of an attentional bias, which occurs when someone's attention becomes distracted when the addictive stimuli (or something that signifies the addictive stimuli) is present. For example, somebody who is addicted to caffeine may experience an attentional bias if they were trying to work in a library, only to become distracted by the presence of a coffee cup on the desk in front of them. It is unclear, however, if certain forms of media, such as social media, can cause an attentional bias.

For example, a recent study (Thomson et al., 2021) found that frequent Facebook users weren't any more likely to have their attention captured on a phone by a Facebook distractor app than participants who did not use Facebook often. This demonstrates that it is possible for users to engage with social media frequently without their functioning being impacted by an attentional bias or addictive behaviour. Another interpretation of this finding is that certain forms of media, such as social media, are not inherently addictive and may not prompt addictive behaviours for all of their users. Instead, these kinds of media could be considered as being neutral, meaning that they can be engaged with in different ways by different people, experienced as being addictive perhaps for some, but by no means for all. Either way, it is worth considering the potential impacts of frequent media engagement on individual and group behaviour.

WANT TO KNOW MORE?

As mentioned in this lesson, research about media addiction is constantly being developed as new patterns of media engagement emerge. One particular area of research interest is 'hikikomori', a cultural phenomenon of media addiction in Japan. Hikikomori is a Japanese term that describes a condition whereby 'adolescents and young adults... become recluses in their parents' homes, unable to work or go to school for months or years' (Teo & Gaw, 2010).

Many hikikomori occupy their time with Internet use, some spending more than 12 hours a day in front of a computer. Consequently, approximately one out of ten hikikomori fit the criteria for Internet addiction (Stip et al., 2016). Nevertheless, it has been determined that a significant amount of hikikomori cases have an existing mental illness, so it isn't usually considered as a mental illness in and of itself. However, there are hikikomori that are not suffering from an existing mental illness. This means that media, such as the Internet, could independently cause this kind of debilitating media addiction for some people.

Information access 2.1.7.5

Finally, different media sources have influenced the speed with which information is spread throughout society. This can be considered largely as a positive influence of media on individual and group behaviour.

Theory details

What do you do when you need to put together a research presentation for a subject at school? Where is the first place that you go to look for information about the topic of your research? This process of finding out information about a particular topic of research or interest, familiar to any student, involves **information access**, which refers to how easily information can be accessed by different people.

In the above example of researching for a school presentation, the first place that you would look for information may very well be online. Information access has changed dramatically in recent history, first with the emergence of the internet, and then in particular with the development of digital technologies that enable us to access the internet at almost any time. Current affairs are no longer transmitted to people exclusively by newspapers or by word of mouth but can be reported on online news sources, or even through social media, as they occur. This speeds up the process of information access, with the transmission of information no longer being limited by the production of print media sources, which often require at least a day of planning and printing before they are available to the public. The ability to access information quickly to learn about a topic of research or interest is a positive influence of media on individual behaviour.

It is important to note, however, that with this kind of increased information access, not all online information that is easily accessible is equally reliable. Misinformation can now also be spread online, which can negatively impact group behaviour. There are often no restrictions on who can share information online, which can mean that anyone can post misleading information that is nonetheless outrageous and eye-catching. For example, misinformation was spread on social media platforms at the beginning of the COVID-19 pandemic. There were false claims made that sipping water every 15-minutes would help to prevent the virus, among several other unproven theories, which gave some people a false sense of hope during a period of uncertainty (Nyilasy, n.d.). Information access may have increased as a result of digital technologies, but not all of this information is reliable, and some of this information is completely false, damaging, and misleading. Can you think of any examples of misinformation being spread online? How did this impact individual and group behaviour?

A positive influence of increased information access on group behaviour is that it enables people to respond quickly to an emergency. For example, we are better equipped now to respond to medical crises than at any other point in history. This ranges from being able to search for symptoms online when feeling unwell, to calling a medical hotline, such as Nurse-On-Call, to receiving professional advice about how to respond to symptoms of concern, to calling 000 in the case of a medical emergency. Consulting these kinds of sources online, or on a phone call, ensures that you can immediately receive crucial medical information about how best to respond to a medical crisis. These precautionary behaviours, learnt in response to the emergence of contemporary media sources, such as smartphones, are undeniably positive, saving thousands of lives in our communities.

Other emergency information can also be communicated immediately through digital media technologies. There is a list of emergency mobile phone applications on the Health Direct Government website (2022), which includes applications like 'Fires Near Me Australia,' which warns users about fires in their area, as well as 'AirRater,' which enables people to manage lung conditions, such as asthma and hayfever. In addition, mental health support is now increasingly accessible with the rise of online helplines. The rapid communication of health information on digital media technologies, such as these kinds of mobile phone applications, represents another positive influence of media on group behaviour.

> **Information access**
> how easily information can be accessed by different people

Theory summary

In this lesson, you learnt about the positive and negative influences of media on individual and group behaviour in relation to the concepts of social connection, social comparison, addictive behaviour, and information access. The intention of this lesson was not to provide a set of prescriptive examples of when media has positive and negative effects on individual and group behaviour, but rather to demonstrate that the influence of media depends largely on the type of media being used, and by whom. Media has the ability to influence behaviour in a positive way, such as by staying in touch with people who you cannot see frequently in person. It is nonetheless also important to recognise that media can negatively influence individual and group behaviour, such as by engaging in behaviours due to damaged self-esteem or encouraging potentially addictive behaviours. The positive and negative influences of media on behaviour discussed in this lesson are summarised in table 4.

Table 4 Summary of how behaviours influenced by media can be considered as positive and/or negative

Example of a behaviour influenced by media	How this behaviour could be viewed as positive	How this behaviour could be viewed as negative
Changing nature of social connections	People can stay connected to friends and family that live overseas.	Social connections formed through digital media may be more superficial than those formed in person.
Social comparison	People can experience self-confidence when comparing themselves to their peers online.	People can experience low self-esteem when comparing themselves to their peers online.
Addictive behaviours	N/A	Some people may spend an excessive amount of time on certain media forms, despite it impacting their functioning.
Information access	People can use digital media to access information about a topic of research or personal interest.	Misinformation can also be spread quickly using online platforms.

7C Questions

Theory review

Question 1

Which of the following options constitute media? **(Select all that apply)**

I. Video games.

II. Advertisements in magazines.

III. Architecture.

IV. High schools.

V. YouTube.

Question 2

Media's presence in our everyday lives inevitably causes us to change our behaviour. While immediate access to reliable online information represents a _____ effect of media on group behaviour, feeling self-conscious about our appearance when comparing ourselves to others online represents a _____ effect.

Which of the following best fills in the blanks?

A. positive; negative

B. negative; positive

Question 3

Which of the following options exemplify how the media can negatively influence group behaviour?

(Select all that apply)

I. Widespread feelings of low self-esteem due to curated social media profiles, leading to people comparing themselves to others.

II. Widespread feelings of isolation due to the abstract nature of online connections.

III. Charity organisations using their advertising reach to raise awareness for a prominent social justice issue.

Question 4

The formation of respectful and rewarding online communities could be considered as a

A. positive influence of media on group behaviour.

B. negative influence of media on group behaviour.

Question 5

Social media can lead to self-consciousness and impair mental health and therefore impact levels of functioning. This reflects a

A. negative influence of social media on individual behaviour.

B. positive influence of social media on individual behaviour.

Question 6

_____ can only be considered as a negative influence of media on individual behaviour, whereas _____ could be considered as either a positive or negative influence of media on individual behaviour, depending on the kinds of relationships that are formed.

Which of the following best fills in the blanks?

A. Addictive behaviour; social connection

B. Social connection; addictive behaviour

Assessment skills

Text analysis

The following assessment skills type reflects the study design assessment type:

- analysis and evaluation of an experiment or case study

Use the following information to answer questions 7–9.

Franc and Irena are both year 12 students entering their final exams. Irena is worried about her psychology exam. In order to prepare, she messages all of her friends in her psychology class for help with difficult revision questions, as well as for emotional support. By contrast, Franc finds that his phone becomes a distraction before his psychology exam. He checks Instagram the night before the exam and sees a story from Irena captioned 'feeling prepared for Psych,' accompanied by an image of all of the revision questions that she has completed. He can't help but feel less prepared for the psychology exam now that he is aware of the amount of revision done by other students.

Question 7

Irena's use of social connections to prepare for the psychology exam is reflected by the statement that

A. 'He checks Instagram the night before the exam.'

B. 'She messages all of her friends in her psychology class for help with difficult revision questions, as well as for emotional support.'

Question 8

Social comparison is evident in this scenario in that

A. Franc measures his level of preparation according to the amount of revision completed by others.

B. Irena is able to compare her revision answers with others.

Question 9

Social media has had a

A. positive influence on Franc's preparation for the psychology exam.

B. positive influence on Irena's preparation for the psychology exam.

Perfect your phrasing

Question 10

Which of the following sentences is most correct?

A. Social connections are the network of people available to someone for support.

B. Social connections are your friends and family members.

Question 11

Which of the following sentences is most correct?

A. Social comparison proposes that our **objective** understanding of our identity is informed by comparing ourselves to others.

B. Social comparison proposes that our **subjective** understanding of our identity is informed by comparing ourselves to others.

Exam-style

Remember and understand

Question 12   (1 MARK)

Media has

A. only positive influences on individual and group behaviour.

B. only negative influences on individual and group behaviour.

C. both positive and negative influences on individual and group behaviour depending on the type of media and how it is used.

D. neither positive nor negative influences on individual and group behaviour.

Question 13   (1 MARK)

Social media can allow us to present the best possible version of ourselves to others. This can be thought of as a

A. negative influence of media because it can promote violent behaviour through observation.

B. positive influence of media on behaviour because it promotes realistic comparisons.

C. negative influence of media on behaviour because it can make people feel self-conscious when comparing themselves to these kinds of unrealistic profiles.

D. positive influence of media on behaviour because it can make people feel self-conscious when comparing themselves to these kinds of unrealistic profiles.

Question 14   (2 MARKS)

Explain information access as a positive influence of media on individual behaviour.

Question 15   (4 MARKS)

With the use of an example, compare social connections and social comparison.

Apply and analyse

Use the following information to answer questions 16 and 17.

Therese and Henri are high-school students who both use the internet frequently for school. Therese finds that the internet helps her to research the topics of her tests and exams, as well as to communicate with teachers to arrange times to go over questions outside of class. By contrast, Henri has recently lost motivation for school. He uses the internet instead to play online games during all of his classes, despite knowing that this will have a negative impact on his grades.

Question 16   (1 MARK)

Henri repeatedly playing online games during class despite being aware of the consequences could be considered as an example of

A.   information access.

B.   social connections.

C.   social comparison.

D.   an addictive behaviour.

Question 17   (1 MARK)

Therese finds the internet helpful for researching the topics of her exams. This is an example of

A.   information access as a positive influence of media on individual behaviour.

B.   social connections as a positive influence of media on individual behaviour.

C.   information access as a positive influence of media on group behaviour.

D.   social connections as a positive influence of media on group behaviour.

Question 18   (2 MARKS)

Certain forms of media, such as social media, have expanded our social connections.

Discuss if this has a positive or negative influence on group behaviour. Justify your response.

Question 19   (3 MARKS)

Discuss if social media has a positive or negative influence on group behaviour. Use an example to justify your response.

Questions from multiple lessons

Question 20   (1 MARK)

It is possible to develop addictive behaviours that are related to certain forms of media, such as video games. Continuing to play video games excessively despite the consequences of this behaviour constitutes

A.   a spinal reflex.

B.   mental illness.

C.   maladaptive behaviour.

D.   adaptive behaviour.

Question 21   (1 MARK)

According to the biopsychosocial approach to mental wellbeing, social connections could be considered as a

A.   biological factor.

B.   psychological factor.

C.   social factor.

D.   biographical factor.

7A	7B	7C	7D

2.1.8.1
Developing independence

└ **2.1.8.1.1** Empowering individual decision-making through independence

2.1.8.2
Anti-conformity

└ **2.1.8.2.1** Empowering individual decision-making through anti-conformity
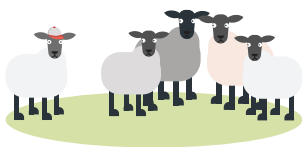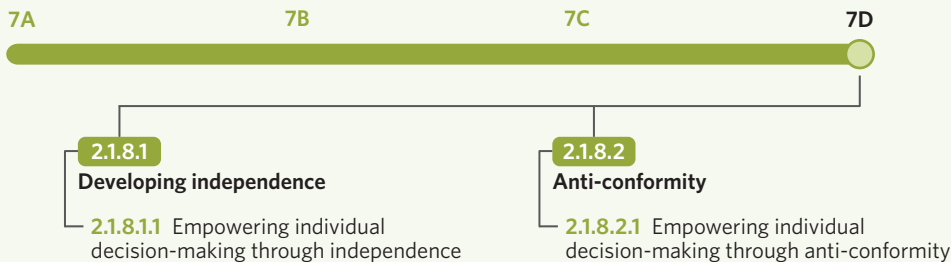
Have you ever heard the term 'people are like sheep'? Sheep tend to blindly follow the herd, no matter what they are doing. Humans can also share this tendency and blindly follow those around them, whether intentional or not. In this lesson, you will learn how people set themselves apart from the 'herd' and feel empowered to take steps out on their own, as an independent individual, or even an anti-conformist.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

KEY TERMS

Independence
being free from the control or influence of others

LESSON LINK

In lessons **7A Social groups and culture** and **7B The influence of obedience and conformity**, you were introduced to the social influences of others, especially in a group. In this lesson, the ways in which you can break free from these social forces and act as an individual when making decisions will be explored.

Developing independence 2.1.8.1

Some people love to express their individuality through their behaviours and attitudes, while others find a lot of comfort in being just like everybody else. What encourages us to speak our minds or do whatever we want regardless of what others think? In this section of the lesson, you will learn about how we can develop independence, and use it to empower individual decision-making.

Theory details

Earlier in this chapter, you learnt that social groups can have a powerful influence on individual behaviour. In group situations, social pressure impacts an individual so that their attitudes, judgements and even perceptions align with the group consensus. This is largely driven by a desire to maintain group membership and uphold social norms. As such, decisions made may reflect the group's beliefs, rather than an individual's unique context and perspective.

In order for people to make their own individual decisions whilst in a group, they require the development of **independence**, which refers to being free from the control or influence of others. When someone is independent, they can be understood as 'having a mind of their own', as their decisions and attitudes are derived from their own personal beliefs, and not the beliefs or expectations of others. Some examples of independence can include:

- taking initiative at your job and doing something you were not explicitly asked to do because you think it is a good idea.
- dressing based on personal preference, rather than what is trendy.
- pursuing a hobby or occupation due to personal preference, rather than the desires of friends, family, or wider society.
- being able to say no to a request that does not align with your values or goals.

How does independence develop?

To become independent, an individual has to develop an ability to separate themselves from a group. This occurs through the process of **self-determination**, which involves engaging in behaviours without the influence of other people as an external force. Self-determination leads to the development of independence by allowing people to feel a greater sense of control over their life. Self-determined people are motivated and equipped to shape their own lives, rather than their lives being shaped by external influences. Without the achievement of self-determination a person cannot be truly independent – so how does one achieve independence through self-determination?

In 1985, two psychologists, Ryan and Deci, first developed the self-determination theory, which they later refined in 2000. The **self-determination theory** is the concept that people achieve self-determination when three basic psychological needs are met: autonomy, competence, and relatedness (Ryan & Deci, 2000). These components are shown in figure 1.
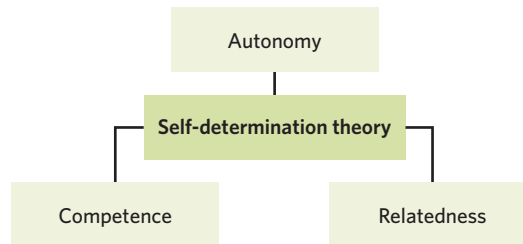
Figure 1 Through self-determination theory, fulfilment of these three psychological needs is necessary to achieve independence

Through this theory, individual behaviour is driven either by extrinsic or intrinsic motivation.

- **Extrinsic motivation** refers to engaging in activities or behaviours for their external benefits. These benefits include rewards, such as money, esteem, or the avoidance of being judged negatively.
- **Intrinsic motivation** refers to engaging in activities or behaviours for their internal benefits. These benefits include personal growth, knowledge, and a greater sense of independence.

The ability to behave largely from intrinsic motivation reflects the achievement of self-determination and independence. It is important to note that someone who is independent may still engage in extrinsically motivated behaviours, however, external rewards are simply not their primary motivator.

Table 1 outlines how these concepts work together in order for an individual to become independent through self-determination.

Table 1 The three basic psychological needs required for independence through self-determination

Psychological need	Ways of being fulfilled	Example
Autonomy refers to the need to be able to act authentically, based on individual choice and intrinsic motivation.	• Having the freedom to act in a way that you want. • Increasing intrinsic motivators so they outweigh extrinsic motivators. • Having clear, achievable goals that are specific to one's individual life and basing one's actions on these goals.	Though his whole family has worked in the same construction firm, Sebastian is passionate about music and wants to be a professional musician. As such, when he finishes school, he chooses to apply for music programs.
Competence refers to the need to feel as though you have the skills required to meaningfully carry out behaviours that affect your environment.	• Developing or mastering skills that are important to you through learning and practice, coupled with positive feedback on your performance. • Taking the initiative to start a challenging task.	Kevin is a chef and has recently started feeling much more confident in his cooking abilities due to practising a lot at work and home. He is now able to make exciting and challenging dishes that the customers seem to love.
Relatedness refers to the need to feel a sense of attachment, connection to, and belonging with other people.	• Seeking and fostering positive relationships with supportive peers. • Trusting and feeling affectionate towards your close peers. • Feeling like you belong in society.	When she first moved to a new city, Bruna felt like she did not fit in. Since joining a local dance school, she has made many solid friendships and now loves living there.

Self-determination
engaging in behaviours without the influence of other people as an external force

Self-determination theory
the concept that people achieve self-determination when three basic psychological needs are met: autonomy, competence, and relatedness

Extrinsic motivation
engaging in activities or behaviours for their external benefits

Intrinsic motivation
engaging in activities or behaviours for their internal benefits

Autonomy (in relation to self-determination theory) the need to be able to act authentically, based on individual choice and intrinsic motivation

Competence (in relation to self-determination theory) the need to feel as though you have the skills required to meaningfully carry out behaviours that affect your environment

Relatedness (in relation to self-determination theory) the need to feel a sense of attachment, connection to, and belonging with other people

The achievement of independence requires active effort and motivation. It may seem counterintuitive, but people typically require a degree of social support when they begin to work towards the fulfilment of their psychological needs. For example, if you are learning an initially unfamiliar and challenging task (relating to competence), you may feel more motivated to keep trying if you have somebody supporting you and encouraging you to improve.

Empowering individual decision-making through independence 2.1.8.1.1

Once independence is achieved, individuals are in a better position to control their own lives and be less influenced by the behaviours of the group. The three basic psychological needs from the self-determination theory can assist individuals in being independent when making decisions; this is summarised in table 2.

Table 2 How the self-determination needs can promote independence when making decisions in a group setting

	How does this psychological need increase independence?	Example of effect on decision-making
Autonomy	If someone believes their behaviour has direct consequences, and that they can choose how they act, they may be more motivated to act based on their own personal and intrinsic goals, rather than those of the group.	You may believe your singular vote counts in an election, this may influence you to vote for who you prefer.
Competence	When people find tasks more difficult they are more susceptible to social influence. Their actions may be based on what others tell them to do as they are less confident in their ability to carry out the task. Self-determined individuals tend to be less susceptible to this social influence, as their higher competence allows them to perceive more tasks as being within their personal capabilities (Lucas et al., 2006; Nail & Ruch, 1992).	You may answer a question based on your own knowledge and trust your ability to formulate a logical answer, rather than what you should say in order to conform to the answers of those around you.
Relatedness	People are more likely to achieve their individual goals and make independent decisions when their peers are supportive and empathetic, rather than controlling, untrustworthy, or overly critical (Koestner & Hope, 2014).	Your family may not agree with your career choice. However, because they are generally supportive of you, you may not feel the need to choose the job they prefer.

While we can look at their individual contributions, the greatest sense of empowerment to make decisions and act independently occurs when all three basic psychological needs are fulfilled. Without the achievement of all three psychological needs, it is difficult for a person to achieve true independence. Figure 2 depicts the three psychological needs as being like a superhero's tools, together forming a stronger individual.

For example, if someone feels connected to others, and has the skills to achieve their goals, but lacks autonomy, they are less likely to act independently as they are less inclined to act based on their beliefs as opposed to the beliefs of others. This can be exemplified by considering someone playing soccer, who loves their team and is a skilled player but lacks autonomy. They may not display their skills by making risky plays unless instructed to do so by someone else, such as their coach.

Captain Independence
'With great independence comes great responsibility — to act as an individual'
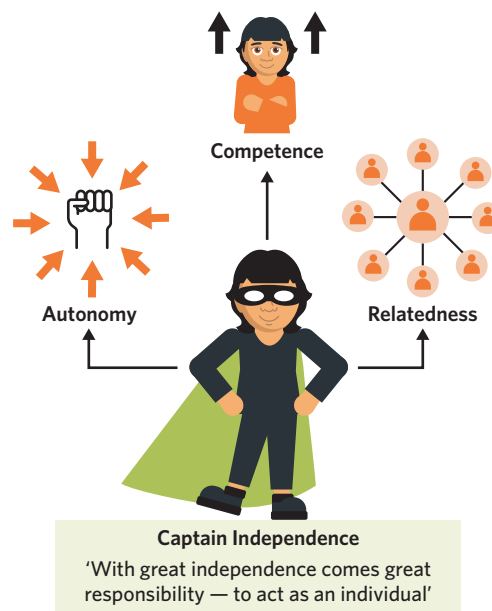
Figure 2 Achieving all three basic psychological needs can give people the power to act separately from a group, even in higher-risk situations (for example when facing rejection from a particular person or group)

Anti-conformity 2.1.8.2

What comes to mind when you hear the names Rosa Parks, Malala Yousafzai, or Eddie Mabo? Throughout history, there are many identifiable, strong and inspirational figures that stand out because of the changes they were able to bring about in society. These changes started with actions that challenged social norms and went against the majority. They can be classified as acts of anti-conformity, a phenomenon that you will learn about in this section of the lesson. Factors encouraging anti-conformity, and ways it can empower individual decision-making, will also be explored.

Theory details

In lesson 7B, you were introduced to **conformity**, as the act of adjusting one's thoughts, feelings, or behaviours to match those of others, a social group, or a social situation. Conversely, as an act of rebellion, **anti-conformity** refers to a deliberate refusal to comply with social norms or standards for thoughts, feelings, or behaviours. It is an active resistance to other people's desires and expectations for an individual's behaviour, accompanied by the purposeful expression of attitudes and behaviours that challenge these social norms. These two components of anti-conformity are depicted in figure 3.

Anti-conformity involves:

Actively resisting the desires and expectations of others for you to behave in a certain way.

The purposeful and intentional expression of attitudes and behaviours that challenge social norms you disagree with.
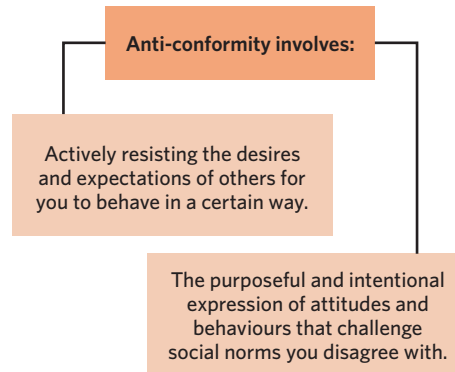
Figure 3 Anti-conformity involves two components

Conformity adjusting one's thoughts, feelings, or behaviours to match those of others, a social group, or a social situation

Anti-conformity a deliberate refusal to comply with social norms or standards for thoughts, feelings, or behaviours

Anti-conformity can involve large-scale, significant actions, such as those of famous civil rights activists, or it can involve smaller-scale refusals to comply with norms in everyday situations, such as standing up to a school bully.

As people tend to conform in order to avoid or alleviate the negative feelings associated with going against a group or being different, for anti-conformity to occur, an individual requires sufficient motivation to overcome these negative feelings. The perceived beneficial outcomes of anti-conformity should outweigh the comfort of group cohesion.

USEFUL TIP

People who are not demonstrating conformity are not always doing so on purpose, as some people are simply unaware of a social norm, such as a tourist in a foreign country. All acts of anti-conformity, however, are on purpose. It is important to specify that anti-conformity is a **deliberate** act of defiance against social constructs, such as social norms. The start of the word being 'anti' can help you to remember this, as 'anti' refers to being against or opposed to something.

PSYCHOLOGY EXPLORATION

The difference between non-conformity which is unintentional, and intentional anti-conformity is actually readable through our body's physiology.

A study by Seery and colleagues (2016) found that, when an individual had an opinion that differed from a group they wished to fit in with, their cardiovascular response (such as blood pressure) resembled that of being in a 'threat' state. Interestingly, when they purposefully aimed to hold an individual response that differed from the group, their cardiovascular response resembled being in a 'challenge' state, where they were invigorated or strengthened. These two different responses are exemplified in figure 4.

Therefore, it may be true that actively being an anti-conformist is a positive experience when you prioritise standing up for what you believe in over the desire to fit in with a group.

What do they mean they don't agree with me? I think I'm in trouble!

I can't wait to share my controversial opinion! I hope I convince some of them to change their mind!

Figure 4 The rejection of the same opinion can be responded to differently, depending on whether or not it was intended as an act of anti-conformity

How does anti-conformity develop?

As an act of rebellion, anti-conformity can only be initiated if an individual has sufficient motivation. People engage in anti-conformity due to various reasons or factors. These factors either motivate the individual to stand up for their beliefs, or weaken the reasons the individual conforms in the first place (so that they can act on their own motivation).

Factors that can motivate individuals include:

• the desire to promote change
• reactance.

While factors that weaken conformity include:

• individuation
• social support.

These are outlined in table 3.

Reactance a motivational state of distress and resistance, caused by a desire to regain personal freedom after it has been removed or threatened by external sources

Individuation when an individual's identity and contributions to a group are noticeable

Social support (in relation to anti-conformity) when others hold a similar attitude or perspective to an individual

Deviant subgroups groups that hold values and norms that exist outside the dominant social norms in society

Table 3 Factors that encourage anti-conformity

Factor	Description
The desire to promote change	When people hold the belief that circumstances are unethical, unfair, or incorrect, they may be encouraged to bring about change in certain contexts. This involves feeling that their belief is morally right and reflects strong personal values (Hornsey et al., 2007).
Reactance	**Reactance** refers to a motivational state of distress and resistance, caused by a desire to regain personal freedom after it has been removed or threatened by external sources (Brehm & Brehm, 1981). Reactant people will do the opposite of what they have been told or encouraged to do or feel simply because their freedom has been restricted. When people use forceful language, such as 'must', 'need', and 'have to', the recipient tends to experience greater reactance due to feeling more restricted. Reactance is only displayed when people feel they are capable of regaining their restricted freedoms (Wright et al. 2015).
Individuation	In lesson 7B, you were introduced to the concept of deindividuation. The opposite of this is **individuation**, when an individual's identity and contributions to a group are noticeable. Individuation removes the sense of anonymity present in deindividuation, increasing people's sense of responsibility.
Social support	**Social support** refers to when others hold a similar attitude or perspective to an individual. Social support can facilitate the development of deviant subgroups. **Deviant subgroups** are groups that hold values and norms that exist outside the dominant social norms in society.

Empowering individual decision-making through anti-conformity 2.1.8.2.1

Similarly to independence, empowering people to engage in anti-conformity can lead to a greater capacity for individual decision-making. In table 4, the different contributions of the factors that encourage anti-conformity to individual decision-making are explored. Additionally, table 4 considers how the factors encouraging conformity are reduced by the factors encouraging anti-conformity.

Table 4 How anti-conformity can assist individual decision-making when in a group

Factor	How does it encourage anti-conformity and individual decision-making?	Real-world example
The desire to promote change	• An individual will engage in anti-conformity if, in a certain situation, it is more important to the individual to seek justice rather than conform to social norms and the way things currently are. • Anti-conformity is more likely if the morally-based attitude is strong and the individual believes social norms can change in line with their attitudes (Hornsey et al., 2007).	The recent movement towards body positivity on social media reflects this concept. Some models have been posting intentional 'unfiltered' images on platforms, such as Instagram. This is an act of anti-conformity against modern beauty standards, aiming to change these standards to be more realistic due to strong personal beliefs. Continues ▶

Table 4 Continued

Factor	How does it encourage anti-conformity and individual decision-making?	Real-world example
Individuation	• When an individual's behaviour is observable, they may feel a stronger sense of responsibility to act. • Individuation can reduce the effect of group shift. Being able to focus on one person's behaviour means people that hold a more extreme position than they would naturally (due to group shift) have to justify this position on an individual level.	During a health emergency on a commercial aeroplane, if a doctor is identified, they may feel a stronger responsibility to help a struggling passengerm even if it means they are not conforming to the behaviour of others. If the doctor is able to blend in with the other passengers, they could more easily diffuse responsibility onto other bystanders and conform by not helping.
Reactance	• As a motivational state, reactance can energise someone and guide behaviour. • Reactant people engage in anti-conformity when they are going against a social norm or standard in a particular context that they believe is restricting their freedom to make independent decisions.	People may feel an urge to touch an exhibit at the museum when it has a 'do not touch' sign in front of it. If the sign was not there, they may never have the desire to touch the exhibit.
Social support	• People express greater independence from social influence when they have even one additional supporter. This can be strengthened if the supporter is judged as credible and competent. • This can reduce the strength of groupthink, a factor increasing conformity. Social support or deviant subgroups can weaken perceptions of unanimity in conforming. • To be constituted as facilitating anti-conformity, the supportive others cannot become the majority as then this would simply be a change in social norms.	A teenager who wants to attend a student strike for climate change during school hours may feel more comfortable doing so if they are accompanied by one or more friends. The students at the strike can be considered a deviant subgroup.
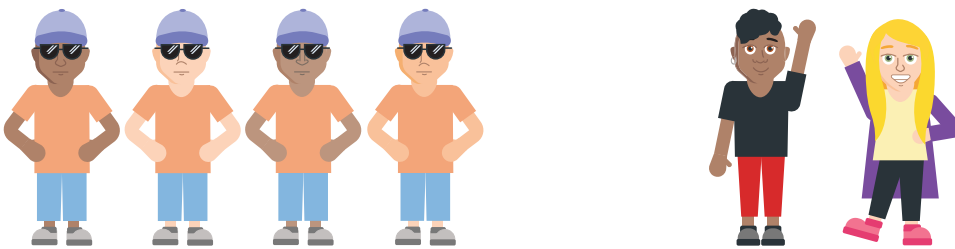
Figure 5 The individuals on the right form a deviant subgroup, and are more likely to make decisions that are distinct from the social group that appears unanimous

LESSON LINK

In lesson **7A Social groups and culture**, you learnt about individualist and collectivist cultures, and that they each hold different social dynamics, values, and needs. These tendencies can contribute to differences in people's likelihood of anti-conformity, such as reactance. Threats to freedom of choice arising from a person's ingroup can lead to greater reactance in people from individualist cultures than those from collectivist cultures as collectivists do not feel as threatened when their decisions are restricted by their ingroup (Markus & Kitayama, 1991).

In collectivist cultures, the greater emphasis on group goals and concern for how others judge their behaviour means anti-conformity may carry more risk than it would for those in individualist cultures. Conversely in individualist cultures, the self-expression associated with anti-conformity is perceived more positively.

WANT TO KNOW MORE?

How would you feel if your parents told you that you had to stop studying or that they wanted you to make your room as messy as possible? What if your friend told you that they no longer wanted you to come to a party they had been convincing you to come to for days? Does not being 'allowed' to do these things make you want to do them more?

You may have heard of the concept of 'reverse psychology'; which is where we attempt to get someone to do something by asking them to do the opposite. Many scientists actually call this term 'strategic self-anticonformity', as it uses factors that encourage anti-conformity, especially reactance, to trick people into behaving a certain way.

(MacDonald et al., 2011)

Theory summary

In this lesson, you learnt about the constructs of independence and anti-conformity. You also learnt about how they can be developed or encouraged and then used to empower individual decision-making when in groups. The representation of the level of empowerment associated with an individual's level of independence and willingness to display anti-conformity is summarised in figure 6.
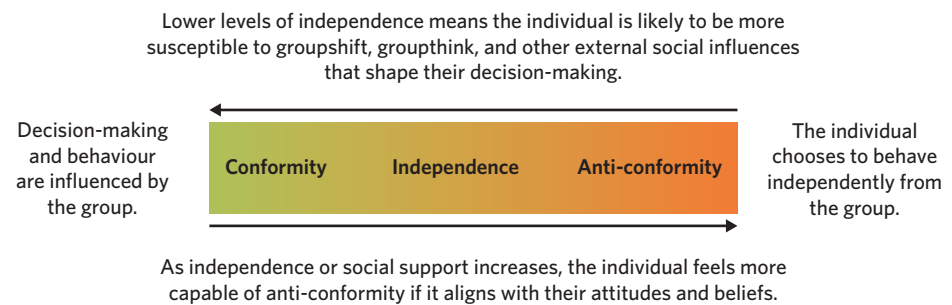
Figure 6 The joint influence of independence and anti-conformity, to enhance individual decision-making when in groups

7D Questions

Theory review

Question 1

When someone achieves independence, they are less likely to be influenced by the beliefs and expectations of others.

A. True.

B. False.

Question 2

Self-determination can increase independence by

A. allowing people to engage in behaviours without the influence of others.

B. feel better able to control their own lives.

C. all of the above.

Question 3

In terms of the self-determination theory, which of the following are basic psychological needs?
(Select all that apply)

I.   Autonomy.

II. Interconnectedness.

III. Self-affirmation.

IV. Relatedness.

V.   Competence.

Question 4

The self-determination theory proposes that regardless of whether all three basic psychological needs are met, an individual can be equally empowered to make individual decisions.

A.   True.

B.   False.

Question 5

Anti-conformity is a _____ that goes against social norms.

Which of the following best fills in the blank?

A.   deliberate act of rebellion

B.   careless display of behaviour

Question 6

Which of the following correctly lists factors that encourage anti-conformity?

A.   Desire to promote change, reactance, social support, and individuation.

B.   Reactance, deindividuation, desire to promote change, and social support.

Question 7

How can the factors that encourage anti-conformity help to empower individual decision-making?
(Select all that apply)

I.   The factors allow people to lose awareness of social norms so they can avoid conforming without thinking about it.

II. The factors weaken the likelihood of conformity.

III. The factors increase motivation for anti-conformity, so that people feel more inclined to act on their morals and intentions.

IV. The factors weaken perceptions of unanimity and reduce groupthink through the perception of social support for going against social norms.

V.   The factors change social norms to match modern ideals and beliefs, so that people are acting more ethically.

Assessment skills

Perfect your phrasing

Question 8

Which of the following sentences is most correct?

A.   Independence refers to being free from the **control** or influence of others.

B.   Independence refers to being free from the **restraints** or influence of others.

Question 9

Which of the following sentences is most correct?

A. As a basic psychological need, autonomy refers to the need to be able to act based on **individual choice** and intrinsic **motivation**.

B. As a basic psychological need, autonomy refers to the need to be able to act based on **personal preference** and intrinsic **reasoning**.

Question 10

Which of the following sentences is most correct?

A. Individuation refers to instances where the individual's identity and **responses** to the group are **evident**.

B. Individuation refers to instances where the individual's identity and **contributions** to the group are **noticeable**.

Question 11

Which of the following sentences is most correct?

A. Reactance refers to **an emotional** state of distress and resistance, caused by **an impulse** to regain personal freedom after it has been removed or threatened.

B. Reactance refers to **a motivational** state of distress and resistance, caused by **a desire** to regain personal freedom after it has been removed or threatened.

Problem-solving

The following assessment skills type reflects the study design assessment dot point:

- problem-solving involving psychological concepts, skills and/or issues

Use the following information to answer questions 12–14.

> Lisa has watched Nelson bully many students at school throughout the year. She wants to stand up against him but struggles to find the courage as nobody ever dares to say anything bad about him. Furthermore, some students join in on his bullying and she worries that she will become a target of many students at once if she speaks up.
>
> One day, Lisa is sitting with her friends in the schoolyard when she sees Nelson pushing around a small, younger student called Millie. She overhears him yelling at Millie, saying 'Nobody can stop me! They all have to do what I say.' This makes Lisa really angry.

Question 12

Which of the following does **not** accurately describe a factor encouraging conformity that Lisa needs to overcome in order to act against the group and stand up against Nelson?

A. Groupthink, as she feels a sense of unanimity as none of the students ever stand up against Nelson.

B. Social norms, as there is an unspoken rule at Lisa's school that people do not intervene or try to stop Nelson.

C. Deindividualisation, as nobody ever singles out Nelson and tells him they have noticed his poor behaviour.

D. Group shift, as nobody ever looks at Lisa to act or expects her to do so.

Question 13

Based on the information provided in the scenario, the fulfilment of which of the following basic psychological needs may assist Lisa to act independently in standing up to Nelson? **(Select all that apply)**

I. Autonomy, as Lisa does not feel she has the ability to willingly choose to act on her motivation to stand up to Nelson.

II. Competence, as Lisa does not feel she has the right to act on her motivation to stand up to Nelson.

III. Competence, as Lisa does not feel she has the social support to stand up to Nelson.

IV. Relatedness, as Lisa worries she will be socially rejected by becoming a target herself.

V. Relatedness, as Lisa feels as though Nelson has more social connections than she does.

Question 14

How might Nelson's actions towards Millie lead to a state of reactance in Lisa so that she can gain the motivation to stand up to Nelson?

A. Lisa is preventing herself from standing up to Nelson, which may increase her desire to stand up to him.

B. They would not lead to reactance in Lisa, as she still has the ability to act according to her own free will. She would need to find motivation through another factor encouraging anti-conformity.

C. Nelson's statements including 'They all have to do what I say' could be identified as using forceful language by Lisa, which may come across as more threatening to her personal freedoms.

Exam-style

Remember and understand

Question 15 (1 MARK)

Which of the following combinations of factors is most likely to lead to independent individual decision-making?

	Characteristic 1	Characteristic 2
A.	Strong desire to promote change	Low social support
B.	Strong desire to promote change	Achievement of all three basic psychological needs
C.	Achievement of all three basic psychological needs	Strong desire to follow social norms
D.	Achievement of all three basic psychological needs	Feeling that individual contributions are never noticeable to others

Question 16 (1 MARK)

Anti-conformity requires sufficient motivation to be expressed because

A. it helps people to achieve group cohesion, which is a big task.

B. conformity occurs when people are unmotivated.

C. there are often negative feelings associated with not fitting in, therefore people must be motivated enough to overcome this desire to fit in and engage in anti-conformity.

D. engaging in anti-conformity always requires a lot more energy and effort than conforming.

Question 17 (2 MARKS)

Compare independence and anti-conformity.

Question 18 (3 MARKS)

Outline what is meant by a deviant subgroup, and explain how they empower an individual to make individual decisions in a group.

Apply and analyse

Use the following information to answer questions 19 and 20.

Sally's behaviour is driven by benefits, such as personal growth and gaining knowledge, whereas Thiago's behaviour is driven by benefits, such as monetary rewards or being admired.

Question 19 (1 MARK)

Which of the following best describes the types of motivation that drive Sally and Thiago's behaviour?

A. Sally's behaviour is extrinsically motivated, while Thiago's behaviour is intrinsically motivated.

B. Both Sally and Thiago's behaviour is intrinsically motivated.

C. Both Sally and Thiago's behaviour is extrinsically motivated.

D. Sally's behaviour is intrinsically motivated, while Thiago's behaviour is extrinsically motivated.

Question 20 (2 MARKS)

Comparing Sally and Thiago's behavioural motivations, identify who out of Sally or Thiago is more likely to be independent. Justify your answer with reference to self-determination.

....

Question 21 (2 MARKS)

Describe independence and explain why someone who is independent does not always display anti-conformity.

....

Question 22 (3 MARKS)

Cody does not know why he depends so much on other people's opinions when making decisions regarding his university course. He has a solid group of friends, with which he has a strong sense of connection and attachment. He also feels as though at the end of the day, he is able to choose what he wants to do, he just struggles not to take other people's beliefs on board. Cody also feels as though he is often not skilled enough to overcome the challenges of university at times, or that he is not good enough at what he decides to do.

Describe how Cody's scenario is an example of the notion that all three basic psychological needs must be fulfilled for an individual to display complete independence.

Evaluate

Question 23 (5 MARKS)

Peter works for a newspaper and is known to be very accepting and reserved by his work colleagues. He is very skilled at his job and has a strong sense of belonging with his friends and family, however, he often does not feel he can act without being influenced by social norms.

When night falls, he puts on a full-body suit and his special owl mask. This uniform makes him strongly identifiable as the superhero 'Owlman'. Owlman always acts to restore his idea of justice, even though in his society, there is a social norm to let the police handle crime. Furthermore, people who require Owlman's help will signal to him by flashing a symbol in the shape of an owl into the night sky using a big searchlight. Lots of people love and support Owlman and think he is the most gifted superhero of them all.

a. Identify and explain an example of individuation that may encourage Owlman to display anti-conformity when he helps someone else. (2 MARKS)

b. Imagining they are two separate people, evaluate the level of independence of Peter in comparison to the level of independence of Owlman with reference to self-determination theory. (3 MARKS)

Questions from multiple lessons

Question 24 (3 MARKS)

Ren lives in a country with a collectivist culture. A social norm in Ren's country relating to marriage and sexuality is negatively impacting the lives of two people he knows; a close family member, and a distant acquaintance. With reference to both a factor that encourages anti-conformity and a priority of collectivist cultures, explain why Ren might be motivated to defend his close family member, but not his distant acquaintance.

Chapter 7 review

Chapter summary

In this chapter, you learnt about the different ways that individual behaviour can be influenced.

In lesson **7A Social groups and culture**, you learnt about the influence that our social environments can have on our behaviour. Specifically, you learnt about:

- what constitutes a group and how belonging to a group can influence individual behaviour through
  - group norms
  - social loafing
  - the social identity theory.
- the different types of cultures and their associated norms, including
  - individualist cultures
  - collectivist cultures.

In lesson **7B The influence of obedience and conformity on behaviour**, you learnt about how the experiences of obedience and conformity can influence individual behaviour. Specifically, you learnt about:

- obedience, including
  - the factors that influence obedience
  - Milgram's experiment on obedience
  - contemporary experiments on obedience.
- conformity, including
  - the factors that influence conformity
  - Asch's study on conformity
  - contemporary studies on conformity.

In lesson **7C Media and behaviour**, you learnt about the influences of different media sources on individual behaviour. Specifically, you learnt about:

- the different sources of media
- how media can influence behaviour through
  - social connections
  - social comparison
  - addictive behaviours
  - information access.

In lesson **7D Empowering individual decision-making**, you learnt about how the development of independence and anti-conformity can empower individual decision-making within a group. Specifically, you learnt about:

- independence, including
  - the self-determination theory
  - how it empowers individual decision-making.
- anti-conformity, including
  - how it is developed
  - how it empowers individual decision-making.

```
┌─────────────────────────┐              ┌──────────────────┐
│ Individual behaviour    │──────────────│      Groups      │
│ is influenced by        │              │                  │
└─────────────────────────┘              └──────────────────┘
        │                                    │            │
        │                   ┌────────────────┐        ┌──────────────────┐
        │                   │     Social     │        │      Culture     │
        │                   └────────────────┘        └──────────────────┘
        │                           │                          │
        │                   ┌────────────────┐        ┌──────────────────┐
        │                   │  Social loafing │        │ Types of cultures │      ┌────┐
┌──────────────┐           └────────────────┘        └──────────────────┘      │ 7A │
│    Media     │           ┌────────────────────┐    │            │            └────┘
└──────────────┘           │ Social identity theory │  ┌──────────────┐ ┌──────────────┐
        │                   └────────────────────┘    │ Individualist │ │ Collectivist │
   through...              ┌────────────────┐         └──────────────┘ └──────────────┘
┌──────────────────────┐  │      Norms     │
│ • Social connections │  └────────────────┘
│ • Social comparison  │
│ • Addictive behaviours│        Milgram
│ • Information access │  ┌────────────────┐
└──────────────────────┘  │   Obedience    │   ┌────┐
   ┌────┐                  └────────────────┘   │ 7B │
   │ 7C │                       Asch             └────┘
   └────┘                  ┌────────────────┐
                           │   Conformity   │
                           └────────────────┘

                           ┌────────────────────┐
                           │ Individual behaviour│
                           │      includes       │
                           └────────────────────┘
                                     │
                           ┌────────────────────┐
   ┌────┐                  │     Individual      │
   │ 7D │                  │  decision-making    │
   └────┘                  └────────────────────┘
                                     │  which is empowered by...
                           ┌──────────────┐ ┌──────────────────┐
                           │ Independence │ │  Anti-conformity  │
                           └──────────────┘ └──────────────────┘
```
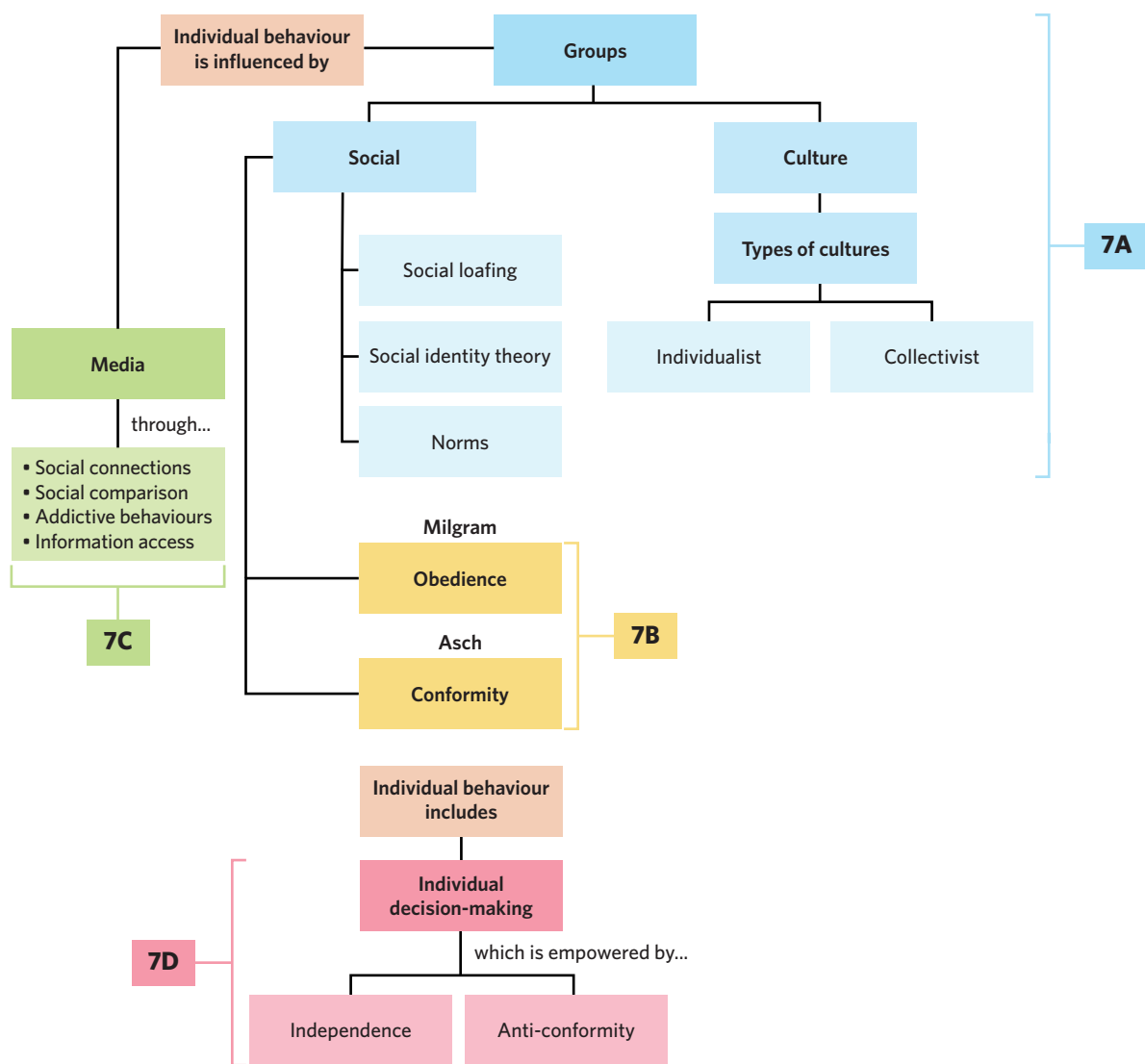
Chapter review activities

Review activity 1: Summary table

This chapter explored many ways in which behaviour can be influenced. Create a summary table for this chapter, you may use the following table or create your own. For each concept that you have explored, identify any key information that you have learnt, and explain how this specific concept impacts behaviour.

Lesson	Concept		Key information	Impact on behaviour
7A	Social groups	Group norms		
		Social identity theory		
		Social loafing		
	Culture	Individualist norms		
		Collectivist norms		Continues ▶

Lesson	Concept		Key information	Impact on behaviour
7B	Obedience	Status of authority figure		
		Proximity		
		Group pressure		
	Conformity	Social norms		
		Groupthink		
		Group shift		
		Deindividuation		
7C	Media	Social connections		
		Social comparison		
		Addictive behaviours		
		Information access		
7D	Independence/ self-determination theory	Autonomy		
		Competence		
		Relatedness		
	Anti-conformity	The desire to promote change		
		Individuation		
		Reactance		
		Social support		

Review activity 2: Label the scenario

For each scenario listed below, label the factor that is most likely to impact the described behaviour.
Choose from the following:

- Deindividuation
- Reactance (in relation to anti-conformity)
- The desire to promote change (in relation to anti-conformity)
- Obedience

Scenario 1: Mona never really uses her phone in class. However, her classmates often do, so her teacher has decided to give the class a lecture. Mona's teacher explicitly outlined that, 'phones are NOT allowed in class, no matter what!'. The next day, Mona decided to check her phone in class.

Scenario 2: Liam lives in Australia with his parents. He hates doing the dishes and will avoid doing them whenever he can. However, one day when his mum got home from work, she told Liam that he needed to do the dishes right away. Liam immediately complied.

Scenario 3: Murial lives in a collectivist culture, in which the beliefs of the group are more valued than those of the individual. However, a new law has passed that, although popular with the majority, goes directly against Murial's beliefs. Murial decides that she is going to protest.

Scenario 4: Whilst at a football match, Alejandro noticed that hundreds of strangers around him were booing the opposing team. Usually, Alejandro would not engage in such behaviour, but he decided to join in as he didn't think that anyone would notice him.

Chapter 7 test

Multiple choice

Question 1   (1 MARK)

The nature of the influence of media on behaviour is

A. positive.

B. negative.

C. neutral.

D. subjective.

Question 2   (1 MARK)

Individuation and deindividuation both

A. increase conformity.

B. influence individual behaviour.

C. increase anti-conformity.

D. increase obedience.

Question 3   (1 MARK)

Which of the following is **not** associated with 'norms'?

A. Obedience.

B. Conformity.

C. The influence of culture.

D. The influence of social groups.

Question 4   (1 MARK)

Which of the following best describes individual behaviour?

A. It is always based on independence and self-determination.

B. It is always determined by others in the environment, implicitly or explicitly.

C. It can be driven by both individual and group values.

D. It is the same as group behaviour.

Question 5   (1 MARK)

Paula has grown up in an individualist culture her whole life. She doesn't feel the need to anti-conform as she feels as though the values of her society match those of her own.

Why may Paula be more inclined to accept cultural norms from within her culture?

A. Because of the conscious fear of being excluded from the group.

B. Because individuals within a culture are often raised in alignment with the values of that culture, therefore the norms tend to align with individual values.

C. Because they emphasise the success and values of the group rather than the individual.

D. Because the norms are based within an in-group rather than an out-group.

Short answer

Question 6   (2 MARKS)

Identify the role of a confederate in Milgram's research and explain why researchers may choose to use confederates in a research setting.

Question 7   (2 MARKS)

Outline one similarity and one difference between social loafing and conformity.

Question 8   (3 MARKS)

With reference to the self-determination theory, explain how independence may develop.

Question 9   (3 MARKS)

Outline and explain the influence of media that would be most appealing to collectivist cultures. Justify your answer.

Question 10   (4 MARKS)

With reference to Asch's study and to anti-conformity, identify and describe a factor that, if present, may have prevented participants from conforming.

Question 11   (2 MARKS)

Emidio finds that he gains a lot of positive experiences from using social media. He is able to connect with his friends and access a wide variety of information that is interesting to him. However, Emidio will often brush off family and school commitments to play online games even though this creates negative consequences for him.

Outline and explain one negative influence of media that Emidio is experiencing.

Question 12   (10 MARKS)

Luis is a high school student who has recently moved from Japan to Australia. Before his move, Luis was thought of as well-behaved in the presence of authority, family-oriented, and reserved. However, his parents have noticed that since his move, he has started to engage in more reckless behaviours. He has begun to disobey his teachers at school, and was even caught bullying another student with his new group of friends.

Discuss the relative influences that may have shaped Luis' former and current behaviours, as well as what his teachers or parents could do to prevent these behaviours from continuing.

Unit 2 AOS 1 review

The VCE study design outlines that, upon completion of this area of study, you must be able to 'analyse how social cognition influences individuals to behave in specific ways and evaluate factors that influence individual and group behaviour.'

SAC assessment 1

The following task can be used as a practice SAC. This task is based on the following study design assessment type:

- problem-solving involving psychological concepts, skills and/or issues

Use the following information to answer questions 1–9.

> When Dewey was in year 10, he was a victim of cyberbullying. This occurred when the other students in his year found out that he was a competitive cheerleader outside of school. Google searches of Dewey's full name uncovered pictures of him at competitions, and these quickly began to spread around the school through messages and group chats. The students thought it was hilarious that a boy would want to participate in a 'girls' sport', while others were annoyed at him for doing something they thought was so abnormal. The students also made anonymous accounts on social media and posted images containing false information, including that Dewey pretended to be a girl to compete in the female division. People at school often mocked him for being girly and ignored his good sense of humour and friendly demeanour.
>
> Dewey felt it was extremely unfair that people were judging his entire personality based on one aspect of his life. He wished they knew that, not only were there several other male cheerleaders on his team, but also that many people on his team were stronger than professional football players and wrestlers. Cheerleading was not the 'weak' or 'fake' sport his school peers thought it was.
>
> Dewey believed he did not have the power to stand up for himself or do anything to improve his situation, feeling that it was out of his control. His memories of school were clouded by the past few months in which he had been bullied. All he recalled were the negative and isolating experiences he had with his peers. He wished even just one person would stand up for him.
>
> Despite the fact that he loved cheerleading and had done it for over 10 years, Dewey started to feel extremely embarrassed about his choice of sport and decided to quit. Daily fights were occurring between Dewey and his parents, who would say they could 'no longer recognise their son' as he had dropped a large part of his identity that they were proud of. Dewey wished year 11 would be better but was not feeling very hopeful.

Question 1 (4 MARKS)

In a social group, an individual's behaviour can be influenced by their peers.

a. Provide two reasons why the year 10 students at Dewey's school constitute a group. (2 MARKS)

b. Outline social norms and explain their role in the students cyberbullying Dewey. (2 MARKS)

Question 2 (2 MARKS)

'Information access can have a negative influence on behaviour when misinformation is spread through social media'.

State whether you agree with this statement and justify your response with reference to Dewey's cyberbullying.

Question 3 (2 MARKS)

Social connections refer to the network of people available to someone for support and engagement. The reach of social connections has expanded due to the increasing use of digital technologies.

a. Suggest a negative influence of online social connections on the group behaviour of Dewey's year 10 peers. (1 MARK)

b. Using your knowledge of the positive influence of online social connections, suggest how they could be used by Dewey to cope with his cyberbullying. (1 MARK)

Question 4 (2 MARKS)

Explain what is meant by the availability heuristic and suggest how it might be used by Dewey when he judges his entire school experience as negative.

Question 5 (8 MARKS)

Dewey feels extremely unsupported by his peers and struggles to not let their negative words influence his decision-making.

a. Learned helplessness can occur when people regularly attribute negative life events to external, seemingly stable causes. Suggest how Dewey may be displaying learned helplessness in relation to his decision to quit cheerleading. (1 MARK)

b. Using your knowledge of independence, how might Dewey having a greater sense of independence encourage him to continue cheerleading? (1 MARK)

c. Using your knowledge of the self-determination theory, identify two basic psychological needs that Dewey has not fulfilled and explain how they could be achieved to assist him to continue cheerleading. (4 MARKS)

d. Is Dewey displaying anti-conformity by going against social norms as a male cheerleader? Justify your response. (2 MARKS)

Question 6 (9 MARKS)

Stereotypes, prejudice, and discrimination respectively align to the three components of the tri-component model of attitudes.

a. Distinguish between the two kinds of discrimination and identify which one Dewey is facing. (3 MARKS)

b. Suggest how stereotypes, prejudice, and discrimination are evident in Dewey's cyberbullying, with reference to their respective components of the tri-component model of attitudes. (6 MARKS)

Question 7 (4 MARKS)

A student reports Dewey's cyberbullying to the school principal, and the principal then makes an effort to go around to all year 10 classrooms and sternly instructs them to stop the bullying immediately.

a. Identify two factors that affect obedience that may lead the students to listen to the principal's instructions. (2 MARKS)

b. Using your answers from **part a**, suggest how each of these factors could lead the students to obey the principal's instructions and reduce their cyberbullying. (2 MARKS)

Question 8 (3 MARKS)

Evaluate whether Dewey is likely to be experiencing optimal or poor mental wellbeing, with reference to the factors that can influence a person's mental wellbeing and the characteristics of optimal wellbeing.

Question 9 (6 MARKS)

There are several approaches to reducing prejudice, discrimination, and stigma that may be used to remove the student's motivations to cyberbully Dewey.

a. Using your knowledge of approaches to reduce prejudice, discrimination, and stigma, suggest two ways Dewey's cyberbullying could be reduced and explain how each one might be used. (4 MARKS)

b. If these approaches from **part a** are effective in reducing the students' prejudice, why might cognitive dissonance be experienced by students who continue sharing nasty messages about Dewey? (2 MARKS)

Unit 2 AOS 1 review

SAC assessment 2

The following task can be used as a practice SAC. This task is based on the following study design assessment type:

- a data analysis of generated primary and/or collated secondary data

Use the following information to answer questions 1–8.

In 2015, the Australian mental health and wellbeing organisation 'Beyond Blue' produced an information paper on 'Stigma and discrimination associated with depression and anxiety'. It was developed with the intention to assist people to understand the stigma surrounding mental health and the impact it can have on people's lives. It also included ways to reduce the impact of stigma.

In their information report, they included the 'Depression and Anxiety Monitor', a survey of 2000 people aged 18 or over. A feature of the survey was an assessment of people's level of stigma towards anxiety. It is important to note that the results of the survey do not present factual representations of anxiety, and that these are simply the stigmatised opinions of a small portion of Australian society.

The results of this survey are presented below. Note that the data was obtained from 2000 people and then translated into a number out of 35 people.

The number of people (out of 35) who agree or strongly agree with statements that reflect stigma towards anxiety, from a sample of 2000 participants
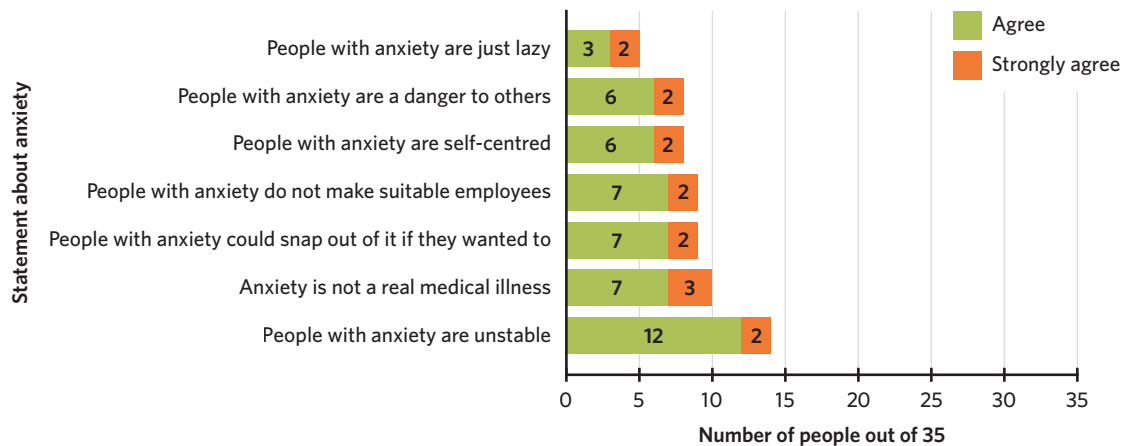
(beyondblue, 2015)

Question 1 (2 MARKS)

Describe the results and suggest what they might say about people's attitudes towards those with anxiety.

....

Question 2 (9 MARKS)

Beyond Blue's 'Depression and Anxiety Monitor' demonstrated a level of stigma towards people with anxiety.

a. How many people out of 35 either agreed or strongly agreed that 'people with anxiety could snap out of it if they wanted to'? (1 MARK)

b. What is the relationship between stereotypes and stigma? (1 MARK)

c. Identify what type of stigma is evident in the statements the participants responded to. (1 MARK)

d. Distinguish between a stereotype and an attitude. (2 MARKS)

e. With reference to the three criteria for attitude formation, suggest a reason why the stigmatised statements from the survey may **not** all reflect an attitude. (2 MARKS)

f. Provide two ways stigma can negatively influence the mental wellbeing of people with anxiety as a group. (2 MARKS)

Question 3   (2 MARKS)

'There were more people that displayed stigma towards anxiety than those that did not display stigma towards anxiety'. Referring to the data, justify whether this statement is true or false.

Question 4   (3 MARKS)

Beyond Blue's survey was conducted in Australia, which is a western society. Differentiate between individualist and collectivist cultures, and suggest which culture the sample is more likely to represent.

Question 5   (9 MARKS)

The data showed different ways in which people may hold stigma towards anxiety.

a. Which two out of the four types of data are evident in this survey? (2 MARKS)

b. Outline one strength or one limitation for each of the two types of data identified in **part a**. (2 MARKS)

c. Which stigmatised statement did the participants least agree with? (1 MARK)

d. With reference to the social identity theory, suggest why people who do not have anxiety may have agreed with the statements. (3 MARKS)

e. Provide one reason why the results of Beyond Blue's survey could not be generalisable to all Australian citizens. (1 MARK)

Question 6   (8 MARKS)

People have a tendency to call on past experiences and biases when judging others.

a. Use one of the survey statements to describe how the representative heuristic is evident in the judgements made by the participants. (2 MARKS)

b. Why might judgements about people made using the representative heuristic be inaccurate? (1 MARK)

c. Briefly outline the actor-observer bias. (1 MARK)

d. 'Participants who display the actor-observer bias are likely to also display the fundamental attribution error when judging people with anxiety'. Outline the fundamental attribution error and justify whether or not you agree with this statement. (4 MARKS)

Question 7   (4 MARKS)

With reference to self-determination theory and the basic psychological need 'relatedness', how could the achievement of stigma reduction allow people with anxiety to feel a greater sense of independence?

Question 8   (3 MARKS)

'Groupthink could influence the opinions of the participants to be less stigmatised if this survey was instead conducted as an in-person group discussion'.

Outline groupthink and explain why this is a true statement, referring to the data.

UNIT 2 AOS 2

What influences a person's perception of the world?

Human perception of internal and external stimuli is influenced by a variety of biological, psychological and social factors. In this area of study students explore the role of attention in making sense of the world around them and they consider two aspects of human perception – vision and taste – and consider how perception is influence by cultural norms and historical experiences.

Students explore the influence of biological, psychological and social factors on visual and gustatory perception. Perceptual distortions of vision and taste are explored when looking at the fallibility of perceptual systems. Students may choose to explore a range of different visual illusions to understand how individuals misinterpret real sensory stimuli. Different forms of agnosia may be investigated by students to understand issues with sensory processing areas within the brain.

Aboriginal and Torres Strait Islander experiences of sensory connection to Country and/or Place, ancestors, spirituality and songlines may also be considered.

Outcome 2

On completion of this unit the student should be able to explain the roles of attention and perception, compare gustatory and visual perception and analyse factors that may lead to perceptual distortions.

Reproduced from VCAA VCE Psychology Study Design 2023–2027

CHAPTER 8

Attention and perception

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

Image: GoodStudio/Shutterstock.com

8A Attention

```
8A              8B              8C              8D
●───────────────────────────────────────────────

        ┌─ 2.2.1.1
           Types of attention
        ├─ 2.2.1.1.1  Sustained attention
        ├─ 2.2.1.1.2  Divided attention
        ├─ 2.2.1.1.3  Selective attention
        └─ 2.2.1.1.4  Using attention to make sense of our world
```

Can you spot all six differences between these two images? What if you were asked to identify what kind of animal this is or count how many fruits you can see in the pictures? Do you think it would be easy to count how many fruits you can see if someone started telling you an interesting story at the same time? These questions relate to the functions of our attention. In this lesson, you will learn about attention and its various types.

Types of attention 2.2.1.1

To understand what is happening in the world around us, as well as the things going on inside our bodies, we need to pay attention to lots of information. However, sometimes when we are distracted or multitasking, it can be difficult to focus and pay attention. In this lesson, you will learn about three types of attention and how they allow us to focus on and make sense of our internal and external world.

Theory details

Attention refers to actively focusing on particular information while simultaneously ignoring other information. Without attention, we would not be able to tune out irrelevant information in our environment. Being able to focus on relevant information allows us to direct our limited energy and brain resources on the most important objects, functions, sensations, and situations. There are two types of information sources that we can pay attention to. These are:

- **internal stimuli**, which are information or sensations that originate from within the body. These can include feeling hungry or tired, having a fever, being hot or cold, experiencing pain (such as a headache), or having an idea.
- **external stimuli**, which are information or sensations that originate from outside the body. These can include conversations you are having with others, tasks you are completing, something you are reading, or other events you experience with your five senses, such as the things you see, hear, smell, touch, or taste.

There are three main types of attention:

- sustained attention
- divided attention
- selective attention.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

KEY TERMS

Attention actively focusing on particular information while simultaneously ignoring other information

Internal stimuli information or sensations that originate from within the body

External stimuli information or sensations that originate from outside the body

Sustained attention 2.2.1.1.1

Sustained attention refers to focusing on one stimulus or task across a prolonged, continuous period of time. It makes it possible to concentrate in order to complete a set task or to attend to something for a specific period of time. Many of our daily activities require sustained attention, for example:

- searching for something in your bag
- watching a video from start to finish
- completing a simple maths question
- holding a conversation for a few minutes.

While these examples may all differ in complexity or duration, they all share the requirement for sustained attention. This is because they need to be attended to for a prolonged, continuous period of time to be completed (Langner & Eickhoff, 2013).

Sustained attention involves three main stages, as outlined in figure 1.

| 1. An individual focuses attention on the stimulus they wish to sustain attention towards. | 2. Maintaining attention on that stimulus (resulting from internal motivation to sustain attention and individual ability to hold focus). | 3. Releasing sustained attention (when the individual no longer needs to focus on the stimuli). |
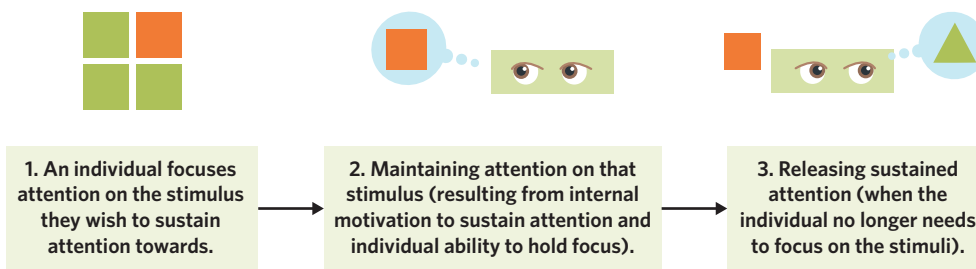
Figure 1 The three stages of sustained attention

How long can we sustain attention for?

Attention is a limited resource. If attention is sustained for long periods of time individuals tend to experience fatigue or become too tired to focus well. Research shows a strong lack of consensus on the average length of a human attention span. Many sources claim 10–15 minutes, but lack proper support for this claim (Wilson & Korn, 2007). Additionally, sustained attention is typically more difficult in intellectually easy or boring situations than in more challenging and interesting ones (Pessoa & Engelmann, 2010). For example, an individual will likely find it easier to maintain focus on writing a paragraph during an English exam than they would watching grass grow for the same amount of time. While there is no set attention span, the ability to sustain attention can be significantly impacted by stimuli acting as distractions.

The effect of distraction

Distractions are internal or external stimuli that draw attention away from the current task. When distractions interfere with the completion of a task, individuals find themselves constantly having to refocus their attention. Sustained attention involves the maintenance of attention even in the presence of distractions, and this is typically easier when the task is more engaging and the individual is less fatigued. For example, someone who studies while listening to music may achieve sustained attention by focusing on answering questions, despite the external distraction of songs changing. Additionally, you may have to ignore distractions from internal stimuli, such as trying to focus on work when you have a headache. Therefore, while distractions can break sustained attention, it can also be achieved in the face of distraction.

PSYCHOLOGY EXPLORATION

You may be familiar with the social media app TikTok, which is used to share videos that typically have a duration of less than a minute. People tend to scroll for extended periods of time, consuming a multitude of these short videos in succession. Have these snappy and attention-grabbing videos led people to feel an effect on their attention spans?

A study investigated the effect of TikTok and other social media apps on how students feel about their academic performance (Tan et al., 2021). Students reported that they felt social media had reduced their attention spans. As this is a newly researched concept, there is not yet a lot of evidence to support or deny the claim that the app negatively impacts our sustained attention. If you or someone you know frequently uses TikTok, perhaps you have your own beliefs about whether it impacts our attention span.

Divided attention 2.2.1.1.2

Divided attention refers to splitting attention across two or more stimuli at one time. This type of attention involves **multitasking**, the act of working on multiple tasks at one time, which is depicted in figure 2.

There is a tendency for individuals to believe that they are better at multitasking than they actually are, as the brain can only process so many things at once. Switching tasks can actually make an individual more prone to distraction and reduce their understanding of the task, decreasing performance (Sanbonmatsu et al., 2013). Multitasking is inevitable, particularly in situations where:
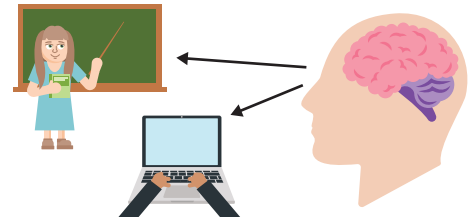
Figure 2 Divided attention involves focusing on two or more stimuli or tasks at once

- it enables us to perform two tasks at the same time when we feel we are unable to complete one before the other. For example, waitstaff taking another order while remembering that the previous table wanted extra bread.
- we are juggling a boring task with a more interesting task so that we feel more entertained. For example, passing the time on a long drive by listening to an interesting podcast.
- we are actively learning, as we can process multiple tasks at once when at least one of the tasks is automatic or easy. For example, writing notes from the whiteboard while understanding what the teacher is saying.

As multitasking requires us to divide our attention, it prevents us from giving our full potential to just one task. This can have negative implications for our performance when:

- we have to stop a task that is not easy to resume. For example, if you are listening to music while writing an essay, you may start to sing along to the song and then lose your flow. The result could be initially writing slower when returning to the task.
- the tasks are less related, or are completed using two different platforms or mediums, as this can mean jumping between them is more disruptive. For example, online shopping while holding a conversation with someone.
- when the tasks are more effortful and complex, as they typically require full attention to be completed. For example, performing a difficult dance routine while reciting as many countries in Europe as you can.

Selective attention 2.2.1.1.3

Selective attention involves exclusively focusing attention on a specific stimulus or task while ignoring all other stimuli or tasks, as depicted in figure 3. Examples of selective attention include:

- being at a crowded party, you often tune your attention into the conversation you are having with someone, despite being able to hear many other conversations at the same time.
- when driving, you may maintain your attention exclusively on the road, despite driving past shops and people on footpaths.
- during a test or exam, you tend to ignore distractions occurring in your classroom to focus on answering the questions as quickly as possible.

Selective attention requires an individual to filter out external stimuli, such as other noises or distracting visual stimuli, however, it also requires filtering out internal stimuli, such as thoughts or emotions.

Figure 3 Selective attention involves focusing on a specific stimulus while ignoring others

Using attention to make sense of the world 2.2.1.1.4

Attention is essential for so many parts of life, as it is responsible for the act of concentration and provides us awareness of different stimuli in our internal and external worlds.
The three types of attention outlined in this lesson are sustained attention, divided attention, and selective attention. Their specific roles in making sense of the world are described below.

Sustained attention

Sustained attention allows us to process incoming information in necessary detail by spending the required amount of time or mental energy focusing on it. When we have difficulty sustaining attention, we may be unable to adapt to changes in the environment and modify our behaviour, as we are unable to process all of the relevant details before our attention shifts.

For example, a particular maths question may naturally take someone a few minutes to solve as that is the time it takes to do the calculations in their head. If they only focus on the question for 15 seconds, they will not have enough time to process the information required for the calculation, and therefore will not be able to produce or fully understand the answer. As a result, they may either never complete the question, or take much longer to complete it due to having to refocus several times.

Divided attention

As you now know, divided attention allows us to understand or respond to multiple aspects of our world at one time, a function necessary for us to keep up with the many events happening around us at all times. For example, when someone is practising a skill while listening to instructions on how to perform that skill. However, we must once again note that attention is a limited resource, as we can only pay attention to so many things at once and for a limited amount of time.

Selective attention

As we cannot attend to everything going on in the world at once, the key role of selective attention is to act as a filter that helps to prioritise incoming information according to its importance. We want to focus on the most important information so that we can process it thoroughly enough to make sense of and use it. According to attentional allocation, there are two key principles that outline whether a stimulus is important enough to grab our focused selective attention:

1. The predictive principle, where we focus on stimuli that are personally meaningful and important to us amongst other less meaningful stimuli.
2. The uncertainty principle, where our attention is captured the most by unpredictable or unfamiliar stimuli. This is due to the stimuli's potential to provide useful information or news about pleasant or dangerous consequences.

In this way, selective attention can help us learn about new stimuli, focus on dangerous or unexpected stimuli, and focus on stimuli that align with relevant current goals and interests.

Theory summary

In this lesson, you have learnt about three main types of attention, as summarised in table 2. You have also learnt about distraction and multitasking, as factors that influence our ability for attention.

Table 2 The three types of attention and their roles.

Type of attention	Role	Example
Sustained attention	Allows us to fully process information or complete a task.	Watching a movie without needing to pause it or go back to understand the plot.
Divided attention	Allows us to process multiple sources of information or stimuli more efficiently.	Driving while following directions from your navigation system.
Selective attention	Acts as a filter that helps us to prioritise incoming information according to its importance.	Focusing on what one person says and ignoring the sounds of other conversations or stimuli that may distract you.

8A Questions

Question 1

There are multiple types of attention that can allow us to make sense of the world.

A. True.

B. False.

Question 2

Which of the following are types of attention? **(Select all that apply)**

I. Selective attention.

II. Maintained attention.

III. Divided attention.

IV. Sustained attention.

V. Social attention.

Question 3

Internal stimuli are information or sensations that originate _____, whereas external stimuli are information or sensations that originate _____.

Which of the following best fills in the blanks?

A. in the world around us; from within the individual

B. from within the individual; in the world around us

Question 4

Selective attention involves multitasking.

A. True.

B. False.

Assessment skills

Perfect your phrasing

Question 5

Which of the following sentences is most correct?

A. Divided attention involves splitting attention across two or more stimuli at **one time**.

B. Divided attention involves splitting attention across two or more stimuli at **separate times**.

Question 6

Which of the following sentences is most correct?

A. Sustained attention involves focusing on one stimulus or task across **many hours**.

B. Sustained attention involves focusing on one stimulus or task across **a prolonged, continuous period of time**.

Problem solving

The following assessment skills type reflects the study design assessment dot point:

- problem-solving involving psychological concepts, skills and/or issues

Use the following information to answer questions 7–10.

> Matthew is in his exam period and is trying to study a lot as he is really eager to do his best. He has his geography exam in one week and decided to prioritise his time and focus only on that one exam. He devises a study plan for the week that involves the following activities:
>
> - he will study from 7am until 12pm every weekday, with no break.
> - after 12pm, if he gets bored he has allowed himself to put on his favourite TV show in the background while he tries to memorise his notes in an attempt to make the task more enjoyable.
> - at the start and end of the day, he will focus on revising the hardest concepts and use the middle of the day to revise topics he finds relatively easy.
>
> Matthew wants to ensure he is using his time as effectively as possible and feels this plan is the best way of achieving that goal. A few days in he starts to doubt his study plan as he is not feeling as efficient as he would have liked to.

Question 7

Using your knowledge of sustained attention, what is a likely outcome of Matthew studying from 7am to 12pm with no break?

A. By 11am, Matthew will not be experiencing any fatigue, and will not find it hard to focus as humans can typically sustain attention for long periods of time without a performance decrease.

B. Matthew will be able to study effectively and get a lot done, with no performance decrease across the time period.

C. By 10am, Matthew will be attentionally fatigued, and may find it rather hard to focus.

D. Matthew will be fatigued after a couple of hours, but he will not be any more distractible than if he studied in short bursts.

Question 8

In the context of fatigue and sustained attention, which of the following alternate study methods do you believe could make Matthew's plan more effective? **(Select all that apply)**

I. Rather than studying uninterrupted from 7am until 12pm, Matthew studies in a series of short 10–15 minute bursts, where he knows he can use as much focus as possible and then take a five-minute break in between. He does this for an hour and then takes a larger break.

II. Rather than studying a consistent and manageable amount every day of the week, Matthew should study from 7am until 5pm with as few breaks as possible, and then take two days to relax for his efforts.

III. Matthew should not revise the harder concepts at the end of the day, and instead go through them at the start of the day only, when he is less fatigued.

Question 9

Which of the following suggestions may be **most** effective if Matthew wishes to watch his favourite TV show to reward himself for studying?

A. Matthew could turn down the volume on the TV so it is a less salient and attention-grabbing external stimulus, allowing him to effectively divide his attention to finish his study and TV show as efficiently as possible.

B. Matthew could break up boring study topics with allocated TV breaks in between blocks of study, therefore using selective attention rather than divided attention as geography study is a complex activity.

C. Under the predictive principle of attentional allocation, he should put on an episode he has seen many times as this will not be a new source of information. The TV show will therefore unconsciously not be deemed as important as his study which is a less familiar source of information.

Question 10

By Friday, Matthew is feeling extremely bored and no longer wants to study, which makes it harder for him to concentrate his sustained attention on geography. Using your knowledge of sustained attention, which method is most likely to keep Matthew engaged? Select the idea that appears most accurate and effective.

A. As sustained attention is easier in challenging yet interesting situations, Matthew could try to turn his study into a game with a friend. This could involve keeping score of how many questions out of 15 they each get correct, and then trying to beat each other's score each time.

B. It is easier for Matthew to avoid distractions when he has been studying for very long periods as he will be 'in the zone'. Therefore Matthew should keep trying to stay engaged and refocus his attention until he reaches the zone every day and no longer has to try as hard to sustain attention.

C. As sustained attention is the easiest in intellectually easy situations, Matthew could interweave harder questions with questions on the easier geography topics to keep him engaged and feeling confident.

Exam-style

Remember and understand

Question 11   (1 MARK)

Which of the following is the most correct order for the process of sustained attention?

A. Releasing attention, selecting attention, capturing attention.

B. Focusing attention on the stimuli, releasing attention, maintaining attention.

C. Focusing attention on the stimuli, maintaining attention, releasing attention.

D. Maintaining attention, releasing attention, capturing attention.

Question 12   (1 MARK)

Which of the following is **not** a role of attention?

A. Focusing our limited brain resources on the most important stimuli.

B. Processing all incoming information from our environment.

C. Being able to finish a task that we have started.

D. Processing internal and external stimuli.

Question 13   (1 MARK)

Which of the following is **not** an example of divided attention?

A. Completing a spot the difference where you are comparing two different pictures.

B. Painting a picture of a flower for an art project.

C. Driving whilst listening to music.

D. Going on a run whilst talking to a friend on the phone.

Question 14   (1 MARK)

Provide one benefit of divided attention for processing information.

Question 15   (1 MARK)

Why can attention not be sustained for an unlimited amount of time?

Question 16   (2 MARKS)

What is the difference between selective attention and sustained attention?

Question 17   (2 MARKS)

Provide an example of a task where divided attention is inevitable and describe how this could have negative implications for the performance of that task.

Apply and analyse

Use the following information to answer questions 18 and 19.

Sarah has been diagnosed with attention deficit hyperactivity disorder (ADHD). Initially, she was prompted to talk to her GP as she found that she was far more distractible in class than many of her peers and struggled to sustain attention. Sarah particularly struggled to maintain focus in class for longer than 10–15 seconds without her mind wandering elsewhere to daydream. Additionally, Sarah finds it difficult to focus on both texting on her phone and holding a conversation with a friend. Despite this, she generally finds it easier to focus on conversations with friends as to her they are more meaningful and important.

Question 18 (1 MARK)

Sarah's inability to hold a conversation with a friend while simultaneously texting on her phone displays a limitation of which type of attention?

A. Selective attention.

B. Sustained attention.

C. Divided attention.

D. Focused attention.

Question 19 (7 MARKS)

Sarah finds it easier to focus on a conversation with a friend, but when Sarah's friend suddenly texts her some new and unexpected information, her attention shifts to her phone and away from the conversation.

a. Identify the relevant principle of attentional allocation that would direct Sarah's selective attention to the conversation, and justify your response. (2 MARKS)

b. Identify and explain which principle of attentional allocation would be most relevant when she is distracted by new information in the text message. (2 MARKS)

c. Sarah's friends say that she is a bad friend because she always attempts to multitask by doing another task when they are talking to her. With reference to the effect of multitasking on performance, explain why Sarah might be able to easily multitask when engaging in a conversation with her friends while she is walking, but not while she is writing an essay. (3 MARKS)

Question 20 (3 MARKS)

Caitlin is a netball player and always maintains a high level of focus when she plays. Suggest the role of sustained attention during the process of Caitlin scoring a goal, and justify why she would find it easier to sustain attention during this process, with reference to distraction.

Questions from multiple lessons

Question 21 (3 MARKS)

Charlie is a vegetarian and believes that eating meat is bad for his health. Whenever he notices information about the nutritional benefits of eating meat, he chooses to ignore it and does not pay it any attention. Conversely, when Charlie sees information on the unhealthy attributes of meat, he focuses his attention and reads all about it.

a. What kind of cognitive bias is Charlie displaying through only attending to information that agrees with his belief that meat is unhealthy? (1 MARK)

b. Explain the role of selective attention in maintaining Charlie's cognitive bias. (2 MARKS)

8A	8B	8C	8D

2.2.2.1
Perception
- **2.2.2.1.1** Visual perception
- **2.2.2.1.2** Gustatory perception

2.2.2.2
Types of perceptual processing
- **2.2.2.2.1** Bottom-up processing
- **2.2.2.2.2** Top-down processing
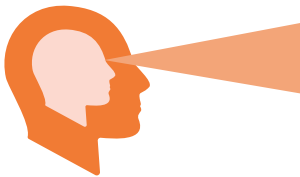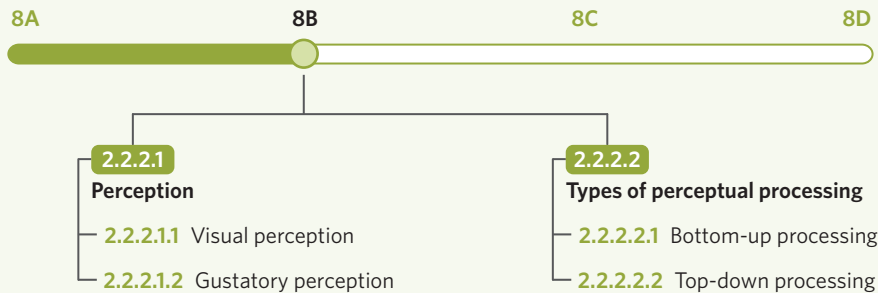
When you walk into a supermarket, what grabs your attention? Perhaps, it is the chocolate aisle because you feel like enjoying something sweet. It could be the children running around playing tag, reminding you that it is your little cousin's birthday. Maybe it is the pop song playing over the loudspeaker. All of these examples demonstrate the psychological process of perception. In this lesson, you will be introduced to perception, the factors that guide perception, and the types of processes informing perception.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

Perception 2.2.2.1

Information from our internal and external worlds is constantly flooding our senses, but we will only become aware of some of this information. In this section of the lesson, you will learn about how we use perception to process the sensory stimuli received during sensation. You will also learn about how specific stimuli are processed through visual perception and/or gustatory perception.

Theory details

Sensation

We must have a way of processing and understanding the various forms of sensory stimuli in order to perceive the world around us. **Sensory stimuli** are the raw pieces of information that are detected by the five senses. **Sensation** refers to the process of receiving and detecting raw sensory stimuli via sensory organs and sending this information to the brain. Sensory data is received, converted into a neural impulse, and then this impulse is sent to the area of the brain that is responsible for processing that specific sensory information. Even once sensation is complete, and raw sensory information has been sent as a neural impulse to the brain, the individual is still not consciously aware of what their senses have detected.

Perception

Once sensation is complete, the brain engages in processing to make sense of what was received; this is called perception. **Perception** refers to the process of selecting, organising, and interpreting sensory information. Although the processes within perception can occur automatically and unconsciously, perception allows sensory information to enter one's conscious awareness so that it can be understood. The process of perception can be broken down into three stages, which are outlined in table 1.

KEY TERMS

Sensory stimuli the raw pieces of information that are detected by the five senses

Sensation the process of receiving and detecting raw sensory stimuli via sensory organs and sending this information to the brain

Perception the process of selecting, organising, and interpreting sensory information

Table 1 The three processes of perception

Stage of perception	How does it work?	Example
1. **Selection:** the process of attending to certain sensory stimuli, or features of certain stimuli, and excluding others.	• During sensation, sensory organs have sent the brain more messages about various stimuli than we can reasonably pay attention to. As a result, not all stimuli that are presented to the brain after sensation continue through the process of perception. • Selection allows the brain to attend to just a few features of sensory stimuli at a time. • Selection can occur consciously or unconsciously.	• Conscious selection: actively choosing to block out distracting stimuli, such as background noise, to concentrate on one stimulus, such as a conversation. • Unconscious selection: only attending to the features of a stimulus that are the most **salient**, meaning they are distinctive, prominent, or important (e.g. an image's bold lines or sharp edges).
2. **Organisation:** the process of regrouping selected features of sensory stimuli in order for them to be cohesively arranged	• Involves arranging the selected stimuli or features into a coherent pattern to then interpret and make sense of them. • Once organised, stimuli is in a more digestible form that allows the recognition of patterns or categories in interpretation.	• The lines and shapes that make up a smiley face are grouped together through organisation so that they can be interpreted as a whole. This allows these lines and shapes to be perceived collectively and form a smiley face.
3. **Interpretation:** the process of understanding and assigning meaning to sensory information in order to understand it.	• During interpretation, an individual can begin to make sense of the information that they have registered and gain conscious awareness of the stimuli. • Interpretation relies on a range of factors, including our memory of past events, our current mood, concentration levels, expectations, and beliefs.	• When somebody sees an unfamiliar flashing light at night, the way they interpret it might be dependent on factors such as our memory (do we know a house nearby that the light could have come from?), their mood (are we scared or relaxed?), and their expectations (would we expect someone to be using a light at this time?).

As you have learnt, the lobes of the cerebral cortex have their own specialised functions. Multiple lobes and their sensory areas can be involved in the interpretation of one sensory stimulus, with the type of stimulus determining where the sensory message is sent for processing. For example, when watching a musical, visual information about what the performers are doing on stage will be processed in the occipital lobe, while auditory information about the sounds of the music will be processed in the temporal lobe.

Figure 1 outlines the sequence of events in which a sensory stimulus is processed to be consciously perceived.
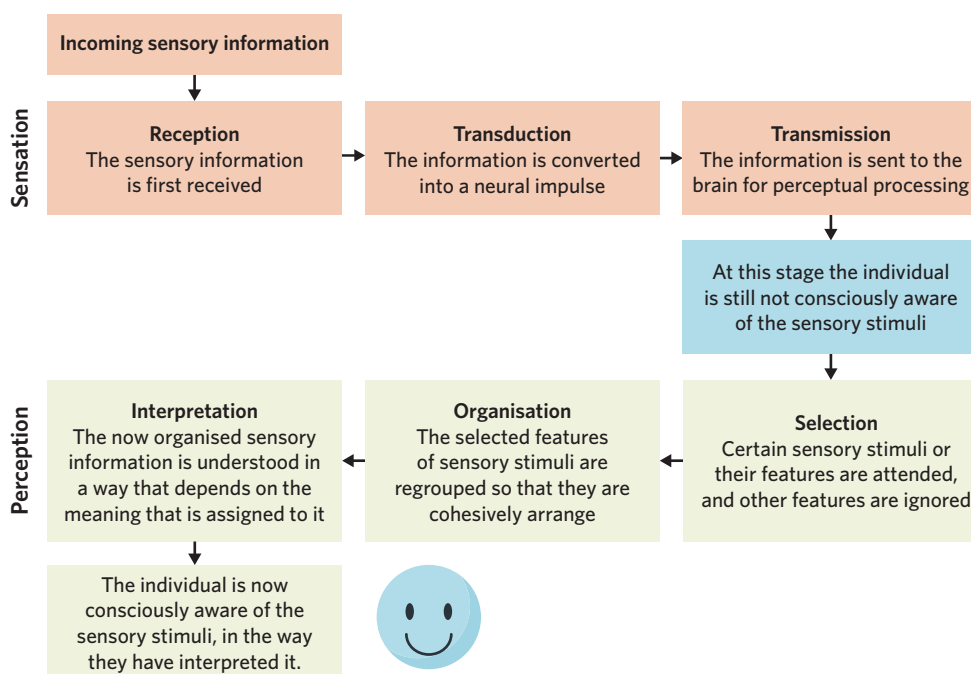
Selection the process of attending to certain sensory stimuli, or features of certain stimuli and excluding others

Salient distinctive, prominent, or important

Organisation (in relation to perception) the process of regrouping selected features of sensory stimuli in order to form a cohesive and meaningful understanding

Interpretation (in relation to perception) the process of understanding and assigning meaning to sensory information

Figure 1 How sensory stimuli are processed through sensation and perception

In the next section of the lesson, you will explore the perception of two specific types of sensory stimuli. These two types of perception are:

• visual perception
• gustatory perception.

Visual perception 2.2.2.1.1

Visual sensory system
the network that is involved in the sensation and perception of visual stimuli, including the eyes, the brain, and the neural pathways connecting them

Visual perception
the process of becoming consciously aware of visual stimuli as a result of the interactions between the visual sensory system, and the individual's internal and external environments

The **visual sensory system** refers to the network that is involved in the sensation and perception of visual stimuli, including the eyes, the brain, and the neural pathways connecting them. **Visual perception** is the process of becoming consciously aware of visual stimuli as a result of the interactions between the visual sensory system, and the individual's internal and external environments.

Sensation in vision

The primary sensory organ for detecting visual stimuli is the eye. Visual sensation occurs in the following way:

• The sensory stimulus received by visual sensory receptors is the external stimuli of light, which comes in the form of electromagnetic energy (as waves across space).
• Light travels through the eye and is projected onto the retina, located at the back of the eye, where the sensory receptors for light information are located.
• Here, the light energy is converted into a neural message and sent to the brain.

Perception in vision

As the type of information being processed is visual, it is sent to the primary visual cortex in the occipital lobe. At this point, the visual information has undergone processing through sensation and is ready to be processed through perception. This sequence is summarised in figure 2.

| Visual stimuli is received by the eye in the form of light | Light is received by receptors in the retina (a layer at the back of the eye) | The light energy is converted into a neural message and sent to the brain | Visual information is received in the occipital lobe of the brain, ready for the process of perception to commence. |

The visual sensory system
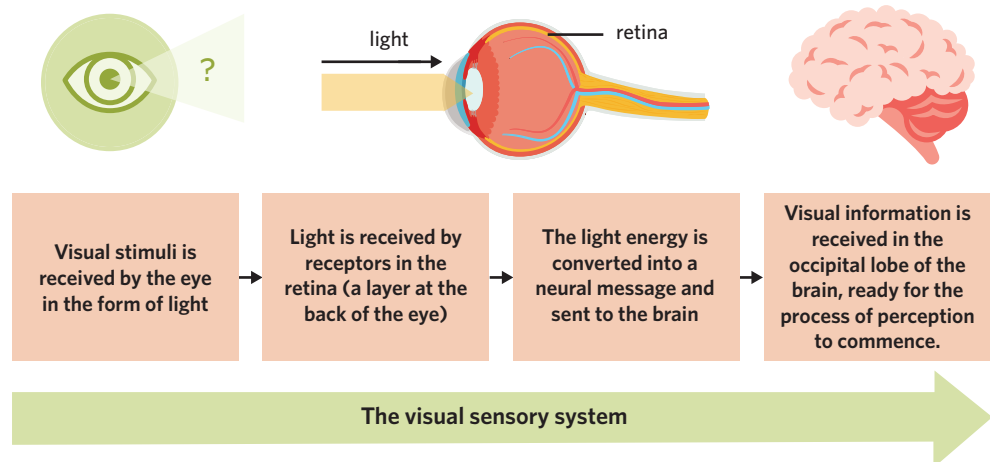
Figure 2 The visual sensory system is involved in the sensation of visual stimuli. Once sensation is complete, perception begins in the brain

You may also recall that the three stages of perception involve selection, organisation and interpretation. The details of these and how they apply to visual perception are outlined in table 2.

Table 2 The processes of perception in vision

Stages of visual perception	
1. **Selection**	Because so many visual signals are sent to the brain, only some are selected for later processing. The visual selection process is performed by **feature detectors**, which are specialised cells along the neural pathway connecting to, and found within, the primary visual cortex. These cells select and filter out visual signals according to certain perceptually important features. For example, some feature detectors respond only to certain colours, shapes, lines, and edges. By only selecting what is salient, significant to our context, or important to our survival (evolutionarily speaking), it helps to reduce how much will need to be interpreted by the brain.
2. **Organisation**	Once selected, the visual signals are regrouped and organised to reflect an image of reality. There are certain guiding principles that help us to group these fragmented signals together again, including our visual perception principles (including Gestalt principles). These will be explored in lesson 8C.
3. **Interpretation**	The primary visual cortex works with other brain areas to interpret and make sense of the visual stimuli. Our interpretation of images is influenced by many things, such as our motives and beliefs, and what is called our perceptual set. These will also be explored in more detail in lesson 8C.

Gustatory perception 2.2.2.1.2

The sensory activity responsible for the ability to taste is **gustatory perception**, the process of becoming consciously aware of flavour. As you have learnt, prior to perception, sensation must occur.

Sensation in taste

The primary sensory organ for detecting gustatory information is our tongue. Gustatory sensation occurs in the following way:

- Before sensation begins, when chewing, our saliva breaks down our food into tastants. **Tastants** are the sensory stimuli received in the form of chemical molecules that can be tasted.
- The tastants are first received by our **gustatory receptors**, the sensory receptors for taste, located within our taste buds. **Taste buds** are clusters of gustatory receptors. There are typically around 100 gustatory receptors in a taste bud. They are mostly located on our tongue, in a large number of papillae, which are the small bumps on the tongue. There are also taste buds located around the mouth, throat, and back of the nose.
- The tastants are converted into a form that is sent to the brain as a neural impulse, and information about the type and intensity of the flavour makes its way to the **primary gustatory cortex**, a sensory area in the parietal lobe responsible for receiving and processing tastes.

The five basic flavours we can sense

As mentioned, each tastant contains different information regarding its flavour. For example, if a tastant is 'sweet', our gustatory receptors will detect this flavour information. Next, neural messages coding for 'sweet' will be generated and then transmitted to the brain for processing. But what are the different flavours?

While we can recall being able to tell apart many different flavours, for example, a pizza compared to a pasta dish, these are dependent on the five basic flavours we can detect: sweet, salty, sour, bitter, and umami (also known as savoury). Examples of foods and their different flavours are provided in table 3.

Feature detectors specialised cells along the neural pathway connecting to, and found within, the primary visual cortex

USEFUL TIP

Portrait mode

Figure 3 Portrait mode

Just like the special portrait mode you may have on your phone which detects and focuses on faces and blurs out the background, our feature detector cells recognise certain features of our environment, such as edges or the direction of lines.

Gustatory perception the process of becoming consciously aware of flavour

Tastants the sensory stimuli received in the form of chemical molecules that can be tasted

Gustatory receptors the sensory receptors for taste

Taste buds clusters of gustatory receptors

Primary gustatory cortex a sensory area in the parietal lobe responsible for receiving and processing tastes

USEFUL TIP

The words taste perception and gustatory perception are relatively interchangeable. If you come across either of these words in a question or scenario, the concepts of taste, flavours, and gustatory perception are likely to be relevant and applicable.

Table 3 The five basic flavours we can sense and examples of foods

Flavour	Examples
Sweet	Cherries, sugar
Salty	Chips, popcorn
Sour	Lemons, limes
Bitter	Coffee, rocket, kale
Umami	Meat, tomatoes, soy sauce

A common misconception regarding these flavours is that we have specific areas of the tongue that are most sensitive to them. You might have seen some 'tongue maps', indicating that for example, one area of the tongue perceives 'bitter' and another 'sweet'. These tongue maps are largely inaccurate: instead of specific areas of the tongue being sensitive to certain flavours, there are taste buds dispersed all around the mouth that can be more sensitive to certain flavours than others. This is depicted in figure 4.
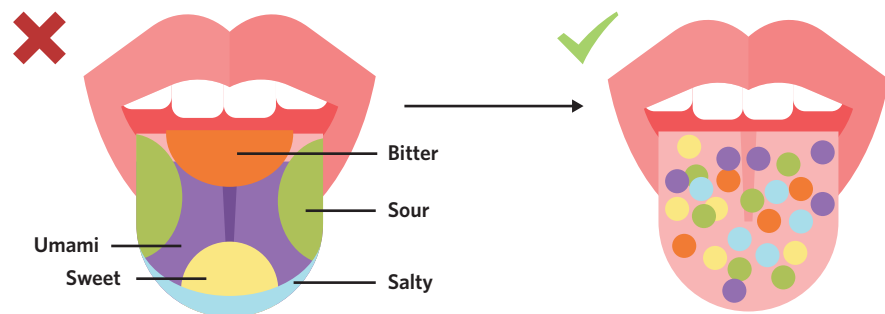
Figure 4 You may have heard of the 'tongue map', but in reality, the arrangement of different flavour-specific taste buds is not restricted to certain tongue regions and is more evenly dispersed

WANT TO KNOW MORE?

Have you ever smelt cheese so strong that you could practically taste it? Well, it turns out, you were indeed tasting it!

This is because our sense of smell, or olfaction, is also involved in our sense of taste. Have you noticed that when you are sick and blocked up, or you block your nose, you can taste food less? Our sense of smell contributes to our sense of flavour both before we eat and during eating.

The smell of food and drink is especially involved in the pleasurable aspects of flavour, such as the perception of more complex and interesting flavours (Spence, 2015).

Figure 5 Our sense of flavour is largely informed by our sense of smell

Perception in taste

The process of gustatory perception is less understood than it is in visual perception. There is still a lack of consensus as to how exactly the processes within perception occur, as well as how we differentiate very complex and nuanced tastes. For example, how do we know that the thing we just put in our mouth, with our eyes closed, is a strawberry dipped in lightly salted caramel chocolate? We can only partially answer this question.

What we do know is that there are five basic flavours that our receptors detect and then send to the brain during sensation. Perception, then, is about making sense of this pre-coded information: the brain begins by detecting the fundamental flavour information and then processes it further by using information from the other senses, such as the texture, colour, and smell of the food.

In lesson 4C, you learnt about the regions of the cerebral cortex. As with vision, perception occurs in the cerebral cortex. Gustatory perception occurs mostly in the primary gustatory cortex, but the interpretation of the flavour of food can involve some teamwork with other brain areas:

- Because our sensation of flavour also relies on our sense of smell, our gustatory cortex may work with our olfactory cortex (the area of the brain that processes smell) to make sense of the flavour we are experiencing.
- Interestingly, our perception of flavour is also influenced by our perception of food texture, and so the gustatory cortex also integrates information from the somatosensory cortex which allows us to perceive information about the feel and texture of food.

These processes are summarised in figure 6.
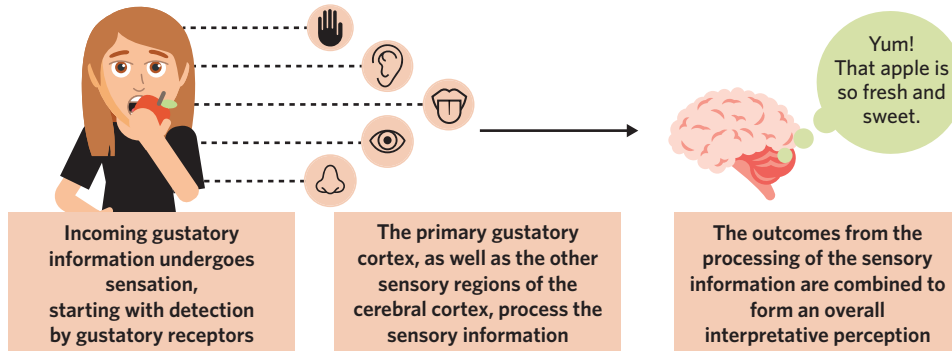
Figure 6 The sequence of processing incoming gustatory information

Taste is not solely responsible for determining how much we like what we are consuming. As with vision, our perception of flavour can be influenced by a multitude of different factors. These will be introduced in lesson 8D.

Types of perceptual processing 2.2.2.2

When you watch a movie, sometimes you learn about the storyline as it unfolds, taking it in as it comes. Other times, you can guess what will happen next based upon similar movies you have seen before, especially if the movie is rather cliché and predictable. These two ways of perceiving a movie's plot line reflect the two types of processing involved in perception: bottom-up and top-down processing.

Theory details

There are two key processes involved in the perception of sensory stimuli that are understood as opposing each other; bottom-up processing and top-down processing.

Bottom-up processing 2.2.2.2.1

During **bottom-up processing**, perception is determined by incoming sensory information moving from specific stimulus information to general knowledge. In this type of processing, perceptual interpretations are entirely based on the way information is organised. Bottom-up processing is typically used when the information is unfamiliar or highly complex. The entry-level sensory data is processed in real-time and moves up to the brain to be perceived and understood.

An example of bottom-up processing can be seen when reading an unfamiliar text, or even when learning a second language. In the example of language acquisition, each letter would be interpreted to form individual words. These words would then be combined to create whole sentences, which then enables the individual to read a piece of writing. This movement from the specific information of letters to the general meaning of whole pieces of text exemplifies bottom-up processing.

Top-down processing 2.2.2.2.2

As discussed, bottom-up processing requires no previous knowledge of the sensory stimuli. By contrast, during **top-down processing** perception is driven by prior knowledge and expectations, moving from general knowledge to specific stimulus information. This type of processing is typically used when what is being perceived is relatively familiar and less complex.

Bottom-up processing perception is determined by incoming sensory information, moving from specific stimulus information to general knowledge

Top-down processing perception is driven by prior knowledge and expectations, moving from general knowledge to specific stimulus information

If something is expected to appear a specific way or mean something in particular, it is more likely to be perceived in alignment with this expectation. For example, imagine an individual spills water on their favourite childhood novel, and the ink smears on several pages. Despite the words being smudged, they can still interpret the sentences and storyline because the novel's familiarity informs their expectations of what is being said.

Our existing **schemas** are the collection of basic knowledge about a concept or stimuli. All of the different schemas are stored in an individual's memory within their various categories, so that incoming sensory stimuli are perceived as fitting within that category. Additionally, schemas can be updated when new information is learnt about that category.

For example, a child with a pet dog may develop a schema for a dog as being an animal that is furry, with four legs and a long tail. If they visit the zoo, through top-down processing they might then perceive that all animals with fur, long legs and a tail are dogs. However, if this child is then taught in school that there are other types of animals with these qualities that are not dogs, their schema will be updated. Figure 7 depicts an ambiguous image that demonstrates that humans have a universal schema for faces. This schema consists of the belief that faces are oval structures with two eyes, a nose, and a mouth. Therefore humans may perceive faces in objects that fulfil some of these qualities even if they are not actually there as a result of top-down processing.

Figure 8 outlines the sequences involved in bottom-up and top-down processing alongside each other, allowing them to be compared.

Schemas the collection of basic knowledge about a concept or stimuli

Image: Creativa Images/Shutterstock.com

Figure 7 Whether we interpret this image as an assortment of fruits and vegetables or a face depends on our schemas
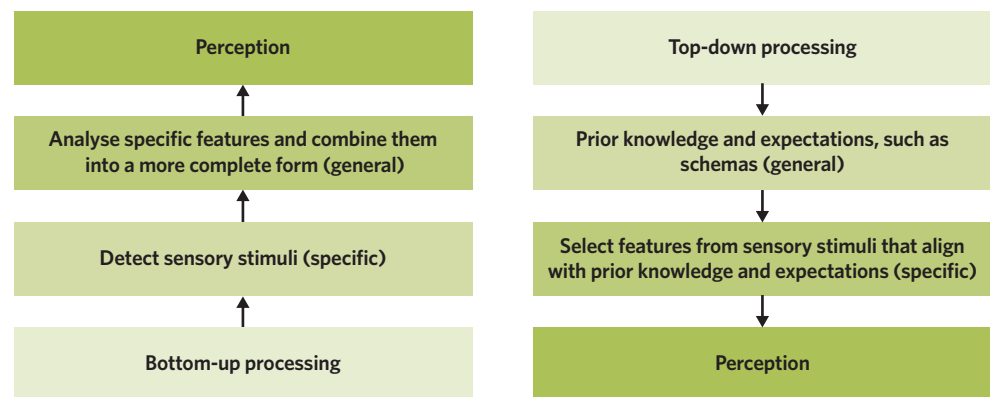
Figure 8 How bottom-up and top-down processing help to inform the perception of sensory stimuli

While they work together to influence our perception of our environment as a whole, bottom-up and top-down processing are relatively distinct from each other. The key differences between these types of processing are outlined in table 4.

Table 4 The difference between bottom-up and top-down processing

	Bottom-up processing	Top-down processing
Explanation	Builds knowledge in real-time as the stimuli are received, allowing each of the elements to be perceived	Uses prior knowledge to fit the incoming stimuli with similar previous understandings
Direction of processing	Specific to general	General to specific
Type of information processed	Unfamiliar and complex	Familiar and less complex

You can understand these two types of processing more clearly by considering how they both contribute to one scenario. We will consider this through the example of stubbing your toe on a piece of furniture:

- Sensory receptors in your toe (sensation) would communicate the message of pain to your brain for processing (perception).
- The sending of this message is a form of bottom-up processing, as the sensory information of the pain lets you know that you have stubbed your toe.
- Following this, you may be extra cautious when walking around that piece of furniture because you remember how terrible it was when you stubbed your toe on it, causing you to perceive it as a hazard. This is an example of top-down processing.

This example is illustrated in figure 9.

Bottom-up processing	Top-down processing
The sensation of pain is sent via receptors to the person's brain causing them to understand they have stubbed their toe and say 'ouch!'	Past experience with the pain of previously stubbing their toe causes the person to understand they should avoid the corners of that couch in the future, through perceiving it as more hazardous.

Figure 9 The application of bottom-up and top-down processing systems as demonstrated by the scenario of stubbing your toe

Due to perception resting on an individual's unique interpretation, there are many factors that can influence the way a stimulus is perceived using top-down processing. There are also factors that influence bottom-up processing, however, these are more specific to the type of stimulus being processed. You will learn more about these factors in lessons 8C and 8D.

Theory summary

In this lesson, you learnt about the processes of sensation and perception. You also learnt about visual perception and gustatory perception, as two different ways of processing visual or taste-related sensory stimuli respectively. Two different types of perceptual processing, bottom-up processing and top-down processing, were introduced. The process of responding to sensory stimuli through sensation and perception is summarised in figure 10.
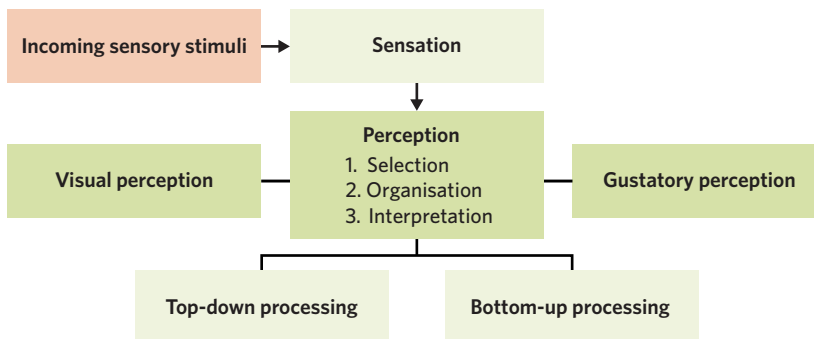
Figure 10 Summary of how incoming sensory stimuli is processed through sensation and perception

8B Questions

Theory review

Question 1

Sensation comes after the process of perception.

A. True.

B. False.

Question 2

Which of the following are stages of perception? **(Select all that apply)**

I. Sensation.

II. Selection.

III. Interpretation.

IV. Transmission.

V. Organisation.

Question 3

Stimuli that are more _____ to the current context are more likely to be _____.

Which of the following best fills in the blanks?

A. salient, perceived

B. beneficial, enjoyed

Question 4

By the time visual information has reached the primary visual cortex, it has undergone sensation
and perception.

A. True.

B. False.

Question 5

Gustatory perception depends only upon the sense of taste and does not involve any other senses, such as our
sense of smell.

A. True.

B. False.

Question 6

Tongue maps accurately outline where most of the taste buds for each of the five basic types of flavours are.
For example, bitter tastes are processed mainly at the back of the tongue.

A. True.

B. False.

Question 7

Top-down processing is used for familiar sensory stimuli, while bottom-up processing is used for unfamiliar
sensory stimuli.

A. True.

B. False.

Question 8

Which of the following factors do **not** directly influence bottom-up processing?

A. Prior knowledge of a stimulus' meaning.

B. The way stimuli are organised.

C. The colour and shape of the stimulus.

Assessment skills

Perfect your phrasing

Question 9

Which of the following sentences is most correct?

A. Sensory stimuli refers to **raw** information that is detected by our five senses.

B. Sensory stimuli refers to **unfiltered** information that is detected by our five senses.

Question 10

Which of the following sentences is most correct?

A. The primary gustatory cortex is a sensory area in the parietal lobe responsible for receiving and **processing** tastes.

B. The primary gustatory cortex is a sensory area in the parietal lobe responsible for receiving and **understanding** tastes.

Question 11

Which of the following sentences is most correct?

A. In bottom-up processing, **new** sensory stimuli determine perception, moving from specific **object** information to general knowledge.

B. In bottom-up processing, **incoming** sensory stimuli determine perception, moving from specific **stimulus** information to general knowledge.

Text analysis

The following assessment skills type reflects the study design assessment type:

- analysis and evaluation of an experiment or case study

Use the following information to answer questions 12–15.

> Lilli has recently entered into a romantic relationship with Harry. However, they find that they have been clashing a lot in the past few months because Harry thinks Lilli can be rude.
>
> Harry seems to think Lilli is often bored or upset with him, as at times she speaks abruptly to him, and has a blank expression when he tells her about his day. Lilli does not know why Harry always thinks she is grumpy or disinterested because she recollects feeling happy and engaged when they are in each other's company.

Question 12

'Harry thinks Lilli can be rude' due to her observable reactions to him. This is an example of

A. top-down processing, as Harry uses his expectations of how he thinks Lilli should engage with him to inform his perceptions.

B. bottom-up processing, as Harry uses real-time sensory information, such as Lilli's facial expressions, to perceive that she does not react very nicely.

Question 13

The sensory information about the appearance of Lilli's face as 'disinterested' would be largely processed in Harry's

A. primary gustatory cortex.

B. primary visual cortex.

C. primary olfactory cortex.

Question 14

Harry focusing attention on Lilli's negative facial expressions is a function of which aspect of perception?

A. Selection through his feature detectors, as Lilli's facial expressions may be considered perceptually important.

B. Organisation through feature detectors, as Lilli's facial expressions may be considered perceptually important.

C. Interpretation, as Lilli's facial expressions may be considered rude as a result of the way Harry attends to them.

D. Bottom-up processing, as Harry's prior expectations for facial expressions guide his attention.

Question 15

Lilli and Harry are likely to have different schemas for facial expressions and tone of voice.

A. True.

B. False.

Exam-style

Remember and understand

Question 16   (1 MARK)

During perception, sensory information undergoes

A. reception, transduction, and then transmission.

B. reception, transmission, and then transduction.

C. organisation, interpretation, and then selection.

D. selection, organisation, and then interpretation.

Question 17   (1 MARK)

Which of the following sentences best describes when we gain conscious awareness of sensory information during the process of perception?

A. Before perception, we have conscious awareness of sensory information, and after perception, we remain consciously aware of the sensory information.

B. Before perception, we do not have conscious awareness of the sensory information, and after perception, we are still not consciously aware of the sensory information.

C. Before perception we do not have conscious awareness of sensory information, whereas after perception we are consciously aware of the sensory information.

D. None of these options are accurate.

Question 18 (1 MARK)

Which of the following most accurately describes features of visual and gustatory perception?

	Visual perception	Gustatory perception
A.	The primary sensory organ is the eye. In the retina, light is first received by specialised light receptors.	The primary sensory organ is the tongue. Here tastants are first received by gustatory receptors.
B.	The primary sensory organ is the eye. In the retina, light is first received by specialised light receptors.	The primary sensory organ is the tongue. Here tastants are first received by taste buds.
C.	The primary sensory organ is the retina. In the eye, light is first received by specialised light receptors.	The primary sensory organ is the brain. Here tastants are first received by specialised neurons.
D.	The primary sensory organ is the retina. In the eye, light is first received by specialised light receptors	The primary sensory organ is the brain. Here tastants are first received by gustatory receptors.

Question 19 (1 MARK)

Which one of the following examples is **not** an example of bottom-up processing?

A. You feel your stomach rumble and see your co-workers grabbing their lunch boxes, and use these cues to perceive that it is lunchtime.

B. You think your favourite artist sounds better when they play live than when you listen to their recorded songs.

C. You receive a letter asking you to save the date for a wedding and perceive it as a wedding invitation.

D. You understand what a paragraph of text means after you finish reading it.

Question 20 (1 MARK)

Which of the following is **not** accurate in describing bottom-up and top-down processing?

	Bottom-up processing	Top-down processing
A.	Knowledge is built in real-time.	Prior knowledge is primarily used.
B.	Stimuli tend to be unfamiliar.	Stimuli tend to be familiar.
C.	Processing is general to specific.	Processing is specific to general.
D.	Sensory stimuli are perceived by breaking up their basic elements.	Sensory stimuli are perceived by aligning them with similar previous stimuli.

Question 21 (1 MARK)

Daniel was stung by a bee for the first time, leading him to find out he is allergic to bee stings. How might Daniel's process of perception for bees be carried out in the future?

A. During selection, visual stimuli that resemble a bee may be chosen by Daniel's feature detectors, as this information is highly relevant to him through top-down processing.

B. During interpretation, visual stimuli that resemble a bee may be chosen by Daniel's feature detectors, as this information is highly relevant to him through top-down processing.

C. During selection, visual stimuli that resemble a bee may be regrouped in a way that allows Daniel to perceive them as such.

D. During organisation, the visual stimuli of any bug will be regrouped so that they resemble a bee through bottom-up processing.

Apply and analyse

Question 22   (2 MARKS)

Describe the relationship between bottom-up processing and the interpretation stage of perception.

Question 23   (4 MARKS)

Eman loves to ride his bike along the river to get into town, whether during the day or at night. When he rides his bike during the day, he finds himself picking up on the colours of the leaves and the speed at which the river is gushing downstream. When he rides at night, he finds himself being aware of other stimuli, such as the sounds of owls and crickets, as well as being extra careful when he knows he is coming up to a familiar turn that is harder to see.

When Eman rides his bike at night compared to during the day, it is evident that different sensory stimuli are perceived as more contextually relevant.

a.   Identify which of the three stages of perception is responsible for this difference. (1 MARK)

b.   Suggest why Eman does not perceive all of the incoming sensory stimuli in his environment when riding his bike. (1 MARK)

c.   Provide an example of bottom-up processing, and an example of top-down processing, that is evident through Eman's perceptions when he is riding along the river. (2 MARKS)

Questions from multiple lessons

Question 24   (1 MARK)

The uncertainty principle of selective attention would be most involved in the

A.   interpretation stage of perception.

B.   organisation stage of perception.

C.   transduction stage of perception.

D.   selection stage of perception.

8C Visual perception

8A   8B   **8C**   8D

2.2.3.1
Factors influencing visual perception
- **2.2.3.1.1** Biological factors
- **2.2.3.1.2** Psychological factors
- **2.2.3.1.3** Social factors
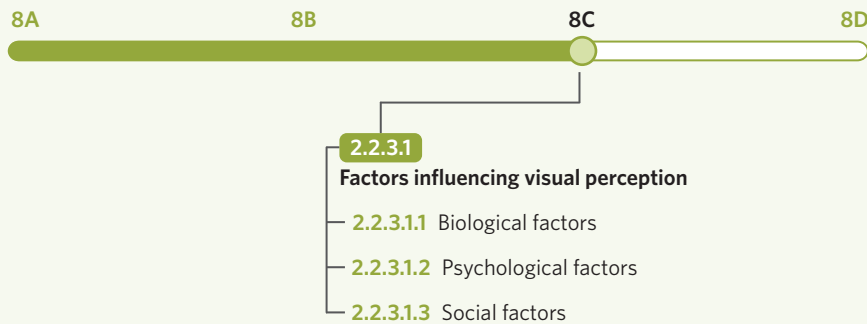
Have you and a friend ever disagreed on whether something was a certain colour? Or whether someone you had just spoken to looked angry or calm? How can we explain instances where two people looking at the same situation walk away and describe two different scenes? Whilst humans have many perceptual similarities, there are also many factors that lead us to perceive the same stimuli very differently. In this lesson, you will be introduced to some of the factors that can influence the way visual information is processed.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

Factors influencing visual perception 2.2.3.1

Our visual sensory system is subject to a range of influences that can determine what we see and attend to, and how we come to understand this information. In this lesson, you will learn about the influence of biological factors (biological depth cues), psychological factors (visual perception principles and perceptual set) and social factors (cultural norms), that influence visual perception.

Theory details

The process of visual perception can be understood as being largely influenced by biological, psychological, and/or social factors. The visual sensory system is inherently biological through its use of physiological components, such as the eyes and brain. However visual perception also interacts with psychological and social processes.

It is important to note that while these three factors can be distinguished and explored separately from each other, they are highly interrelated. It is both the individual contributions of, and the interactions between, these factors that lead us to see something one way, while somebody else sees it another way.

LESSON LINK

In lesson **2B The biopsychosocial model**, you were introduced to biological, psychological, and social factors that form the biopsychosocial model. As a way of understanding the human experience, this three-part model can be applied to visual perception.

Biological factors   Psychological factors   Social factors
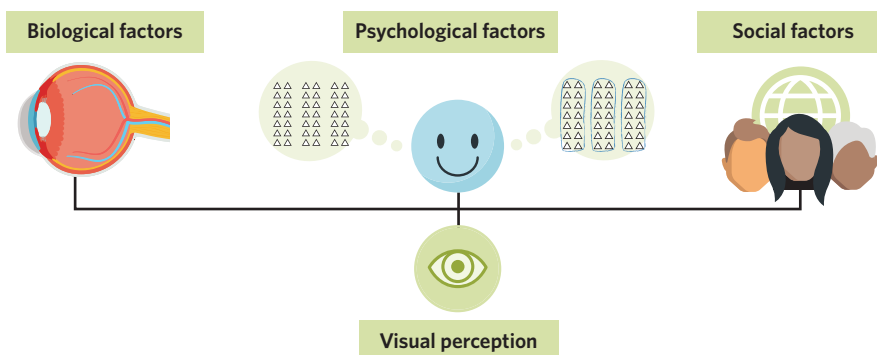
Visual perception

Figure 1 The factors that can influence visual perception can be understood as biological, psychological, or social

Biological factors 2.2.3.1.1

Biological factors are internal genetic and/or physiologically based factors. As such, we can consider some biological factors that influence the way we perceive visual stimuli. Many biological factors are largely based on the eyes as visual sensory organs.

The eye

The eye is the sensory organ responsible for receiving light to enable vision. Light first enters the eye through the pupil, and is focused through the lens onto the retina (which is at the back of the eye). The retina contains **photoreceptors**, the sensory receptors of the eye which receive light and convert this sensory information into a form that can be sent to the brain. These structures are shown in figure 2.
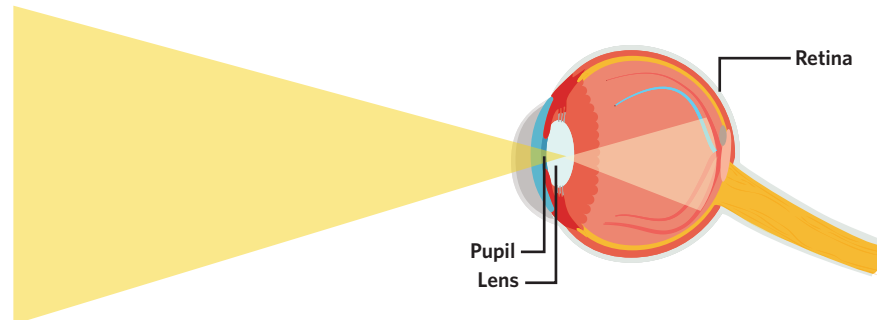
Figure 2 How light travels through the eye before being sent to the brain

There are two types of photoreceptors located in the retina:

- **rods**, which are photoreceptors that allow someone to see in low levels of light.
- **cones**, which are photoreceptors that allow someone to see colour and fine details in well-lit conditions.

Figure 3 depicts these photoreceptors, as well as their characteristic shapes as described by their names. Rods are shaped like long cylinders and cones are exactly that, cone-shaped. Table 1 compares rods and cones, as while they are both photoreceptors they have distinct roles when processing light information.
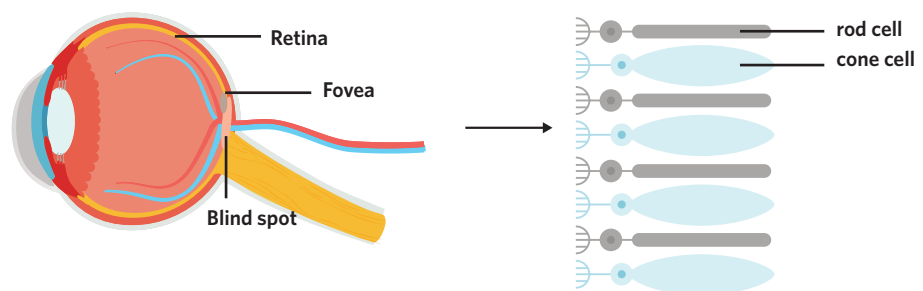
Figure 3 The two types of photoreceptors, rods and cones, are located at the back of the retina

Table 1 Rods and cones have different roles in visual perception

	Rods	**Cones**
Responds well to/in...	Low levels of light	Bright light conditions
Specialised for...	Night vision	Day vision
Do they process colour vision?	No	Yes
Do they process fine detail?	No	Yes (responsible for high **visual acuity**, referring to the level of detail and clarity of vision)
Location in the eye	Mostly on the outer edges of the retina	Most densely concentrated in the centre of the retina (the fovea)
Do they allow peripheral vision?	Yes	No

KEY TERMS

Biological factors internal genetic and/or physiologically based factors

Photoreceptors the sensory receptors of the eye which receive light and convert this sensory information into a form that can be sent to the brain

Rods photoreceptors that allow someone to see in low levels of light

Cones photoreceptors that allow someone to see colour and fine details in well-lit conditions

Visual acuity the level of detail and clarity of vision

Colour blindness as a biological abnormality

Our photoreceptors heavily influence how we perceive visual stimuli. For example, how do you know that your understanding of the colour red is the same as everybody else's?

The truth is, it may not be. Colour blindness affects approximately 1 in 12 men (8% of the population) and 1 in 200 women (0.5% of the population) and results from defective photoreceptors, usually from a genetic cause.

There are three main types of colour blindness:

- red-green colour blindness, where people struggle to tell the difference between the colours red and green.
- blue-yellow colour blindness, where people struggle to tell the difference between the colours blue and green, and yellow and red.
- complete colour blindness (also known as monochromacy), where people struggle to differentiate between colours at all, and often struggle to see clearly.

Within each of the three types of colour blindness, there are further subdivisions, varying in the severity of the condition as well as the types of colours that someone is unable to differentiate. For this lesson, however, you only need to be aware of the three broad types of colour blindness. The way these three types can affect visual perception is depicted in figure 4.

| Normal vision | Complete colour blindness | Red-green colour blindness | Blue-yellow colour blindness |
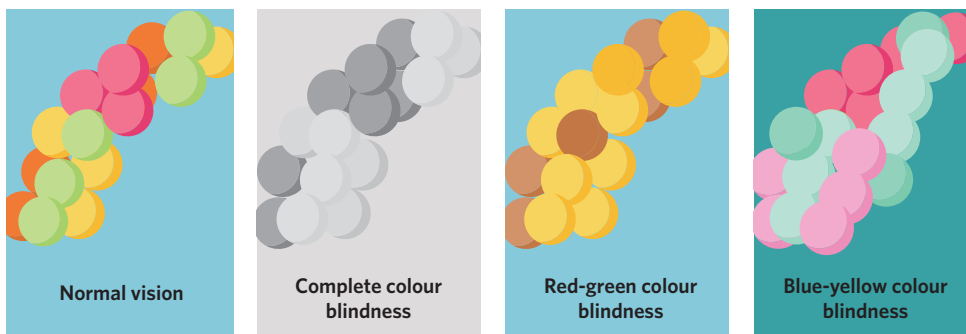
Figure 4 A colourful array of balloons is viewed differently by people with different types of colour blindness

Short-sightedness as a biological abnormality

The eye naturally bends or 'refracts' to focus light onto the retina. Abnormalities in the shape of the cornea (and lens) in the eyes can lead to refractory errors **refractory errors**, which are defects in the eye causing it not to bend light as it is supposed to, resulting in reduced visual acuity. One particular type of refractory error is **myopia**, which refers to short-sightedness due to the focal point of one or both eyes being located in front of, instead of on, the retina. A comparison between the eye of someone with myopia, and a normal eye, is shown in figure 5.

Myopia causes far-away objects to appear blurry, however objects that are closer to the viewer can still be viewed clearly. This biological abnormality can typically be corrected using prescription glasses or contact lenses. Figure 6 demonstrates how someone with myopia may perceive a visual scene compared to someone with normal vision.

Refractory errors defects in the eye causing it not to bend light as it is supposed to, resulting in reduced visual acuity

Myopia short-sightedness due to the focal point of one or both eyes being located in front of, instead of on, the retina

Image: sruilk/Shutterstock.com

Figure 6 Perceiving a visual scene with myopia or short-sightedness (left) or normal vision (right)

Normal vision

The focal point of one or both eyes being located in front of, instead of on, the retina.

Myopia

Figure 5 A myopic versus normal eye

Depth cues visual clues that allow someone to perceive the world in three dimensions and judge the distance and position of objects in their environment

Monocular depth cues rely on visual information perceived by just one eye

Binocular depth cues rely on visual information from both eyes
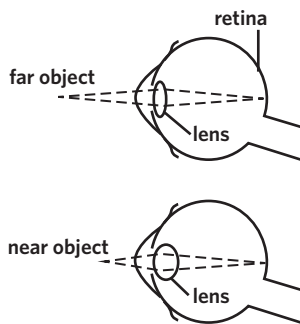
Depth cues

How do we see the world as three-dimensional and not flat like a cartoon? **Depth cues** are visual clues that allow someone to perceive the world in three dimensions and judge the distance and position of objects in their environment. Because the visual stimulus is first received in a two-dimensional way, seeing depth requires the application of these depth cues during perception.

There are two overarching categories of depth cues, depending on whether one eye or both eyes are required for the judgement. These are:

- **monocular depth cues**, which rely on visual information perceived by just one eye.
- **binocular depth cues**, which rely on visual information from both eyes.

These depth cues can be divided into further subdivisions.

Monocular depth cues

Monocular depth cues make sense of the inputs received in one eye, and this can be done in multiple different ways. The three types of monocular depth cues are:
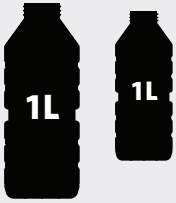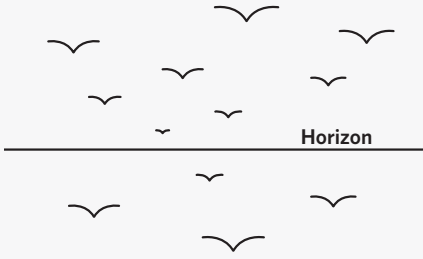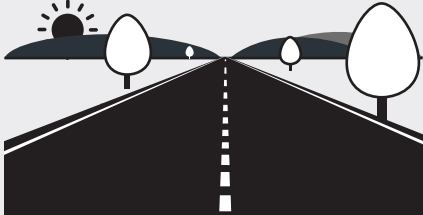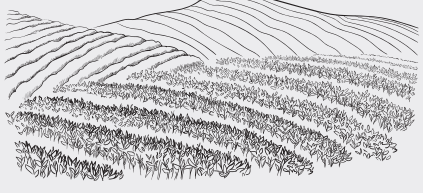
- accommodation
- motion parallax
- pictorial depth cues.

Their descriptions are outlined in table 1.

Table 2 The three types of monocular depth cues

Type of monocular depth cue	Description
Accommodation	Accommodation involves our lens bulging and flattening according to how far away an object is. In this way, our eye is accommodating for distance. In order to fit a large, close-up object in our visual field, our lens need to bulge. However, when focusing on an object in the distance, our lens flattens. Our brain receives this information about our lens changing, and uses this information to infer the distance of an object from the eye. The appearance of this monocular depth cue is depicted in figure 7.
Motion parallax	Motion parallax uses our perception of movement to help us gauge how far away things are. This phenomenon helps us to measure depth: the less objects in our visual field move, the further they are away from us. For example, imagine you are in a car: the objects in the distance seem to stay still, yet the objects closest to us that we are passing with speed seem to move by very quickly. This difference in perception is due to motion parallax recognising that things closer to us move by quicker than things that are further away.
Pictorial depth cues	Pictorial depth cues are named as such because they are often manipulated by artists when painting or drawing a picture. Pictorial depth cues include: • relative size • height in visual field • linear perspective • interposition (also known as overlap) • texture gradient. It is worth noting that, although they are depth cues, pictorial depth cues are considered psychological (cognitive) factors. Though they rely on the eye, their effects are interpreted within the brain. These different types of pictorial depth cues are described in more detail in table 2.

Figure 7 Accommodation involves the bulging or flattening of the eye depending on the distance of objects in our visual field

Table 3 Monocular pictorial depth cues

	Description	Example
Relative size	The relative size of objects to one another in our visual field helps us to judge distance. If two similar objects cast different sized images on the retina, the object that casts the larger image is perceived to be closer, and the one that cast a smaller image is perceived to be further away. For example, If we have two one-litre water bottles, and one appears smaller, we know that this smaller one is further away thanks to our knowledge of their true size and our ability to compare them relative to one another.	**Figure 8** Because of relative size, we see the bigger water bottle as being closer
Height in visual field	In our visual field, the closer objects are to the horizon line, the further away they appear. This means that their height in the visual field helps us to determine their distance.	**Figure 9** The birds closest to the horizon appear furthest away
Linear perspective	Parallel lines within our visual field appear to gradually converge (come together) as they recede into the distance, but are separated up close. In this way, our perspective of lines (linear perspective) allows us to gauge distance.	**Figure 10** We perceive the point at which the road lines converge to be the furthest away
Interposition (also known as overlap)	When objects overlap with one another, we perceive the object that is covered by another as being further away than the one obscuring it.	**Figure 11** We perceive the buildings overlapping other buildings as being closer
Texture gradient	We rely on the use of texture to judge how far away objects are. The closer we are, the greater the detail of texture we can see. When looking at a field up close, we can make out the individual blades of grass or flowers. The further away the field is, the less details we can see.	Image: Vectorgoods studio/Shutterstock.com **Figure 12** The more texture detail we can make out, the closer elements appear to be

Binocular depth cues

Unlike monocular depth cues, binocular depth cues rely on the use of both eyes. There are two types of binocular depth cues:

- retinal disparity
- convergence.

These are outlined in table 4.

Table 4 The two types of binocular depth cues

Type of binocular depth cue	Description
Retinal disparity	When you hold a finger in front of your face and close one eye and then the other, you notice that your finger appears to move slightly as the angle from which we see it changes. Because our eyes are about seven centimetres apart, their different perspectives produce slightly different images from their different angles.
	Retinal disparity refers to the difference, or 'disparity', between the different images received on the retina of either eye. The closer an object is, the greater the disparity.
	Using the same finger test, try now closing one eye and then comparing it to where your finger is placed when you have both eyes open. You'll notice a slight angle change, but the difference is not as big when comparing the difference between one eye being shut to the other eye.
	When we perceive an object, we use a combination of images from either eye. That is why the position of our finger with both eyes open appears as a 'midway point' between the image projected onto our left eye and the image projected onto our right eye. When combining these two images, our brain takes note of the two different images and uses these to create a combined, cohesive image. This allows us to accurately see the distance of objects in space.
Convergence	Look at your finger again when right up close to your face. Can you feel your eye muscles straining? When we look at things up close, our eyes turn inwards and our eye muscles are strained. This turning inwards is called convergence, and the strain that it produces signals to our brain that something is up close.
	Again, this is a binocular depth cue because it relies on both eyes for our brain to be able to gauge the distance of objects.

Psychological factors
internal factors pertaining to an individual's mental processes, including their cognition, affect, thoughts, beliefs, and attitudes

Visual perception principles guiding rules that apply to incoming visual signals and determine how they are organised and interpreted

Gestalt principles
the guiding rules of perception that allow us to organise and group separate visual stimuli into a meaningful whole

USEFUL TIP

Gestalt is the German word for shape or form. Gestalt psychologists operate with the principle that 'the whole is greater than the sum of its parts'. In other words, when we perceive, we can create a cohesive and meaningful whole from the individual fragmented pieces that are our visual signals.

Psychological factors 2.2.3.1.2

Psychological factors are internal factors pertaining to an individual's mental processes, including their cognition, affect, thoughts, beliefs, and attitudes. Particularly relevant to visual perception is the mental process of cognition, due to the act of mentally processing the incoming stimuli.

In lesson 8B, you were introduced to the stages of perception; selection, organisation, and interpretation. In this section of the lesson, we will explore visual perception principles and perceptual set, as two types of psychological factors that influence our visual perception by acting on the stages of perception.

Visual perception principles

Visual perception principles are guiding rules that apply to incoming visual signals and determine how they are organised and interpreted. They help make sense of our reality by combining visual signals in a systematic way. We usually apply these principles automatically and unconsciously, however, we can make ourselves consciously aware of them.

In this lesson, we will explore two types of visual perception principles:

• Gestalt principles
• Visual constancies.

Gestalt principles refer to the guiding rules of perception that allow us to organise and group separate visual stimuli into a meaningful whole. They utilise processes of pattern and object recognition. For example, rather than seeing the individual lines of pages piled on top of each other, we are able to perceive a book. There are several Gestalt principles, and some of these are explored in table 5.

The Gestalt principles include:

• the proximity principle
• the similarity principle
• the figure-ground principle
• the closure principle.

We tend to apply these principles immediately and automatically, so much so that you might not have realised that your brain performs these operations during the organisation and interpretation stages of visual perception.

Table 5 Gestalt principles and examples

	Without the principle	Rule	With principle applied
The proximity principle The proximity principle refers to our brain's tendency to group together items in an image based on their physical closeness to one another.	 **Figure 13** Without the proximity principle, an image like this is comprised of lots of ungrouped, individual triangles	Group together items that are physically close to one another.	 **Figure 14** When the proximity principle is applied, our brain sees columns of triangles because of their nearness to one another in lines
The similarity principle This principle reflects our brain's tendency to group together parts of an image that are similar in some way. Elements of an image can be similar in their size, shape, colour, position and so on.	 **Figure 15** Without the similarity principle, we would see an image of random black and white triangles	Group together figures that look similar or are related to one another.	 **Figure 16** Because of the similarity principle, we are able to see rows of black triangles and rows of white triangles. This is because we have grouped them based on their similarity of colour
The figure-ground principle This principle involves our brain's tendency to see some figures as being at the front of an image, i.e. the 'foreground', and others as falling back into the 'background'.	 **Figure 17** Without the use of figure-ground, we would see this as a 2D road sign comprising two colours that are equally positioned at the front of the image. However, as we tend to apply the figure-ground principle automatically, you might already see the bump sign as being in the foreground of the image. Can you unsee it?	Separate figures in an image by placing some in the foreground and some in the background.	 **Figure 18** Because of figure-ground, we tend to automatically see the bump symbol on this sign as being in the foreground of the image, and the yellow as being the background
The closure principle The closure principle refers to our brain's ability to mentally complete images that are otherwise incomplete.	 **Figure 19** Without the closure principle, we would perceive random shapes of black and not a soccer ball	Fill in the empty spaces or gaps of an incomplete picture to create a whole.	 **Figure 20** The closure principle allows us to mentally fill in the gaps of the image and perceive a whole soccer ball

This famous optical illusion draws upon one of the Gestalt principles for its effect. The way in which we apply the figure-ground principle determines what we see. If we bring the white to the foreground, we can see a vase. Alternatively, if we bring the black to the foreground, we can see two human profiles looking at each other. Which did you see in the foreground first?

A Gestalt switch is the name given to a sudden change in perception. Gestalt switches occur as a result of applying a Gestalt principle in one way and then suddenly applying it another way. This occurs here as we switch between seeing the vase and then seeing the faces.
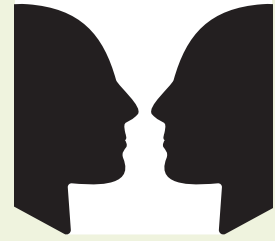
Figure 21 Rubin's vase

Visual constances refer to our ability to perceive visual objects as staying the same, even though they may appear to change or do change in our sensation. If we look at an object from another angle, position, or under different light conditions, we know that the object itself is not changing thanks to perception. Three visual constances that affect our interpretation of visual stimuli include:

- shape
- size
- brightness.

These three visual constances can be understood using the example of visually perceiving trees in a forest.

- When looking at a tree from a different angle, such as from directly below it, the tree may look different compared to when it is looked at from a higher viewing point. In this case, shape constancy helps us to realise that the shape has not actually changed, we are just perceiving the tree from a different angle.
- As you walk away from the forest, the trees take up a smaller proportion of the visual scene than they did previously. Our perception of size constancy allows us to perceive them as remaining their realistic size (but getting further away) rather than shrinking.
- If you are walking at night, despite the colours of the trees looking darker, you know that they have not actually changed colour, due to the brightness constancy.

Another example of size constancy is provided in figure 22. This particular example of a visual constancy relies on our knowledge that humans are unlikely to shrink or grow rapidly.

Perceptual set

In the previous lesson, you learnt that top-down processing is influenced by factors including our prior knowledge, expectations and experience. These factors all play a role in the development of our perceptual set. A **perceptual set** is a predisposition to perceive certain features of sensory stimuli and ignore other features that are deemed irrelevant. As you learnt in lesson 8B, schemas are the collection of basic knowledge about a concept or stimuli. As such, our perceptual set is guided by our pre-existing schemas.

> **Visual constancies** our ability to perceive visual objects as staying the same, even though they may appear to change or do change in our sensation

Figure 22 When someone is moving towards us we use size constancy to perceive them as coming closer or moving further away.

> **Perceptual set** a predisposition to perceive certain features of sensory stimuli and ignore other features that are deemed irrelevant

LESSON LINK

In lesson **8B Perception**, schemas were discussed as driving top-down processing. Our perceptual set also drives top-down processing. Figure 23 shows the relationship between an individual's perceptual set and their schemas.

| Schema | Schema | Schema | Schema | Schema | Schema | Schema | Schema |
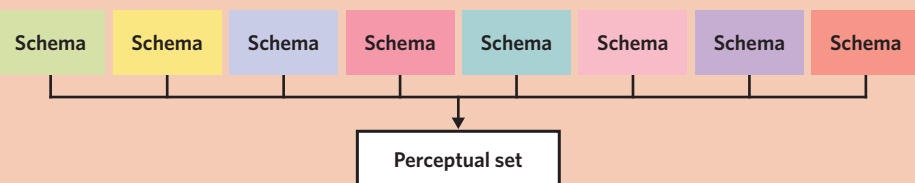
Perceptual set

Figure 23 A perceptual set includes the many schemas an individual may have, to form a holistic way of perceiving the world that is very specific to the individual

In lesson 8B, you were introduced to the processes of perception. Our perceptual set can affect our processes of visual perception, including:

- Selection. Our feature detectors may select or ignore certain visual stimuli according to our predispositions.
- Interpretation. We may interpret what we see in a certain way, especially when it is ambiguous. For example, if we are hungry and see an ambiguous brown object in the corner of our eye, we may have a greater readiness to interpret it as chocolate.

Who we are today depends on what we have previously experienced, and this concept extends directly to our perception through our perceptual set. Our **historical experiences** refer to our lived events from the past. They can lead to the belief that similar events will happen in the future. An individual perceives what they expect or want to perceive, either consciously or subconsciously, as their perceptual set is influenced by their historical experiences. This can particularly influence visual perception when the way something appears to be is affected by prior knowledge of similar or related stimuli.

Historical experiences
lived events from the past

LESSON LINK

In lesson **6B Cognitive dissonance and cognitive biases**, you were introduced to confirmation bias as the tendency to search for and accept information that supports our prior beliefs or behaviours and ignore contradictory information. Our perceptual set facilitates this cognitive bias, as we may be predisposed to perceive sensory information that confirms our prior beliefs.

For example, a sheep farmer will typically have a larger degree of historical experience and prior knowledge relating to lots of different sheep than someone who has not had any significant history with many sheep. As a result, the sheep farmer may visually perceive the difference between different sheep, or recognise them more easily than someone who has little experience with sheep. This influences their selection of relevant stimulus features during their visual perception of the animals.

PSYCHOLOGY EXPLORATION

Have you ever turned your head thinking that someone had called your name when really they were calling out a slightly different name? Does our perceptual set sometimes lead us to perceive words inaccurately? An early experiment by Siipola (1935) illustrated the perceptual set in action. They presented their participants with different versions of non-words, such as 'sael'. They found that participants who were told that they would be reading animal-related words were more likely to read 'sael' as 'seal', while those expecting to read boat-related words were more likely to read 'sael' as 'sail'. This shows how important our perceptual set is when we unconsciously perceive sensory stimuli.

Social factors 2.2.3.1.3

Social factors are external factors relating to an individual's interactions with others and their external environment, including their relationships and community involvement. In this section of the lesson, cultural norms will be explored as a social factor influencing visual perception.

Cultural norms

In many European countries, saying hello may involve a kiss on both cheeks, while in Japan people often greet each other with a bow. **Culture** outlines the customs, behaviour, and values of a particular group in society. It is a key influence on who we are. A **cultural norm** is a standard, value, or rule that outlines an appropriate behaviour or experience within a culture. Common cultural norms may involve language, food, style of education, religion, clothing, or social dynamics specific to a culture.

Our cultural background can shape our perceptual set, predisposing us to perceive visual stimuli in certain ways specific to our cultural context. People within the same culture may share certain predispositions to perceive certain sensory stimuli similarly through the lens of what is culturally normal.

Social factors external factors relating to an individual's interactions with others and their external environment, including their relationships and community involvement

Culture the customs, behaviours, and values of a particular group in society

Cultural norm a standard, value, or rule that outlines an appropriate behaviour or experience within a culture

For example, when comparing various cultures' ways of perceiving the world, some differential patterns of visual perception through the stage of selection can be observed. Research has shown that when visually perceiving a scene, East Asian individuals (such as those from Japan) are more likely to attend to the broad scene, and are more consciously aware of relationships and changes. Conversely, Western individuals (such as those from Australia) tended to attend to a specific salient object in the scene, such as one that is big, colourful, or fast-moving, and analyse this object's individual attributes (Nisbett & Miyamoto, 2005). We can therefore think of cultural norms like the lens of a pair of glasses, that frame our way of viewing the world. Figure 24 demonstrates how these research findings can be demonstrated using this analogy.

Figure 24 Different cultures may select different parts of a visual scene to perceive, based upon their cultural norms relating to visual perception

LESSON LINK

In lesson **8B Perception**, you learnt about the two types of perceptual processing; bottom-up and top-down.

Visual perception can be seen to operate through bottom-up processing when influenced by:

- biological factors. They typically involve processing stimuli based on analysing the way the eye(s) respond to light inputs in real-time, rather than involving interpretation based on previous knowledge.
- psychological factors. For example, perception using Gestalt principles starts from the bottom (using individual features to influence perception), and works its way up, being organised and combined until a complete image is perceived.

Visual perception can also be seen to operate through top-down processing that draws on our perceptual set when influenced by:

- psychological factors. For example, when visual perception is influenced by historical experiences.
- social factors. For example, our cultural norms and expectations can lead us to perceive what we see in a particular way.

It is important to note that these are not the only instances when these two types of processing may be evident in visual perception, as in real-life they can be hard to distinguish.

Theory summary

In this lesson, you learnt about the different types of biological, psychological, and social factors that influence visual perception. These are summarised in figure 25.

Visual perception
is influenced by...

Biological factors | Psychological factors | Social factors

Depth cues | Visual perception principles | Perceptual set | Cultural norms

Monocular
• Accommodation
• Motion parallax
• Pictorial depth cues

Gestalt principles
• Proximity
• Similarity
• Figure-ground
• Closure

Historical experiences

Binocular
• Retinal disparity
• Convergence

Visual constancies

Figure 25 Biological, psychological, and social factors that can influence visual perception

8C Questions

Theory review

Question 1

Visual perception is only influenced by a small and limited number of factors.

A. True.

B. False.

Question 2

Which of the following statements accurately describe visual perception?

A. Visual perception is a purely psychological process, as it involves the way we think about and mentally process visual stimuli.

B. Social factors are most important in determining our visual perception.

C. Biological, psychological, and social factors interact and influence each other to form a holistic understanding of a visual scene.

Question 3

Visual colour perception involves both rods and cones.

A. True.

B. False.

Question 4

Which of the following are psychological factors?

A. Binocular depth cues, cultural norms, and pictorial depth cues.

B. Visual constancies, monocular depth cues, and social norms.

C. Gestalt principles, visual perception principles, and perceptual set.

Question 5

Which of the following is true of visual perception principles? **(Select all that apply)**

I.   They are applied during sensation.

II. They are applied during perception.

III. They help us to create meaningful images.

IV. They are always applied consciously.

Question 6

Which of the following are not direct examples of cultural norms that can influence visual perception?
(Select all that apply)

I.   A tendency for one culture to visually perceive the bigger picture rather than individual features.

II. Thinking that your meal looks extra tasty because you are really hungry.

III. The types of clothes that are trendy.

IV. The colours that are described in language.

V.   Being scared of sausage dogs because you were bitten by one last week.

Assessment skills

Perfect your phrasing

Question 7

Which of the following sentences is most correct?

A.   Gestalt principles refer to the guiding **values** of perception that allow us to organise and group separate visual stimuli into a **conceptual whole**.

B.   Gestalt principles refer to the guiding **rules** of perception that allow us to organise and group separate visual stimuli into a **meaningful whole**.

Question 8

Which of the following sentences is most correct?

A.   Depth cues are visual **clues** that allow someone to perceive the world in three dimensions and judge the **distance** and position of **objects** in their environment.

B.   Depth cues are visual **guidelines** that allow someone to perceive the world in three dimensions and judge the **depth** and position of **images** in their environment.

Question 9

Which of the following sentences is most correct?

A.   Visual constancies refer to our **tendency** to perceive visual objects as **looking similar**, even though they may appear to change or do change in our sensation.

B.   Visual constancies refer to our **ability** to perceive visual objects as **staying the same**, even though they may appear to change or do change in our sensation.

Text analysis

The following assessment skills type reflects the study design assessment type:

- media analysis of one or more contemporary media texts

Use the following information to answer questions 10 and 11.

Florida man gets bitten in the leg after mistaking seven-foot alligator for a friendly dog

A man living in Florida was on a stroll and stopped to look at what he thought was a dog on a leash outside of the Water Springs Motel in the middle of the night. It was not until he got closer that he realised the 'dog' was actually a seven-foot alligator.

Spotting the man as well, the alligator sped towards him, biting him in the leg and holding the man in the strong grip of its jaw. Luckily, there was a deputy nearby who raced to the scene, jumping on the alligator's back. The man was rushed to a Florida hospital, where his injuries were confirmed to be non-life-threatening.

(Dimuro, 2022)

Question 10

The man mistaking the large alligator for a dog best demonstrates which of the following psychological factors?

A. Visual constancies, as despite the image the man's retina received increasing in size as he walked towards the alligator, he still perceived it as the size of a dog.

B. The proximity Gestalt principle, as he may have just passed a dog and as the alligator was close by, he was prompted to group the two stimuli together.

C. The similarity Gestalt principle, as he perceived the alligator similarly to a dog.

D. Historical experience, as he may have been predisposed to perceive the alligator as a dog, due to his expectation for a dog to be at that location based on seeing them there in the past.

Question 11

How might cultural norms have facilitated the man's faulty perception of the alligator as a dog?

A. The man might have previously seen a dog there, leading him to expect to see the same situation again based on his historical experiences.

B. Having a pet dog might be very common amongst people in the Florida region the man is from, increasing his expectations to see a dog on his walk.

C. The man might have been in a good mood, influencing his perceptual set with a predisposition for visual stimuli that could further boost his mood. This prompted him to perceive the alligator as a dog because he loved dogs.

D. The man might have been told there was a dog outside, encouraging him to go on a walk to try and spot it. This could have prompted him to think the first animal he saw was a dog, due to his perceptual bias.

Exam-style

Remember and understand

Question 12 (1 MARK)

If someone has myopia, which of the following things would they be best able to see clearly without assistance?

A. The shape of a boat in the distance.

B. The colour of a helicopter flying in the sky.

C. A singer at a concert from a seat on the second story of a stadium.

D. A book they are reading in bed.

Question 13 (1 MARK)

Which of the following is an example of a binocular depth cue?

A. Linear perspective.

B. Retinal disparity.

C. Texture gradient.

D. Relative size.

Question 14   (1 MARK)

Gestalt principles are

A.   a type of biological factor that involves organising a group of visual stimuli into its separate parts.

B.   a type of biological factor that involves organising separate visual stimuli into one meaningful group.

C.   a type of psychological factor that involves organising a group of visual stimuli into its separate parts.

D.   a type of psychological factor that involves organising separate visual stimuli into one meaningful group.

Question 15   (1 MARK)

Which of the following examples accurately exemplify biological, psychological, and social factors of visual perception?

	Biological factor	**Psychological factor**	**Social factor**
A.	Language	Gestalt principles	Cultural principles
B.	Monocular depth cues	Visual dependencies	Visual perception principles
C.	Binocular depth cues	Gestalt principles	Cultural norms
D.	Visual constancies	Monocular depth cues	Cultural norms

Question 16   (1 MARK)

What is retinal disparity in visual perception?

Question 17   (2 MARKS)

Explain how one monocular depth cue allows a person to judge the depth of their environment.

Apply and analyse

Question 18   (1 MARK)

Johann is on a road trip around Tasmania that he has previously completed the year before, and is busting to go to the toilet. He remembers going to a public restroom along the route he is currently travelling. Driving along the road, Johann sees a sign that he reads as, 'TOILET', in front of a small house. Relieved, he pulls over and enters the house, only to find that he is at an open inspection for a rental. Heading back outside, Johann realised that he misread the sign which actually reads, 'TO LET'.

Which of the following best identifies a possible reason for Johann's mistaken perception?

A.	Perceptual set	Johann's historical experience meant that he had a predisposition to look out for toilet signs in that location.
B.	Perceptual set	Johann's cultural norms meant that he had a predisposition to look out for toilet signs in that location.
C.	Gestalt principle	The figure-ground principle meant that Johann saw the letters as standing out in the foreground against the background.
D.	Gestalt principle	The proximity principle meant that Johann filled in the space between the two words 'to' and 'let' with the letter 'i'.

Question 19   (4 MARKS)

Explain how two different Gestalt principles allow a person to make out the image on this road sign.

Evaluate

Question 20 (3 MARKS)

Maxine is cleaning out her fridge after just coming back from a long holiday and believes many of her food items will now be out of date. The first things she notices are a couple of jars that have spilled, leaving smelly mould around them. As Maxine continues to clean the fridge, she now is biassed to expect more spilled foods. Due to her early finding, her eyes now skim over many of the non-spilled packaged foods that are past their use-by date. After cleaning up all of the spills and mould, she feels satisfied with her visual search for out-of-date foods, closing the fridge and carrying on with the rest of her day.

In the context of this scenario, evaluate whether you think the influence of Maxine's perceptual set on her visual perception is more positive or negative.

Question 21 (5 MARKS)

Kody and Yuko are at an art gallery, and there is an exhibition displaying paintings of visual scenes across the world. Kody is from Australia, while Yuko grew up in Japan. After they leave the gallery, Kody says he loved the finer details of the artworks and thought the landmarks in the paintings stood out the most. In contrast, Yuko had a greater appreciation for the cohesiveness of the scenes as a whole and noticed less of the individual features of the paintings.

a. Which specific factor influencing visual perception is most relevant to Kody and Yuko's different perceptions of the visual paintings? (1 MARK)

b. Why is this factor not a good example of a biological factor influencing visual perception? (2 MARKS)

c. When walking around the gallery Kody and Yuko were able to look at the same paintings from different angles. When standing further away, despite the images of the paintings reflected on their eyes being smaller, they are still able to perceive their size as constant.
What are visual constancies, and how were they involved in Kody and Yuko's perceptions of the size of the paintings from different perspectives? (2 MARKS)

Questions from multiple lessons

Question 22 (1 MARK)

A difference between depth cues and perceptual set is that

A. depth cues influence selection whereas perceptual set influences organisation.

B. depth cues influence perception and rely on information sent from or about our eye/s, whereas perceptual set influences perception and relies more on psychological and social information.

C. depth cues rely on information from one eye, whereas perceptual set relies on information from both eyes.

D. both A and B.

Question 23 (3 MARKS)

While our perceptual set involves a predisposition to perceive certain features of sensory stimuli, attitudes can involve the positive or negative evaluation of that stimulus.

a. Attitudes are learnt through experience. Provide an example of a historical experience that can assist in the development of an attitude. (1 MARK)

b. Suggest how this attitude could guide an individual's perceptual set, and provide an example of how this perceptual set would influence their visual perception. (2 MARKS)

Question 24 (3 MARKS)

Rohan recently fell off of his bike and is now extra cautious when riding on dirt bike paths.

Explain how the selection stage of Rohan's visual perception might interact with his perceptual set, with reference to the influence of the incident of falling off of his bike.

8D Gustatory perception

8A	8B	8C	8D

2.2.3.2
Factors influencing gustatory perception
- **2.2.3.2.1** Biological factors
- **2.2.3.2.2** Psychological factors
- **2.2.3.2.3** Social factors

Evolutionarily speaking, our ability to distinguish poisonous from nutritious food relies on our sensory system of taste, or 'gustation'. In the past, if something was sweet and delicious, this meant that it was ripe and nutritious and that we should eat it! Whether evolutionarily based, or learnt across our lifetime, the way we perceive the taste of different foods can be influenced by various factors. In this lesson, you will learn about some of the factors that influence gustatory perception.

Factors influencing gustatory perception 2.2.3.2

Like visual perception, gustatory perception is influenced by various factors that can determine our judgement of foods or drinks. In this lesson, you will learn about the influence of biological factors (age and genetics), psychological factors (food packaging and appearance) and social factors (culture) on gustatory perception.

Theory details

Our experience of taste, known as gustatory perception, is subjective and is influenced by biological, psychological, and social factors. While these three types of factors can be explored separately, they are interconnected with our other senses, such as smell, to construct the overall experience of gustatory perception.
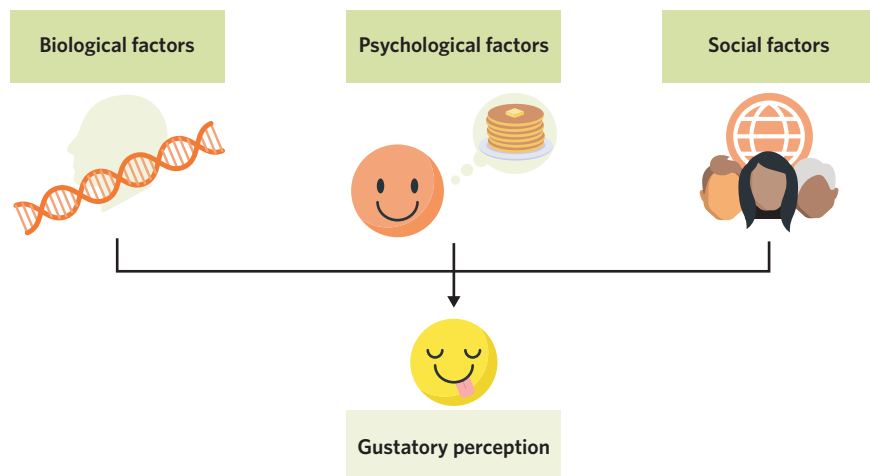
Figure 1 The factors that can influence gustatory perception can be categorised as biological, psychological, or social

Can the sounds of food change its flavour profile? Zampini and Spence (2004) investigated this in their study on whether the audible crunch of a Pringle could influence an individual's gustatory perception. Their participants sat in a soundproof booth in front of a microphone. As they bit into almost two hundred original-flavoured Pringles, the sound of their crunching into potato chips was looped in a pair of headphones they were wearing. Unbeknownst to the participants, the crunching noises were often distorted by the researchers to falsely sound more or less crunchy, varying from trial to trial. After about an hour, the researchers asked each participant whether they thought all of the chips were of the same quality (which they were).

Nearly every participant reported that the chips were different or that some had been left out in the open to go stale while others were fresh. When analysing the results, the researchers found that the Pringles that were bitten into while louder, higher-pitched crunches were played into the headphones, were found to be 15% fresher than the chips eaten whilst a softer sounding crunch was played through the headphones.

This was the first time the link between gustatory perception and sound was drawn in such a way and the paper eventually went on to award its authors the Ig Nobel Prize for Nutrition in 2008.

(Twilley, 2015)

Figure 2 The sounds of the pringles we are eating may influence our perception of the chip's flavour and quality

Biological factors 2.2.3.2.1

Gustatory perception is dependent on the parts of the body that detect and process flavours. Differences in an individual's physical ability to taste are considered to be biological factors. In this section of the lesson, these factors will be explored in the context of age and genetics.

Age

Our age has a biological influence on the way we perceive flavour. In lesson 8B, you learnt that sensory information is first detected through the gustatory receptors in our taste buds. Essentially, as we age, our sensation of flavours becomes less sensitive. Although more research is required, this is speculated to result from a variety of factors, including:

- a decline in the number of taste buds we have (thereby decreasing our number of gustatory receptors, which peak in childhood).
- the papillae on our tongue (containing the taste buds) become less sensitive with age. This prevents the chemicals in food responsible for taste from being detected by the gustatory receptors (in the taste buds). As a result, less 'tasting' of foods occurs due to lower reception at the taste buds (Pavlidis et al., 2013).
- poorer chewing tends to occur due to decreased oral health, as well as a decrease in saliva production with age. Both of these changes decrease the reception of flavours by gustatory receptors as they make it harder to break down and transport the chemicals in food (Boyce & Shone, 2006).
- a general age-related decline in the sensitivity of our other senses in addition to those in the mouth, such as smell or vision, which play a key role in how we taste.

Because we are receiving and transmitting less gustatory-based information during sensation, as a result, we are unable to perceive as much flavour. This may explain why many adults acquire the taste for things like coffee and dark chocolate, while children are mostly fussy about what they eat – the children can taste the bitterness more strongly!

Genetics

Do you like chilli or spicy food? How about coriander or Brussels sprouts?

Our genetic makeup inherited from our parents can also have a biological influence on the way we perceive flavour and our food preferences. Our genes can determine whether we are more or less sensitive to certain flavours, as well as our sensitivity to flavour more generally. Depending on a person's genes, they may be a supertaster, medium-taster, or non-taster (Bartoshuk, 1993). As with age, the amount of food we are able to sense during sensation is genetically determined and therefore influences the amount and types of flavours we are able to perceive. These genetic sensitivities can cause people to be:

- 'supertasters' who are highly sensitive to flavour, including bitterness and sweetness. They inherit more taste buds than the average person. You will learn more about supertasters in lesson 9B.

- 'medium-tasters' who make up the majority of the population. They have medium sensitivity to flavours.
- 'non-tasters' who have a lower sensitivity to flavour, inheriting fewer taste buds than the average person.

Aside from general sensitivity to flavour, research has also shown that our preference for certain food items can be genetic; for example, whether or not we think coriander is delicious or tastes like soap is often genetically determined (Mauer, 2011).

Psychological factors 2.2.3.2.2

In lesson 8C, you learnt that our **perceptual set** is a predisposition to perceive certain features of sensory stimuli and ignore other features that are deemed irrelevant. As such, our perceptual set can influence taste. Our historical experiences, mood, motivation, the appearance of food, and its present context can all psychologically cause us to expect a flavour to be a certain way. As a result, we become more likely to perceive flavour in line with these expectations, paying more attention to features that confirm our predictions.

Research has shown that superficial influences occurring prior to actually tasting the food can inform our perceptual set (Piqueras-Fiszman & Spence, 2015). These factors can include cues external to the product, such as the branding and labelling, as well as cues internal to the product, such as the smell of the food or even what it sounded like when preparing it (Spence, 2015).

This has an evolutionary function; our ability to judge food based on its appearance or our historical experiences allows us to safely navigate and ingest food from our environment. For example, the colour of food allows us to determine its ripeness.

Appearance

The appearance of our food can contribute to our expectations of its taste and, as a result, our enjoyment and perception of its flavour. This demonstrates that the primary gustatory cortex (the part of the brain where taste is processed) integrates information from the primary visual cortex (the part of the brain where visual information is processed) when perceiving flavour. Our judgement of flavour based on appearance also interacts with information from our historical experiences; for example, we know green lollies are often minty because of prior associations.

The colour and shape of foods can influence our perception of their flavour (Spence, 2015). Some of these effects are present in table 1.

Table 1 The influence of colour and shape on gustatory perception

	Effect on gustatory perception	Example
Colour	• When we artificially change the colour of a food or drink, a person's ability to accurately assess its flavour tends to be lowered (Zampani et al., 2007). • If a food's colour does not match our expectations then we may actually taste something wrong with it, even if this is not the case. Figure 3 provides an example of how we might have different perceptions of foods with colours that differ from our expectations.	• A green milkshake might predispose us to expect a minty flavour. When we taste it, even if it is just a plain old vanilla milkshake with green food colouring, we might falsely perceive the taste of mint. • If we eat a blue apple, we may expect to taste that it is out of date or different even if it is not.
Shape	• The shape of our food or drink, or the vessel it is in or on, may also influence our gustatory perception. • Round shapes tend to be associated with sweet flavours, while more angular and cornered shapes are associated with more bitter and savoury flavours (Spence & Ngo, 2012).	• Research has shown that the shape of a coffee glass can influence the way the coffee tastes to us, including its sweetness (Carvalho et al., 2018). • When the owner of Cadbury changed their chocolate blocks from being rectangularly segmented into curved segments, their customers criticised the chocolate for tasting 'too sugary', despite having identical ingredients (Spence, 2013).

KEY TERMS

Perceptual set
a predisposition to perceive certain features of sensory stimuli and ignore other features that are deemed irrelevant

Figure 3 Which of these steaks looks the tastiest? Perhaps the appearance of one of them, in particular, suggests it will taste out of date or strange. These assumptions are based on our perceptual set

Food packaging

As well as the colour of food packaging, other visual information on food packaging, such as brand names, brand logos, and images can all influence the way we perceive the flavour of food. Once again, this is due to their influence on our perceptual set.

Our familiarity with a brand and its associations may cause us to judge flavour in certain ways. For example, if we know the contents of a packet are from an expensive or trusted brand, this may lead us to judge the flavour as being of high quality. This is just one reason why knock-offs of certain products often try to mimic the packaging style of certain foods, as demonstrated in figure 4. You will learn more about this phenomenon in the next chapter.

Images on food packaging may also influence our flavour perception. If we see images of fresh produce or farming scenery on a juice bottle, we may associate the juice with freshness, and thereby perceive that it tastes delicious and healthy.

Figure 4 What brand does this bottle remind you of?

PSYCHOLOGY EXPLORATION

As you have learnt, your historical experiences with certain sensory stimuli can influence your perception of future stimuli. We can consider this in the context of the big yellow 'M' sign you always pass on a long road trip. If you started to picture McDonald's, then your perception has been directly influenced by your previous (and likely frequent) encounters with this fast-food chain. The strong perceptual expectations tied to experiencing McDonald's were demonstrated in a study by Robinson et al. (2007) with young children. They found that these young children enjoyed fries more when they were served in what they recognised as a McDonald's bag compared to a plain white bag, despite the fries being the same. This shows that what we expect to perceive can influence how we experience different sensory stimuli, to the point of making potentially inaccurate judgements or comparisons.
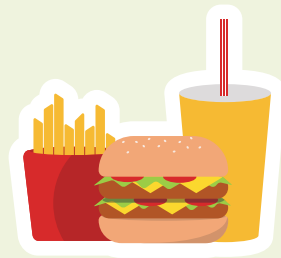
Social factors 2.2.3.2.3

Culture

In the previous lesson, you learnt about the influence of cultural norms on visual perception. Now focusing on gustatory perception, it can be understood that culture also acts as a social influence on our perception and enjoyment of flavour. The foods we have grown up with and have become accustomed to eating are likely to be tolerated and enjoyed more than foods that are foreign to us. This demonstrates that there are also social influences on our gustatory perception, and that flavour perception can be learnt through experience; we learn what we like to eat.

As you would have observed, ethnic cultures vary greatly in the kinds of foods they make and enjoy. For example, Thai and Indian foods are often spicy, whereas American foods are often quite sweet and salty. What is considered 'normal' to eat is also often culturally determined and the ethnic culture we have grown up in will generally have a great influence on the foods we like.

Besides ethnic culture, other cultural aspects can influence our flavour perception, such as values. If we have grown up in a culture that emphasises health and wellbeing, we may have a greater liking for the flavour of healthy foods like vegetables and legumes. On the other hand, if we have grown up not being taught about the importance of nutrition, this may mean that we don't enjoy the taste of healthy food. Research has actually shown that if the packaging or marketing of a food brand symbolises certain values, for example socialising and having fun, and these values are endorsed by an individual, the individual may be more likely to perceive the product as having a better taste and aroma (Allen et al., 2008; Paasovaara et al., 2012). Cultures tend to have norms that encourage particular values. As a result, a food's external value symbols, as expressed through packaging or advertising, can influence gustatory perception.

Another common example of cultural influences you might be familiar with is the perception of mock meats. As being vegetarian or vegan is on the rise, many supermarkets and restaurants are increasingly adding mock meat food items. Some people love these items and claim you cannot tell the difference between a good mock meat dish, and real meat, particularly those who identify as vegetarian or vegan. Others who taste these foods may be predisposed to expect the mock meat to taste 'funny', different, or worse, and therefore perceive it as such.

The influence of the values symbolised by certain brands or external packaging is identified as a social factor, whereas food packaging has been identified in this lesson as a psychological factor. Through analysing these two factors, it is clear they share a lot of similarities, such as shaping one's perceptual set. Therefore, we can see through this example how the different factors (whether biological, psychological, or social) can be interrelated. This also means the factors can be hard to distinguish at times.

When answering questions about the factors, make sure to justify which one you are talking about, by stating explicitly what kind of factor it is, and using language specific to that factor.
For example, for

- biological factors, you may justify your answer with reference to genetics or body parts or functions.
- psychological factors, you may justify your answer with reference to perceptual set and ways of thinking about the sensory information.
- social factors, you may justify your answer with reference to cultural influences.

LESSON LINK

In lesson **2A Nature versus nurture**, the differing contributions of one's genetics and environment on psychological development and mental wellbeing were explored. Similarly, we can look at the factors influencing gustatory perception in this way. The influence of genetics on gustatory perception can be seen as a source of 'nature', as someone's number of taste buds is genetically predetermined. Conversely, the influence of many psychological and social factors can be perceived as a source of nurture. This is because they are external and dependent on the environment and the kinds of experiences that occur throughout an individual's life.

Theory summary

In this lesson, you learnt that our ability to taste and judge the flavour of the food we eat is subject to many influences. More specifically, you learnt that our gustatory perception can be shaped by biological factors (influencing our taste buds and gustatory receptors), psychological factors (interacting with our perceptual set), and the social factor of culture. These factors are further summarised in figure 5.

Biological factors
- Age
- Genetics

Psychological factors
- Perceptual set
  - Influenced by factors, such as, the appearance and packaging of food

Social factors
- Culture

→ **Gustatory perception**
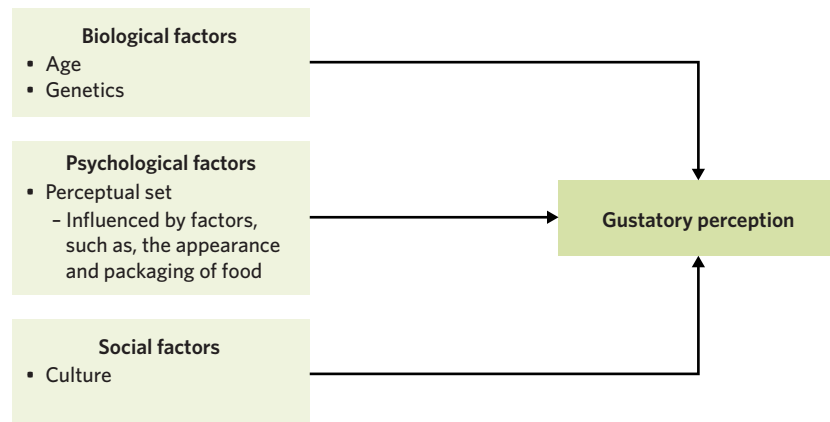
Figure 5 Biological, psychological, and social factors on gustatory perception

8D Questions

Question 1

Biological, psychological, and social factors all interact to influence gustatory perception.

A. True.

B. False.

Question 2

Which of the following factors has a biological influence on a person's taste perception?

A. The colour of food.

B. The number of sensory receptors on a person's tongue.

C. A person's familiarity with the brand of food they are consuming.

Question 3

Everyone has the same number of taste buds.

A. True.

B. False.

Question 4

Which of the following can contribute to a person's perceptual set regarding flavour? **(Select all that apply)**

I. The colour of food.

II. Historical experiences with food.

III. The packaging of food.

Question 5

Food packaging can influence gustatory perception due to its interactions with factors including _____ and _____.

Which of the following best fills in the blanks?

A. historical experience; genetics

B. perceptual set; cultural norms

Assessment skills

Perfect your phrasing

Question 6

Which of the following sentences is most correct?

A. Our perceptual set is a **predisposition** to perceive certain features of sensory stimuli and ignore other features of the stimulus **deemed irrelevant**.

B. Our perceptual set is a **tendency** to perceive certain features of sensory stimuli and ignore other features of the stimulus that are **less noticeable**.

Data analysis

The following assessment skills type reflects the study design assessment type:

- a data analysis of generated primary and/or collated secondary data

Use the following information to answer questions 7–10.

In a study by Zampini et al. (2007), a group of adults attempted to identify the flavour of a certain drink, where the different drinks they based their guesses on were various colours. Red, orange, or green food dye was added, as well as the existence of a colourless version of each flavour they were tested on.

The following data shows the results of the study, for the condition in which the participants were given a drink that was lime flavoured. The accuracy of the flavour guessed based on the colour of the drink the participants consumed is displayed in the graph.

Note that the word 'double' after the colour description means that the drink the participant consumed contained two times as much food colouring as the 'standard' colour description. This made the colour darker and more intense.

The percentage of correct participant responses based on colour of solution
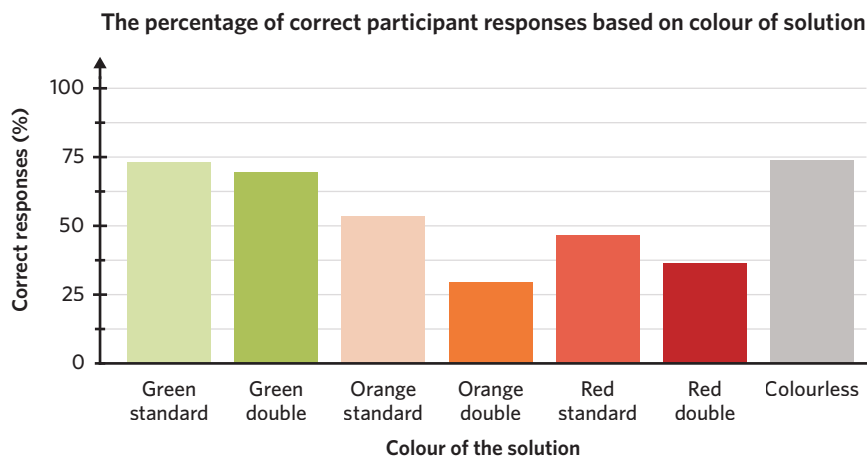
Question 7

What type of data has been provided by Zampini et al.'s (2007) study?

A. Qualitative.

B. Normally distributed.

C. Quantitative.

Question 8

The experimenters told the participants to ignore the colour of the drink when guessing its flavour.
Based on the data, do you believe the participants successfully followed this instruction?

A. Yes.

B. No.

C. The data gives no indication of whether or not they might've used the colour of the drink or not when guessing the flavour.

Question 9

What does the data for the colourless solution suggest about the effect of colour on gustatory perception?

A. Other sensory cues for different flavours influence gustatory perception, such as visual appearance, but when they are not present, the remaining available sensory information is still used to understand the flavours.

B. Colour has the strongest influence on gustatory perception beyond taste, so when it is not present, the participants were no longer subject to any perceptual biases.

Question 10

Which of the following factors are likely to have contributed to these results? **(Select all that apply)**

I. Psychological factors may have contributed to these results, as the participant's perceptual set for colours and the flavours they represent led them to perceive the drink's flavour incorrectly.

II. Biological factors may have contributed to these results, as the participants could have different amounts of taste buds, affecting their ability to detect minor changes in flavour.

III. Social factors may have contributed to these results, as it is a cultural norm for all lime-flavoured drinks to be orange.

IV. Biological factors may have contributed to these results, as the participants were all adults with weaker taste buds due to their age, affecting the accuracy of gustatory perception.

Exam-style

Remember and understand

Question 11 (1 MARK)

Psychological factors can influence gustatory perception

A. only after food consumption.

B. only before food consumption.

C. before food consumption, but not before drink consumption.

D. before and after food consumption.

Question 12 (1 MARK)

Which of the following best demonstrates a social factor that can influence gustatory perception?

A. Someone hating the taste of peanuts because they are highly allergic to them.

B. Kids prefer dark blue lemonade to clear lemonade, as they perceive the dark blue lemonade to be sweeter.

C. People believe the recipe of a common commercial snack has been changed to be more savoury and less sugary, now that it is baked in a triangular shape, rather than its original circular shape.

D. In an experiment, more people report enjoying a protein powder with an image of a cyclist crossing a finish line on the packaging if they are a part of a cycling community group.

Question 13 (2 MARKS)

Identify a sense other than taste that can influence gustatory perception and explain its influence.

Question 14 (2 MARKS)

Explain how age can act as a biological factor that can influence someone's taste perception.

Apply and analyse

Question 15 (1 MARK)

Caleb has a packet of lollies in which the flavours do not match the usual colour of the lolly. For example, a yellow lolly which is usually lemon flavoured is flavoured with raspberry. Caleb gives his brother one of these yellow lollies and asks him what flavour he is tasting. Caleb laughs when his brother says it is lemon.

Which of the following most likely influenced Caleb's brother's inaccurate taste perception?

A. His perceptual set, influenced by the colour and the shape of the lolly.

B. His perceptual set, influenced by the colour of the lolly and his historical experiences with other lolly packets.

C. His perceptual set, influenced by his genetics.

D. His perceptual set, influenced by his age.

Question 16 (3 MARKS)

Using an example, explain how a person's culture can act as a social factor that can influence their taste perception.

Question 17 (4 MARKS)

Identify one relevant biological factor and one relevant social factor to explain why individuals tend to dislike coffee as children and then grow to like it as adults.

Question 18 (5 MARKS)

Jemma despises coriander, while her friend Davide loves adding it to all of his cooking.

a. With reference to the factors influencing gustatory perception, why might Jemma and Davide perceive the flavour of coriander differently? (1 MARK)

b. Jemma admits she doesn't actually dislike coriander that much when it is served in a more savoury dish, as she hates when the coriander tastes sweet, as well as when the flavours are not as strong. Davide attempts to make a coriander-based pastry that Jemma might like. Using your knowledge of factors that increase or decrease the perception of sweetness or flavour, what shape and colour of the pastry are likely to be most enjoyed by Jemma? (2 MARKS)

c. Jemma says she actually does not mind the pastry Davide made her, except that it is too spicy to be fully enjoyed. How might cultural norms have led Jemma to this conclusion? (2 MARKS)

Evaluate

Question 19 (3 MARKS)

A new fast-food chain is about to be launched and is finalising its menu. They have temporarily hired a small team of 'taste testers' to judge the menu items based on the level of flavour and enjoyment of the dish. The people taste testing are all classified as 'supertasters', with many more taste buds than the general population.

Evaluate whether using supertasters as taste testers is a good way to represent the general population's taste preferences, justifying your answer.

Questions from multiple lessons

Question 20 (4 MARKS)

Liam avoids lots of foods because he does not like them, causing him to be referred to as a 'picky eater' by his friends. Suggest the role of one biological, psychological, or social factor as a source of nature, and one factor as a source of nurture, that may contribute to Liam being a 'picky eater'.

Chapter 8 review

Chapter summary

This chapter was about how we use attention and perception to make sense of our internal and external worlds. You learnt that we selectively perceive information from our environment, with these processes being susceptible to the influence of a diverse range of factors.

In lesson **8A Attention**, you learnt about the various roles and functions of attention. In particular, you learnt about:

- the three types of attention:
  - sustained attention
  - divided attention
  - selective attention.
- the roles of sustained, divided, and selective attention in making sense of our world.

In lesson **8B Perception**, you were introduced to the ways sensory stimuli enter our conscious awareness. In particular, you learnt about:

- sensation and perception, including
  - the mechanisms of visual sensation and perception.
  - the mechanisms of gustatory sensation and perception.
- the two types of perceptual processing:
  - bottom-up processing
  - top-down processing.

In lesson **8C Visual perception**, you learnt about the factors influencing the sensation and perception of visual stimuli. In particular, you learnt about:

- biological, psychological, and social factors. Table 1 presents a summary of the factors explored in this lesson.

Table 1 Summary of the factors influencing visual perception

Biological factors	Psychological factors	Social factors

• Monocular depth cues, including:
  – accommodation
  – motion parallax
  – pictorial depth cues
• Binocular depth cues, including:
  – retinal disparity
  – convergence
	• Visual perception principles, including:
	  – Gestalt principles
	  – visual constancies
	• Perceptual set
	• Historical experiences
		• Cultural norms

In lesson **8D Gustatory perception**, you learnt about the factors influencing the sensation and perception of gustatory stimuli. In particular, you learnt about:

- biological, psychological, and social factors. Table 2 presents a summary of the factors explored in this lesson.

Table 2 Summary of the factors influencing gustatory perception

Biological factors	Psychological factors	Social factors
• Age • Genetics	• Appearance (including shape, and colour) • Food packaging • Perceptual set	• Culture

8A

Incoming internal or external stimuli

These stimuli are detected during...

Attention

Sustained

Divided

Selective

Stimulus that is 'selected' is attended to...

8B

Light energy → **Sensation**

1. Selection

2. Organisation

Top-down processing (using schemas) ← **3. Interpretation** → **Bottom-up processing**

Chemical molecules (tastants)

Eyes

Visual sensory system

Brain

Taste buds

Brain

Visual perception → **Perception** ← **Gustatory perception**

Top-down processing (through perceptual set)

8C

8D

Social factors — Cultural norms — Culture — **Social factors**

Visual perception — **Psychological factors** — Visual perception principles — Appearance — **Psychological factors** — **Gustatory perception**

Historical experiences — Food packaging

Biological factors — Depth cues — Age — **Biological factors**

Genetics

Bottom-up processing

Chapter review activities

Review activity 1: Fill in the diagram

In chapter 8, you learnt about the different types of attention and their roles in making sense of the world. You also learnt about the three stages of perception. The diagram below summarises this knowledge. Copy the diagram into your notes and fill in the blanks.

Sensation

Incoming sensory stimuli can be:
• internal, originating from _____ the body
• external, originating from _____ the body.

Directly after sensation, the individual is _____ (consciously/not consciously) aware of the stimuli.

Perception

Selection → [ ] → **Interpretation**

Selection works by _____

_____ works by _____

Interpretation works by _____

Attention

Attention refers to _____

There are two types of perceptual processing:

_____ processing, in which incoming sensory stimuli _____

_____ processing, in which perception is driven by _____

Sustained attention

The role of sustained attention in making sense of the world around us is _____

_____ attention

The role of _____ attention in making sense of the world around us is _____

_____ attention

The role of _____ attention in making sense of the world around us is _____

Schemas

Inform our _____, as a form of _____ processing.

Review activity 2: Match the scenario to the factor influencing perception

The table below summarises some different ways in which biological, psychological, and social factors can influence perception. Copy out and fill in the table. The first row has been done for you as an example.

Scenario	Visual or gustatory perception?	Specific factors that may be influencing perception
Timothy is separating a bowl of lollies by colour. To make his job faster, he tries to grab handfuls of those that are the same colour if they are nearby. He is also able to recognise that when a lolly is covering the other, it is closer to his hand and easier to grab.	Visual	• Psychological: Gestalt principles (the similarity principle) • Biological: monocular depth cues (pictorial depth cue of interposition)
Kate is a beekeeper and loves to eat honey. Her favourite honey is from her family farm as she has always grown up eating it. On the external packaging of the glass honey jars, there is a cartoon of her grandparents, and the honey appears a deep yellow colour.		
Glen and Dave are brothers, and both grew up eating a similarly low amount of spicy food. Surprisingly, Dave adores food that is very spicy, whereas Glen cannot even have a bite of the same spicy dishes without having to suck on an ice cube.		
Iris is driving through the mountains. She looks out of the window and sees numerous large fields of cows. Some look extremely small in comparison to others that appear larger. Iris however is able to recognise that they would actually all be a similar size, and it is just that the smaller ones are further away. She also notices that the 'larger cows' move by the car quicker than the 'smaller' ones that are further away.		
Sam is a professional chef and has his kitchen set up so that he can quickly throw spices into his food. One day, someone else in his kitchen rearranged the spice boxes without Sam's knowledge. During the dinner rush, he quickly threw in many pinches of the wrong spices by mistake before noticing. He claimed it was because they were similarly coloured and positioned to the spices he thought he was using.		

Chapter 8 test

Multiple choice

Question 1   (1 MARK)

Which of the following is **not** a role of attention?

A.   It allows us to finish something we set out to do.

B.   It allows us to switch between tasks seamlessly.

C.   It allows us to process multiple sources of information.

D.   It allows us to filter out information that is not important or relevant to us.

Question 2   (1 MARK)

A key difference between bottom-up and top-down processing is

A.   bottom-up processing involves the way that information is organised, whereas top-down processing does not consider this at all.

B.   bottom-up processing is typically used with easy-to-understand stimuli, whereas top-down processing is used with more complex stimuli.

C.   bottom-up processing uses the individual stimulus features to create a complete understanding, whereas top-down processing uses prior contextual understandings to make sense of the stimulus features.

D.   bottom-up processing occurs in real-time, whereas top-down processing occurs before the stimulus is presented.

Question 3   (1 MARK)

Which of the following statements best describes the process of becoming consciously aware of a sensory stimulus?

A.   The sensory stimulus is first detected by sensory receptors and first undergoes perception before being sent to the brain where it reaches conscious awareness.

B.   The stimulus is selected by sensory receptors that filter through the relevant stimuli, and send the sensory information to the brain where it undergoes perception to reach conscious awareness.

C.   All stimuli detected by sensory receptors have reached conscious awareness, and it is only those that are not detected at all that are not able to be noticed.

D.   The sensory stimulus is first detected by sensory receptors, then it is sent to the brain where it reaches conscious awareness and undergoes perception.

Question 4   (1 MARK)

Which of the following visual perceptions are **not** facilitated by Gestalt principles?

A.   Being able to do paint-by-numbers, as you can recognise the shape that the final image is meant to be.

B.   Perceiving close-by items that appear similarly as a group.

C.   When an object is obscured, we perceive it as further away, and the object that is covering it up is perceived as closer to us.

D.   Being able to imagine closed lines in an incomplete shape to form a coherent image.

Question 5 (1 MARK)

Luci is 80 years old and moved to Australia from England when she was 24 years old. She remembers a particular pie that she used to eat from a shop in her hometown. Luci loved that the pie was so flavoursome, and has not had the chance to try it again. For her 80th birthday, Luci's family had one of the pies sent over from her hometown so that she could try it again. Upon taking the first bite, Luci was very disappointed to find that it tasted very bland compared to what she remembered.

Which of the following factors influencing gustatory perception is the most likely explanation for Luci's difference in taste?

A. The biological factor of age, as her taste buds would have decreased since the last time she tried the pie causing its flavours to be perceived more weakly.

B. The social factor of culture, as the pie was a source of nostalgia for her hometown, but this was not actually reflective of the flavour.

C. The psychological factor of appearance, as she may have remembered the pie looking different, causing her to think it also tastes different.

D. The social factor of culture, as she no longer aligns with the cultural values symbolised by the pie and this caused her to dislike its taste.

Short answer

Question 6 (3 MARKS)

Explain how historical experiences can interact with selective attention to influence an individual's visual perception.

Question 7 (4 MARKS)

Identify and explain one example of top-down processing and one example of bottom-up used in gustatory perception.

Question 8 (3 MARKS)

Joe is engaged in divided attention. Can he successfully apply the Gestalt principles to visual stimuli in his surroundings, if one of his tasks involves visually searching a room for their phone? Justify your answer with reference to multitasking.

Question 9 (2 MARKS)

Differentiate between a person's perceptual set and schemas.

Question 10 (3 MARKS)

Explain the relationship between the perceptual stage of selection and attention. Suggest a potential outcome for our ability to pay attention if this stage was removed.

Question 11 (10 MARKS)

Luca is travelling around Australia in his camper van and is currently near the border of the Northern Territory. As he drives along a very bumpy dirt road, he tunes in to the sounds of his rattling tyres, worrying that one may go flat. Additionally, his playlist shuffles to a song that reminds him of a bad experience that he had, causing him to feel further distressed. Continuing down the dirt road, Luca misses the road sign for the turn-off he was meant to take. He only realises he has gone the wrong way when it starts to get dark. Luca also notices his stomach starting to rumble, and becomes aware that he is long overdue for some dinner. Feeling rather lost, he starts to panic and sets his focus on finding the nearest remote town to grab a meal and refill his petrol tank. Luca finally reaches town, and while relieved, he is rather unsatisfied with his meal at the pub. Despite the flavours being fine, the smell and colour of his steak lead him to find it rather hard to eat.

Luca's series of unfortunate events can be understood through the functions of his attention and perception. Analyse how his attention and perception could have led to the occurrence of these events, and discuss why you think they happened. In your response, you should consider:

• the roles and mechanisms of Luca's attention when navigating.

• the role of perception when Luca is processing his environment.

• biological, psychological, and social factors that may have influenced Luca's visual and/or gustatory perception.

CHAPTER 9

Perceptual distortions

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 judgement of flavours
- distortions of perception of taste and vision in healthy individuals, such as synaesthesia and spatial neglect

Image: GoodStudio/Shutterstock.com

9A — 9B — 9C

2.2.4.1
The fallibility of visual perception
— **2.2.4.1.1** Visual illusions
— **2.2.4.1.2** Agnosia
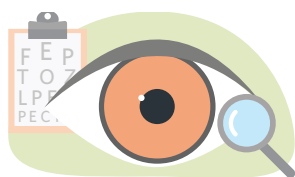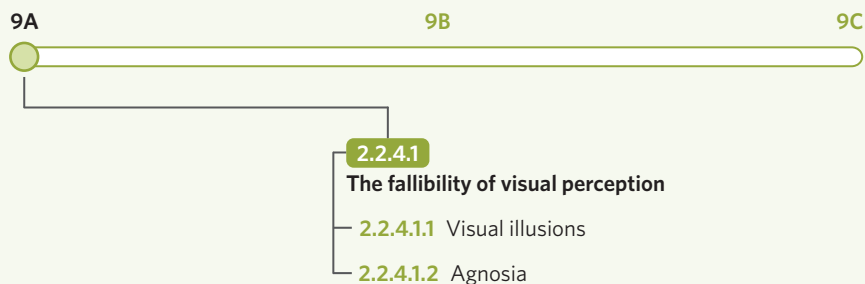
We rely on our sight for almost everything in our lives. We use our eyes to help us make decisions, guide us through our environment, choose what to wear, what to eat, and much more. So what if you were told that your sense of sight is not always reliable? In this lesson, we will explore the ways in which our visual perception system is prone to error, such as visual illusions and agnosia.

KEY TERMS

Fallibility the quality of being prone to error or experiencing difficulties in judgement

Perceptual distortion an error in the judgement or interpretation of sensory stimuli

The fallibility of visual perception 2.2.4.1

Our visual perception, like most of our senses, is subject to error. In this lesson, we will explore contexts in which our visual perception may be inaccurate, including the effects of visual illusions and agnosia.

Theory details

Have you ever been walking down a road and seen a puddle in the distance, only to arrive at the destination of the puddle and realise it wasn't there at all? Have you ever seen a shadow in the corner of your room, only to realise it was just your imagination? The fallibility of our visual perception is clear when we notice these kinds of perceptual errors. **Fallibility** refers to the quality of being prone to error or experiencing difficulties in judgement. Further, these errors in the judgement or interpretation of sensory stimuli are known as **perceptual distortions**. The fallibility of visual perception and the presence of perceptual distortions does not mean something is wrong, but rather demonstrates that normally functioning brains are susceptible to error.

As you learnt in the previous chapter, in order to recognise sensory stimuli, the processes of sensation and perception must both occur. Sometimes the fallibility of visual perception is not due to our inability to detect sensory information. Instead, it is due to the errors made within our brains in processing this information. To demonstrate these perceptual errors we will explore visual illusions and agnosia.

In addition to the examples of errors of sight discussed within this lesson, there are other phenomena that demonstrate the fallibility of visual perception. In each of our eyes, we have an area in which there are no photoreceptors (special neurons that aid in vision), this area is known as a 'blind spot' as it does not function in image detection. When we are looking at an object with both eyes open, this blind spot goes unnoticed as the visual information received from each of our eyes overlaps to create a whole image (Kawabata, 1982).

Even when we are looking at something using only one eye, we often still do not notice this blind spot as our brains conduct a process known as perceptual filling-in, in which it tries to conceal the blindspot in accordance with what our vision is already showing (Raman & Sarkar, 2016). However, under certain conditions, we can 'see' our blind spot.

Looking at figure 1, close your right eye and look at the plus sign with your left eye. Move your head towards and then away from the image whilst keeping your focus on the plus sign. You should find a point at which the black dot disappears from your vision – this is your blind spot. This process is just another example of how our perception, including our visual perception, is subject to error.
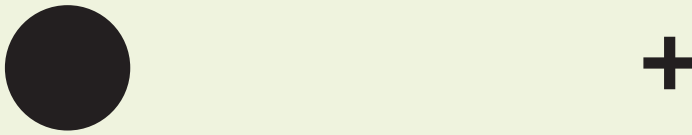
Figure 1 Task to identify the existence of the blindspot

Visual illusions 2.2.4.1.1

One way in which we can experience errors in visual perception is through the consideration of visual illusions. A **visual illusion** is the perception of a visual stimulus that conflicts with how it is in physical reality. It is not entirely understood how all visual illusions occur, but they can result from a variety of sources (Gregory, 1997). Common sources of visual illusions are outlined in table 1.

Visual illusion
the perception of a visual stimulus that conflicts with how it is in physical reality

Table 1 Visual illusions are often caused by environmental, biological, or psychological factors

Cause of illusion	Explanation
Something in our external environment.	Something in our physical external environment that makes an image tricky to interpret during perception. For example, you may have noticed that the closer the moon is to the horizon line, the bigger it looks. This is something within our physical environment that gives rise to a perceptual visual illusion.
Something physiological.	Something physiological that makes an image difficult to interpret. For example, have you ever looked at a bright light and then turned it off? Could you still see the image of the bright light, almost like a bright shadow? This is due to our eyes and brain not keeping up with a changing reality after intense light and giving rise to a perceptual visual illusion.
Something psychological.	Something psychological. As you know, we may see things in a certain way due to our own application of biased reasoning (as demonstrated by perceptual sets). This can also give rise to perceptual visual illusions.

Müller-Lyer illusion

One famous visual illusion is the Müller-Lyer illusion, named after the man who first identified it. Take a look at figure 2. Which line is longer? The one on the left or the one on the right?
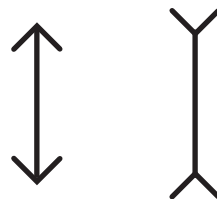
Figure 2 The Müller-Lyer illusion is seen when comparing the length of these two lines
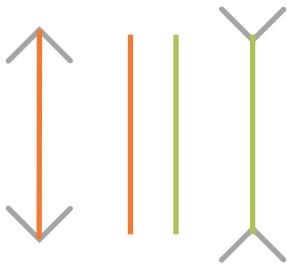
Figure 3 It's easy to 'unsee' the Müller-Lyer illusion when we look at it like this
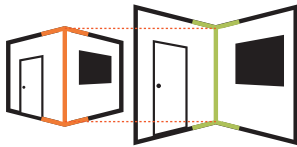
Figure 4 The carpentered world hypothesis is a theory used to explain the Müller-Lyer illusion

When measured, the two lines are the same length, as demonstrated in figure 3. However, it is extremely common for individuals to perceive the right line as being longer. So why does the Müller-Lyer illusion occur? The illusion relies on the influence of the accompanying arrowheads of each line, specifically whether the line is contained within inverted arrowheads or regular arrowheads. However, the process by which these arrowheads affect our visual perception is debated. As mentioned, the causes of visual illusions are not entirely understood, however there are proposed psychological and social/environmental explanations to explain the Müller-Lyer illusion. These are outlined in table 2.

Table 2 Explanations of the Müller-Lyer illusion

Cause of Müller-Lyer illusion	Description
Psychological	Some psychological explanations of the Müller-Lyer illusion emphasise the role of our personal learning and memory.
	This is based on the idea of the 'carpentered world hypothesis'. Richard Gregory (1968) suggests that when we see the plain two-dimensional lines of the illusion, we automatically apply them to real three-dimensional objects in our world stored in our memory, such as the corners of rooms and buildings (objects made by 'carpenters').
	• When we apply the line with a regular arrowhead to the world, it forms the outward corners and wall of a building (shown on the left side of figure 4).
	• When we apply the line with an inverted arrowhead to the world, it forms the inward corners of a room (right side of figure 4).
	• We tend to perceive the line representing the outward corners of a building as extending toward us and therefore being closer to us, whereas we perceive the line representing the inward corners of a room as being further away because the corners extend outwards and away from us. This can be considered as a misapplication of depth cues.
	• Some explanations suggest that this is due to the misapplication of linear perspective to the lines of the arrowheads: each arrowhead is made up of two 'parallel' lines and the point at which they meet creates a 'corner' of a room or building. For the regular arrowhead, the lines converge at the top point of the arrowhead and separate out downwards. Therefore, they reflect the outside corners of a building because the point at which these arrowhead lines converge emulates the pointed outside corner of a building that extends toward us. On the other hand, the inverted arrowhead shows two 'parallel' lines which begin converging and then separate upward. Where the inverted arrowhead lines are converged is therefore the inside corner of a room that extends away from us.
Environmental/social	Environmental or social explanations for the illusion have also been proposed. The Müller-Lyer illusion has been found to be environmentally influenced (Ahluwalia, 1978). A study investigating the applicability of the carpentered world hypothesis showed participants in Zambia the illusion. It found that people who lived in cities were more susceptible to the illusion than people that lived in more rural, 'un-carpentered' areas. This suggests that those with more exposure to 'carpentered' settings are perhaps more likely to see the illusion.

The Ames Room illusion

Another well-known visual illusion is the Ames Room illusion which is depicted in figure 5. This illusion occurs when a person views two people in a special Ames Room through a peephole using only one eye.

As you can see, the person on the left of the room looks to be much tinier than the person on the right. However, in reality, both people are normal-sized humans. Primarily, the illusion occurs because the shape of the room has been constructed in a specific way in order to 'trick' our visual perceptual systems.

Image: Artazum/Shutterstock.com
Figure 5 The Ames Room

As you can see in figure 6, the back wall of an Ames Room is not straight and square. The left side of the back wall extends away from the peephole, allowing the person in the left corner to stand much further away from the viewer than the person in the right corner. Furthermore, the ceiling of the room is not parallel to the floor, being twice as high on the left side of the room compared to the right. Both of these design manipulations allow the person on the left to look much smaller than the person on the right.

Importantly, the room's design purposefully manipulates certain visual cues in order to impair a viewer's ability to correctly apply visual constancies (the ability to perceive an object as staying physically the same, even when projecting different images onto our eyes). These are outlined in table 3.

Table 3 Manipulation of visual cues in the Ames room

Visual cue	Description
Judging the size of objects (size constancy)	A person standing on the left actually looks to be shrinking as they get further away. Normally, our brain would allow us to see a change in size like this as a change in distance, and therefore it would not affect our perception of a person's true size compared to the image of them cast onto our eyes. However, because the room is deceptively designed, we are unable to see their change in distance and are therefore unable to apply size constancy.
Judging the shape of the room (shape constancy)	We are also likely to misinterpret the shape of the room. We see the room as maintaining a constant rectangular shape when viewed through the peephole because we are unaware that the room is a trapezoid.

Agnosia 2.2.4.1.2

Imagine if you woke up one day and went to go and brush your teeth and you left your toothbrush in the same spot that you always do. However, when you go to reach for it, you cannot find it no matter how hard you try. Now, what if it turned out that in this situation, your toothbrush was in fact in the exact same place as it always is. This is an example of what it may feel like to experience visual agnosia. **Agnosia** is a disorder involving the loss or impairment of the ability to recognise familiar stimuli through the use of one or more senses, despite the senses functioning normally otherwise. Simply, this means that individuals suffering from agnosia have difficulty identifying sensory information, such as objects in their environment.

Agnosia usually occurs as the result of a brain lesion (Kumar & Wroten, 2022). An agnosia-causing brain lesion may be incurred as a result of a stroke, dementia, brain injury, brain tumour, or overexposure to a toxin. Visual agnosia, for example, is commonly associated with brain lesions that occur in the parietal lobe, temporal lobe, and occipital lobe, as these areas of the brain are associated with processing visual information. However, different forms of agnosia are associated with different areas of damage. The two main subtypes of visual agnosia are outlined in table 4.

Table 4 Types of visual agnosia

Type	What it involves
Apperceptive visual agnosia	• Difficulty in perceiving visual information • Intact mental understanding of what objects look like • Inability to identify objects is caused by a difficulty in perceiving the form or visual elements of an object • Otherwise normally functioning vision.
Associative visual agnosia	• Difficulty in identifying what object is being viewed • No difficulty in perception; individuals are able to identify the individual visual elements of objects • Identification difficulties stem from being unable to link prior experience to the object they are viewing • Otherwise normally functioning vision.
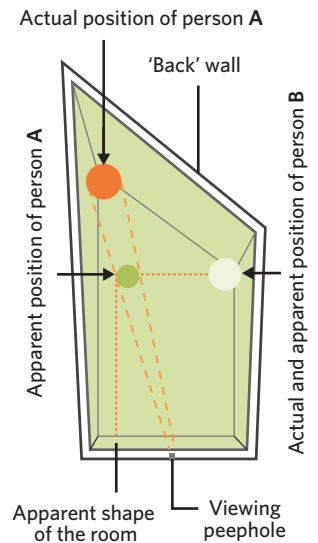
Figure 6 Even though from front-on the Ames Room appears to be the shape of a normal rectangular room, it is actually trapezoid in shape

Agnosia a disorder involving the loss or impairment of the ability to recognise familiar stimuli through the use of one or more senses, despite the senses functioning normally otherwise

LESSON LINK

In lesson **4A Approaches to understanding the brain**, we learnt that brain lesions are points of damage to the brain that can be surgically induced or be acquired through illness or injury. We learnt that brain lesions can be used to determine what functional difficulties a patient has acquired based on where this damage occurred. Similarly, depending on the type of agnosia a patient is experiencing, professionals will likely be able to determine what area of the brain a lesion has occurred.

It is important to note that these forms of visual agnosia do not suggest that the sufferers have malfunctioning senses. An individual who experiences visual agnosia may still have perfect vision. Instead, it is their processing of this sensory information that leads to errors in perception. In essence, individuals with visual agnosia can see clearly, but cannot necessarily identify what they are seeing.

Another example of visual agnosia can be seen in the case study of 'C.K.', who suffered from associative visual agnosia (Behrmann, et al. 1994). Associative visual agnosia causes individuals to be unable to form a mental representation of the world in their brains as they are only able to perceive elements of a whole and not the whole itself. Like other forms of visual agnosia, sufferers are also unable to categorise or give meaning to objects. For example, when shown an image of a dog, patient C.K. would be able to correctly answer questions such as 'does it have a long or short tail?' and 'what colour is its fur?', but when asked to identify what the animal is, he would not be able to.

PSYCHOLOGY EXPLORATION

Oliver Sacks, a famous physician, published a book in 1985 called 'The man who mistook his wife for a hat'.

The book contained stories of many patients he had treated, but was named after Dr. P, a distinguished music professor who was suffering from agnosia. Dr. P reported that 'people seem to think there's something wrong with my eyes' and when asked if he recognised any issues with his sight, he stated, 'No, not directly, but I occasionally make mistakes'. This demonstrates that, for individuals with agnosia, vision is not an issue. Rather the issue is within their processing of visual information.

Sacks detailed many seemingly strange behaviours demonstrated by Dr. P, including:

- being unable to recognise the faces of his students, yet knowing them by the sound of their voices
- seeing faces in objects that did not have one
- mistaking inanimate objects, such as fire hydrants, for children
- and most famously, he mistook his wife for a hat!

In addition, just like patient C.K., Dr. P was able to recognise the individual parts of an object but not the object itself. For example, when presented with a rose, he described it as a red form with a green tube attached to it.

(Sacks, 1985)

Theory summary

In this lesson, you learnt that visual perception is fallible, in that it is prone to error. You explored examples of this fallibility by looking at visual illusions, including theories as to why these illusions occur, and you looked at the experience of individuals with agnosia.
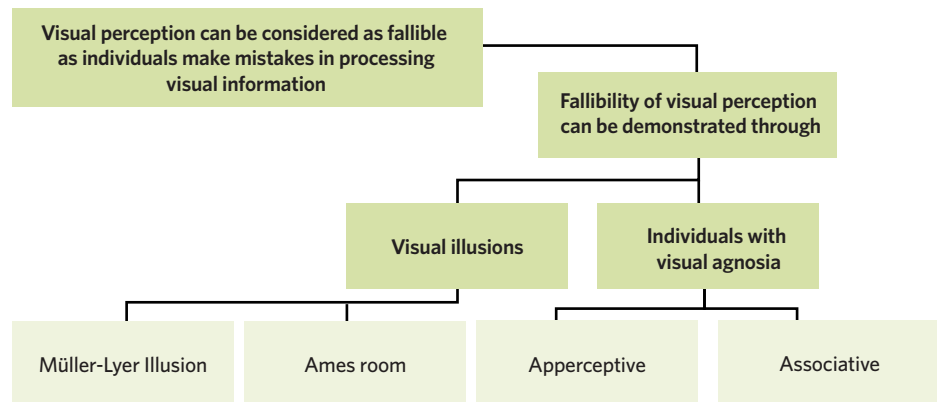
Figure 7 The fallibility of sight and its related examples

9A Questions

Theory review

Question 1

Visual perception is always a reliable and accurate representation of the world.

A. True.

B. False.

Question 2

Errors in sight are most commonly attributed to

A. an error in processing visual information.

B. blindness of the eye.

C. an inability to receive visual information.

Question 3

Visual illusions and agnosia demonstrate

A. that visual perception should never be trusted.

B. that visual perception is reliable in all contexts.

C. the fallibility of visual perception.

Question 4

Which of the following are explanations for why visual illusions occur? **(Select all that apply)**

I. We do not receive images correctly with our eyes.

II. Something in our physical environment makes the interpretation process of visual perception difficult.

III. Something biological within our eyes or brain makes the perceptual process difficult.

IV. Something psychological means that the way we uniquely perceive and interpret an image makes it appear different from reality.

Question 5

People who suffer from agnosia have difficulty in seeing objects which leads to difficulty in identifying said objects.

A. True.

B. False.

Assessment skills

Perfect your phrasing

Question 6

Which of the following sentences is most correct?

A. Fallibility is the quality of being prone to **bias** or experiencing **errors** in judgement.

B. Fallibility is the quality of being prone to **error** or experiencing **difficulties** in judgement.

Question 7

Which of the following sentences is most correct?

A. Visual illusions occur when an individual's **perception** of a visual stimulus is experienced in a way that **conflicts** with how it is in physical reality.

B. Visual illusions occur when an individual's **perspective** of a visual stimulus is experienced in a way that **challenges** how it is in physical reality.

Question 8

Which of the following sentences is most correct?

A. Agnosia is a disorder involving the loss or impairment of the ability to recognise or identify **familiar** stimuli through the use of one or more senses, despite the senses functioning **normally** otherwise.

B. Agnosia is a disorder involving the loss or impairment of the ability to recognise or identify **similar** stimuli through the use of one or more senses, despite the senses functioning **regularly** otherwise.

Text analysis

The following assessment skills type reflects the study design assessment type:

• analysis and evaluation of an experiment or case study.

Use the following information to answer questions 9–12.

Agnosia is a complex condition, therefore researchers often undertake case study research to understand the perspectives of those who experience it. One case study of visual agnosia is that of patient JPM. JPM is a well-educated and successful man, however, he was diagnosed with associative visual agnosia following a heart attack which caused parts of his brain to be deprived of oxygen. Examinations by researchers showed that his neurological functioning, visual field, perceptual processing, and brain magnetic resonance imaging (MRI) were all normal.

During an assessment of JPM's ability to recognise objects, researchers found that this skill was severely impaired. JPM was only able to recognise 7/48 photographs of inanimate objects.

JPM was also assessed using an object decision task, in which he was asked to decide whether an image portrayed a real object or a 'non-object'. During this task he scored at 'chance level', meaning that he scored similarly to someone who was just guessing.

(Charnallet, et al. 2008)

Question 9

What are the two main criteria that JPM demonstrated to be diagnosed with visual agnosia?

A. He had normal intelligence levels and he had difficulty in identifying visual stimuli.

B. He had normal intelligence levels and he had normal visual functioning.

C. He had otherwise normal visual functioning and he had difficulty in identifying visual stimuli.

Question 10

It is likely that JPM would still be able to perceive individual elements of objects, such as their colour or size.

A. True.

B. False.

Question 11

What would **not** be an appropriate task to test JPM's agnosia?

A. Asking him to identify a specific object from a list of photographs.

B. Asking him to identify an object that he has never encountered before.

C. Asking him to name an object being presented to him.

Question 12

What ethical consideration is being adhered to by hiding JPM's real name?

A. Voluntary participation.

B. Withdrawal rights.

C. Confidentiality.

Exam-style

Remember and understand

Question 13 (1 MARK)

A visual illusion is

A. the misunderstanding of an image due to the way visual information is received at the eye during sensation.

B. the misunderstanding of an image due to the way visual information is transmitted during sensation.

C. a perceptual distortion of an image due to the way visual information is understood during perception, caused by environmental, biological, or psychological factors.

D. a perceptual distortion of an image due to the way the image actually is in physical reality, caused by environmental, biological, or psychological factors.

Question 14 (1 MARK)

Fallibility in relation to sight involves

A. being prone to error during the process of perception.

B. the eyes being unreliable.

C. errors in the processing of visual sensation.

D. individuals being aware that they are making errors in visual sensation and perception.

Question 15 (1 MARK)

Which of the following statements regarding agnosia is **not** correct?

A. Patients with agnosia have otherwise normally functioning senses.

B. Agnosia is the loss or impairment of the ability to recognise or identify familiar stimuli through the use of sight.

C. Agnosia is commonly the result of a brain lesion.

D. Patients with visual agnosia can see clearly but have difficulty identifying what they are seeing.

Question 16 (3 MARKS)

Identify and describe one visual illusion and provide one explanation for why it occurs. You may use a diagram in your response.

Apply and analyse

Question 17 (1 MARK)

When in a car at night, Priya watches the moon and notes that it looks like the moon is following her car. This visual illusion is likely a result of

A. something in Priya's physical external environment that makes the image tricky to interpret during perception.

B. something biological within Priya that makes the image difficult to interpret.

C. something psychological in Priya that causes her to be biased about the moon's location.

D. an issue with Priya's vision.

Question 18 (1 MARK)

Noel has spent his whole life on a small island and has never visited or seen images of built-up areas, such as a city. When viewing the Müller-Lyer illusion, compared to someone who lives in Melbourne's central business district (CBD), Noel is

A. more likely to be susceptible to the illusion as demonstrated by the carpentered world hypothesis.

B. less likely to be susceptible to the illusion as demonstrated by the carpentered world hypothesis.

C. more likely to be susceptible to the illusion due to issues with his sight.

D. less likely to be susceptible to the illusion due to issues with his sight.

Question 19   (2 MARKS)

Anika was diagnosed with visual agnosia. To test her abilities, researchers presented her with a drink bottle. Briefly describe the abilities and difficulties that Anika may demonstrate when viewing the drink bottle.

Evaluate

Question 20   (3 MARKS)

Evaluate whether visual perception should be trusted as a reliable process.

Questions from multiple lessons

Question 21   (1 MARK)

Being susceptible to a visual illusion due to biased reasoning is an example of

A.   the fallibility of the external environment.

B.   an error of sensation.

C.   top-down processing.

D.   bottom-up processing.

Question 22   (2 MARKS)

Outline what is meant by a schema and explain how an individual's schemas may be used to explain the Ames room illusion.

9B Errors of taste
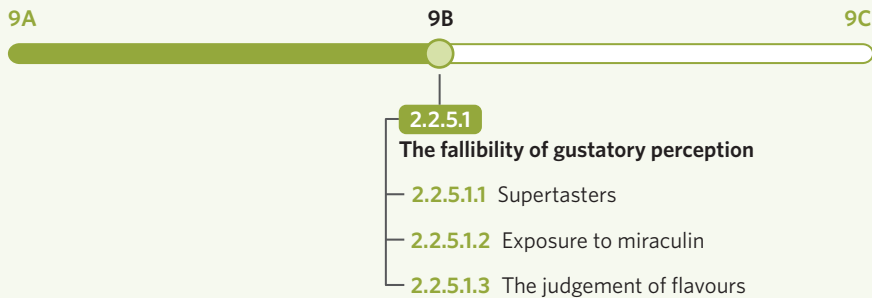
If you were blindfolded and asked to identify different foods by taste, would you be confident in your answers? When humans were hunter-gatherers, an accurate sense of taste may have saved lives by preventing individuals from eating rotten or poisonous foods. However, today this is prevented by laws and food manufacturers. Both during hunter-gatherer times and in the modern day, taste perception can be regarded as error-prone. Despite this, we often overestimate how much we can depend on our senses, such as taste.

The fallibility of gustatory perception 2.2.5.1

In this lesson, we will explore examples of the fallibility of gustatory perception, including supertasters, exposure to miraculin, and factors that influence the judgement of flavours.

Theory details

Our sense of taste has an impact in many areas of our lives. It can help to determine the foods that we eat, our favourite restaurants, and it can protect us from foods that are poisonous or contaminated. As taste is so central to our lives, it should be relatively accurate, shouldn't it? Like all of our senses, our gustatory perception is also prone to error, meaning it is fallible.

In the previous lesson, we learnt about the fallibility of sight; our sense of taste experiences this fallibility in a similar way. In lesson 8D Gustatory perception, we learnt about the process of gustatory perception, and its biopsychosocial influences. In this lesson, you will learn about the situations in which our gustatory or taste perception may be prone to error, including:

- supertasters,
- exposure to miraculin,
- and factors that influence the judgement of flavours.

Supertasters 2.2.5.1.1

Taste is a significantly important factor in our perception of food. As you learnt in the previous chapter, human taste is facilitated through receptors found in taste buds within the papillae, which are found in the mouth and tongue. Some aspects of taste perception are genetically determined (Shepherd, 2012), hence why some people love the fragrant flavour of coriander but others are convinced that it tastes like soap.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

Supertasters individuals who have significantly low thresholds for taste stimuli and an unusually high number of taste buds

American university professor, Linda Bartoshuck (1994), established a very interesting finding while researching the genetic differences in taste perception. She measured people's ability to detect a common bitter-tasting chemical known as 'PROP', and found that 25% of people were extremely sensitive to its taste. Bartoshuck (1994) found that those same people who were extremely sensitive to PROP also had many more taste buds, and therefore more taste receptors than the average person. These individuals are called **supertasters,** which refer to individuals who have significantly low thresholds for taste stimuli and an unusually high number of taste buds. The difference in taste buds for supertasters as compared to normal individuals is depicted in figure 1.

Supertaster   Non-supertaster
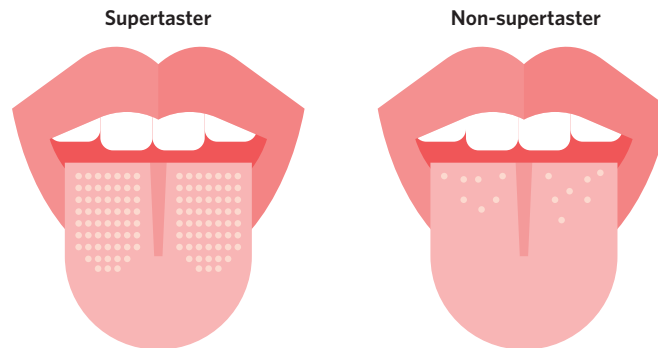
Figure 1 Supertasters have a significantly higher number of papillae than the average person

To some, a heightened tasting experience may sound exciting. In reality, however, a supertaster's sensitivity to bitter foods can lead to many impacts on one's day-to-day life. They may be more likely to withhold from alcohol use and smoking which is positive for health. However, supertasters also often experience difficulty eating vegetables that contain essential nutrients, and are frequently labelled as 'picky eaters'. In addition, they often consume excess salt, as salt can counteract the perceived bitterness in their food. This consumption of excess salt can lead to negative health impacts over a prolonged period of time. It is important not to confuse the experience of supertasters with a perceptual distortion, as their perception is actually accurate. Their difference in perceiving taste is due to the biological difference of an increased number of papillae, affecting their reception of taste stimuli.

Exposure to miraculin 2.2.5.1.2

What if there was a magical pill that you could take to make all of your least favourite foods taste amazing? Well, there is! **Miraculin** is a type of protein extracted from the 'miracle berry' which alters taste perception in humans. Although it may not make a salad taste like a cheeseburger, it does have the ability to make sour foods taste sweet.

Miraculin a type of protein extracted from the 'miracle berry' which alters taste perception in humans
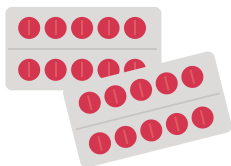
Figure 2 Miraculin can come in pill form or can be consumed by eating the 'miracle berry'

WANT TO KNOW MORE?

From an evolutionary perspective, how has the human utilisation of such a berry persisted across time? Although the discovery of the miracle berry was first documented in the 1700s by European explorers, its properties were utilised by the West African natives long before this.

The natives would chew on the berry before eating, making any acidic foods they consumed more palatable. It is not likely that the berry was used simply because the natives loved the taste of sugar. Instead, some researchers suggest that the natives may have incorporated the berry into their diets as a way to consume larger quantities of fermented foods, which though sour, benefit gut health and preserve food's longevity.

(Lipatova, 2016).

You may be wondering how this 'miracle berry' actually works. Miraculin is an example of how our senses can be purposefully manipulated to alter perception. When a sour food enters the mouth, the acidity of the food activates gustatory receptors on the tongue that are responsible for detecting sour flavours. In the same way, when a sweet food enters the mouth, the taste receptors on the tongue that are responsible for detecting sweet flavours are activated. Interestingly, miraculin does not cause physiological changes to the functioning of these sour taste buds. Instead, miraculin binds to the taste buds that are responsible for detecting sweet flavours and activates them when an acidic environment is created in the mouth (Koizumi, et al. 2011).

The judgement of flavours 2.2.5.1.3

Our perception of flavour involves information integrated from other sensory systems, including vision, touch, and smell. Perceptual distortions or difficulties when judging flavour often occur due to external and internal influences on taste, often from these other sensory systems. Although information from our other senses like vision, or faculties like our memory, can help us to judge flavours, they can also 'fool' us into believing we are tasting something different from what is objectively there. Our perceptual set, the intensity of the food's colour, and the food's texture can all influence the way we judge flavour.

Influence of perceptual set

As you have learnt, a perceptual set is a predisposition to perceive certain sensory stimulus features and ignore other features of the stimulus deemed irrelevant. Our perceptual set can cause perceptual distortions when they cause us to interpret flavours differently, or cause us to taste something more or less intensely than it truly is in our food. For example, the appearance of food and its packaging can give us certain expectations that can influence the flavours we perceive. If we eat food with packaging that represents a popular brand, we may be predisposed to expect a high-quality taste and therefore actually believe we are tasting better food. This example is depicted in figure 3.

Images (left to right): Audio und werbung, BigMouse/Shutterstock.com

Figure 3 A food's packaging and appearance can influence our taste perception through perceptual sets

Influence of colour intensity

Would you rather eat a bright red strawberry, or a slightly pink strawberry? The intensity of the colour of the food we eat can lead to perceptual distortions in flavour judgement. As a general rule, food that is more intensely coloured leads us to perceive it to have a stronger flavour, even when this is not the case. This information exists within our perceptual set, as past experience has predisposed us to expect that a brighter colour means something is more ripe or intensely flavoured. Several studies have found, for example, that the intensity of a beverage's colour correlates to the intensity of sweetness perceived (Johnson et al., 1982; Roth et al., 1988). This association can often encourage food brands to artificially dye their products, especially confectionery. Consider figure 4 and think about which strawberry you would rather eat.

Influence of texture

How would you feel if you were given a mushy apple? Or a crunchy and gritty banana? How a food feels in the mouth, or its 'texture', can affect our experience and judgement of a food's flavour. Two ways that texture can affect our judgement of flavour are that:

 1. It can change the intensity of the flavour we experience.

This is because the texture of food determines how much of it actually is received by our gustatory receptors and how long it stays in the mouth. For example, orange juice is generally more flavourful than an orange. In liquid form, more of the 'orange' flavours are able to be received by our gustatory receptors, whereas when we chew an orange less of it comes into direct contact with them. Creamier foods also tend to stay in our mouth longer than thinner, more liquidy foods, and so we are able to taste them more. This is not a perceptual distortion because we are physically able to taste more or less of the food we are consuming depending on its form.

Figure 4 The colour of food can influence our perception and expectations of its taste

2. It can also change how much we enjoy the flavour we perceive.

Whether we judge food to be tasty is also dependent on its texture. This is often informed by our expectations of how a food should feel and our past experiences with specific food items. If you were given soft crackers, would you still enjoy them? Our enjoyment of flavour according to texture is not necessarily a perceptual distortion either. Additionally, preferences for the kinds of textures that are more enjoyable in different foods may vary between individuals.

WANT TO KNOW MORE?

Have you ever been so hungry, that when you finally ate a meal it was the best-tasting meal you had ever had? Later, when you ate it again while you were less hungry, it may not have tasted anywhere near as delicious. Many people claim that the hungrier you are, the better food tastes, and it seems that research actually does support this notion.

A study by Zverev (2004) found that when people were deprived of food for a short period of time, their sensitivity to the taste of sweet and salty flavours was heightened as compared to when they had not been deprived of food. Similarly, recent research by Fu et al. (2019) found that when mice were deprived of food, they demonstrated a preference for sweet tastes and demonstrated a decreased sensitivity to bitter tastes. This study suggested that this change was due to the activation of specific neurons in the hypothalamus, which influences taste preferences during times of fasting in order to increase food consumption and therefore survival.

This phenomena is just another example of the fallibility of taste and how biological changes can alter the way in which food and flavours are experienced, even in the absence of perceptual distortions.

Theory summary

In this lesson, we learnt about the ways in which our sense of taste is fallible, meaning that it is prone to error and individual differences or distortions. This fallibility includes:

- genetic variations in taste, such as supertasters
- purposeful manipulation of our senses, such as intentional exposure to miraculin
- unconscious influences on our judgement of flavours, such as perceptual set, colour intensity, and texture.

9B Questions

Theory review

Question 1

Gustatory perception is completely reliable as it receives sensory information from physiological structures, such as papillae.

A. True.

B. False.

Question 2

Supertasters are categorised by

A. a decreased sensitivity to taste sensation.

B. a high threshold for taste sensation.

C. a low threshold for taste sensation.

Question 3

Miraculin is known for

A. making sweet foods taste sour.

B. making sour foods taste sweet.

C. heightening taste sensitivity.

Question 4

An individual's judgement of flavour is influenced by

A. perceptual set, colour intensity, and texture.

B. previous experience, texture, and sweetness.

C. perceptual set, time of day, and colour intensity.

Question 5

Biology, purposeful manipulation of the senses, and perceptual set can all lead to errors in gustatory perception.

A. True.

B. False.

Assessment skills

Data analysis

The following assessment skills type reflects the study design assessment type:

- a data analysis of generated primary and/or collated secondary data

Use the following information to answer questions 6–9.

Bellizzi and Martin (1982) conducted a study in order to compare the effects that branding, specifically name-brands and generic brands, had on taste perception. The researchers set up a booth at a university fair and presented each participant with two identical sized jars of grape jelly. One was labelled with a name brand, and one was labelled with a generic brand. In one trial, both jars contained the same name-brand jelly, and in another trial, both jars contained the same generic brand jelly.

The participants' taste perception of the jellys was measured using a 5-point rating system, starting from 'this jelly has an excellent taste' (1) to 'this jelly has an extremely bad taste' (5). This means that the lower a jelly was scored, the higher that its taste was rated by participants.

The results of the participants' ratings of what they perceived to be the name-brand and generic jellys are depicted in the graph below. The researchers were interested in the data that demonstrated the participant's taste perceptions based on the labelling of the jars across both trials.

Mean ratings of jelly products
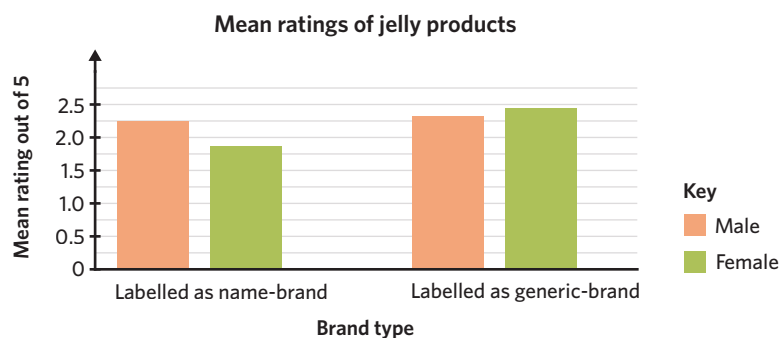
The difference in ratings between the name-brand and generic-brand jars were found to be significant.

Note: The researchers purposely used an inverse scoring method, so that a higher score means a worse taste rating.

Question 6

Which type of jelly was rated as tasting better?

A. Name-brand.

B. Generic brand.

C. This conclusion cannot be made with the information provided.

Question 7

A taste rating of 5 would indicate that

A. the jelly has a perfect taste score.

B. the participants are biased.

C. the jelly is rated poorly.

Question 8

The mean rating that females gave the name-brand jelly was 1.7, this means that

A. all females who particiapted rated the name-brand jelly as 1.7.

B. when all of the female's ratings of the name-brand jelly were added up, it equated to 1.7.

C. to work out the male's mean rating of the name-brand jelly, 1.7 should be subtracted from the total score of 5.

D. some females may have rated the name-brand jelly higher than 1.7 and some females may have rated the name-brand jelly lower than 1.7.

Question 9

The type of brand the jelly is labelled as, is **not** related to what type of influence on flavour judgement?

A. Perceptual set.

B. Colour intensity.

C. Prior experience.

D. Beliefs about a brand.

Exam-style

Remember and understand

Question 10   (1 MARK)

A defining biological characteristic of a supertaster is

A. increased levels of the bitter-chemical 'PROP' in their bloodstream.

B. a larger sized tongue.

C. reduced smoking levels.

D. a significantly greater amount of taste buds.

Question 11   (1 MARK)

How does miraculin affect gustatory perception?

A. It binds to the taste buds that detect sweet flavours and activates them in an acidic environment.

B. It causes temporary physiological changes to the functioning of taste buds responsible for detecting sour flavours.

C. It binds to the taste buds that detect sweet flavours and instantaneously activates them.

D. It alters the brain during the process of perception.

Question 12   (1 MARK)

When judging flavour, what influence does the texture of food have?

A. It causes individuals to experience perceptual distortions when it conflicts with past experiences.

B. It can change the intensity and enjoyment of flavours.

C. It causes individuals to experience perceptual distortions as it can determine how much of a food's taste is received by gustatory receptors.

D. All of the above.

Question 13   (2 MARKS)

Using an example, explain how colour intensity can influence flavour perception.

Apply and analyse

Question 14 (1 MARK)

Jona hates eating whole pieces of fruit, but loves blending fruit to make smoothies as he claims that they taste much better. Jona's preference for smoothies is an example of

A. food being more enjoyable when it can be consumed faster.

B. a supertaster, as Jona is sensitive to the flavour of fruit.

C. a perceptual distortion, as both food items consist of the same things.

D. the texture of food influencing the intensity of flavour as liquid foods are more easily received by gustatory receptors.

Question 15 (1 MARK)

Ahmed had been recommended by a friend to visit a popular Italian restaurant in his town. His friend tirelessly emphasised how amazing the food was and how much he loved it. Ahmed decided to visit the restaurant with his parents, who had never heard of it. Ahmed and his parents decided to share multiple dishes so that they could all experience the food together. When the meal was over, Ahmed could not believe how amazing the food was, whereas his parents were rather unimpressed.

What is the most likely possible explanation for the difference in opinion between Ahmed and his parents?

A. Ahmed has a lower threshold for taste than his parents.

B. Ahmed was influenced by his perceptual set due to being exposed to his friend's opinions, whereas his parents were not.

C. Ahmed lied about the food being good so he did not upset his friend.

D. Ahmed and his parents have a different amount of pappilae.

Question 16 (3 MARKS)

Describe the concept of a perceptual set and explain how it can lead to perceptual distortions in taste, using an example.

Question 17 (3 MARKS)

Is the experience of supertasters a perceptual distortion? Justify your response.

Questions from multiple lessons

Question 18 (1 MARK)

In the processing of sensory stimuli, during what stage does the difference in taste for supertasters occur?

A. Sensation.

B. Organisation.

C. Interpretation.

D. Saliency.

Question 19 (1 MARK)

An individual's judgement of flavour being influenced by past experiences is an example of

A. a perceptual distortion.

B. top-down processing.

C. bottom-up processing.

D. organisation.

Question 20 (2 MARKS)

With reference to nature and nurture, compare the difference between supertasters and individuals who are influenced by their perceptual set when tasting food.

9C Perceptual distortions

9A　　　　　　　　　　9B　　　　　　　　　　9C

2.2.6.1
Distortions of taste and visual perception

2.2.6.1.1 Synaesthesia

2.2.6.1.2 Spatial neglect
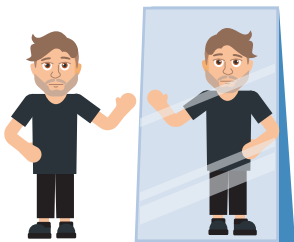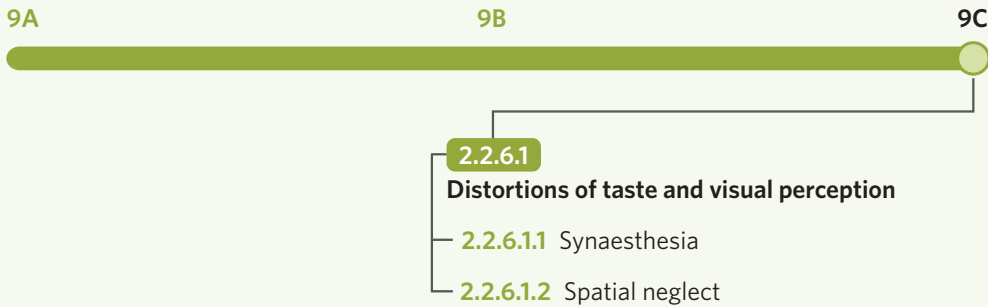
Throughout this chapter we have learnt about the ways in which our brains can make errors when processing sensory information. So, what does this mean about us and our level of functioning? How do we fix this? The experience of distortions in our perception of the world is normal, expected, and often not harmful. Our brains are not perfect computers and our perceptual experience is individual and dynamic. In this lesson, you will learn about synaesthesia and spatial neglect, which are conditions that demonstrate that otherwise healthy people can experience perceptual distortions.

Distortions of taste and visual perceptions 2.2.6.1

In this lesson, we will explore the ways in which healthy individuals may experience distortions within their visual and taste perceptions. Specifically, we will explore the experiences of individuals with synaesthesia and spatial neglect.

Theory details

Imagine that you had a distorted mirror. Every time you looked at yourself your face was warped and your body didn't look like your own. You may be inclined to think of this mirror as malfunctioning, broken, and want to replace it. However, not everything that produces distortions has something inherently wrong with it.

Our brains, and in turn our perceptual processing systems, are prone to distortions, such as distortions of taste and visual perception. At the beginning of this chapter, we learnt that perceptual distortions are errors in the judgement or interpretation of sensory stimuli. However, it is important to note that these distortions occur in most healthy brains and provide no indication of something being 'wrong'. In this lesson, we will explore examples of how individuals with otherwise normally functioning brains may experience perceptual distortions, including through the experiences of synaesthesia and spatial neglect.

Synaesthesia 2.2.6.1.1

What if you could see sounds? Or taste images? Imagine that each letter in the alphabet had its own colour. These kinds of perceptual experiences really do occur for some people who experience a phenomenon called 'synaesthesia'. **Synaesthesia** is a perceptual phenomenon characterised by the experience of unusual perceptions in one sensory system after another sensory system has been activated. Importantly, even though synaesthesia involves perceptual distortions, it is not a mental health disorder and can occur in people who have healthy, intact brains.

KEY TERMS

Synaesthesia
a perceptual phenomenon characterised by the experience of unusual perceptions in one sensory system after another sensory system has been activated

Synaesthesia is a phenomenon of perception that occurs when two sensory systems cross over in an abnormal and involuntary manner. More specifically, when one sensory system is activated, another sensory system also involuntarily experiences unusual or unexpected perceptions. For example, some synaesthetes (people who experience synaesthesia) see a colour when they hear a specific music note (e.g. they see the colour green when they hear the note F#). There are some consistent characteristics of synaesthesia, outlined in table 1.

Table 1 Characteristics of synaesthesia

Characteristic	Description
Synaesthesia is automatic and cannot be controlled	The perceptual experiences elicited in the secondary sense feel very vivid and real. Further, if an individual sees the colour green when looking at the number 4, the perception is out of the individual's control and cannot be prevented.
Synaesthesia is generally experienced as a one-way process	A person who sees the colour green when looking at the number 4 will not see the number 4 when looking at the colour green.
Synaesthesia is usually consistent	A person who sees the number 4 as green will usually always see it as green and not as another colour.
The way that synaesthesia is experienced is unique to the individual	If one person sees the number 4 as green, this does not mean that a person with the same kind of synaesthesia will also see a 4 as green. They might, for example, see 4 as red.
Synaesthesia is relatively common	There are a wide range of estimates regarding its prevalence, and some forms are far more common than others. However, estimates can range from as high as one in 100 people to as low as one in 2000 people (Neckar et al., 2014).

As discussed, synaesthesia does not exclusively impact one sense and can occur in a range of different combinations between individuals. Therefore, there are many recognised forms of synaesthesia, the most common, involving visual and gustatory perceptual systems, are outlined in table 2.

Table 2 Common forms of synaesthesia

Form of synaesthesia	Description
Grapheme-colour	Grapheme-colour synaesthesia occurs when a person sees colours when looking at ordinary symbols, such as numbers and letters (Lunke et al., 2019). For example, an individual may perceive the letter 'A' to be blue.
Sound-colour	Sound-colour synaesthesia occurs when sounds cause the secondary perception of colours. For example, an individual may see the colour red when they hear a car horn.
Lexical-gustatory	In lexical-gustatory synesthesia, when a person sees a word (a 'lexeme'), a taste is triggered (Simner et al., 2009). For example, an individual may taste garlic when reading the word 'train'.

We know that our senses work together to make sense of sensory information; for example, flavour perception makes use of both taste and smell areas of the brain as they integrate different information that has come from their sensations of food. However, this is not what occurs in synaesthesia. In synaesthesia, a secondary sensory system, which has not been stimulated by any sensation, experiences and integrates unusual perceptions. An example of this process is depicted in figure 1.
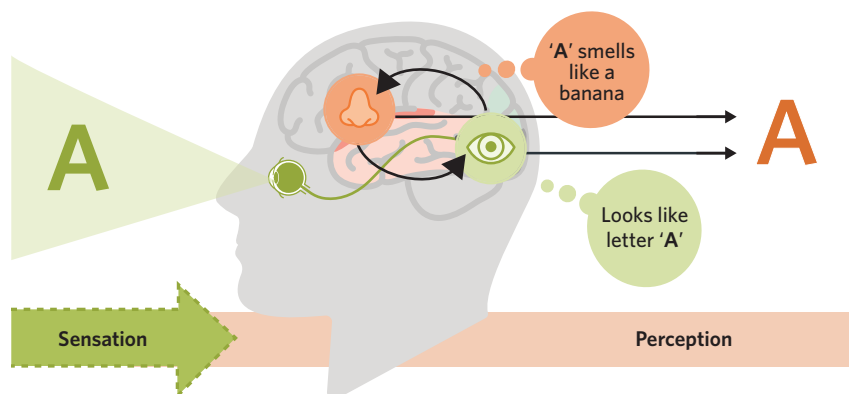
Figure 1 An individual with synaesthesia, when viewing the letter 'A', may begin to smell the scent of a banana due to their sense of smell activating involuntarily when their sense of sight detects sensation

This process can be further broken down into two distinct steps, as follows:

1. A sensory stimulus is detected by one sensory system.
2. During perception, information from another secondary area of the brain is integrated and combined within the cerebral cortex as though it belongs to the same true sensory experience.

This process supports the notion that the brain is in fact in charge of our perception, and for synaesthetes, the brain is responsible for their unique perceptual distortions. In addition to this, the phenomenon of synaesthesia also demonstrates that sensation and perception are two distinct processes, with perception being highly subjective. Many synaesthetes are, at least at first, unaware that they are experiencing unusual perceptions. However, this ultimately demonstrates that two individuals who are perceiving the same stimuli can experience vastly different things.

USEFUL TIP

The experience of synaesthesia can be thought of as 'getting our wires crossed', or accidentally turning on the wrong switch. For example, when we see a word, we want to turn on the 'switch' for visual perception; however, a person who experiences synaesthesia might automatically turn on their 'switch' for taste perception as well. This is depicted in figure 2.

Figure 2 Synaesthesia 'turns on' the switch for a secondary sensory system's perception even though it has not experienced any sensations

---

People with synaesthesia are often born with it, however, it can also develop in some people as a result of substance use or brain injury.

WANT TO KNOW MORE?

The phenomenon of synaesthesia leaves many people wondering why it might occur. Theories behind why synaesthesia occurs are still largely unclear and controversial, however, there are a range of proposed explanations for synaesthesia which are explored in table 3.

Table 3 Proposed explanations for synaesthesia

Sensitivity to neural associations	Synaesthetes are highly sensitive to the associations that a sensory stimulus triggers. In childhood development, unusually strong networks between a sensory stimulus and its associations are formed through learning.
	For example, lexical-gustatory synaesthetes may have learnt in childhood to associate the word 'pear' with the taste of 'pear', so much so that the taste perception is now experienced when the word pear is seen (Simner et al., 2009). However, less obvious associations can also be formed, such as tasting spice when reading the word 'pear'.
Structurally unique brains	The brain networks of synaesthetes are structurally unique. The connections between different areas of the brain may result in the activation of one area, automatically triggering the activation of another, such as the sense of taste being activated when the sense of sight detects sensory information (Neckar et al., 2014).
Synaptic pruning	It has been suggested that synaesthetes undergo less synaptic pruning than non-synaesthetes. Synaptic pruning involves the elimination of underused synapses. Therefore synaptic connections between neurons are eliminated during development in order to create room for essential neural connections in the brain, and make brain functioning more efficient. Instead of undergoing this typical developmental process, synaesthetes may maintain synaptic connections that would have otherwise been pruned, leading to connections being activated in an unusual way.

Spatial neglect 2.2.6.1.2

While synaesthesia is a perceptual distortion that can be experienced within any of the five senses, there are also perceptual phenomena that are related primarily to one sense. Spatial neglect is one of these, which is a perceptual distortion that mainly affects visual perception. **Spatial neglect** refers to an individual's inability to perceive, report, or orient sensory information located within one side of space (Li & Malhotra, 2015). For example, an individual with spatial neglect will only perceive sensory information from either the left or right side of the environment, as depicted in figure 3.

Real sensory information

Individual without spatial neglect

Individual with spatial neglect
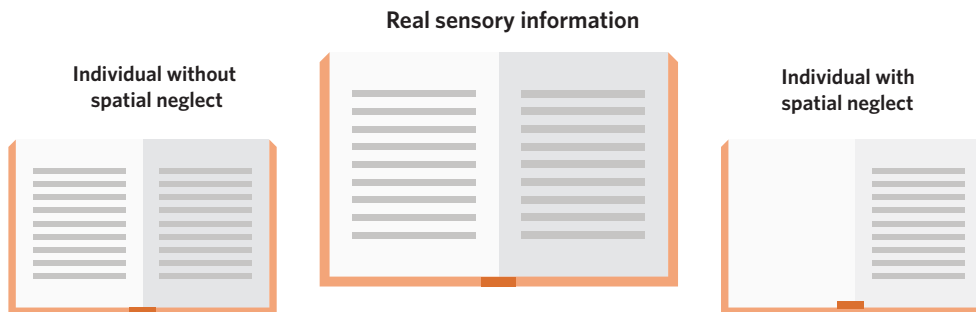
Figure 3 Individuals with spatial neglect fail to perceive information in one side of space

It is important to understand that individuals who experience spatial neglect do not have malfunctioning senses. In fact, most sufferers have otherwise normally functioning vision, with the distortion instead occurring during the process of perception. It is an attentional disorder, where patients simply ignore one side of their visual field.

Spatial neglect, unlike synaesthesia, cannot be caused innately and is most often attributed to a brain lesion resulting from neurodegenerative diseases, trauma, or a hemispheric stroke. The hemisphere of the brain that the lesion occurs in dictates which side of space the individual is unable to attend to, as spatial neglect occurs contralaterally. This means that if a lesion occurs within the right hemisphere of the brain, the left field of vision will be impacted. While it can occur within either hemisphere, spatial neglect mainly occurs due to damage in the brain's right parietal lobe. Like synaesthesia, the phenomenon of spatial neglect is experienced in a consistent way, in that the side of space that cannot be attended to does not change.

As we have learnt, often individuals who experience perceptual distortions don't realise their difference in perception until they are alerted by others, which for some conditions may take many years. However, spatial neglect is often very obvious to those surrounding a sufferer due to the way in which it can affect behaviour (Sarwar & Emmady, 2022). Some common ways that this manifests include that an individual with spatial neglect:

- may consistently gaze in a way that 'drifts' toward the side of the brain in which the lesion occurred. For example, spatial neglect of the left visual field that has occurred due to a lesion in the right side of the brain may cause an individual to be constantly looking to the right, even when considered inappropriate, such as during conversation.
- may begin to display difficulties in dressing or grooming themselves as they unintentionally fail to attend to one side of their body. For example, an individual may only shave one side of their face or put a shoe on only one of their feet.
- will fail to attend to stimuli on one side of their visual field in obvious ways, such as only eating food off of one side of a plate.
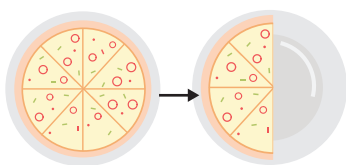
If food is presented in this way, the individual will only attend to the information on one side of space and not realise that there is more food in front of them
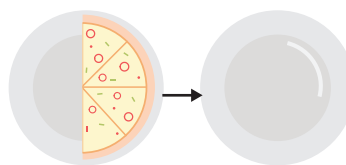
If you were to then move the remaining food to the side of space which they can attend to, they would be able to eat it

Figure 4 An example of how spatial neglect may manifest during meal-times

Although spatial neglect is commonly recognised by those around the individual with spatial neglect, there are specific tests used by clinicians in order to diagnose the condition (Molenberghs & Sale, 2011). Some of these tests are outlined in table 4.

Table 4 Examples of clinical tests used to diagnose spatial neglect

Test	Details
Line bisection task	Individuals are provided with a line and are asked to mark where they perceive the middle of the line to be. Individuals with normal perception will be relatively accurate in their marking, whereas an individual with spatial neglect will likely demonstrate a clear bias to one side. **Figure 5** Example of differing results in the line bisection task
Target cancellation task	Individuals are presented with a picture of different shapes, with the left and right side containing an equal number of each shape. They will be asked to 'cross out' all of a specific type of shape, such as all of the circles. If an individual only crosses that shape on one side of the image, it is likely they are suffering from spatial neglect. **Cross out all of the circles** **Figure 6** Example of differing results in the target cancellation task
Copying tasks	Individuals are provided with different images and are asked to draw a copy of the images provided. Individuals who suffer from spatial neglect tend to disregard one side of the images when reproducing them. **Figure 7** Example of differing results in a copying task

WANT TO KNOW MORE?

In 1995, Ro and Rafal conducted a study in which they tested whether the Müller-Lyer illusion would work on a patient with spatial neglect.

Earlier in this chapter, you learnt about visual illusions including the Müller-Lyer illusion. In order for the Müller-Lyer illusion to work, we know that both arrowheads need to be perceived.

It was hypothesised that an individual with spatial neglect would not be affected by the Müller-Lyer illusion due to an inability to perceive both arrowheads.

Müller-Lyer illusion

However, when a patient with spatial neglect was asked to view the Müller-Lyer illusion, it was found that the arrowheads affected her perception of the illusion (similarly to an individual that did not have spatial neglect), even though she was unable to perceive the full illusion.

According to the researchers, this provides evidence that spatial neglect is rooted in errors of perceptual processing rather than visual deficits.

(Ro & Rafal, 1996)
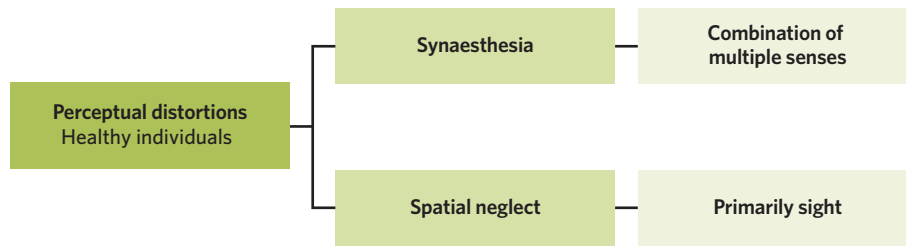
9C Questions

Theory review

Question 1

Perceptual distortions indicate that there is something wrong with an individual's brain.

A. True.

B. False.

Question 2

Which of the following is **not** an example of a perceptual distortion?

A. A damaged pupil leading to blindness in one eye.

B. Synaesthesia.

C. Spatial neglect.

Question 3

Synaesthesia occurs when two different sensory systems detect sensation and integrate this information.

A. True.

B. False.

Question 4

Individuals with spatial neglect fail to _____ sensory information located within one side of space.

Which of the following best fills in the blank?

A. perceive

B. detect

Question 5

Spatial neglect is usually a result of

A. an intellectual deficit.

B. genetics.

C. a brain lesion.

Assessment skills

Data analysis

The following assessment skills type reflects the study design assessment type:

- a data analysis of generated primary and/or collated secondary data

Use the following information to answer questions 6–9.

Grapheme-colour synaesthesia is a form of synaesthesia in which a person sees colours when looking at ordinary symbols, such as numbers and letters.

A correlational study was conducted to test whether this form of synaesthesia had a higher prevalence in art students in comparison to the general population. The study consisted of two groups, art students and non-art students.

An objective measure was used to test the 'consistency' of synaesthetic colour experiences in order to ensure the prevalence recorded was accurate. The results of the study are shown in the graph.

Prevalence of synaesthesia
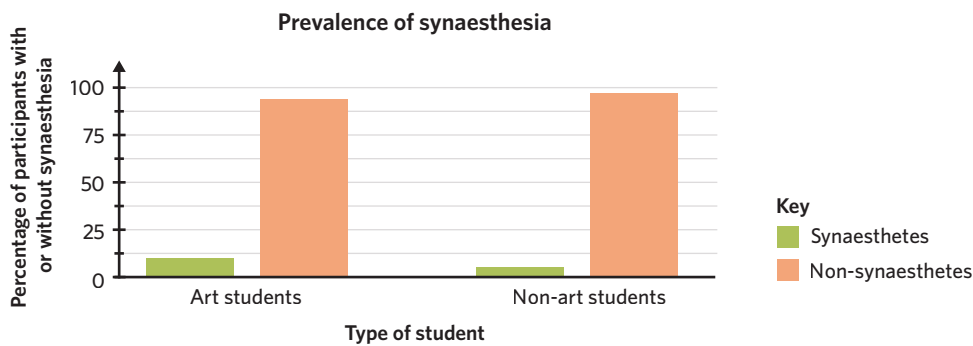
(Rothen & Meier, 2010)

Question 6

The y-axis of the graph demonstrates the percentage of students with synaesthesia.

A. True.

B. False.

Question 7

What were the comparison groups of interest in the study?

A. Art students that are synaesthetes, art students that are non-synaesthetes.

B. The general population, art students.

C. Art students, non-art students.

D. Art students, the general population.

Question 8

The results support the statement that

A. art students are more likely to develop synaesthesia than non-art students.

B. people with synaesthesia are more likely to become art students.

C. in this study, art students had a higher prevalence of synaesthesia than non-art students.

D. non-art students are immune to synaesthesia.

Question 9

Why would the researchers have chosen an objective measure over a subjective measure?

A. Synaesthesia is a physiological condition and therefore needs to be measured objectively.

B. Synaesthesia is highly complex and open to interpretation, therefore objective measures are most suitable.

C. Objective measures can be more valid than subjective measures.

Exam-style

Remember and understand

Question 10 (1 MARK)

Which of the following statements is **not** true regarding perceptual distortions?

A. Perceptual distortions occur during the detection of sensory stimuli.

B. Perceptual distortions are a common occurrence for healthy individuals.

C. All of the senses are prone to perceptual distortions.

D. Synaesthesia and spatial neglect are examples of perceptual distortions.

Question 11 (1 MARK)

The process of synaesthesia involves

A. two sensory systems crossing over in an abnormal and voluntary way.

B. a secondary sensory system that has not been stimulated integrating perceptual information with the stimulated sensory system.

C. two senses working together to make sense of different sensory information.

D. All of the above.

Question 12 (1 MARK)

The phenomenon of synaesthesia demonstrates that

A. perception is highly objective.

B. the brain is not in charge of perception.

C. individuals initially are often very aware of their perceptual distortions.

D. sensation and perception are two distinct processes.

Question 13 (1 MARK)

The abnormal visual experience of individuals with spatial neglect occurs during which process?

A. Sensation.

B. Detection.

C. Vision.

D. Perception.

Question 14 (1 MARK)

Explain what is meant by spatial neglect occurring contralaterally.

Question 15 (2 MARKS)

Identify and describe one proposed explanation for synaesthesia.

Apply and analyse

Use the following information to answer questions 16–18.

Drew recently suffered from a stroke which caused a brain lesion in her right hemisphere. She has recovered relatively well, but her family has noticed some strange changes in her behaviour. Her family took her to a doctor and she was diagnosed with spatial neglect.

Question 16 (1 MARK)

Drew's brain lesion being in her right hemisphere means that

A. she is unable to attend to stimuli in her left visual field.

B. she is unable to attend to stimuli in her right visual field.

C. her brain will no longer function contralaterally.

D. the functioning of her sense of sight is likely to be impaired.

Question 17 (1 MARK)

Drew's family have also noticed something odd about her gaze.

Which of the following is most likely to represent what Drew's family has noticed?

A. Drew no longer looks to the left as she cannot see stimuli in her left field of vision.

B. Drew's gaze constantly drifts towards the right as that is the side that her lesion occurred.

C. Drew no longer looks to the right as she cannot see stimuli in her right field of vision.

D. Drew's gaze constantly drifts towards the left as that is the side that her lesion occurred.

Question 18 (2 MARKS)

Provide another example of a behaviour that Drew's family may have noticed and explain why it is common for the loved ones of spatial neglect patients to notice the condition before the patient does.

Question 19 (2 MARKS)

Identify one similarity and one difference between synaesthesia and spatial neglect.

Questions from multiple lessons

Question 20 (2 MARKS)

Daryl has had spatial neglect for 10 years. Because of this, he often only shaves the left side of his face using a mirror, only eats from the right side of his plate and often bumps into objects that are in the left side of his visual field.

Is Daryl displaying atypical behaviour? Justify your answer.

Question 21 (4 MARKS)

Identify whether spatial neglect and synaesthesia can be attributed to nature or nurture. Justify your responses.

Chapter 9 review

Chapter summary

In this chapter, you learnt about the fallibility of our senses and the phenomena of perceptual distortions.

In lesson **9A Errors of sight,** you learnt about the ways in which our visual perception can be prone to error. Specifically, you learnt about:

- the fallible nature of sight
- visual illusions, including the Müller-Lyer illusion and the Ames room
- agnosia.

In lesson **9B Errors of taste,** you learnt about the ways in which our gustatory perception can be prone to error. Specifically, you learnt about:

- the fallible nature of gustatory perception
- supertasters
- exposure to miraculin
- factors affecting the judgement of flavours, including

  - the influence of perceptual set
  - the influence of colour intensity
  - the influence of texture.

In lesson **9C Perceptual distortions,** you learnt about the instance of perceptual distortions in otherwise healthy individuals. Specifically, you learnt about:

- how gustatory and visual perception are prone to perceptual distortions
- synaesthesia
- spatial neglect.
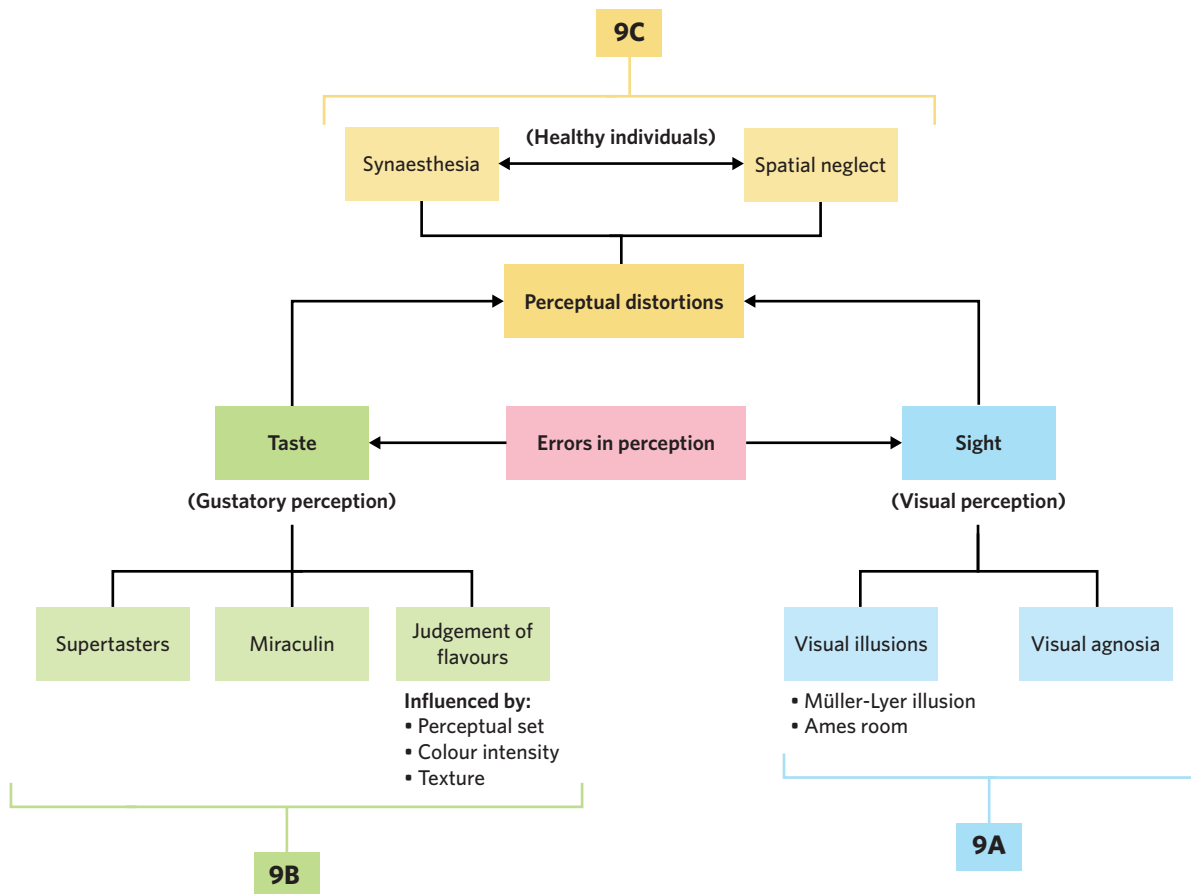
Review activity 1: Fill in the diagram

There are many ways in which our perception can be prone to errors. Print out and fill in the following diagram about these errors.

Spatial neglect

Involves the sense(s) of:

What it involves:

Perceptual distortions often occur in _____ individuals.

Synaesthesia

Involves the sense(s) of:

What it involves:

These senses are _____ and are prone to _____ distortions

Sight

Visual illusions
These can be caused by:

1.

2.

3.

Müller-Lyer illusions
Psychological explanation:

Environmental explanation:

Visual agnosia
Two types:

1.
Explanation:

2.
Explanation:

Ames room
Manipulation of visual cues:

Taste

Supertasters
Characterised by:

1.

2.

Miraculin
Causes _____ foods to taste _____ by:

Judgement of flavours
Influences:

1.
Explanation:

Influences:

2.
Explanation:

Influences:

3.
Explanation:

Review activity 2: Label the scenario

For each scenario listed below, label which type of error or perceptual distortion is likely being experienced. Choose from the following:

- Visual agnosia
- Supertaster
- Spatial neglect

- Judgement of flavours (texture)
- Synaesthesia

Scenario 1: Joseph often finds himself avoiding bitter, bright green vegetables, such as broccoli. He finds the taste to be extremely overpowering. He feels the same way about alcohol and is often considered to be a picky eater.

Scenario 2: Nimesh recently had a stroke. Ever since he got out of the hospital, his family have noticed some changes in his functioning. He often has difficulty recognising objects in his visual field. He can identify their colour and shape when asked, but cannot identify the object itself.

Scenario 3: Lucinda has recently noticed that her perception sometimes differs from those around her. This is something she has experienced all of her life, but she only recently discovered that not everyone shares the same experience. Whenever she hears a word, she tastes a flavour that is specific to that word. The flavour that matches a specific word never changes.

Scenario 4: Iris recently had a stroke. Ever since she got out of the hospital, her family have noticed some changes in her functioning. She often only brushes the right side of her hair, only eats foods off of the right side of her plate, and her gaze often drifts to the right, seemingly without her noticing.

Scenario 5: Elaine has never really liked oranges. However, she finds that freshly squeezed orange juice tastes completely different and finds herself drinking it every morning.

Chapter 9 test

Multiple choice

Question 1   (1 MARK)

Which of the following is considered to be a perceptual distortion?

A. Experience of supertasters.

B. Effects of miraculin.

C. Perceptual set influencing flavour perception.

D. The influence of texture on the intensity of flavours.

Question 2   (1 MARK)

A sense being fallible means that

A. it is unreliable and should not be trusted as accurate.

B. it will experience perceptual distortions.

C. it is biased.

D. it is prone to error.

Question 3   (1 MARK)

Perceptual distortions commonly occur in individuals who

A. are healthy and have normally functioning brains.

B. have a disruption to the functioning of one or more senses.

C. have incurred significant brain damage.

D. are intellectually below average.

Question 4   (1 MARK)

Perceptual distortions involve

A.   an issue in the detection of sensory stimuli.

B.   an error in the interpretation of sensory stimuli.

C.   an overexposure to specific sensory stimuli.

D.   a difference in cognitive abilities.

Question 5   (1 MARK)

Which of the following is **not** a common cause of the occurrence of visual illusions?

A.   An environmental influence.

B.   A psychological influence.

C.   Damage to the eye.

D.   A physiological influence.

Short answer

Question 6   (2 MARKS)

Outline one similarity and one difference between apperceptive visual agnosia and associative visual agnosia.

Question 7   (2 MARKS)

Can visual illusions be categorised as perceptual distortions? Justify your response.

Question 8   (4 MARKS)

Compare the influence of a food's texture on both the intensity and enjoyment of flavour, with reference to perceptual distortions.

Question 9   (6 MARKS)

Identify and explain two general characteristics of synaesthesia, using examples.

Question 10   (10 MARKS)

Dr Levine is interested in researching the experience of spatial neglect and visual agnosia in stroke patients. She recruited 6 patients from a local hospital who had recently suffered from a stroke. Three patients exhibited symptoms of spatial neglect whilst three patients displayed symptoms of visual agnosia. All patients had the physiological effects of the stroke on their brains examined. Dr Levine plans to test and compare the visual perceptions of patients suffering from spatial neglect and those suffering from visual agnosia.

Using appropriate psychological terminology, evaluate the proposed design for Dr Levine's research study.
Your evaluation should consider:

- the experimental design, sampling method, and variables used in the investigation.
- the likely results of Dr Levine's research and the key points of comparison within the results with respect to visual agnosia and spatial neglect.
- limitations of this research study and how they may be overcome.

Unit 2 AOS 2 review

The VCE study design outlines that, upon completion of this area of study, you must be able to 'explain the roles of attention and perception, compare gustatory and visual perception and analyse factors that may lead to perceptual distortions.'

SAC assessment 1

The following task can be used as a practice SAC. This task is based on the following study design assessment type:

- a report of a scientific investigation, including the generation, analysis and evaluation of primary data

Use the following information to answer questions 1 and 2.

Practical investigation – the effect of age on gustatory perception

Dr Sinclair has decided to investigate the influence of age on the gustatory perception of individuals. She has recruited 150 participants who are currently inpatients at the hospital where she works. Their ages range from 15 to 85 years.

Question 1   (6 MARKS)

Before conducting her research, Dr Sinclair must outline certain factors pertaining to the study.

a.   Outline the aim of the study. (1 MARK)

b.   Identify the independent and dependent variables that will be measured. (2 MARKS)

c.   State a hypothesis for the study. (3 MARKS)

Question 2   (5 MARKS)

Identify and evaluate the sampling method used by Dr Sinclair, including any recommendations on how to improve her sampling procedure.

Use the following information to answer questions 3–7.

Results of the study

Dr Sinclair decided to use a mixed methodology of both between-subjects and within-subjects designs to conduct the study. Each participant was first given a plain cup of water to taste, followed by a cup of water that contained a small amount of dissolved sugar. The participants were asked to outline whether the two drinks were the same or different.

The results, categorised by age, are outlined below.

Age range	Percentage of accuracy per group
15–25	89%
26–35	92%
36–45	83%
46–55	77%
56–65	78%
66–75	72%
76–85	69%

Question 3   (4 MARKS)

Using the blank template below, graph the results.

Question 4   (6 MARKS)

With reference to the results and methodology of the study,

a.   Justify why Dr Sinclair's research was a correlational study, and evaluate this type of research. (4 MARKS)

b.   State whether Dr Sinclair's hypothesis was supported, and provide a biological influence on taste that supports these results. (2 MARKS)

Question 5   (5 MARKS)

Scientific research is often prone to error.

a.   With reference to types of processing, explain how participants' schemas may have impacted the results. (3 MARKS)

b.   Explain how the cultures of the participants may have impacted the results. (2 MARKS)

Question 6   (6 MARKS)

Gustatory perception, like most senses, is often considered to be fallible. Other than the effects of age, compare the fallibility of gustatory perception and visual perception with reference to both biological and non-biological influences.

Question 7   (8 MARKS)

Visual and gustatory perception are said to be interconnected.

a.   Explain the process of perception in vision, and compare this with what is known about the process of perception in taste. (6 MARKS)

b.   Identify and explain one way in which these two senses may overlap. (2 MARKS)

Unit 2 AOS 2 review

SAC assessment 2

The following task can be used as a practice SAC. This task is based on the following study design assessment type:

- reflective annotations of a logbook of practical activities

Refer to the following logbook activity to answer questions 1 and 2.

Does multitasking impact performance?

Aim

To investigate the impact of multitasking on task performance.

Method

1. Set a timer for 1 minute.
2. Students hand-write the alphabet from A–Z in order as fast as they can. If they get to Z and the timer is still going, they should start again from 'A' and continue until the time is finished.
3. Students add up how many letters they managed to write down. Calculate the class average.
4. Reset the timer for 1 more minute.
5. Students repeat the exercise from step 2, but this time, alternate between writing down letters and numbers (i.e. A 1 B 2 C 3 D 4).
6. Students once again add up how many letters/numbers they managed to write down. Calculate the class average.

Question 1 (4 MARKS)

This practical investigation focuses on the phenomena of attention.

a. Outline the impact that this task would likely have on the duration of sustained attention. Justify your response. (2 MARKS)

b. Identify a possible distraction for this investigation and suggest a way in which this could be minimised by changing elements of the experimental design. (2 MARKS)

Question 2 (6 MARKS)

The process of perception allows us to make sense of the world around us.

a. Compare attention and perception. (2 MARKS)

b. Explain the process of perception that would have occurred when counting the number of letters recorded. (3 MARKS)

c. Identify the area of the brain that is associated with the final stage of this type of perception. (1 MARK)

Refer to the following logbook activity to answer questions 3–5.

What impacts our experience of taste?

Aim

To investigate how much our sense of taste is dependent on our other senses.

Materials

- a packet of jelly beans with different flavours
- a partner or friend
- a piece of paper
- a pen.

Continues ▶

Method

Part 1. Taste and smell

1. Pinch your nose shut using one hand.
2. Grab a jelly bean with the other and eat it.
3. On a piece of paper, record whether your flavour judgement was accurate. Could you taste which flavour it was?
4. Repeat steps 1 to 3 as many times as you'd like.

Part 2. Taste and vision

1. Close your eyes.
2. With your eyes closed, grab another jelly bean and eat it. Get a friend to notice the flavour you are grabbing.
3. Guess the flavour you are eating and ask your friend if you were right. On a piece of paper, record whether your flavour judgement was accurate.
4. Repeat steps 1 to 3 as many times as you'd like.

Question 3   (4 MARKS)

Identify and describe the type of data being collected, with reference to two different categorisations of data.

Question 4   (3 MARKS)

Our gustatory perception is often influenced by other senses.

a. Identify the two areas of the brain that are used when the senses of smell and taste are combined. (2 MARKS)

b. Outline the role of the somatosensory cortex in flavour perception. (1 MARK)

Question 5   (4 MARKS)

Identify and explain the difference between the types of processing that would be used for part two of the investigation, versus when eating a jelly bean normally.

Refer to the following logbook activity to answer questions 6 and 7.

Müller-Lyer illusion

Aim

To test the fallibility of sight using the Müller-Lyer illusion.

Materials

- a pen
- a piece of paper
- a copy of the Müller-Lyer illusion.

Method

Note: This practical investigation is designed as a class experiment to be run by a teacher.

1. Begin by either printing or drawing a copy of the Müller-Lyer illusion.
2. Present the image to the class and ask them to identify whether the left or right line is longer or whether they are the same length.
3. Record their answers.
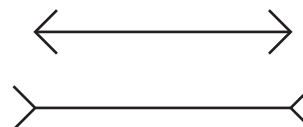
Question 6   (6 MARKS)

This practical investigation is focused on the fallibility of visual perception.

a. Describe the physiological process that would occur prior to perception when viewing the Müller-Lyer illusion. (4 MARKS)

b. When viewing the Müller-Lyer illusion, during which stage of the process of vision does the fallibility occur? Justify your response. (2 MARKS)

Question 7 (3 MARKS)

Another visual illusion is known as the Ames room.

a. Outline whether this illusion relies on monocular or binocular depth cues. (1 MARK)

b. Explain the influence of two visual constancies on an individual's perception whilst viewing the Ames room. (2 MARKS)

Refer to the following logbook activity to answer questions 8–10.

Supertasters

Aim

To determine whether you are a supertaster.

Materials

- food colouring
- a cotton ball
- a piece of paper
- a hole puncher
- a pen.

Method

Note: It may help to partner up with a classmate for this activity.

1. Take a sheet of paper and use a hole puncher to create a hole.
2. Coat a cotton ball in food colouring.
3. Stick out your tongue and use the cotton ball to coat the first half of your tongue with the food colouring. The colouring should not stick to the papillae of the tongue and should contrast with the colour of the rest of the tongue.
4. Place the piece of paper over your tongue, ensuring the hole is also on your tongue.
5. Count how many papillae you can see within the hole in the paper.
6. Classify yourself, according to your tasting ability, using the following categories:

Number of papillae	Type of taster
<15	Reduced tasting ability
15–35	Average taster
>35	Supertaster

(Murray, 2004)

Question 8 (2 MARKS)

Identify the type of attention that would be used when counting the number of someone's papillae. Justify your response.

Question 9 (4 MARKS)

Like other senses, gustatory perception begins with sensation.

a. Explain the process of sensation in taste. (3 MARKS)

b. Outline the stage of this process in which the experience of a supertaster first differs. (1 MARK)

Question 10 (4 MARKS)

A researcher wants to use the data your class collected in order to determine the gender differences in the incidence of being a supertaster.

a. Outline the type of study that this would be classified as and explain why. (2 MARKS)

b. Using an example, explain one other individual difference that can influence taste perception. (2 MARKS)

UNIT 2 AOS 3

Student-directed scientific investigation guide

Image: GoodStudio/Shutterstock.com

During Unit 2, you will conduct your own practical investigation assessment to complete Area of Study 3. Similar to the research investigation in Unit 1, there will be multiple formats in which you can present your investigation. Your investigation will focus on **the impact of internal and/or external influences on perception and/or behaviour**, in relation to content you learnt during Unit 2.

To conduct this practical investigation, you will need to refer to the skills you have learnt about in **Chapter 1 Key science skills**. In this guide, you will learn some new skills that you will need to conduct your own practical investigation, as well as revisit some skills you learnt for your research investigation in Unit 1.
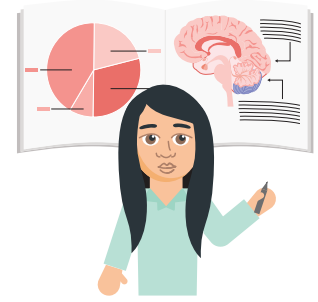
A step-by-step guide on practical investigations

To help you approach this assessment task, this guide will break down each of the steps you will need to accurately design, conduct, and present your investigation. The guide will also include examples to help support your understanding of the task.

ACTIVITY

Log into your Edrolo account for activities that support this lesson.

A step-by-step guide on practical investigations

| Research skills | Planning your investigation | Conducting your investigation | Writing up your investigation |

Research skills
- Role of scientific investigations in reducing uncertainty
- Health and safety guidelines
- Characteristics of primary data

Planning your investigation
- Step 1 – Create a logbook
- Step 2 – Formulate a research question
- Step 3 – Investigate relevant psychological studies
- Step 4 – Formulate an aim and hypothesis
- Step 5 – Decide on the research design
- Step 6 – Design the methodology
- Step 7 – Decide on a data collection and generation method
- Step 8 – Consider ethical guidelines and any potential errors or biases

Figure 1 A mindmap of what will be covered in this guide

The steps you need to take to carry out your investigation will be outlined in this guide. These steps include:

1. Developing a research question related to the impact of internal and/or external influences on perception and/or behaviour. This will involve looking at contemporary research available for your topic to decide what you want to study and how you should conduct the study.

2. After you have chosen a research question, you will then have to design your practical investigation. In designing your investigation, you will have to make multiple decisions, such as what type of data you will collect.

3. After conducting your practical investigation, you will need to organise the data you have collected.

4. You will then need to use the data you collected in combination with your findings from contemporary psychological research studies to form a conclusion in response to the research question.

5. You will also need to complete a logbook throughout the course of this assessment.

6. Once you have conducted your practical investigation, you will then need to decide how to present your investigation. This may include a scientific poster, an article for scientific publication, a practical report, an oral presentation, a multimedia presentation, or a visual report.

(VCAA, 2022)

Research skills

Before you start designing and conducting your practical investigation, you need to make sure that you understand all of the key concepts and skills that you will need to use. You have already learnt about many of these concepts in chapter 1, such as validity and reliability, accuracy, and the use of data. You have also learnt some skills and concepts from carrying out your Unit 1 AOS 3 investigation, including effective scientific communication and the nature of evidence. However, there are some additional key knowledge points, which are outlined below, that you will need to learn before carrying out your practical investigation.
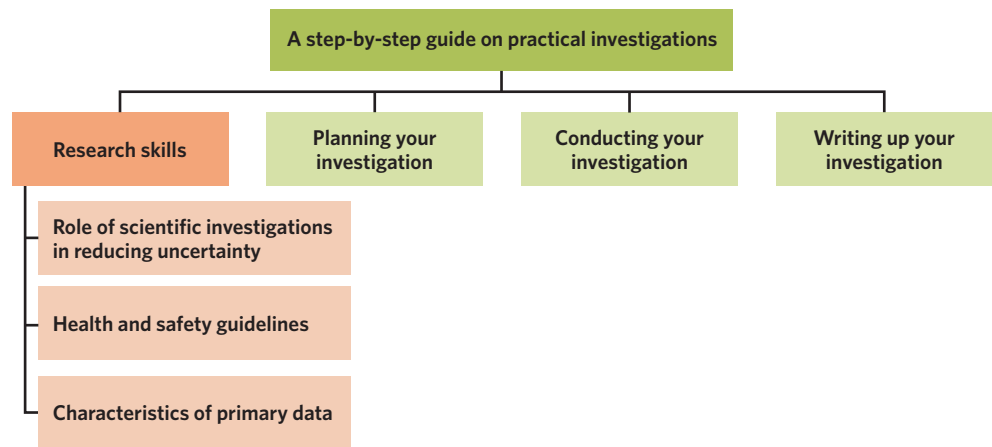
Figure 2 In this section of the guide, you will learn about research skills

Role of scientific investigations in reducing uncertainty

As you learnt in lesson **1F Evaluating research**, uncertainty refers to the lack of exact knowledge relating to something being measured due to potential sources of variation in knowledge. This is particularly apparent in the field of psychology due to scientific investigations often studying abstract psychological constructs, such as personality traits.

Findings from scientific investigations are never certain and continue to be challenged by new research findings. For example, reproducing existing studies often leads to findings which contradict previous findings, or instead support them. This is an ongoing process that helps to inform theories and contribute to existing knowledge in psychology, and hopefully make theories continually less uncertain as more research is conducted.

With this in mind, carefully consider how your study will be designed to support or challenge previous research.

LESSON LINK

In lesson **1A Introduction to research**, you learnt about the scientific method. You learnt that scientific investigations help to create or modify theories, which contributes to less uncertainty in the field of psychology.
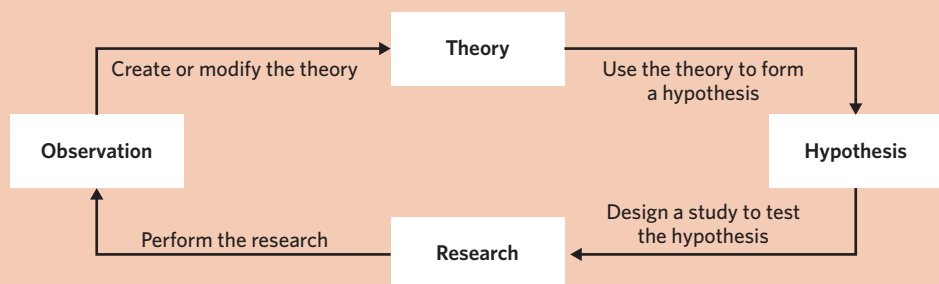
Figure 3 The scientific method involves scientific investigations contributing to psychological theories and subsequently reducing uncertainty relating to these theories

Health and safety guidelines

When conducting practical investigations, it is important to take into account the rights of research participants and ensure that their health and safety is protected. To ensure this, health and safety guidelines need to be taken into account. Some examples of health and safety guidelines include ensuring that:

- any tasks you administer to participants do not inflict any harm (physiologically and psychologically).
- the environment/s in which you conduct the practical investigation is safe.
- the rights of participants are protected. This includes voluntary participation, informed consent, withdrawal rights, confidentiality, deception, debriefing, and the no-harm principle, all of which are outlined in lesson **1G Ethical considerations**.

It is vital that you follow all health and safety guidelines when conducting your research investigation.

Characteristics of primary data

You learnt about collecting primary data in lesson **1E Organising and interpreting data**. Primary data collection refers to data that the researcher directly collects that they will later organise and interpret.

Characteristics of primary data include that the data:

- is collected by the researcher
- is original and unique to the study
- requires considerable time and effort to collect
- can be established as accurate and relevant to the study. By contrast, information about how secondary data (data previously collected by another researcher) is collected is not always available.

In this task, you are required to collect your own primary data.

Planning your investigation

Figure 4 In this section of the guide, you will learn about the steps involved in planning your investigation

USEFUL TIP

A lot of the steps outlining how to plan your study are interrelated. A good way to design your study is to conduct a quick brainstorm about the elements you definitely want to include. During your planning, you may need to revise previous steps or plan steps simultaneously, depending on your investigation. For example, to formulate your hypothesis (step 4) you need to know aspects of your research design, such as who your research population is (step 5).

STEP 1 ▶ Create a logbook

You will need to use a logbook when completing this investigation, just as you did in the Unit 1 research investigation. The exact structure and content of your logbook will vary depending on what your teacher expects, so make sure you check with them before starting this step.

The purpose of the logbook is to authenticate the work you complete in collecting your primary data. It can also be used to keep track of all the work you complete, which can then be compiled when you present your findings.

Don't forget to log into your Edrolo account for the logbook activities that support this guide.

STEP 2 ▶ Formulate a research question

Before you start designing and conducting your practical investigation, you first need to decide what you want to investigate. To do this, you need to formulate a research question. This research question needs to be related to internal and/or external influences on perception and/or behaviour, which is specified by VCAA. These factors differ in that:

- external influences arise from the environment of an individual.
- internal influences arise from within the individual.

Biological, psychological, social, and cultural factors all have influences on individuals, with these influences either being internal or external. Your investigation is likely to relate to one of these factors. You may have freedom on what you investigate, or your teacher may specify a type of factor that you should focus on. Your teacher may also specify whether you need to focus on perception or behaviour, or whether you have the freedom to choose. This will help to inform your research question.

To formulate your research question, it is a good idea to look through the concepts and topics you have learnt in Unit 2 and see what interests you most. As you learnt in the **Unit 1 AOS 3 Student-directed research investigation guide**, researchers analyse the existing psychological literature to formulate their own research questions. This may involve finding a slightly different angle to approach or even discovering errors or biases in a research study that you want to try to correct through your research. You also have the option to adapt an existing study.

EXAMPLE

The research question we will investigate as an example is

'How does branding (as part of one's perceptual set) influence gustatory perception?'.

This question has been formulated from content in Unit 2, Area of Study 2 which you learnt about in lessons **8D Gustatory perception** and **9B Errors of taste**.

STEP 3 ▶ Investigate relevant psychological studies

Now that you have formulated a research question, it is important to investigate the relevant existing psychological literature. Through your research, you may discover a popular or universally accepted method or test used to measure a psychological phenomenon that you can include or revise for your own study.

This research will help you during the following steps that outline when you are to formulate a hypothesis, decide on a research design, design your method, and consider any ethical implications of your research.

If you find multiple scientific research studies that present contradictory findings, it is important to note this down. These contradictory findings could have occurred for several reasons, such as different measures being used in different studies, or inconsistent sample sizes, as well as errors in the study. The notes you have on uncertainties in the research could be used in the introduction section of your write-up when outlining a reason as to why you are undertaking the investigation. You could also discuss whether any information in the psychological studies you looked at challenge or are incongruent with existing theories or models in the field of psychology.

USEFUL TIP

You should take note of any useful psychological studies or research that you come across during this step. This will enable you to refer to previous theories and research in the introduction and discussion sections when you write up the findings from your study. You will also need to reference these studies.

STEP 4 ▶ **Formulate an aim and hypothesis**

In lesson **1A Introduction to research**, you learnt about aims and hypotheses, and how these are distinct from models and theories. This involved learning that a/an:

- aim is a statement outlining the purpose of an investigation.
- hypothesis is a testable prediction about the outcome of an investigation.
- variable is a condition or component of an experiment that can be measured or manipulated.

For your investigation, you will first need to formulate your own aim.

- Your aim should be directly informed by your research question.
- For example, 'To investigate the impact of branding (as part of one's perceptual set) on gustatory perception'.

You then need to identify the independent (IV) and dependent variable (DV) in your study.

- The IV is manipulated by the researcher, while the DV is measured.
- It is important for you to operationalise these variables so that you know exactly how these variables will be measured/used in the study.
- This is not only important to plan for your study, but also to include in your hypothesis, and so future researchers can replicate your study.

Finally, you need to formulate your hypothesis.

- Your hypothesis needs to outline your IV and DV and outline a clear predicted direction of the relationship between the variables.
- You can also choose to specify the population of interest, although it is not always necessary.
- The link between the aim and hypothesis is illustrated by figure 5.
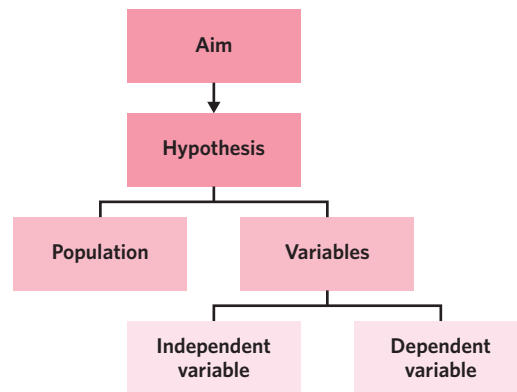
Figure 5 Components you need to outline at this stage of planning your investigation
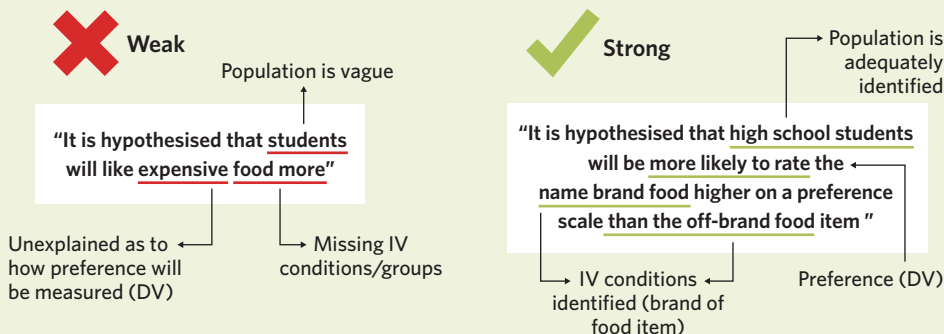
Figure 6 A weak hypothesis compared to a strong hypothesis

As can be seen in figure 6, the strong hypothesis is much clearer and more specific when compared to the weak hypothesis. This makes it easier to measure because there is a clearly outlined dependent variable (DV), a specified population, and both conditions (control and experimental) or groups relevant to the IV have been identified. Due to this clearer hypothesis, it will be easier for other researchers to replicate the study. Importantly, the hypothesis also starts with 'It is hypothesised... ' and clearly outlines the direction of the hypothesis.

STEP 5 ▶ Decide on the research design

Now that you have formulated a hypothesis, there are multiple decisions that you need to make about the research design. If you need a refresher on any of these concepts, return to **Chapter 1 Key science skills**. The decisions you have to make include:

- what **investigation methodology** will you use? The different types of investigation methodologies include, but are not limited to, identification and classification, controlled experiments, correlational studies, fieldwork, case studies, modelling, and simulation. It is important to consider what is feasible for you to do. For example, you would not be able to conduct a study over multiple years for the purpose of this assessment task. In fact, you are the most likely to conduct a correlational study or controlled experiment in this assessment task.

- what **controlled experimental design** will you select (if you choose to conduct an experiment)? This will involve evaluating whether it is most appropriate to use a within-subjects design, a between-groups design, or a mixed design.

- what will the **size of your sample** be? It is important to again consider what is feasible here. For example, it is unlikely that you will be able to interview 100 participants due to time constraints.

- what **sampling procedure** will you use? Are you able to use random or stratified sampling, or is it best to use convenience sampling?

- what **allocation method** will you use? Are you able to randomly allocate your participants into the conditions?
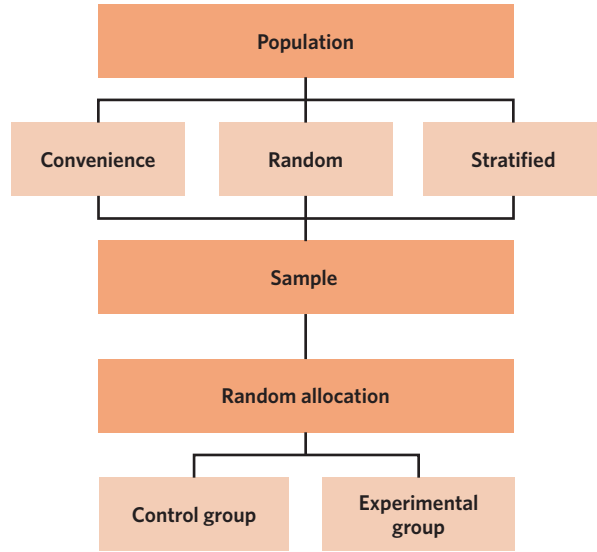
Figure 7 Components related to a controlled experimental design that you need to outline at this stage of planning your investigation

It is important to consider the strengths and limitations of each decision you make for your practical investigation so that you can discuss them in your report or presentation.

STEP 6 ▶ Design the methodology

In lesson **1D Preventing error and bias**, you learnt about standardised instructions and procedures. It is vital to have set instructions and procedures before conducting your investigation to ensure that all participants have similar experiences during the study, minimising extraneous and confounding variables.

To ensure standardised instructions and procedures are used, it is important to outline your method and decide on how you will collect the data from the study. The main two areas you need to consider when making decisions about your method are materials and procedure. The procedure is best outlined as a step-by-step guide on what you will instruct your participants to do. These instructions need to be clear so that you can follow it closely for each participant, as well as so that researchers can repeat your study in the future and have similar results (reproducibility). Considerations relating to the materials you intend to use and the design of your procedure are outlined in table 1.

Table 1 Considerations relating to materials and procedures

	Considerations
Materials	• Informed consent sheet • Questionnaires/rating scales (and pens/pencils you will need to fill these in) • Any materials needed to record data, e.g. timer, camera, etc. • Any other materials needed for the investigation
Procedure	• Are the instructions standardised? The more standardised the instructions, the less likely it is that there will be confounding variables. • Are the instructions and methods of measurement clearly outlined? Having clear steps ensures that the study is able to be replicated in the future. • Have you outlined the difference in procedure between the control and experimental group/s? It is important to clearly outline this so that your procedure is easy to follow.

Another important component of the method is the participants section. However, you should have made most of these decisions in step 5. It is important to consider demographic information you may need to collect from your participants to include in your write-up (such as their age, year level, gender, etc.). You may include instructions at the start of your method to collect this information from the participants.

STEP 7 ▸ Decide on a data collection and generation method

There are multiple decisions you need to make about how you will collect and generate your data from the investigation. If you need a refresher on these methods, return to lesson **1E Organising and interpreting data**. Some of the questions you will have to consider include:

- Should I collect quantitative or qualitative data? Which is the most appropriate to answer my research question?
- Will the data collected be subjective or objective?
- How will I collect this data? Will it be from survey responses, a rating scale, or responses to an interview?
- How will I record this data? Will I write these down during the investigation, or after? If recording the data afterwards, how do I ensure the accuracy of the data I capture?
- If using quantitative data, how will I process and organise the data collected? Will I calculate measures of central tendency (mean, median, mode) or variability (standard deviation)? If so, does the data I collected allow that?
- If using qualitative data, how will I process and organise the data collected? Will I compare responses between the two groups? If so, does the data I collected allow that?
- Will I be able to easily present and interpret this data in my report or presentation?

STEP 8 ▸ Consider ethical guidelines and any potential errors or biases

Before conducting your investigation, you need to consider any ethical concepts and guidelines that are relevant to your study, as well as any potential errors and biases which may arise.

When considering the ethics of your investigation, it is important for you to draw on the information you learnt in lesson **1G Ethical considerations**, as well as the health and safety guidelines you learnt about earlier in this guide. If you need a refresher on these concepts, make sure to return to these sections before considering your own investigation. Some ethical questions related to ethical concepts that you should ask yourself before conducting your practical investigation are outlined in table 2.

LESSON LINK

In lesson **1F Evaluating research**, you learnt about the concepts of accuracy, precision, repeatability, reproducibility, and validity. To ensure these requirements (e.g. to have precise measurements) are met, you need to consider them when deciding on the measures you will use, and your data generation methods, as this is often where you can introduce errors.

Table 2 The main ethical concepts

Ethical concepts	Questions to ask before conducting your study
Respect for human beings	• Have I provided the participants with as much information about the nature and risks of the study as possible (without compromising my ability to conduct the study)? • Have I made sure to not coerce any individuals to participate in the study? • Have I taken the cultural beliefs and practices of my participants into account? • Does the procedure/method I have designed protect the dignity of each participant?
Justice	• Am I treating all participants in a fair and equal way? • Am I putting any pressure on any of my participants to participate?
Beneficence	• Have I considered all potential risks the participants may be exposed to during the study? Do the benefits of the study still outweigh these risks? • Have I attempted to minimise risks to participants as much as possible?
Non-maleficence	• Will the design or procedure of the study cause harm to any participants? • Have I considered all harm that could be done to participants? Including social, mental and emotional harm, as well as physical.
Research merit and integrity	• Have I taken the time to research previous studies related to my research question to ensure that I will conduct a safe, accurate, and effective practical investigation? • Have I adequately prepared before conducting my practical investigation?

You should also consider the following questions:

- Have I considered the no-harm principle and taken adequate steps to ensure that the participants will not experience physical or psychological harm due to my study?
- Have I considered the following? If the answer is 'no' to any of the following ethical guidelines, you may need to make some adjustments to your investigation.

  – Voluntary participation

  – Informed consent

  – Withdrawal rights

  – Confidentiality

  – Deception

  – Debriefing

Using all of these ethical concepts and ethical guidelines, you need to consider whether any adjustments or considerations need to be made to how you conduct your practical investigation. Even when you do consider the ethics of your study, some things can occur during a study that are unplanned. For example, you may remember when writing up your study that you forgot to debrief one of your participants. This should of course be avoided, but accidents can happen. If something like this happens during your investigation, make sure to record this so that you can mention this in your write-up.

It is also important to consider any errors or biases that may occur and to prevent these when possible. In lesson **1D Preventing error and bias**, we learnt that extraneous variables (EVs) are any variables other than the independent variable that may produce unwanted results on the dependent variable in a study. To minimise these unwanted effects you should ask yourself the following questions:

- Have I chosen an appropriate sampling procedure and experimental design to minimise participant-related variables?
- If using a within-subjects design, have I considered whether order effects could be produced? If so, how could you minimise these order effects?
- Have I considered implementing a placebo and potentially a single-blind procedure to minimise the placebo effect?
- Have I considered implementing a double-blind procedure to minimise experimenter expectations or biases?
- Are my instructions and procedures standardised?

It is not always possible to prevent all extraneous variables due to time constraints and limited resources, as well as extraneous variables potentially arising while conducting your investigation. If this is the case, make sure to note this down in your logbook so you can include it in your report, poster, or presentation.

USEFUL TIP

One of the most important ethical considerations is to ensure that you have gained informed consent from your participants. If you are using participants under the age of 18, it is important that you gain consent for their participation from a parent or guardian. However, it is also important that you gain assent from participants under the age of 18, which means that they understand the aim, nature, and risks of the study to the best of their ability.

Figure 8 It is important that you gain informed consent from participants before conducting the study

Now that you have deliberated the ethical guidelines and any errors or biases which may occur in your investigation, you may need to revise any plans you made in previous steps to accommodate for necessary or relevant changes. For example, after considering experimenter biases, you may have to revise your method at step 6 to include the use of a double-blind procedure.

Conducting your investigation

It is now time for you to conduct your investigation. It is important that you set aside enough time before your scientific poster or report is due to ensure that you can carry out your research. Depending on your investigation, this may be conducted at your school, at your house, or at a family or friend's house.
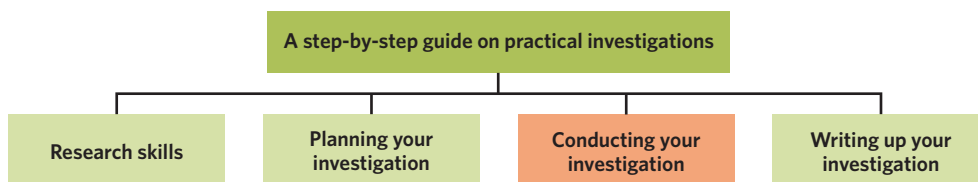
Figure 9 In this section of the guide, you will learn about how to conduct your investigation

Due to this most likely being the first time you have conducted your own scientific investigation, it is natural for things to go wrong or to not turn out in a way that you expected. This is completely normal! It is important to not only record your results, but also to write notes while conducting your investigation to ensure that you can mention what did and did not go to plan in your write-up. For example, if you gave one participant non-standardised instructions, this may account for why their data is an outlier, which is something you can mention in the discussion section of your report. Similarly, when conducting the investigation with one participant, you may have been in a noisy environment, potentially acting as an extraneous variable.
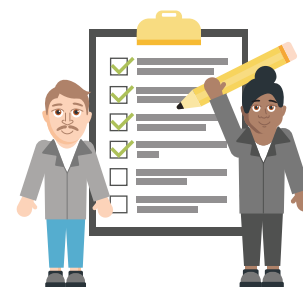
Figure 10 It is important to take notes both during or after conducting your investigation to ensure that you remembered what did and did not go to plan

Writing up your investigation
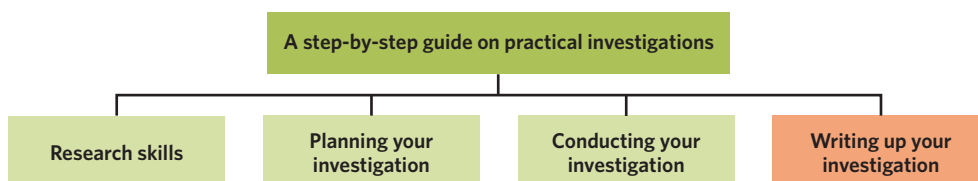
Figure 11 In this section of the guide, you will learn about how to write up your investigation

Now that you have planned and conducted your study, it is time to interpret your findings and present them. There are multiple formats in which you can present your work, with VCAA suggesting a scientific poster, an article for scientific publication, a practical report, an oral presentation, a multimedia presentation, or a visual report. Your teacher may select a format for you, or you may have free choice.

Regardless of the format, you must include the sections outlined in figure 12. It is likely that you will be expected to write around 600 to 1200 words for this assessment, depending on what your teacher has outlined. Refer to figure 12 as a rough guide on how many words you should spend on each section of your presentation, scientific poster, or report. It is important to ensure that your write-up is as concise as possible, while still including all the necessary components.

There is a sample scientific poster at the end of this guide which presents an example of each section of your investigation. Scientific posters are similar to written reports, except they are likely to be more concise and have a more rigid structure that needs to be followed. It is important to remember that this example is only a guide, and your teacher may have different guidelines about what is necessary to include in your write-up.

Title Student name		
Introduction (200 words) • Brief reason for undertaking investigation • Aim, testable hypothesis and/or prediction • Relevant background psychological concepts		**Discussion** (200 words) • Interpretation and evaluation of analysed primary data • Limitations in data and methods, and suggested improvements • Cross-referencing of results to relevant psychological concepts and previous research • Linking of results to the investigation question and the aim, to explain whether findings support the hypothesis • Implications of the investigation and/or suggestions as to further investigations
Methodology and methods (100 words) • Brief outline of the selected methodology (participants, materials, and procedure) • Summary of the data generation methods and data analysis methods	**Communication statement** reporting the key finding of the investigation as a one-sentence summary	
Results (50 words) • Presentation of generated data/evidence in appropriate format to illustrate trends, patterns, and/or relationships		**Conclusion** (50 words) • Conclusion that provides a response to the investigation questions • Identification of the extent to which the analysis has answered the investigation question, with no new information being introduced
References and acknowledgements of all quotations and sourced content		

Figure 12 A guide on the content to include in each section of your investigation write up in the format of a scientific poster *(adapted from VCAA, 2022)*

USEFUL TIP

Scientific posters and reports should follow a funnel method. The width of each part of the diagram represents how broad the information of that section is. For example, the start of the introduction should include background information to justify the reason for undertaking the investigation (broad). The end of the introduction is significantly more specific and subsequently has a narrower band, in which the aim and a testable hypothesis should be outlined.

The method and results section contain highly specific information to the investigation.

The discussion also starts specific (hence being narrow on the diagram), as the primary data you have collected is interpreted and evaluated. While the end of the discussion outlines implications of the investigation, such as implications for the 'real-world' environment or future studies (more broad).

Figure 13 The funnel method of a scientific poster, in which the widest parts of the funnel represent the broadest information, and the narrowest parts represent the most specific information

This example poster investigates the influence of branding on gustatory perception. Each of the sections in the poster will be explored in depth and annotated examples will be provided.

Title

At the top of your scientific poster or report, or at the start of your presentation, you will have to present the title you formulated for your investigation. To formulate your title, you should refer to your research question and make some small adjustments if necessary.

As a general guide, you should try to have your title be 12 words or less. You are aiming to have a short and concise title which outlines the variables of your investigation, but is not overly complex or long. An example of a title could be 'Investigating the effects of (the IV) on (the DV)'.

Introduction

In your introduction you will need to include:

- a brief reason for undertaking the investigation
- relevant background psychological concepts
- an aim, testable hypothesis, and/or prediction.

Reason for undertaking the investigation

Firstly, you need to start off with reasons for undertaking the investigation. This is typically achieved by providing relevant real-world or background information to contextualise your investigation. By contextualising your area of research, you should be indirectly justifying why the investigation is important to conduct. As outlined previously in this guide, your reason for undertaking the investigation could relate to reducing uncertainty in a specific area where scientific information is inconsistent. Your reason for undertaking the investigation should be no more than a few sentences.

Overview of relevant background psychological concepts

In this section, you should define and outline any relevant psychological concepts, as well as outline the findings of relevant past research in this area. This includes defining any key terms. It is important to note the findings of past studies to act as a basis from which you can form your hypothesis and expectations about the findings of your research. In such a way, this section should provide links between the psychological concepts and theories, previous research, and your own investigation.

Identification of research aim and testable hypothesis and/or prediction

You should then state your aim for your study in a sentence (not as a question). You can start your aim with 'This study/investigation aims to…'.

It is then important to outline your research hypothesis. Remember that this should clearly outline a direction and relevant variables (IV and DV). Depending on your investigation and the instructions of your teacher, you may then provide the operationalised independent and dependent variables in your study.

Method

In your methodology, you will need to:

- briefly outline the selected methodology (participants, materials, and procedure) used to address the research question.
- summarise the data generation methods and data analysis methods.

Participants

The outline of participants should be a brief sentence or two and refer to information about the demographic of the participants, such as the gender, age, and school (if relevant) of the participants. The sampling method used to source these participants should also be outlined.

Materials

The overview of the participants should be followed by referring to the materials used to conduct your study. These can be formatted into dot points or a list. It is important to ensure that you provide a detailed list of materials so that your investigation is replicable. That is, so that another researcher is able to repeat your study in the future with the same materials, under the same conditions, and following the same procedure to ensure that the results aren't a 'one-off'.

> **USEFUL TIP**
>
> In chapter 1, you learnt that a hypothesis should always start with 'It was hypothesised…'. This is because hypotheses that refer to a study that has already been conducted need to be phrased in the past tense. However, when identifying your hypothesis in your introduction, your hypothesis should be phrased in the future tense. In such a way, your hypothesis should, therefore, start with 'It is hypothesised…'.

> **USEFUL TIP**
>
> To make sure that you include all relevant components when outlining the participants used in your investigation, you can remember the acronym SNAG.
>
> **S**ampling method
> **N**umber of participants
> **A**ge of participants
> **G**ender of participants

> **USEFUL TIP**
>
> It may be necessary to include an appendix in your write-up. This involves providing relevant documents, such as the informed consent sheet or a questionnaire that was used. An example of how to refer to an appendix in your report, scientific poster, or presentation, is 'Participants were provided with an Empathy Strength questionnaire '(see Appendix A)'. The title Appendix A would then be provided on a separate page at the end of your write-up.

Figure 14 Providing documents in an appendix allows you to attach relevant documents to your write-up

Procedure

The information included in your procedure should be based on decisions you made during steps 5 to 8 when planning your investigation. This should include the sampling methods used and the steps involved in carrying out the investigation with your participants. This can be formatted by numerical steps or in a paragraph depending on the requirements of the assessment that your teacher has outlined, as well as what works best for your investigation.

You also need to summarise the data generation methods and data analysis methods. This can be included as part of your procedure, or can follow your procedure section in a couple of sentences.

Steps taken to minimise errors and consider ethical guidelines (Optional section)

The inclusion of steps taken to minimise errors and biases as well as to consider ethical guidelines is optional to include in this section. This is dependent on what your teacher has outlined, as well as if it is relevant to your investigation. It might also be best to outline this in a paragraph which is separate to the other steps outlined in the procedure, to integrate it into your procedure, or to mention it in your discussion.

Results

In this section, you need to provide a presentation of generated data/evidence in appropriate format to illustrate trends, patterns, and/or relationships. To do so, you will need to use the skills you learnt in lesson **1E Organising and interpreting data**. This includes the skill of visually presenting quantitative data in formats, such as a bar chart or line graph. If you used qualitative data, you may have to present your data in a list or paragraph rather than a visual format, such as listing the most common responses to an open-ended question that the participants were asked.

USEFUL TIP

As you learnt in chapter 1, it is important that any graphs or other data presentation methods that you use include a clear and relevant title, are labelled correctly (both the horizontal and vertical axis) and clearly outline the units of measurements used in the study. The title of the graph should refer to the variables from both axes, such as 'the effects of (X) on (Y)'. As a general rule, you should also ensure that the independent variable is listed on the horizontal (x) axis and the dependent variable is listed on the vertical (y) axis.
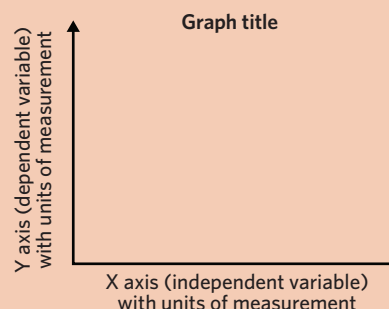
Figure 15 It is important to correctly label and title the method you use to visually present your data

---

Discussion

The discussion is one of the most important components of your write-up. You will need to include:

- an interpretation and evaluation of analysed primary data.
- the linking of results to the investigation question and the aim, to explain whether the investigation data and findings support the hypothesis.
- an identification of limitations in data and methods, and suggested improvements.
- cross-referencing of results to relevant psychological concepts and previous research.
- implications of the investigation and/or suggestions as to further investigations that may be undertaken.

Interpretation and evaluation of analysed primary data

Once the data has been meaningfully and clearly presented in the results, it is important to write a short interpretation and evaluation of it. When evaluating your results, it is important to refer to the overall trend, pattern, or relationship between variables. For example, an overall pattern could be that group A had an overall higher score than group B.

Linking of results to the investigation question, aim, and hypothesis

You then need to link your results to your research question. This involves stating whether your results support or reject your hypothesis. For example, you could state 'As shown in the graph, high school students had a greater taste preference for more expensive food compared to less expensive food'. You can then link this to your overall research aim by restating your aim.

It is important to remember that you will not lose marks if your hypothesis is not supported, in fact this is quite likely to occur due to the conditions of your study, such as having a small sample and little time and resources. Whether or not your hypothesis is supported or not does not make your research 'right' or 'wrong'; both outcomes are valuable in developing your understanding of the psychological concepts you researched.

PSYCHOLOGY EXPLORATION

In recent years it was discovered that many researchers had engaged in a process called HARKing. This is a deceptive practice in which researchers change their hypothesis after they have conducted their study and analysed their results to ensure that they have a hypothesis that is supported. This practice led to social psychologist Norbert Kerr (1998) coining the term HARKing, which is an acronym that represents 'Hypothesising After the Results are Known'.

The practice of HARKing is an extremely dishonest practice that is now being targeted within scientific research. With this in mind, it is important not to change your hypothesis once you have finished planning your study, but rather to honestly present your data and to accurately state whether your hypothesis was or was not supported.

Cross-referencing of results to relevant psychological concepts and previous research

Now that you have stated whether your hypothesis was or was not supported, you need to incorporate the existing research, theories, and psychological concepts that you had outlined in your introduction into the discussion of your investigation. Did your study have similar findings or completely different findings? Why may this be? In this section, you could outline whether your study contributed to minimising uncertainties in the area of research.

Identification of limitations in data and methods, and suggested improvements

Your hypothesis could be rejected due to the limitations in the methods used in the investigation, such as the use of a small sample or inappropriate data generation method. These limitations may involve errors or biases which occurred when conducting your study and may have led to extraneous or confounding variables. It could also relate to any issues with the accuracy, precision, repeatability, reproducibility, and validity of measurements in relation to the investigation. It is important to identify and explain these limitations, and to explain whether these may have influenced the results.

Once these limitations have been identified, you need to suggest potential improvements. These improvements will help contribute to research in the area by providing ideas on how the study could be re-run to support the hypothesis or to make the study more valid or reliable. These suggestions may also help to explain and minimise remaining uncertainties which arose in the results of your investigation, such as whether the DV was actually affected by the IV or by an extraneous variable in the study.

Implications of the investigation and/or suggestions as to further investigations

Using the limitations you have identified, what suggestions do you have for how to navigate and potentially minimise or eliminate these issues in further studies? You may consider what steps you could take to improve your study. For example, you may identify that the questionnaire you used was designed for older adults, and the use of a revised questionnaire for a teenage sample may be useful and generate more accurate results.

Finally, you should identify any implications that your research has in real life or in the realm of research. For example, if the findings from your investigation could be applied to how students best learn in the classroom, how marketers should advertise products, and so on, this is where you could identify this.

Conclusion

It is now time to write your conclusion. The conclusion of your investigation write-up serves a similar purpose to conclusions at the end of an essay in that you want to present the main findings of your research, as well as mention any generalisations or implications of the study.

In your conclusion you need to:

- provide a response to the investigation question.
- identify the extent to which the analysis has answered the investigation question, with no new information being introduced.

Response to the investigation question

You should start by restating the aim of your investigation, which was adapted from your research question. For example, 'the study aimed to investigate...'. This should be followed by a statement as to whether your hypothesis was supported or rejected based on your results.

Identifying the extent to which the analysis has answered the investigation question

After identifying whether your hypothesis was supported or rejected, you should include a statement as to whether these results can be generalised to the population. If your hypothesis is unable to be supported, you may include a summary sentence as to why this is, which you would have outlined in more depth in your discussion.

Communication statement

A communication statement reports the key finding of the investigation as a one-sentence summary. As such, other individuals should be able to gauge a sense of your study and its findings just by looking at the sentence. This is particularly important to include if you are presenting your investigation as a scientific poster or an article for scientific publication, however your teacher may also require it for other presentation formats.

The communication statement should be directly related to your research question. In essence, it should answer the research question by outlining the findings of your study. As such, it should include the independent and dependent variables that relate to your investigation.

Some examples of communication statements include:

- Closer proximity to an authority figure was associated with a greater likelihood of obedience.
- Year eight students were more likely to fall for the Müller-Lyer illusion compared to year twelve students.
- More expensive foods were perceived to be tastier than less expensive foods.

References and acknowledgements

You will need to include a bibliography or reference list at the end of your presentation, scientific poster, or report. As you learnt in the **Unit 1 AOS 3 Student-directed research investigation guide**, it is necessary to reference the sources you referred to in your write-up to avoid plagiarism. There are multiple ways in which you can do this, and it is a good idea to ask your teacher what type of bibliography or reference list style is preferred.

USEFUL TIP

It is important to avoid absolute and definitive language in your conclusion, such as 'this has proved that...' and 'it is obvious that...'. This is to ensure that you do not overstate the strength of your research. For example, the use of qualifying language such as 'may have' or 'might have' is more appropriate to use in your conclusion.

No matter which style you use, there are some components which should always be included. It is also important to list the references alphabetically according to the last name of each author. The components to include are:

- The name of the author of the source
- The year (and potentially the full date) of the source
- The title of the journal article/newspaper article/video/book/interview etc.
- The weblink of any online source

You may also have some acknowledgments you need to include, such as acknowledging any individuals who assisted you in conducting your investigation by giving up their time or lending you equipment or resources to use. This can be included in a short sentence or two at the end of this section.

Scientific communication conventions

There are certain conventions you need to follow when writing a scientific report or poster. You may also need to include these conventions in other presentation formats, such as a multimedia presentation.

Scientific terminology

When writing up your investigation, it is important that you use accurate and appropriate scientific terminology and representations. It is also important that you use terminology in the correct context of the scientific investigation. Some terminology can have different meanings in everyday life compared to within a scientific investigation.

For example, the term 'organisation' in the real-world may be applied to someone who constantly keeps lists of all the tasks they need to complete. By contrast, the term 'organisation' in the context of an investigation on perception refers to the process of regrouping selected features of sensory stimuli in order to form a cohesive and meaningful understanding. For the sake of reader understanding, it is important that you use this terminology correctly and outline the terminology in an accurate way which aligns with the context of the investigation.

Standard abbreviations and units of measurement

There are certain standard abbreviations that can be used in scientific investigations. For example, in psychology research, it is common to use the abbreviation DSM-5 when referring to the Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition. Similarly, certain units of measurement, including measures of weight, time, and temperature are consistently used in write-ups of scientific reports. These include:

- cm (centimetre)
- kg (kilogram)
- ° (degrees celsius)
- min (minute).

These abbreviations and units of measurement may be particularly helpful in your presentations of data, such as in a graph or in your results section.

USEFUL TIP

There are many different styles of referencing. It is important to note that the referencing used in this lesson (including in the example scientific poster) uses APA 7th style referencing. It is important to ask how your teacher wants you to set out your reference list as it may be different to this example.

Sample annotated poster
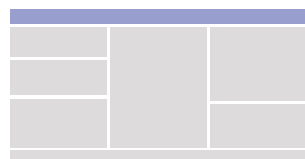
How does branding influence gustatory perception?
Student name

A concise title that reflects the research question.
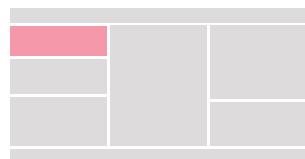
Introduction

Research suggests that perceptual set, such as the branding of food and its associated costs, can influence gustatory perception (Unnamalai & Gopinath, 2020). [Specifically,[1]][name-brand products, which are typically more expensive than home-brand products, are perceived to be of a higher quality and better taste[2]] (Glanz et al., 1998; Paasovaara et al., 2011). [It is important to examine this among Australian adolescents because previous research has focused on adults from other countries.[3]]

[Perceptual set refers to a predisposition to perceive certain features of sensory stimuli while ignoring others[4]] (Unnamalai & Gopinath, 2020). Gustatory perception can be distorted when influenced by perceptual set, such as individuals interpreting flavours of name-brand food more favourably.

[This study aims to investigate the influence of food brand type on taste preference.[5]][It is hypothesised that high school students who are exposed to brand labels will be more likely to prefer name-brand chocolate over home-brand chocolate than students who are not exposed to the brand labels.[6]]

Definition of 'perceptual set' which is a relevant psychological concept and key term.[4]

Testable hypothesis that outlines a relationship between the independent and dependent variables, the direction of this relationship, and the population.[6]

Use of a linking word to demonstrate that this sentence explains the psychological context identified in the first sentence in more depth.[1]

Identification of real-world context.[2]

Highlighting a gap in previous research as a reason for undertaking the investigation.[3]

Aim of the study written in present tense.[5]
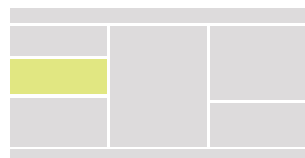
Methodology and methods

[**Participants**[1]]

14 students [(8 female and 6 male)[2]] aged between 16 and 17 from Edrolo Secondary College, selected using convenience sampling.

[**Materials**[3]]

- informed consent form
- home-brand chocolate
- name-brand (Cadbury) chocolate
- paper
- pen.

[**Procedure**[4]]

1. Provide the participants with the informed consent form and ensure that they are made aware of their withdrawal rights.
2. Randomly allocate the participants into two conditions (control = blind-taste test, experimental = exposed to brands of chocolate).
3. Present the participants in the experimental condition with the two chocolate brands and their respective packaging.
4. Allow each participant to taste both products and identify which they prefer.
5. Repeat steps three and four for participants in the control condition, ensuring that the brands of the chocolates are not revealed to the participants.
6. [Tally the number of preferences of the home- and name-brand chocolates for each condition. Present the tallies in a bar chart to allow for comparison.[5]]

Brief outline of the procedure used to address the research question. Written as a clear, numbered list.[4]

Reflects how data generation and analysis occurred in the study.[5]

The SNAG acronym is represented here, with the sampling method, number, age, and gender of the participants identified.[1]

Use of brackets to identify the genders of the participants in a clear and concise way.[2]

Identification of the materials used.[3]

Results

Investigating the effect of branding on food preference
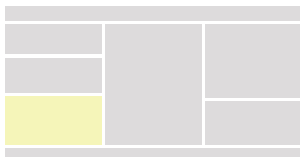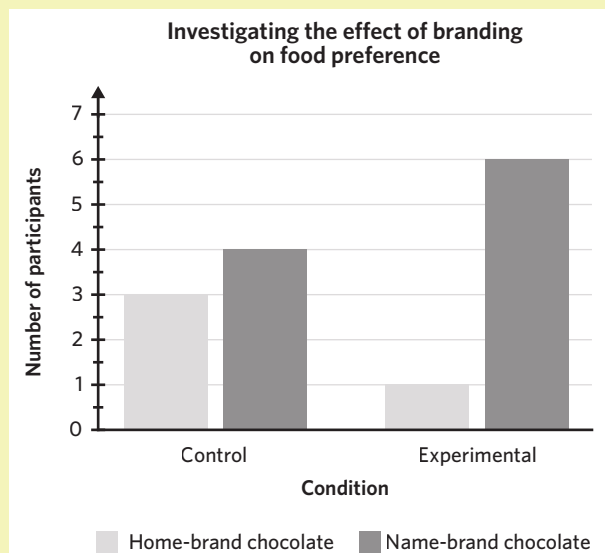
The results demonstrated that three of the participants in the control group preferred the home-brand chocolate and four preferred the name-brand chocolate. By contrast, one of the participants in the experimental group preferred the home-brand chocolate and six preferred the name-brand chocolate.

Use of a bar chart to visually present the data. The graph includes a clear title. All axes are labelled (the horizontal axis represents the IV, while the vertical axis represents the DV). A scale is provided on the vertical axi

Discussion

[The results of the study support the hypothesis that high school students exposed to brand labels will be more likely to prefer name-brand chocolate over home-brand chocolate than students who are not exposed to the brand labels.[1]]
[The graph demonstrates this,[2]][with approximately 86% of the participants exposed to the brand (experimental) preferring the name-brand, compared to 57% of those not exposed to the brand (control).[3]][The results from the study are [congruent[4]] with previous studies that suggested name-brand food is more likely to be preferred than home-brand food because it is more expensive (Glanz et al., 1998; Paasovaara et al., 2011). Expanding upon previous research conducted by Paasovaara et al. (2011), the current study implemented blind-taste testing by the control group to easily compare the two conditions.[5]]

[The study contained some limitations.[6]][Firstly, the small sample size and use of convenience sampling limits the study's external validity.[7]][Additionally,[8]] half-way through the experimental condition, the researcher realised that they had been scrunching up their nose in disgust when pointing at the home-brand chocolate. The researcher then attempted to have a neutral face when pointing to both brands. [However,[9]][the experimenter effect occurred[10]] for the first four participants in the experimental condition, acting as a confounding variable. [To prevent this in future studies, a research assistant unaware of the study's hypothesis could read the participant instructions.[11]][If the future study attains similar results, the influence of brand cost on taste preference could be considered by marketing campaigns.[12]]

Link of results to the investigation question by stating that the findings support the hypothesis.[1]

Explicit reference to the visual data presentation to ensure the results are analysed and interpreted.[2]

Interpretation of analysed primary data.[3]

Use of sophisticated scientific language.[4]

Cross-referencing of results to previous research.[5]

Identification of limitations.[6]

Identification of errors or biases in the data and method.[7]

Use of a transition word to identify further information is being presented.[8]

Use of a comparison word to ensure that the reader is aware that this sentence and the following sentence present contrasting information.[9]

Clearly identifies limitations of the study.[10]

The suggestion of potential improvements to avoid or reduce the identified limitations in the data and method.[11]

Identification of implications of the findings.[12]
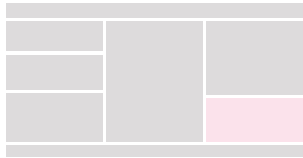
Conclusion

[The study aimed to investigate the influence of food brands on taste preference.[1]][The hypothesis was supported.[2]][However, due to limitations of the study, including sampling limitations and the presence of a confounding variable, replication of the current study with a larger sample and improved methods is required to generalise these findings to the population of high school students.[3]]

Identification of the aim.[1]

Response to the research question.[2]

Identification of the extent to which the analysis answered the research question, with a summary as to why the findings cannot be generalised to the population.[3]
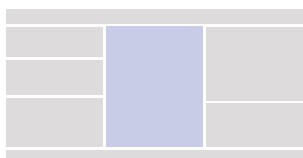
Communication statement

Name-brand chocolate was perceived to be tastier than home-brand chocolate

Findings of the investigation as one sentence.
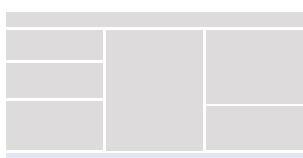
References

Glanz, K., Basil, M., Maibach, E., Goldberg, J., & Snyder, D. (1998). Why Americans Eat What They Do: Taste, Nutrition, Cost, Convenience, and Weight Control Concerns as Influences on Food Consumption. *Journal of American Dietetic Association, 98*(10), 1118–1126. https://doi.org/10.1016/S0002-8223(98)00260-0

Paasovaara, R., Luomala, H. T., Pohjanheimo, T., & Sandell, M. (2011). Understanding consumers' brand-induced food taste perception: A comparison of 'brand familiarity' – and 'consumer value – brand symbolism (in)congruity' – accounts. *Journal of Consumer Behaviour, 11*, 11–20. https://doi.org/10.1002/cb.356

Unnamalai, T., & Gopinath, R. (2020). Brand preference and level of satisfaction in consuming noodles. *International Journal of Management, 11*(11), 2909–2917. https://doi.org/10.34218/IJM.11.11.2020.274

References in APA 7th style.

ANSWERS

CONTENTS

Image: GoodStudio/Shutterstock.com

1A Introduction to research

1. B. False. *Psychology is a science because its claims meet many of the hallmark features of science including verifiability, objectivity, and provisionality and it often uses the scientific method.*

2. A. True. *Anecdote and personal opinion are non-scientific because they meet features of non-science including that they are not based on empirical evidence, are subject to bias, and are non-objective.*

3. III; IV. *You can have more than one hypothesis and it is the aim, not the hypothesis, that sets out a study's overall objective.*

4. B. In an experiment, researchers want to know the effect of the **independent** variable on the **dependent** variable. *Remember the results of an experiment 'depend' on how the 'dependent' variable is affected.*

5. B. *A controlled variable is used to ensure that effects on the dependent variable can more likely be attributed to manipulation of the independent variable, not something else.*

Assessment skills

Perfect your phrasing

6. A   7. A

Text analysis

8. B   9. B   10. A

Exam-style

Remember and understand

11. C   12. B   13. C   14. D

Apply and analyse

15. A   16. D

17. [To investigate the effects of florally-fragranced hair on levels of attraction.[1]]

✓ ✗   I have written an aim for the experiment.[1]

18. [It was hypothesised that the participants who consumed alcohol before sleep[1]][would have poorer sleep quality[2]][than participants who did not consume alcohol.[3]]

✓ ✗   I have included the independent variable.[1]

✓ ✗   I have included the dependent variable.[2]

✓ ✗   I have stated a direction (predicted effect of the IV on the DV) for my hypothesis.[3]

Other acceptable answers include:

- You may have stated an alternative direction for your hypothesis, so long as you correctly identified the IV and DV.

19. a. Independent variable: [the consumption of caffeine.[1]]
    Dependent variable: [feelings of anxiety among individuals with hyperthyroidism.[2]]

✓ ✗   I have identified the independent variable.[1]

✓ ✗   I have identified the dependent variable.[2]

b. [Other medication participants are taking.[1]]

✓ ✗   I have suggested a relevant potential controlled variable for this study.[1]

20. [It was hypothesised that people who spend 30 or more minutes each day doing yoga[1]][are more likely to[2]][experience positive mood than those who do yoga for less than 30 minutes a day.[3]]

✓ ✗   I have stated an independent variable.[1]

✓ ✗   I have stated a direction for my hypothesis.[2]

✓ ✗   I have stated a dependent variable.[3]

Other acceptable answers include:

- You may have included a hypothesis that did not operationalise the variables.

1B Scientific research methodologies

1. I; II. *Investigation methodologies are any technique or process used at any stage of research to obtain information, not just during a study.*

2. I; II; III. *All three of these things are important considerations to make when selecting investigation methodologies.*

3. A. *A feature of controlled experiments is the active manipulation of independent variables in an attempt to establish a causal relationship between two or more variables.*

4. B. False. *This is false because there are different research designs, within-subjects, between subjects and mixed design, which each have their own unique procedures.*

5. III; IV; V. *Fieldwork is research that involves observation and/or interaction with people in more real-world settings, so controlled experiments and its respective research designs are not examples.*

Assessment skills

Perfect your phrasing

6. A   7. A

Problem-solving

8. B   9. A   10. B

Exam-style

Remember and understand

11. B   **12.** C   **13.** D

14. [One advantage of case studies is that they allow researchers to obtain rich, qualitative data.[1]] [One disadvantage of case studies is that their findings cannot be easily generalised to a wider population.[2]]

     ✓ ✗   I have outlined an advantage of case studies.[1]

     ✓ ✗   I have outlined a disadvantage of case studies.[2]

Apply and analyse

15. C   **16.** B

17. [In controlled experiments, the researcher plays an active role and must carefully manipulate the independent variable and carefully measure its effect on the dependent variable.[1]] [In contrast, in direct observation, the researcher is more passive and just observes and records variables without intervention.[2]]

     ✓ ✗   I have outlined the role of the researcher in controlled experiments.[1]

     ✓ ✗   I have compared the role of the researcher in direct observation.[2]

     ✓ ✗   I have used comparison words, such as 'in comparison'.

18. [Ciro is using a simulation.[1]] [One advantage of this methodology is that it can be used as an explanatory tool for concepts that are otherwise difficult to examine.[2]] [However, a disadvantage is that simulations are not always accurate or entirely reflective of reality.[3]]

     ✓ ✗   I have identified Ciro's investigation methodology.[1]

     ✓ ✗   I have outlined an advantage of this methodology.[2]

     ✓ ✗   I have outlined a disadvantage of this methodology.[3]

     ✓ ✗   I have referred to the character's name (Ciro) in my response, and to the scenario.

Other acceptable answers include:

- modelling, including an advantage and disadvantage of this methodology.

Evaluate

19. [Nora used a mixed design.[1]] [We can tell this because there were elements of between-subjects (participants were split into different groups and complete different conditions) and within-subjects designs (the same participants completed two conditions; i.e. the pre- and post-concentration test.[2]] [An advantage of this design is that it allows experimenters to compare results both across experimental conditions and across individuals,[3]] [while a disadvantage is that it is demanding and time consuming for people like Nora to conduct.[4]]

     ✓ ✗   I have identified a mixed design.[1]

     ✓ ✗   I have explained why a mixed design is by referring to features of the design evident in the scenario.[2]

     ✓ ✗   I have outlined an advantage of this controlled experiment design.[3]

     ✓ ✗   I have outlined a disadvantage of this controlled experiment design.[4]

     ✓ ✗   I have referred to the character's name (Nora) in my response, and to the scenario.

Questions from multiple lessons

20. A

1C Population, sample and sampling

Theory review

1. B. *The group of people who participate in a study are the sample, not the population.*

2. A. True. *It is true that the size of a sample affects how representative it is, with larger samples being more representative.*

3. B. False. *This is false because the sampling technique used also has bearing on how representative a sample may be.*

4. A. *Convenience sampling is the least likely to create a representative sample, whereas stratified sampling or a large random sample are more likely to.*

Assessment skills

Perfect your phrasing

5. B   **6.** A   **7.** A

Problem-solving

8. A   **9.** B   **10.** A

Exam-style

Remember and understand

11. B   **12.** B

13. [One way to increase the representativeness of the sample is to have a large sample size[1]] [and another is to use a sampling procedure, such as random sampling, that reduces bias in the sample.[2]]

     ✓ ✗   I have listed one way to increase the representativeness of a sample.[1]

     ✓ ✗   I have listed another way to increase the representativeness of a sample.[2]

14. ⎡Random sampling is when a procedure is used that ensures that every member of the population has the same chance of being selected for the sample.[1]⎤⎡For example, putting all members of the population into a random generator and then asking it to generate names for a sample.[2]⎤⎡In contrast, stratified sampling involves selecting people from the population in a way that ensures that its strata (subgroups) are proportionally represented in the sample.[3]⎤⎡This may involve dividing the population first into strata, and then using a random generator to proportionally select people from each of those strata for the sample.[4]⎤

✓ ✗   I have outlined what random sampling is.[1]

✓ ✗   I have provided an example of random sampling.[2]

✓ ✗   I have outlined what stratified sampling is.[3]

✓ ✗   I have provided an example of stratified sampling.[4]

✓ ✗   I have used comparison words such as 'in contrast'.

Apply and analyse

15. A

16. ⎡One advantage of convenience sampling is that it is time efficient,[1]⎤⎡which is important for Professor Snickers' upcoming deadline with his team.[2]⎤⎡However, a limitation is that it may make his sample less representative because it uses no chance or systematic procedure to ensure representativeness[3]⎤⎡which may limit Professor Snickers' ability to generalise his findings to the research population of middle-aged Melbourne women.[4]⎤

✓ ✗   I have stated an advantage of convenience sampling.[1]

✓ ✗   I have explained why this is an advantage for Professor Snickers.[2]

✓ ✗   I have stated a limitation of convenience sampling.[3]

✓ ✗   I have explained why this is a limitation for Professor Snickers.[4]

✓ ✗   I have referred to the character's name (Professor Snickers) in my response, and to the scenario.

Questions from multiple lessons

17. B   **18.** C

1D   Preventing error and bias

Theory review

1. I; III. *Confounding variables, are found to have affected the dependent variable after the results of a study have been examined, whereas extraneous variables are any variable that has the potential to impact the dependent variable.*

2. B. False. *Even if a researcher is aware of all possible extraneous variables, not all can be actively controlled due to constraints like time and resources.*

3. B. False. *The difference between extraneous and confounding variables is not whether they can be controlled, but whether or not they have been shown at the conclusion of an experiment to have systematically and directly affected results.*

4. II; IV; V. *The other options are extraneous or confounding variables, rather than ways to prevent extraneous or confounding variables.*

Assessment skills

Perfect your phrasing

5. A   **6.** B

Problem-solving

7. B   **8.** I; II   **9.** B

Exam-style

Remember and understand

10. B   **11.** C

12. ⎡A single-blind procedure is a procedure in which participants are unaware of the experimental group or condition they have been allocated to.[1]⎤⎡This is used to control for extraneous variables such as participants' expectations.[2]⎤⎡In an experiment, it may involve a procedure like assigning participants to either the control or experimental group, but not letting them know which one they are in e.g. by giving one group a placebo and the other the active intervention.[3]⎤

✓ ✗   I have defined single-blind procedures.[1]

✓ ✗   I have named at least one extraneous variable this controls for.[2]

✓ ✗   I have provided an example of how a single-blind procedure might control for extraneous variables in an experiment.[3]

Apply and analyse

13. A   **14.** C

15. ⎡Doctor Shwepp should consider situational variables, such as participants' work environment or demands on the day of study.[1]⎤⎡This is an extraneous variable because it could also affect the dependent variable of anxiety symptoms at work.[2]⎤

✓ ✗   I have identified one relevant extraneous variable that Doctor Shwepp should consider.[1]

✓ ✗   I have explained how this variable could confound results.[2]

✓ ✗   I have referred to the character's name (Doctor Shwepp) in my response, and to the scenario.

Other acceptable answers include:

- You may have identified other extraneous variables, so long as they could be justified as potentially affecting the dependent variable of anxiety symptoms. Examples include, but are not limited to participant differences, such as pre-existing anxiety conditions, amount of sleep, and so on.

16. A   **17.** B

1E Organising and interpreting data

Theory review

1. A. True. *When a finding is supported by multiple forms of data, such as both qualitative and quantitative data, it is considered more robust than if it were only supported by one form of data.*

2. B. **Secondary data** is data from others' past research, whereas **primary data** is collected first-hand by a researcher in their current research. *Think of secondary data as coming second-hand from other sources.*

3. B. False. *Personal feelings can be measured and recorded using objective data, such as participants' self-reported ratings on a standardised mood scale.*

4. B. False. *Raw quantitative data often needs to be processed by a researcher so it can more easily be interpreted and communicated.*

5. I; II; III. *Tables and graphs are ways of presenting data as opposed to descriptive statistics.*

6. A. The **mean** is the mathematical average of a data set, whereas the **median** is the middle of a data set that has been ordered from lowest to highest. The mode is the most frequently-occurring value in a data set. *While all measures of central tendency describe the overall 'centre' of a data set, there are differences between them.*

7. I; II; III. *While processing and presenting data can help researchers interpret it, they cannot make conclusions only using these.*

Assessment skills

Data analysis

8. B   **9.** B   **10.** A

Perfect your phrasing

11. A

Exam-style

Remember and understand

12. A   **13.** C

14. ⌈One reason to use the median is when the data is not evenly distributed and so the mean is a less accurate measure of central tendency.[1]⌉⌈Another reason is when there are outliers, because extreme data values make the mean a less accurate measure of central tendency.[2]⌉

   ✓ ✗ I have listed a situation when the median should be used instead of the mean.[1]

   ✓ ✗ I have listed another situation when the median should be used instead of the mean.[2]

15. C   **16.** B

17. ⌈Standard deviation is a measure of variability, expressed as a value that describes the spread of data around the mean.[1]⌉⌈While the mean just describes the average of a data set, the standard deviation would tell Rhian just how much data values vary around the mean.[2]⌉

   ✓ ✗ I have described what is meant by standard deviation.[1]

   ✓ ✗ I have described how standard deviation would give Rhian more detail about her data set.[2]

   ✓ ✗ I have referred to the character's name (Rhian) in my response, and to the scenario.

18. D

1F Evaluating research

Theory review

1. B. False. *Researchers must evaluate their research data and investigation methods in order to make high quality conclusions.*

2. B. *Conclusions comment on whether a hypothesis was supported or not, not whether ideas were proved or disproved.*

3. I; II; III. *True value and conclusivity are not concepts that help researchers to evaluate their investigation.*

4. A. **Internal validity** assesses whether a study investigated what it intended to measure, whereas **external validity** assesses whether a study's results can be applied to similar individuals in different settings. *Remember that internal validity concerns the present study only.*

5. A. **Precision** is affected when there are random errors, whereas **accuracy** is affected when there are systematic errors. *Remember that precision concerns how closely a set of measurement values agree with each other, so if precision is lacking, random errors have occurred.*

6. B. False. *Given the nature of some psychological phenomena being a more imprecise construct, such as intelligence, it is not always possible to measure things with certainty.*

Assessment skills

Perfect your phrasing

7. B   **8.** B

Problem-solving

9. A   **10.** B   **11.** I; II

Exam-style

Remember and understand

12. B

13. [While repeatability is the extent to which a study's results are the same when it is repeated under identical experimental conditions (e.g. same participants, researcher, and environmental conditions),[1]] [reproducibility is the extent to which a study's results are the same when it is repeated under different experimental conditions (e.g. different participants, researcher, or environmental conditions).[2]]

✓ ✗ I have outlined what repeatability is.[1]

✓ ✗ I have outlined what reproducibility is.[2]

✓ ✗ I have used comparison words such as 'whereas'.

Apply and analyse

14. C   **15.** C   **16.** D

17. [A strength of Stefan's study was that it showed high repeatability[1]] [because it produced similar results when conducted again under the same conditions.[2]] [However, a weakness of Stefan's study was that it had low reproducibility[3]] [in that results were not reproduced when the study was conducted again but with different conditions (different setting and researcher), thereby compromising external validity.[4]]

✓ ✗ I have outlined a strength of Stefan's study, referring to repeatability.[1]

✓ ✗ I have outlined how Stefan's study demonstrated repeatability.[2]

✓ ✗ I have outlined a weakness of Stefan's study, referring to reproducibility.[3]

✓ ✗ I have outlined how Stefan's study did not demonstrate reproducibility.[4]

✓ ✗ I have referred to the character's name (Stefan) in my response, and to the scenario.

Questions from multiple lessons

18. [Situational variables, such as the context the volleyballers played in (in practice matches on familiar courts),[1]] [may have affected the results. This is because these variables may have systematically improved players' performance in games,[2]] [meaning that it may not have been the independent variable (pre-game anxiety levels) that affected the dependent variable (performance), but something else. If this was the case, this means internal validity could have been threatened, potentially compromising Maria's ability to draw a valid conclusion.[3]]

✓ ✗ I have correctly identified a relevant extraneous variable.[1]

✓ ✗ I have explained how this extraneous variable may have affected results.[2]

✓ ✗ I have explained how this may have affected Maria's ability to draw a valid conclusion.[3]

✓ ✗ I have referred to the character's name (Maria) in my response, and to the scenario.

1G Ethical considerations

Theory review

1. A. **Ethical concepts** refer to the broad moral guiding principles that psychologists and researchers should consider, whereas **ethical guidelines** are the rights research participants have and a researcher must ensure are met. *Another phrase for ethical considerations is 'participants' rights'.*

2. I; II; V. *Remember that ethical concepts are broad in nature and have to do with values, such as respect.*

3. II; III; V. *Remember that ethical guidelines are rights that participants are entitled to in research.*

4. A. True. *All of these factors influence what is right and wrong with regard to psychological research, issues, and practice.*

Assessment skills

Perfect your phrasing

5. A

Text analysis

6. B   **7.** A   **8.** B

Exam-style

Remember and understand

9. B   **10.** A   **11.** C

12. [One ethical concept is beneficence.[1]] [This guides researchers and practitioners to maximise benefits and minimise the risks and harms involved in taking a particular position or course of action.[2]]

✓ ✗ I have identified one ethical concept.[1]

✓ ✗ I have outlined this ethical concept.[2]

Other acceptable answers include:
- integrity
- justice
- non-maleficence
- respect.

Apply and analyse

13. D

14. [Doctor Petsopoulos would need to conduct thorough debriefing[1]] [at the end of the study to inform participants about which group they were assigned to and tell them the results and intentions of the study.[2]] [He would also need to make sure there is informed consent[3]] [at the start of the study that they may be allocated to a placebo condition and that they will not know whether they are receiving the treatment or not.[4]]

		I have identified debriefing as an ethical guideline Doctor Petsopoulos would need to satisfy.[1]
		I have explained how he would satisfy this guideline.[2]
		I have identified informed consent as another ethical guideline Doctor Petsopoulos would need to satisfy.[3]
		I have explained how he would satisfy this guideline.[4]
		I have referred to the character's name (Doctor Petsopoulos) in my response, and to the scenario.

Questions from multiple lessons

15. D   **16.** C   **17.** C

Chapter 1 review

Multiple choice

1. A   **2.** C   **3.** B   **4.** A

5. D

Short answer

6. a. [A non-scientific idea is an idea that is formed without empirical evidence and does not use the methods or principles of science.[1]][For example, old wives tales can be considered to be a non-scientific idea as they are based on opinion and anecdotal evidence.[2]]

| | | I have explained what is meant by a non-scientific idea.[1] |
| | | I have provided an example of a non-scientific idea.[2] |

b. [The use of empirical evidence,[1]][predictions,[2]][and an aim to be objective would indicate that the idea in the paper is likely scientific.[3]]

		I have outlined one quality that would suggest the idea is scientific.[1]
		I have outlined another quality that would suggest the idea is scientific.[2]
		I have outlined a final quality that would suggest the idea is scientific.[3]

Other acceptable answers include:
- claims that are testable are included
- systematic methodologies are included
- the idea is formed using the methods of science
- the scientific method is used.

c. [The scientific method is commonly used when investigating scientific ideas.[1]][The scientific method is a procedure used to obtain knowledge that involves hypothesis formulation, testing, and re-testing through processes of experimentation, observation, measurement and recording.[2]]

| | | I have identified the method that is commonly used to investigate scientific ideas.[1] |
| | | I have explained this method.[2] |

d. [In her conclusion, Niam should address the extent to which the data supports or rejects the hypothesis,[1]][whether further evidence is required,[2]][and whether there are clear recommendations for further studies.[3]]

		I have identified one consideration that Niam should address.[1]
		I have identified another consideration that Niam should address.[2]
		I have identified a final consideration that Niam should address.[3]
		I have referred to the character's name (Niam) in my response, and to the scenario.

7. a. [In Pearl's study, the control group would not be exposed to the influence of a group[1]][while the experimental group would be exposed to the influence of a group.[2]][Control groups are beneficial in scientific research as they serve as a baseline to compare the results of the experimental group against.[3]]

		I have outlined the conditions of the control group.[1]
		I have outlined the conditions of the experimental group.[2]
		I have explained the benefits of using a control group in scientific research.[3]
		I have referred to the character's name (Pearl) in my response, and to the scenario.

b. [Pearl could use the measure of repeatability to analyse the extent to which successive measurements or studies produce the same results when carried out under identical conditions within a short period of time.[1]][She could also use the measure of reproducibility to analyse the extent to which successive measurements or studies produce the same results when repeated under different conditions.[2]]

		I have described one measure that could be used.[1]
		I have described another measure that could be used.[2]
		I have referred to the character's name (Pearl) in my response, and to the scenario.

8. Students needed to display that they had a thorough understanding of the question by demonstrating:
- an effectively structured response
- that all parts of the question had been addressed
- that psychological terminology had been used in their answer.

In relation to the relevant introductory statements, discussion of the following would be awarded:

- Identification of the aim being to investigate the effects of previous experience and expectations on taste perception.
- Identification of the independent variable as previous experience and expectations and the dependent variable as taste perception.
- A hypothesis of the results that includes both levels of the independent variable, dependent variable, the population and a statement of direction (either direction is accepted).

In relation to the methods and procedures of the investigation, discussion of the following would be awarded:

- Identification of the sampling method used by Meadow as convenience sampling.
- The ethical guidelines that would have been followed whilst conducting the study.
- How the variables were operationalised.
- The selection of the most appropriate investigation methodology, which would be a controlled experiment.
- The chosen allocation procedure and the use of experimental and control groups.
- Whether a between subjects, within subjects, or mixed methodology was used.

In relation to the type of data that was collected and how this would be reported, discussion of the following would be awarded:

- Based on the student's proposed design, whether the data collected was quantitative or qualitative and objective or subjective.
- The descriptive statistics that could be reported, based on the student's proposed design.

In relation to the evaluation of the investigation, discussion of the following would be awarded:

- The small sample size of ten people, as it reduces the generalisability of results to the general population. This limitation may be overcome by increasing the sample size so that the sample is more representative of the population.
- The use of convenience sampling as it reduces the generalisability of results to the general population. This limitation may be overcome by using stratified sampling in future research.
- Limitations of using a controlled experiment, such as experimenter effects. This limitation could be overcome by implementing a single-blind or double-blind procedure in future research.
- If a within subjects design was used, the possibility of order effects and how this could be resolved through counterbalancing.
- If a between subjects design was used, the possibility of participant-related variables and how this could be resolved by using a matched participant design.
- Any other potential extraneous or confounding variables relevant to the student's proposed study design.

2A Nature versus nurture

Theory review

1. B. *Psychological development encompasses aspects of emotional, social, and cognitive development.*

2. B. False. *Psychological development is a lifelong process.*

3. A. *Social, emotional, and cognitive development interact with one another to influence development.*

4. B. In terms of development, hereditary factors are **genetically based**, whereas, environmental factors are **the influence of one's outer world**. *Hereditary factors are passed down from parents to offspring through genetics and environmental factors are external influences not related to DNA.*

5. B. False. *Contemporary psychology accepts that nature and nurture have relatively equal influences on development.*

6. A. *Hereditary and environmental factors are interactive in their influence on development, and rarely operate completely independently.*

Assessment skills

Text analysis

7. C   8. I; III   9. A

Data analysis

10. A   11. B   12. C

Exam-style

Remember and understand

13. A   14. C   15. C   16. A

17. [The term 'blank slate' refers to the idea that humans are born without developmental predispositions and are shaped by their experiences.[1]][This notion supports the nurture school of thought as it emphasises the effects of environmental factors on development.[2]]

  ✓ ✗   I have explained the term 'blank slate'.[1]

  ✓ ✗   I have linked the term 'blank slate' to the nurture school of thought.[2]

Apply and analyse

18. D

19. [Social development involves skills used to interact with others and allows one to make meaningful connections with others.[1]][This could therefore influence emotional development, which involves one's ability to control and express emotions in an appropriate way,[2]][as by spending more time with others and making connections, an individual will likely become more in tune with their emotions and the emotions of others.[3]]

  ✓ ✗   I have explained social development.[1]

  ✓ ✗   I have explained emotional development.[2]

  ✓ ✗   I have explained how social development and emotional development can interact with one another.[3]

20. [Hereditary influences, such as hair colour,[1]][are factors that are genetically passed down from one's parents to influence development.[2]][Whereas, environmental factors, such as the school a child attends,[3]][are factors that arise from an individual's environment or external world to influence development.[4]]

  ✓ ✗   I have provided an example of a hereditary factor.[1]

  ✓ ✗   I have described hereditary factors in reference to development.[2]

  ✓ ✗   I have provided an example of an environmental factor.[3]

  ✓ ✗   I have described environmental factors in terms of development.[4]

  ✓ ✗   I have used comparison words, such as 'whereas'.

21. a. [Psychological development is a product of the interaction between hereditary and environmental factors.[1]][Therefore, despite Ricky and Karl having the same genetics, their upbringings differed and in turn, the impact of these environmental factors altered their development.[2]]

  ✓ ✗   I have described the interaction of different factors in development.[1]

  ✓ ✗   I have provided an example to explain why the twin's personalities differed.[2]

  ✓ ✗   I have referred to the characters' names (Ricky and Karl) in my response, and to the scenario.

  b. [Genetic predisposition refers to the increased likelihood of developing certain traits if certain conditions are met.[1]][Therefore, despite both twins likely having the genetic predisposition for depression,[2]][it was only expressed in Ricky due to the interaction of his environment and genetics, whereas Karl's environment may not have met the conditions required for this trait to be expressed.[3]]

  ✓ ✗   I have explained genetic predisposition.[1]

  ✓ ✗   I have identified that both twins were likely to have the genetic predisposition.[2]

  ✓ ✗   I have provided an explanation as to why the condition only developed in one twin.[3]

  ✓ ✗   I have referred to the characters' names (Ricky and Karl) in my response, and to the scenario.

Evaluate

22. [In terms of the nature school of thought, genetic predispositions provide evidence that certain traits can be passed down from parent to offspring.[1]] [However, this school of thought fails to explain why these genetic predispositions are not always expressed or may differ among siblings.[2]] [In terms of the nurture school of thought, children being able to learn through rewards and punishments provides evidence that environmental factors shape development.[3]] [However, this school of thought does not explain why individuals can receive different developmental outcomes as a result of the same environmental experience.[4]]

✓ ✗ I have outlined a strength of the nature school of thought.[1]

✓ ✗ I have outlined a limitation of the nature school of thought.[2]

✓ ✗ I have outlined a strength of the nurture school of thought.[3]

✓ ✗ I have outlined a limitation of the nurture school of thought.[4]

2B The biopsychosocial model

Theory review

1. B. *The biopsychosocial model includes biological, psychological, and social factors.*

2. A. *Biological factors are factors that can be based in physiology.*

3. C. *Mental wellbeing is related to an individual's internal experience including their thoughts, emotions, and cognition and can be experienced in high or low levels.*

4. B. False. *A strictly biological approach is often ineffective in dealing with complex issues, such as mental wellbeing.*

5. A. True. *Biopsychosocial influences are interactive and rarely operate in isolation.*

6. I; II; III. *Psychological development encompasses the life-long development of social, emotional and cognitive abilities.*

Assessment skills

Text analysis

7. C   8. A   9. B   10. I; II; III

11. C

Exam-style

Remember and understand

12. C   13. B   14. A   15. A

16. [A biological factor that can influence psychological development is diet during childhood and infancy.[1]] [A psychological factor that can influence psychological development is an individual's levels of self-esteem.[2]] [A social factor that can influence psychological development is the way in which an individual's parents interacted with them earlier in life.[3]]

✓ ✗ I have identified one biological factor that can influence psychological development.[1]

✓ ✗ I have identified one psychological factor that can influence psychological development.[2]

✓ ✗ I have identified one social factor that can influence psychological development.[3]

Apply and analyse

17. D   18. A

19. [According to the biopsychosocial model, biopsychosocial factors interact and influence one another. As such, experiencing a negative influence from one of these factors in childhood may influence negative outcomes in other factors later in life.[1]] [For example, if a child is put down a lot during school (social)[2]] [they may experience low self-esteem during their adolescence (psychological).[3]]

✓ ✗ I have explained the interactive nature of biopsychosocial factors.[1]

✓ ✗ I have provided an example of a negative biopsychosocial influence during childhood.[2]

✓ ✗ I have provided an example of a negative future biopsychosocial outcome.[3]

Questions from multiple lessons

20. C

21. [Nature and nurture and the biopsychosocial framework both contain factors that influence and interact with one another.[1]] [However, nature and nurture are primarily used to identify the origins of developmental outcomes, whereas the biopsychosocial framework is interdisciplinary and is applied to numerous areas of the human experience.[2]]

✓ ✗ I have identified one similarity between nature and nurture and the biopsychosocial model.[1]

✓ ✗ I have identified one difference between nature and nurture and the biopsychosocial model.[2]

✓ ✗ I have used comparison words, such as 'however'.

22. [Nature and nurture and the biopsychosocial model both contain factors that are interconnected.[1]] [Therefore, in a research setting it is difficult to attribute changes in the dependent variable to a specific factor as they do not operate independently and often influence one another.[2]]

✓ ✗ I have explained the interconnected nature of both nature and nurture and the biopsychosocial model.[1]

✓ ✗ I have explained why this may be an issue in a research setting.[2]

2C Psychological development across the lifespan

Theory review

1. II; IV. *Psychological theories are carefully considered explanations for specific psychological processes but are not necessarily proven through empirical evidence.*

2. B. False. *Psychological development is a lifelong process.*

3. C. *Developmental periods vary between individuals and theories.*

4. B. False *Bowlby's different types of attachment styles fall under the two categories of secure and insecure attachment.*

5. C. *The term 'cognitive' pertains to thoughts and mental processes.*

6. B. False. *Despite the supporting research, it is very difficult to prove a psychological theory to be true and completely accurate.*

Assessment skills

Data analysis

7. A   8. D   9. C   10. I; II

Exam-style

Remember and understand

11. C   12. A   13. B   14. D

15. [Emotional development refers to continuous, lifelong development of skills which allow individuals to control, express, and recognise emotions in an appropriate way.[1]][For example, learning to hold in anger when it is inappropriate to express it outwardly.[2]][Social development refers to the continuous, lifelong development of certain skills, attitudes, relationships, and behaviours that enable an individual to interact with others and to function as a member of society.[3]][For example, learning when to speak and when to listen during a conversation.[4]][Cognitive development refers to the continuous, lifelong development of the ability to produce thought as well as comprehend and organise information from the internal and external environment.[5]][For example, learning addition and subtraction.[6]]

   ✓ ✗ I have explained emotional development.[1]

   ✓ ✗ I have provided an example of emotional development.[2]

   ✓ ✗ I have explained social development.[3]

   ✓ ✗ I have provided an example of social development.[4]

   ✓ ✗ I have explained cognitive development.[5]

   ✓ ✗ I have provided an example of cognitive development.[6]

Apply and analyse

16. D   17. B

18. [Psychological development, including social development, is a process that takes place throughout the lifespan.[1]][Therefore, Marriane has the opportunity to change her negative developmental outcomes as her development continues.[2]]

   ✓ ✗ I have considered psychological development as a lifelong process.[1]

   ✓ ✗ I have explained that it is possible to change developmental outcomes later in life because psychological development is a lifelong process.[2]

   ✓ ✗ I have referred to the character's name (Marriane) in my response, and to the scenario

Evaluate

19. [One strength of Piaget's theory is that each proposed stage can be tested through simple tasks.[1]][However, Piaget's theory fails to account for developmental diversity, which is the idea that each person's experience of development is individualised.[2]][Therefore, while it is useful in providing stages of cognitive development that are easy to test, it may not be applicable to all children.[3]]

   ✓ ✗ I have evaluated Piaget's theory by considering its strengths.[1]

   ✓ ✗ I have further evaluated Piaget's theory by considering its limitations.[2]

   ✓ ✗ I have made a concluding evaluation of the adequacy of Piaget's theory.[3]

Questions from multiple lessons

20. A

21. [Attachment theory suggests that the bond between an infant and caregiver influences the infant's emotional development later in life.[1]][Biological factors, such as the infant having their nutritional needs met by a caregiver, are likely to support healthy brain development and therefore normative emotional regulation.[2]][Psychological factors, such as the infant having their emotions soothed by a caregiver, will likely lead to healthy emotional expression.[3]][Finally, social factors, such as receiving support and attention from the caregiver, are also likely to support healthy emotional development.[4]]

   ✓ ✗ I have identified the link between attachment theory and emotional development.[1]

   ✓ ✗ I have explained biological factors related to attachment theory and development.[2]

   ✓ ✗ I have explained psychological factors related to attachment theory and development.[3]

   ✓ ✗ I have explained social factors related to attachment theory and development.[4]

2D Critical and sensitive periods

Theory review

1. A. True. *Critical periods are narrow and rigid, while sensitive periods are flexible.*

2. B. Critical periods refer to specific times in which skills **have to be learnt**, whereas sensitive periods refer to times in which specific skills **are most optimally learnt**. *Sensitive periods are opportunities in which it is the easiest and most efficient to learn a skill, but with the ability to still be learnt at a later time. In contrast, critical periods have a set time in which skills need to be learnt if they are to be learnt at all.*

3. I; IV. *As a unique map of an individual's developmental trajectory, maturation determines when the critical and sensitive periods will be experienced.*

4. B. False. *Genie's situation was unique, allowing researchers to examine the critical and sensitive periods of language acquisition in ways that they could not normally.*

5. A. *Having a more malleable brain means children can easily fit new language into their pre-existing brain structures used for language. Learning grammatical skills for a first or native language is a critical period while learning a second language is a sensitive period.*

Assessment skills

Perfect your phrasing

6. B   7. A

Text analysis

8. B   9. A

Exam-style

Remember and understand

10. C   11. B   12. D   13. A

14. [A similarity of critical and sensitive periods is that they are both set out by an individual's process of maturation.[1]]

   ✓ ✗ I have identified a similarity of critical and sensitive periods.[1]

Apply and analyse

15. B   16. C

17. a. [The acquisition of a second language has a sensitive period.[1]]

   ✓ ✗ I have stated that the acquisition of a second language has a sensitive period.[1]

   b. [Kairo would learn Japanese slower than his brother Logan did.[1]] [This is due to the acquisition of a second language having a sensitive period, in which it is easier and faster to learn a second language (in this case, Japanese) before the age of 12, as Logan did.[2]]

   ✓ ✗ I have predicted that Kairo would learn Japanese at a slower pace than his brother Logan did.[1]

   ✓ ✗ I have referred to the acquisition of a second language as a sensitive period to justify my prediction.[2]

   ✓ ✗ I have referred to the characters' names (Kairo and Logan) in my response , and to the scenario.

18. a. [Grammar has a critical period[1]] [as Genie was unable to learn grammar at an older age, suggesting that there is a strict period in which this skill needs to be learnt to be learnt at all.[2]]

   ✓ ✗ I have identified grammar has a critical period.[1]

   ✓ ✗ I have justified my response.[2]

   ✓ ✗ I have referred to the character's name (Genie) in my response, and to the scenario.

   b. [At a younger age, Genie's brain would be more malleable and able to be shaped by new experiences and learning due to having greater plasticity.[1]]

   ✓ ✗ I have explained that the brain is more malleable at a younger age due to having greater plasticity.[1]

   ✓ ✗ I have referred to the character's name (Genie) in my response, and to the scenario.

19. [Genie's case study found that elements of first language, such as speaking a few words, could be learnt, however, other elements, such as grammar, were unable to be learnt after this period.[1]] [These findings did not support the critical period hypothesis[2]] [as she was able to learn elements of a first-language after the supposed critical period, such as learning certain words.[3]]

   ✓ ✗ I have described the main findings of Genie's case study.[1]

   ✓ ✗ I have related the findings back to the critical period hypothesis by saying they did not support it.[2]

   ✓ ✗ I have justified why the critical period hypothesis was supported or not.[3]

   ✓ ✗ I have referred to the character's name (Genie) in my response, and to the scenario.

Other acceptable answers include:

- other verbal language skills beyond grammar that Genie could not produce, such as full sentences or intonation.
- that her inability to communicate verbally normally showed support for the critical period hypothesis, because she was unable to develop these skills after the critical period.

20. [Critical periods are the narrow, rigid developmental period in which a specific skill or function must be learnt,[1]] [for example first-language acquisition,[2]] [whereas sensitive periods refer to the optimal developmental period for a specific function or skill to be learnt in the fastest and easiest way,[3]] [for example second-language acquisition.[4]]

| ✓ ✗ | I have provided the definition of critical periods.[1] |

| ✓ ✗ | I have provided an example of a critical period.[2] |

| ✓ ✗ | I have provided the definition of sensitive periods.[3] |

| ✓ ✗ | I have provided an example of a sensitive period.[4] |

| ✓ ✗ | I have used comparison words, such as 'whereas'. |

Other acceptable answers include:

- other examples of critical periods, such as imprinting or prenatal development.
- other examples of sensitive periods, such as word learning and learning sign-language as a second-language.

Questions from multiple lessons

21. B

Chapter 2 review

Multiple choice

1. C   2. A   3. D   4. A

5. D

Short answer

6. [Two parents that are intelligent may produce an intelligent child due to the interaction between hereditary and environmental factors.[1]][The parents may pass down a genetic predisposition for intelligence to the child (hereditary)[2]][which may then interact with environmental factors, such as the parents reading to the child from a young age or prioritising the child's schooling, producing an intelligent child.[3]]

| ✓ ✗ | I have attributed the developmental outcome to the interaction of hereditary and environmental factors.[1] |

| ✓ ✗ | I have identified an example of a hereditary influence.[2] |

| ✓ ✗ | I have identified an example of an environmental influence.[3] |

7. [When an individual is younger, they have greater brain plasticity, meaning their brain is more malleable and able to be shaped by new experiences.[1]][Thus, more critical and sensitive periods occur during this time as the skills obtained help to develop the necessary communicative pathways more efficiently.[2]]

| ✓ ✗ | I have explained that younger individuals experience greater brain plasticity.[1] |

| ✓ ✗ | I have explained that this is necessary for the efficient development of skills and functions.[2] |

8. [Adrian has likely experienced a disruption to his social development.[1]][Social development is the continuous, life-long development of certain skills, attitudes, relationships, and behaviours that enable an individual to interact with others and to function as a member of society.[2]][This is evident in the scenario as Adrian struggles with making and maintaining friendships [3]][and finds it difficult to converse with people.[4]]

| ✓ ✗ | I have identified the area of development that has likely been disrupted.[1] |

| ✓ ✗ | I have explained this area of development.[2] |

| ✓ ✗ | I have justified my answer with an example from the scenario.[3] |

| ✓ ✗ | I have justified my answer with another example from the scenario.[4] |

| ✓ ✗ | I have referred to the character's name (Adrian) in my response, and to the scenario. |

9. [According to attachment theory,[1]][Adrian may have not had his needs consistently met during infancy, leading to an insecure attachment to his primary caregiver.[2]][This, therefore, would have likely influenced his current inability to establish and maintain close relationships.[3]]

| ✓ ✗ | I have identified the relevant theory.[1] |

| ✓ ✗ | I have explained what may have happened during Adrian's childhood according to this theory.[2] |

| ✓ ✗ | I have explained how this would have led to Adrian's current issues with relationships.[3] |

| ✓ ✗ | I have referred to the character's name (Adrian) in my response, and to the scenario. |

10. [The biopsychosocial model suggests that biological, psychological, and social factors all interact to influence different areas of an individual's life.[1]][Adrian is likely still able to do well in his work as one negative biopsychosocial influence, such as his negative social experience on its own is not enough to stop his daily functioning.[2]][Adrian likely has positive biological influences, such as a good diet and sleep patterns, and positive psychological influences, such as feeling as though he is capable of doing his job well, that protect him from the negative social influence.[3]]

| ✓ ✗ | I have explained the biopsychosocial model in terms of how it influences an individual's life.[1] |

| ✓ ✗ | I have explained that one negative biopsychosocial influence is not enough to disrupt functioning.[2] |

| ✓ ✗ | I have explained how protective biopsychosocial factors can reduce the effects of a negative influence.[3] |

| ✓ ✗ | I have referred to the character's name (Adrian) in my response, and to the scenario. |

11. Students needed to display that they had a thorough understanding of the question by demonstrating:

- an effectively structured response
- that all parts of the question had been addressed
- that psychological terminology had been used in their answer.

Students will need to analyse Nikita's developmental outcomes. Students will need to provide a rationale for Nikita's career success with reference to nature, nurture, and the biopsychosocial model. Discussion of the following would be awarded:

- Explanation of Nikita's parents being musicians as a biological influence, with reference to hereditary factors. Such as the genetic predisposition for certain attributes which may enhance musical skills for example, hand-eye coordination.
- Explanation of Nikita's guitar lessons and/or socioeconomic status as a social influence, with reference to environmental factors.
- Discussion of a possible psychological influence on Nikita's guitar skills (such as high self-efficacy).
- Explanation of how these biopsychosocial, hereditary and environmental factors interact to influence this outcome.

Students will need to consider Nikita's emotional development and subsequent developmental outcomes. Discussion of the following would be awarded:

- Attachment theory, which is used to explain how emotional development can occur.
- Explanation of how it is likely that Nikita experienced insecure attachment in her early life, leading to maladaptive emotional development.
- Explanation of attachment as an environmental factor (nature versus nurture) and social/psychological factor (biopsychosocial model).
- Possible hereditary (nature versus nurture)/biological (biopsychosocial model) factors, such as a genetic predisposition to anger issues that may have contributed to Nikita's emotional developmental outcome.

Students will need to consider Nikita's social development and subsequent developmental outcomes. Discussion of the following would be awarded:

- Erikson's psychosocial theory of development, which is used to explain how social development can occur.
- Discussion of the possible environmental (nature versus nurture) factors, such as parental influence, and psychological/social (biopsychosocial model) factors, such as levels of self-esteem, associated with Erikson's model.
- Explanation of how disruption to the crises of the psychosocial model could lead to Nikita's maladaptive social development.

Students will need to consider Nikita's cognitive development and subsequent developmental outcomes. Discussion of the following would be awarded:

- Piaget's theory of cognitive development, which is used to explain how cognitive development can occur.
- Discussion as to how Nikita may have progressed through the stages of the theory. Nikita would have likely progressed through the stages in a normative way and within the described age ranges.
- Reference to biological (such as a genetic predisposition for intelligence), psychological (such as high self-efficacy), and social (such as access to education or encouragement from parents) factors that can influence cognitive development.
- The impact of hereditary factors (such as the aforementioned biological factors) and environmental factors (such as the aforementioned psychological and social factors) on Nikita's cognitive development.

3A Categorising typical and atypical behaviour

Theory review

1. A. *Typicality is centred around an individual and how their behaviour compares to how they usually act.*

2. B. False. *Behaviour that is typical for you may actually be atypical for others and vice versa. Remember that typical behaviour is in relation to how someone usually acts.*

3. II; IV; V. *Social norms, personal distress, and maladaptive behaviour are all psychological criteria used to categorise behaviour as typical or atypical.*

4. I; III; V. *If you are in personal distress, you may feel scared, anxious, or guilty. These emotions are usually felt when in distress.*

5. B. It is important to be aware of the **usefulness** and **limitations** of using criteria so that you are able to effectively **categorise** behaviour. *Due to the abstract nature of behaviour, psychological criteria can aid in the categorisation of behaviour. However, it is also limited in that certain criteria may not always be applicable or the most appropriate.*

Assessment skills

Text analysis

6. A   7. D   8. C

Data analysis

9. B   10. C   11. B

Exam-style

Remember and understand

12. C   13. A

14. [Using cultural perspectives to categorise behaviour involves considering different traditions and customs,[1]] [whereas using social norms involves considering expectations held in a society.[2]]

     ✓ ✗   I have explained how cultural perspectives are used to categorise behaviour.[1]

     ✓ ✗   I have explained how social norms are used to categorise behaviour.[2]

     ✓ ✗   I have used comparison words, such as 'whereas'.

15. [An strength of statistical rarity is that it allows for an objective way to categorise behaviours.[1]] [A limitation of statistical rarity is that it can be difficult to understand and apply to an abstract concept, such as behaviour.[2]]

     ✓ ✗   I have outlined a strength of using statistical rarity.[1]

     ✓ ✗   I have outlined a limitation of using statistical rarity.[2]

16. [Typical behaviour is an activity that is consistent with how an individual usually behaves,[1]] [whereas atypical behaviour is an activity that is unusual or unnatural according to how an individual usually behaves.[2]] [For example, being the life of a party would be typical for someone who is extroverted and friendly, as it is how they would usually behave,[3]] [but the same behaviour would be atypical for someone who is introverted and reserved, as they would not usually act that way.[4]]

     ✓ ✗   I have explained typical behaviours.[1]

     ✓ ✗   I have explained atypical behaviours.[2]

     ✓ ✗   I have used an example to explain how a behaviour may be typical for one individual.[3]

     ✓ ✗   I have explained how the same behaviour may be atypical for another individual.[4]

Apply and analyse

17. D

18. [The school counsellor may have told Daniel's host family to not worry about his tea-drinking habits because he may have categorised Daniel's behaviour as typical, due to cultural perspectives.[1]] [Cultural perspectives are the influence of society and community on one's thoughts.[2]] [From a cultural perspective, the school counsellor may have come to understand that drinking tea four times a day in Daniel's origin country is normal and hence, Daniel's current behaviour is typical as it is how he usually behaves.[3]]

     ✓ ✗   I have attributed the school counsellor categorising Daniel's behaviour as typical due to cultural perspectives.[1]

     ✓ ✗   I have explained cultural perspectives.[2]

     ✓ ✗   I have suggested why the school counsellor may have told Daniel's host family to not worry about his tea-drinking habits, with respect to cultural perspectives.[3]

     ✓ ✗   I have referred to the character's name (Daniel) in my response, and to the scenario.

Evaluate

19. [Rohan's psychologist may have used cultural perspectives[1]] [and statistical rarity to categorise his behaviour.[2]] [Cultural perspectives are useful as they allowed Rohan's psychologist to provide an explanation for Rohan's behaviour as he was aware that children slept in the same room as their parents for the first few years of their life and hence, Rohan's behaviour is typical.[3]] [However, cultural perspectives are limited as they provide a collective approach to categorising Rohan's behaviour rather than an individual approach, causing his behaviour to be seen as atypical.[4]] [Statistical rarity is useful as it allowed the psychologist to objectively categorise Rohan's behaviour as atypical as only 3% of children retain this behaviour from childhood.[5]] [However, statistical rarity is limited as it can be difficult to apply numbers to behaviours as they can slightly differ or have different intentions.[6]]

✓ ✗ I have outlined that cultural perspectives were used to categorise Rohan's behaviour.[1]

✓ ✗ I have outlined that statistical rarity was also used to categorise Rohan's behaviour.[2]

✓ ✗ I have outlined one way cultural perspectives are useful in categorising behaviour.[3]

✓ ✗ I have outlined one way cultural perspectives are limited in categorising behaviour.[4]

✓ ✗ I have outlined one way statistical rarity is useful in categorising behaviour.[5]

✓ ✗ I have outlined one way statistical rarity is limited in categorising behaviour.[6]

✓ ✗ I have referred to the character's name (Rohan) in my response, and to the scenario.

Questions from multiple lessons

20. a. [Anant's behaviour as a toddler can be attributed to environmental factors,[1]] [as his shy personality may have been influenced by the lack of attention and affection that he received from his parents growing up.[2]]

✓ ✗ I have identified that Anant's behaviour can be attributed to environmental factors.[1]

✓ ✗ I have explained how an environmental factor has influenced Anant's behaviour.[2]

✓ ✗ I have referred to the character's name (Anant) in my response, and to the scenario.

b. [Anant's parents may be confused about Anant's behaviour after the first week of Prep as he is exhibiting atypical behaviour[1]] [and engaging in behaviour, such as being assertive and making friends, which is unusual to how he usually acts at home (shy and reserved).[2]]

✓ ✗ I have suggested that Anant's parents may be confused as Anant is exhibiting atypical behaviour.[1]

✓ ✗ I have explained that Anant is behaving in a way that is unusual to how he usually acts.[2]

✓ ✗ I have referred to the character's name (Anant) in my response, and to the scenario.

3B Understanding normality and neurotypicality

Theory review

1. B. False. *Psychologists have not agreed upon one universal approach to understanding normality but rather identified approaches that attempt to define normality.*

2. I; II. *The socio-cultural and medical approaches can be used to define normality. The universal approach is not an approach that is used to define normality.*

3. B. False. *Things that seem maladaptive to you may actually be adaptive to others and vice versa. Remember that there are many approaches and factors that influence what we view as adaptive and maladaptive. Also, some things may be adaptive in one situation but not in another.*

4. C. *Neurotypical and neurodiverse are two complementary terms used to describe people in terms of their neurological functioning. These terms combine to form a spectrum on which normality is talked about.*

Assessment skills

Perfect your phrasing

5. A   6. B

Data analysis

7. I; IV   8. C   9. D

Exam-style

Remember and understand

10. C

11. [Crying and throwing a tantrum when lost at a supermarket would be considered an adaptive behaviour for a three-year-old because they are probably in a new environment and crying and making a fuss are the only useful skills in getting their mother back.[1]] [However, the same behaviour would be considered maladaptive for a 17-year-old as they have better skills, such as communicating with other shoppers that they are lost, to help them in this unfamiliar situation.[2]]

✓ ✗ I have explained why the three-year-old's behaviour would be adaptive.[1]

✓ ✗ I have explained how the 17-year-old's behaviour would be maladaptive.[2]

12. ['Adaptive' means being able to adjust to the environment appropriately and function effectively[1]] [whereas 'maladaptive' means being unable to adapt to the environment appropriately and function effectively.[2]] [For example, lowering your voice when you enter a library would be considered adaptive as you are adjusting to the quieter environment. However, maintaining this low voice when you go back to your class would be considered maladaptive are you are not adjusting to the changed and freer conditions.[3]]

√ ✗ I have explained what is meant by 'adaptive'.[1]

√ ✗ I have explained what is meant by 'maladaptive'.[2]

√ ✗ I have provided a contrasting example that demonstrates both 'adaptive and maladaptive'.[3]

√ ✗ I have used comparison words, such as 'whereas'.

Apply and analyse

13. C   **14.** D   **15.** A

16. [Malik's reaction to packing up at school was adaptive[1]] [as sitting back and watching as his peers clean up for lunch allows him to learn more about his environment and be able to better adjust when the same situation reoccurs.[2]]

√ ✗ I have identified Malik's behaviour at school to be adaptive.[1]

√ ✗ I have explained how Malik's behaviours displayed at school were adaptive to his environment.[2]

√ ✗ I have referred to the character's name (Malik) in my response, and to the scenario.

Evaluate

17. a. [According to the socio-cultural approach, which defines normality based on the set of codes relating to the social and cultural context that you are a part of,[1]] [Neel's time of arrival would be considered normal in Sri Lanka but abnormal in Australia.[2]] [In Sri Lanka, Neel would have had to get to school at 7am but in Australia, he only has to be there by 9am.[3]]

√ ✗ I have explained the socio-cultural approach.[1]

√ ✗ I have identified that Neel's time of arrival would be considered normal in Sri Lanka but abnormal in Australia.[2]

√ ✗ I have explained and specified the different arrival times for each culture.[3]

√ ✗ I have referred to the character's name (Neel) in my response, and to the scenario.

b. [According to the situational approach, which defines normality based on different contexts,[1]] [Neel feeling overwhelmed and highly anxious would be considered normal.[2]] [This is because it is his first day at a new school and he may not know anyone or be familiar with the new environment.[3]]

√ ✗ I have explained the situational approach.[1]

√ ✗ I have identified that Neel's emotions would be considered normal.[2]

√ ✗ I have explained why Neel's emotions would be considered normal.[3]

√ ✗ I have referred to the character's name (Neel) in my response, and to the scenario.

Questions from multiple lessons

18. a. [Hereditary factors are factors that influence development that are genetically passed down from biological parents to their offspring,[1]] [whilst environmental factors are factors that influence development that arise from an individual's physical and social surroundings.[2]] [However, only environmental factors have influenced Calista's development.[3]] [For example, her parents not being highly active in her life may have caused her not to develop crucial social skills that are now inhibiting her ability to make friends.[4]]

√ ✗ I have outlined what is meant by hereditary factors.[1]

√ ✗ I have outlined what is meant by environmental factors.[2]

√ ✗ I have outlined that only environmental factors have influenced Calista's development.[3]

√ ✗ I have outlined how an environmental factor has influenced Calista's development.[4]

√ ✗ I have referred to the character's name (Calista) in my response, and to the scenario.

Other acceptable answers include:
- geographical location
- relationship with siblings
- other environmental factors that influenced Calista's development.

b. [Being a 'maladaptive individual' means that you are unable to adapt to the environment appropriately and function effectively[1]] [Calista feeling uncomfortable when her parents try to be more involved in her life could become maladaptive if she becomes uncomfortable with anyone getting involved in her life as it would hinder her relationships.[2]] [Calista could also exhibit the maladaptive behaviour of skipping school because she wants to avoid interactions with others, which would then affect her grades and not allow her to succeed in school.[3]] [Finally, Calista may also start to think that no one likes her and that she will forever be alone, which is also maladaptive as it would reduce her self-esteem and hinder her ability to function effectively in everyday life.[4]]

√ ✗ I have explained what it means to be a 'maladaptive individual'.[1]

√ ✗ I have explained a possible maladaptive emotion that Calista could experience.[2]

√ ✗ I have explained a possible maladaptive behaviour that Calista could experience.[3]

√ ✗ I have explained a possible maladaptive cognition that Calista could experience.[4]

√ ✗ I have referred to the character's name (Calista) in my response, and to the scenario.

3C Neurodiversity

Theory review

1. II; IV. *Neurodiversity is focused on neurological development and functioning, particularly in regards to those with autism and ADHD.*

2. A. True. *Autism is a condition that can be considered 'neurodivergent' as it involves a variation in neurological development and functioning.*

3. B. **Neurodiversity** is an overarching term for **developmental disorders** and it aims to **normalise** such variations. *Neurodiversity aims to reduce stigma and misconceptions around developmental disorders and instead encourage inclusivity of all brain structures and functioning.*

4. C. *ADHD is largely characterised by behavioural difficulties, such as fidgeting. Autism is also categorised by behavioural difficulties, however, the condition is more commonly characterised by impaired social interactions and verbal and nonverbal difficulties.*

5. A. *A phenomenon has been found in which children with **ADHD** are more likely to also have **dyslexia**. An inverse relationship also exists in which children with dyslexia can also have ADHD.*

Assessment skills

Perfect your phrasing

6. A   7. A

Problem-solving

8. B   9. A   10. I; II   11. C

Exam-style

Remember and understand

12. C

13. [Dyslexia is a neurologically based learning disorder manifested as severe difficulties in reading, spelling, writing words, and sometimes in arithmetic.[1]][A strength of the condition is that people with dyslexia often have good big-picture thinking[2]][however, a challenge is that people with dyslexia often have difficulties with reading and writing.[3]]

   ✓ ✗   I have described dyslexia.[1]

   ✓ ✗   I have described a strength that people with dyslexia have.[2]

   ✓ ✗   I have described a challenge that people with dyslexia face.[3]

Apply and analyse

14. B

15. [Alyse can study for her Psychological exam using audio or video recordings,[1]][which may effectively manage her dyslexia as she does not have to read or write notes but rather listen to them instead.[2]]

   ✓ ✗   I have proposed a strategy to manage dyslexia.[1]

   ✓ ✗   I have explained how the proposed strategy may effectively manage dyslexia.[2]

   ✓ ✗   I have referred to the character's name (Alyse) in my response, and to the scenario.

16. [Autism is a neurodevelopmental disorder characterised by impaired social interactions, verbal and non-verbal difficulties, narrow interests, and repetitive behaviours[1]][whereas, ADHD is a neurological disorder characterised by the persistent presence of symptoms that impair functioning.[2]][A similarity between the two conditions is that they both involve behavioural symptoms, such as repetitive actions.[3]][However, they differ in that autism also involves impaired social interactions, such as understanding others' emotions.[4]]

   ✓ ✗   I have explained what autism is.[1]

   ✓ ✗   I have explained what ADHD is.[2]

   ✓ ✗   I have identified a similarity between autism and ADHD.[3]

   ✓ ✗   I have identified a difference between autism and ADHD.[4]

   ✓ ✗   I have used comparison words, such as 'whereas'.

Evaluate

17. a. [Edlephant may not be a neurodiverse workplace.[1]][This is because they are located in the city centre and the hustle and bustle of this environment may lead to sensory overload and overwhelm neurodiverse people.[2]]

   ✓ ✗   I have determined that Edlephant does not have a neurodiverse workplace.[1]

   ✓ ✗   I have justified why Edlephant does not have a neurodiverse workplace.[2]

   b. [The job at Edlephant may be inappropriate for Rory.[1]][As a person with ASD, Rory may be more easily distressed by minor changes in routine[2]][and this is likely to happen on the job as it involves a lot of last-minute changes, often without explanation.[3]]

   ✓ ✗   I have identified the job as inappropriate for Rory.[1]

   ✓ ✗   I have outlined a challenge or need Rory may experience as someone with ASD.[2]

   ✓ ✗   I have explained how an aspect of the job may not cater towards the suggested strength or challenge.[3]

   ✓ ✗   I have referred to the character's name (Rory) in my response, and to the scenario.

Questions from multiple lessons

18. [Neurodiversity aims to alter the way in which developmental disorders are viewed and to normalise these variations.[1]]

   ✓ ✗   I have described how neurodiversity helps conceptualise normality.[1]

19. [Neurodiversity refers to variations in neurological development and functioning, such as those experienced by people with autism and ADHD,[1]][whereas neurotypicality is a term used to describe individuals who display neurological and cognitive functioning in a way that is typical or expected.[2]]

✓ ✗   I have outlined neurodiversity.[1]

✓ ✗   I have outlined neurotypicality.[2]

✓ ✗   I have used comparison words, such as 'whereas'.

20. [A behaviour associated with ADHD may be fidgeting[1]] [and this may be considered typical if it is consistent with how the individual usually behaves,[2]] [but it can also be considered maladaptive if it is hinders the individual's ability to adjust to the environment and function effectively.[3]]

✓ ✗   I have identified a behaviour associated with ADHD.[1]

✓ ✗   I have explained how this behaviour may be typical for an individual with ADHD.[2]

✓ ✗   I have explained how the same behaviour may be maladaptive for this individual.[3]

3D   Role of mental health workers, psychologists, psychiatrists and organisations

Theory review

1. II; IV; V. *Youth workers, social workers, and occupational therapists are all considered mental health workers as they are members of mental health treatment teams who assist in a range of mental health services.*

2. B. *Psychologists cannot prescribe medication. Only psychiatrists, who are medical doctors, can.*

3. B. False. *In order to become a mental health worker, you only have to study for about three years, whereas six years of study is required to become a psychologist, and 12 years is required to become a psychiatrist.*

4. I; III; IV. *A mental health organisation provides many services including raising awareness, school-based early intervention programs, and over-the-phone counselling.*

5. B. It is important to practise in a **culturally responsive** way so that people from **different cultures** feel **acknowledged**. *It is important to include people of all cultures and make them feel comfortable when receiving psychological help.*

Assessment skills

Text analysis

6. C   **7.** D   **8.** B

Problem-solving

9. C   **11.** D

10. B

Exam-style

Remember and understand

12. D   **13.** A

14. [A psychologist is responsible for providing advice and strategies to people who are struggling with mental wellbeing and psychological development[1]] [whereas, a psychiatrist is responsible for prescribing medication to manage a mental illness or a neurological development.[2]]

✓ ✗   I have outlined a responsibility that is unique to a psychologist.[1]

✓ ✗   I have outlined a responsibility that is unique to a psychiatrist.[2]

✓ ✗   I have used comparison words, such as 'whereas'.

15. [A mental health organisation is a company or group that works to address or advocate for mental health, such as through providing support or specialised services.[1]] [A service they can provide is 24/7 phone services[2]] [and this allows individuals to receive immediate help regarding their mental wellbeing.[3]]

✓ ✗   I have explained what a mental health organisation is.[1]

✓ ✗   I have identified a way in which a mental health organisation provides support for mental wellbeing.[2]

✓ ✗   I have explained how the example assists mental wellbeing.[3]

Apply and analyse

16. D

17. [Sreya may be getting frustrated each time her parents bring up the florist's son as she cannot practise in the same way a psychiatrist can.[1]] [While psychologists and psychiatrists both diagnose and treat mental health issues,[2]] [only a psychiatrist can prescribe medication.[3]]

✓ ✗   I have suggested that Sreya may be getting frustrated as she cannot practise in the same way a psychiatrist can.[1]

✓ ✗   I have outlined a similarity between a psychologist and a psychiatrist.[2]

✓ ✗   I have outlined a difference between a psychologist and a psychiatrist.[3]

✓ ✗   I have referred to the character's name (Sreya) in my response, and to the scenario.

Questions from multiple lessons

18. [The three domains that psychologists may consider when attempting to support psychological development are emotions, behaviours, and cognitions.[1]]

✓ ✗   I have identified that the three domains psychologists may consider when attempting to support psychological development are emotions, behaviours, and cognitions.[1]

19. [A psychiatrist may use cultural perspectives[1]][to categorise Jovita's behaviour as typical.[2]][The psychiatrist may understand that in the country that Jovita comes from, students may be required to take notes of everything their teacher says, including instructions for group activities, and hence, this behaviour would be similar to how Jovita usually acts.[3]]

- ✓ ✗ I have identified that a psychiatrist may use cultural perspectives to categorise Jovita's behaviour.[1]
- ✓ ✗ I have identified that a psychiatrist may categorise Jovita's behaviour as typical.[2]
- ✓ ✗ I have explained that Jovita may be acting how she usually does back home, causing her behaviour to be typical.[3]
- ✓ ✗ I have referred to the character's name (Jovita) in my response, and to the scenario.

20. a. [A responsibility that Dr Chelsea would have is developing strategies that support Azfar's psychological needs.[1]]

- ✓ ✗ I have identified one responsibility that Dr Chelsea may have in supporting Azfar's psychological development.[1]
- ✓ ✗ I have referred to the characters' names (Dr Chelsea and Azfar) in my response, and to the scenario.

Other acceptable answers include:
- providing counselling for Azfar and his loved ones
- referring Azfar to medical specialists
- helping plan for school and post-school options etc.

b. [Using the psychological criteria of social norms, which are society's unofficial rules and expectations regarding how individuals should act, Dr Chelsea may categorise Azfar's behaviour as atypical.[1]][This is because there is a social expectation that students are focused in class but Azfar has been distracted and unable to focus, suggesting that the behaviour is atypical.[2]]

- ✓ ✗ I have explained the psychological criteria of social norms, which was used to categorise Azfar's behaviour as atypical.[1]
- ✓ ✗ I have explained how Azfar's behaviours do not match social expectations, causing them to be atypical.[2]
- ✓ ✗ I have referred to the characters' names (Dr Chelsea and Azfar) in my response, and to the scenario.

c. [Dr Chelsea may categorise Azfar's behaviour as typical.[1]][This is because she may understand that Azfar is demonstrating behaviours that are common for someone who is diagnosed with ADHD and hence, this is how he may usually behave.[2]]

- ✓ ✗ I have identified that Dr Chelsea may categorise Azfar's behaviour as typical.[1]
- ✓ ✗ I have provided a reason for Dr Chelsea's categorisation.[2]
- ✓ ✗ I have referred to the characters' names (Dr Chelsea and Azfar) in my response, and to the scenario.

Chapter 3 review

Multiple choice

1. D　　**2.** C　　**3.** B　　**4.** C

5. A

Short answer

6. [Social norms is a psychological criterion[1]][and it helps categorise behaviour by comparing it to how an individual is expected to behave in a situation.[2]]

- ✓ ✗ I have identified a psychological criterion used to categorise behaviour.[1]
- ✓ ✗ I have explained how the psychological criterion is used to categorise behaviour.[2]

Other acceptable answers include:
- cultural perspectives
- statistical rarity
- maladaptive behaviour
- personal distress.

7. [Atypical behaviours are activities that are inconsistent with how an individual usually behaves.[1]][An example of an atypical behaviour would be sleeping for only four hours if you usually sleep for eight hours.[2]][Contrastingly, a behaviour would be maladaptive if the behaviour is harmful, causing the individual to be unable to adapt to their environment appropriately and function effectively.[3]][An example of a maladaptive behaviour may be purposefully staying up all night for several nights in a row, as this would negatively impact functioning during the day.[4]]

- ✓ ✗ I have explained atypical behaviours.[1]
- ✓ ✗ I have given an example of an atypical behaviour.[2]
- ✓ ✗ I have explained maladaptive behaviours.[3]
- ✓ ✗ I have given an example of a maladaptive behaviour.[4]
- ✓ ✗ I have used comparison words, such as 'contrastingly'.

8. [A mental health organisation is a company or group that works to address or advocate for mental health, such as through providing support or specialised services.[1]][A way that 'Patience is key' can support Jerome's psychological development is by conducting workshops that provide education about assistive technology.[2]][They may teach Jerome how to use assistive technology effectively at school or at home to manage his dyslexia.[3]]

- ✓ ✗ I have described what a mental health organisation is.[1]
- ✓ ✗ I have identified one service a mental health organisation may provide.[2]
- ✓ ✗ I have explained how Jerome's psychological development would be supported.[3]
- ✓ ✗ I have referred to the character's name (Jerome) in my response, and to the scenario.

9. a. [The neurological disorder that Robin may have is dsylexia.[1]]

☑ ☒ I have identified that Robin may have dyslexia.[1]

☑ ☒ I have referred to the character's name (Robin) in my response, and to the scenario.

b. [A psychiatrist or a psychologist can officially diagnose Robin with dyslexia.[1]]

☑ ☒ I have identified who can diagnose Robin with dyslexia.[1]

☑ ☒ I have referred to the character's name (Robin) in my response, and to the scenario.

c. [Robin's brain may differ from others in that she has decreased grey matter volume[1]][and this would impact her reading skills, phonological processing, and spelling recognition.[2]]

☑ ☒ I have identified one way that Robin's brain may be different to others.[1]

☑ ☒ I have explained what effect her neurological difference has.[2]

☑ ☒ I have referred to the character's name (Robin) in my response, and to the scenario.

Other acceptable answers include:
- weaker white matter organisation
- hypoactivation of certain regions of the brain
- reduced neuroplasticity of left-hemispheric regions.

d. [Robin's psychological development may be supported by a mental health worker.[1]][A mental health worker is a member of a mental health treatment team who assists in providing a wide range of services and care for patients with psychological or social problems.[2]][The mental health worker may develop and teach Robin strategies that build her confidence in English activities, helping her to manage her dyslexia.[3]]

☑ ☒ I have identified a source of support for Robin's psychological development.[1]

☑ ☒ I have explained their role in supporting Robin's psychological development.[2]

☑ ☒ I have explained how this source would support Robin's psychological development.[3]

☑ ☒ I have referred to the character's name (Robin) in my response, and to the scenario.

Other acceptable answers include:
- psychologist
- psychiatrist.

10. Students needed to display that they had a thorough understanding of the question by demonstrating:
- an effectively structured response
- that all parts of the question had been addressed
- that psychological terminology had been used in their answer.

Students will need to discuss changes in Diya's categorisation of Nami's behaviour. Students will need to provide rationale for Diya's decision with reference to behaviours that are considered typical at certain ages. Discussion of the following would be awarded:
- Explanation of changes in Diya's categorisation as a result of working with Nami for over ten years.
- Explanation that behaviours may be typical at one age but not another. For example, it may be typical for a four-year-old to interrupt others due to a shorter attention span or spontaneity, but interrupting others as a 14-year-old may be considered rude and inconsiderate.

Students will need to discuss Diya's role in supporting Noami's psychological development. Discussion of the following would be awarded:
- Explanation of the role of a psychologist.
- Suggestions of the services Diya may have provided Noami, such as counselling for the client and her loved ones, developing strategies to manage her behaviour, or creating a helping plan for school options.
- Suggestions of where Diya and Nami may have worked together, such as a hospital, Nami's home, or Nami's school.

Students will need to discuss the influence of hereditary and environmental factors on Nami's personality. Students will need to demonstrate an understanding that hereditary and environmental factors can have an interactive influence. Discussion of the following would be awarded:
- Suggestion of a hereditary factor that may have influenced Nami. Such as a genetic predisposition to being as sociable as her parents are.
- Suggestion of an environmental factor that may have influenced Nami. Such as having a large social circle in which she may interrupt to get her point across or having to interrupt her siblings to get her parents' attention.
- Explanation of how hereditary and environmental factors interact to influence Nami's personality.

Students will need to discuss Diya's application of the biopsychosocial approach to explain Nami's behaviour. Discussion of the following would be awarded:
- Explanation of the biopsychosocial model and why a psychologist may employ it.
- Discussion of a possible biological factor that Diya may attribute Nami's behaviour to, such as an excess in hormones that cause her to be more energised, and hence, sociable.
- Discussion of a possible psychological factor that Diya may attribute Nami's behaviour to, such as a strong sense of self that elicits her to assert herself into conversations.
- Discussion of a possible social factor that Diya may attribute Nami's behaviour to, such as having sociable parents who talk a lot, prompting her to mimic them and also talk alot.
- Explanation of how these influences have an interactive effect on Nami's behaviour.

Students will need to consider the reasons for Diya's referral. Students will need to demonstrate an understanding of the differences between a psychologist and a psychiatrist. Discussion of the following would be awarded:
- Explanation of a psychiatrist's role in defining and supporting psychological development.
- Discussion of services that a psychiatrist may provide that Diya can not, such as diagnosing Nami with a condition and prescribing her medication.
- Suggestions of where the psychiatrist and Nami may work together, such as a hospital, clinics, or private practice.

Unit 1 AOS 1 review

SAC assessment 1

1. a. [The biopsychosocial model is a holistic, interdisciplinary framework for understanding the human experience in terms of the influence of biological, psychological, and social factors.[1]]

✓ ✗ I have explained what the biopsychosocial model is.[1]

b. [Factors that may have influenced Traian's behaviour include a lack of nutrition (biological),[1]][psychological distress from when his mother left (psychological)[2]][and a lack of human interaction (social).[3]]

✓ ✗ I have identified a biological factor that may have influenced Traian's behaviour.[1]

✓ ✗ I have identified a psychological factor that may have influenced Traian's behaviour.[2]

✓ ✗ I have identified a social factor that may have influenced Traian's behaviour.[3]

✓ ✗ I have referred to the character's name (Traian) in my response, and to the scenario.

c. [Hereditary factors are factors that are genetically passed down from biological parents to their offspring.[1]][Environmental factors are factors that arise from an individual's physical and social surroundings.[2]]

✓ ✗ I have explained what hereditary factors are.[1]

✓ ✗ I have explained what environmental factors are.[2]

d. [Hereditary and environmental factors combine to have an interactive influence on an individual's psychological development.[1]][For example, the impacts of Traian's predisposition to aggressive tendencies (hereditary) and living in the wild (environmental) may have combined to result in an unusual and animalistic development.[2]]

✓ ✗ I have explained that hereditary and environmental factors combine to have an interactive influence on an individual's psychological development.[1]

✓ ✗ I have suggested an interactive influence on Traian's psychological development.[2]

✓ ✗ I have referred to the character's name (Traian) in my response, and to the scenario.

2. [Psychological development is a lifelong process that is continuously influenced by biopsychosocial factors.[1]][After being taken into care, Traian may have been provided with more nutritious food (biological factor),[2]][his participation in school may have increased his self-efficacy (psychological factor),[3]][and he may have made friends in school (social factor). This may have all contributed positively to his psychological development.[4]]

✓ ✗ I have identified psychological development as a lifelong process.[1]

✓ ✗ I have identified a biological factor that may have positively contributed to Traian's psychological development.[2]

✓ ✗ I have identified a psychological factor that may have positively contributed to Traian's psychological development.[3]

✓ ✗ I have identified a social factor that may have positively contributed to Traian's psychological development.[4]

✓ ✗ I have referred to the character's name (Traian) in my response, and to the scenario.

Other acceptable answers include:
- better quality sleep (biological factor)
- reduced psychological stress (psychological factor)
- increased community involvement (social factor).

3. a. [Traian may have insecure attachment[1]][as his mother being a victim of domestic violence may have meant that his needs as an infant were not consistently met.[2]]

✓ ✗ I have identified that Traian may have insecure attachment.[1]

✓ ✗ I have justified why Traian may have insecure attachment.[2]

✓ ✗ I have referred to the character's name (Traian) in my response, and to the scenario.

b. [Due to his insecure attachment in his early childhood, Traian is likely to struggle with his emotions in his adult life.[1]][He may either crave or reject affection from others,[2]][which may create strains in his relationships.[3]]

✓ ✗ I have suggested that Traian may struggle with his emotion in his adult life.[1]

✓ ✗ I have identified a developmental outcome of insecure attachment.[2]

✓ ✗ I have explained how the developmental outcome may impact Traian's adult life.[3]

✓ ✗ I have referred to the character's name (Traian) in my response, and to the scenario.

Other acceptable answers include:
- Traian may have an inappropriate expression of or the inability to express emotions.
- Traian may have increased feelings of anxiety.

4. a. [Cognitive development is the continuous, life-long development of the ability to think, comprehend, and organise information from the internal and external environment.[1]]

✓ ✗ I have explained what cognitive development is.[1]

b. [As Traian was found at the age of seven, he would have been in the late preoperational stage of Piaget's theory of cognitive development.[1]]

   ✓ ✗ I have identified that Traian would have been in the late preoperational stage of Piaget's theory of cognitive development.[1]

   ✓ ✗ I have referred to the character's name (Traian) in my response, and to the scenario.

c. [The key cognitive development of overcoming egocentrism may have been delayed for Traian[1]][as his perception of the world was not challenged due to a lack of human interaction.[2]]

   ✓ ✗ I have identified a key cognitive development that Traian may have missed out on.[1]

   ✓ ✗ I have explained how or why Traian may have missed out on the key cognitive development.[2]

   ✓ ✗ I have referred to the character's name (Traian) in my response, and to the scenario.

Other acceptable answers include:
- overcoming centration
- understanding reversibility.

d. [A limitation of applying Piaget's theory to Traian's psychological development is that Piaget failed to account for developmental diversity.[1]][Using Piaget's theory would not allow for looking at Traian's psychological development as unique to him, possibly leading to inaccurate understandings of his development.[2]]

   ✓ ✗ I have identified a limitation of Piaget's theory.[1]

   ✓ ✗ I have explained how the limitation would affect applying Piaget's theory to Traian's psychological development.[2]

   ✓ ✗ I have referred to the character's name (Traian) in my response, and to the scenario.

Other acceptable answers include:
- Piaget based his theory on observational research of his own children, which gives rise to questions about generalisability and experimenter bias.
- The theory is very rigid, with age ranges assigned to each stage being relatively concrete, hence expecting every individual to develop at the same rate.

5. a. [Social development is the continuous, life-long development of certain skills, attitudes, relationships, and behaviours that enable an individual to interact with others and to function as a member of society.[1]]

   ✓ ✗ I have explained what social development is.[1]

b. [As Traian did not learn how to form relationships when he lived in the wild, he may have struggled to trust people after he was found.[1]]

   ✓ ✗ I have suggested an impact on Traian's social development after he was found.[1]

   ✓ ✗ I have referred to the character's name (Traian) in my response, and to the scenario.

c. [Traian's mother leaving would have affected his psychological development greatly.[1]][Her absence would have resulted in the absence of a mediator between Traian and his involvement with his peers and the community.[2]]

   ✓ ✗ I have identified what effect Traian's mother leaving would have had on his psychological development.[1]

   ✓ ✗ I have explained why his mother leaving would have had this impact.[2]

   ✓ ✗ I have referred to the character's name (Traian) in my response, and to the scenario.

d. [In 2007, Traian would have been in the industry vs. inferiority stage of Erik Erikson's psychosocial theory as he would be around 12-years-old.[1]]

   ✓ ✗ I have identified that Traian would have been in the industry vs. inferiority stage of Erik Erikson's psychosocial theory.[1]

   ✓ ✗ I have referred to the character's name (Traian) in my response, and to the scenario.

e. [Individuals progress to the next stage of Erik Erikson's psychosocial theory if they successfully resolve the psychosocial crisis associated with the stage.[1]][In order to progress to the next stage, identity vs. role confusion, Traian would need to feel proud of his performances, in which he holds the belief that he is competent.[2]]

   ✓ ✗ I have explained how individuals progress to the next stage of Erik Erikson's psychosocial theory.[1]

   ✓ ✗ I have explained what Train would need to do to progress to the next stage.[2]

   ✓ ✗ I have referred to the character's name (Traian) in my response, and to the scenario.

f. [A limitation of Erik Erikson's psychosocial theory is that it was based heavily on case studies and biographical data that reflected Western standards.[1]][Therefore, the theory is subjective and culturally biased, potentially hindering a proper analysis of an individual's social development.[2]]

   ✓ ✗ I have identified a limitation of Erik Erikson's psychosocial theory.[1]

   ✓ ✗ I have explained how this limits the analysis of an individual's social development.[2]

6. a. [Critical periods are the narrow, rigid developmental periods in which a specific function or skill must be learnt,[1]][whereas sensitive periods are the optimal developmental period for a specific function or skill to be learnt in the fastest and easiest way.[2]]

✓ ✗ I have explained what a critical period is.[1]

✓ ✗ I have explained what a sensitive period is.[2]

✓ ✗ I have used comparison words, such as 'whereas'.

b. [Learning to read and write was a sensitive period for Traian.[1]] [This is because although it would have been the easiest for him to learn the skills when he was younger,[2]] [he was still able to learn the skills but it may have taken a little longer for the acquisition to occur.[3]]

✓ ✗ I have identified that learning to read and write is a sensitive period.[1]

✓ ✗ I have explained that learning to read and write would have been the easiest at a younger age.[2]

✓ ✗ I have explained that Traian was still able to learn, but acquisition may have taken a little longer.[3]

✓ ✗ I have referred to the character's name (Traian) in my response, and to the scenario.

7. a. [The psychological term used to describe the brain's ability to change in shape is plasticity.[1]]

✓ ✗ I have identified the psychological term as plasticity.[1]

b. [It may have been more difficult for Traian to learn how to speak at an older age[1]] [as his brain would become less malleable and structural pathways would be less likely to change physically in response to experiences during his maturation.[2]]

✓ ✗ I have identified that learning how to speak would have been more difficult for Traian at an older age.[1]

✓ ✗ I have suggested that the brain would be less malleable and structural pathways would be less likely to change physically.[2]

✓ ✗ I have referred to the character's name (Traian) in my response, and to the scenario.

Unit 1 AOS 1 review

SAC assessment 2

1. a. [Neurodiversity is a term used to recognise normal variations in neurological development and functioning within and between groups of people.[1]]

✓ ✗ I have explained what neurodiversity is.[1]

b. [Neurodivergent refers to individuals who have a variation in neurological development and functioning.[1]]

✓ ✗ I have explained what is meant by neurodivergent.[1]

c. [A neurotypical individual is able to adapt to changes in routines[1]] [whereas a neurodivergent person may experience difficulty in adapting to change, especially if it is sudden.[2]]

✓ ✗ I have identified a characteristic of a neurotypical individual.[1]

✓ ✗ I have compared the characteristic, mentioned above, to a neurodivergent individual.[2]

✓ ✗ I have used comparison words, such as 'whereas'.

Other acceptable answers include:
- functioning in distracting environments
- focusing.

2. a. [Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterised by impaired social interactions, verbal and non-verbal communication difficulties, narrow interests, and repetitive behaviours.[1]]

✓ ✗ I have explained what ASD entails.[1]

b. [Michael's and Kassandra's brains may have a thinner temporal cortex than a neurotypical individual's brain.[1]]

✓ ✗ I have suggested a way in which Michael's and Kassandra's brains may differ from neurotypical individuals.[1]

✓ ✗ I have referred to the characters' names (Michael and Kassandra) in my response, and to the scenario.

c. [A person with ASD and a person with ADHD may both engage in repetitive behaviours.[1]] [A person with ASD may also have verbal communication difficulties but a person with ADHD may not.[2]]

✓ ✗ I have identified a way in which a person with ASD and a person with ADHD are similar.[1]

✓ ✗ I have identified a way in which a person with ASD and a person with ADHD are different.[2]

3. a. [A strength of ASD that Michael exhibited during the speed dating night is superior retention of facts about being a Germanophile.[1]]

✓ ✗ I have identified a strength of ASD that Michael exhibited.[1]

✓ ✗ I have referred to the character's name (Michael) in my response, and to the scenario.

b. [A challenge of ASD that Michael faced during the speed dating night is being unable to make or keep eye contact.[1]]

✓ ✗ I have identified a challenge of ASD that Michael faced.[1]

✓ ✗ I have referred to the character's name (Michael) in my response and the scenario.

4. [Typical behaviour is an activity that is consistent with how an individual usually behaves.[1]][As Michael's eyes may usually widen when he hears something surprising, this behaviour would be typical for him.[2]]

✓ ✗ I have explained what typical behaviour is.[1]

✓ ✗ I have explained how Michael's eyes widening may be typical for him.[2]

✓ ✗ I have referred to the character's name (Michael) in my response, and to the scenario.

5. a. [Abnormality is the state of deviating from the norm, usually in a way that is undesirable,[1]][whereas atypical behaviours are activities that are unusual or unnatural according to how an individual usually behaves.[2]]

✓ ✗ I have described abnormality.[1]

✓ ✗ I have described atypical behaviours.[2]

✓ ✗ I have used comparison words, such as 'whereas'.

b. [According to the psychological criterion of social norms,[1]][the other children may have been behaving typically as there is a social expectation that students sit together during school to socialise, therefore they would be acting as they usually do.[2]]

✓ ✗ I have identified a psychological criterion.[1]

✓ ✗ I have explained why the other children's behaviour is typical or atypical according to the psychological criteria chosen above.[2]

Other acceptable answers include:
- cultural perspectives
- statistical rarity
- personal distress
- maladaptive behaviours.

c. [An advantage of using personal distress to categorise Kassandra's behaviour is that it can provide a visual indication that she is behaving in a way that is uncommon for her, allowing for easier categorisation.[1]][However, a disadvantage is that Kassandra may conceal personal distress, causing difficulty in identifying atypical behaviours.[2]]

✓ ✗ I have discussed an advantage of using personal distress to categorise Kassandra's behaviour.[1]

✓ ✗ I have discussed a disadvantage of using personal distress to categorise Kassandra's behaviour.[2]

✓ ✗ I have referred to the character's name (Kassandra) in my response, and to the scenario.

6. a. [A psychiatrist may have diagnosed Kassandra.[1]]

✓ ✗ I have identified that a psychiatrist may have diagnosed Kassandra.[1]

✓ ✗ I have referred to the character's name (Kassandra) in my response, and to the scenario.

b. [A psychiatrist can also prescribe medication[1]][and provide referrals to other health professionals.[2]]

✓ ✗ I have outlined one additional role of a psychiatrist.[1]

✓ ✗ I have outlined another additional role of a psychiatrist.[2]

Other acceptable answers include:
- treating mental health issues
- using talk-based therapies, such as cognitive behavioural therapy
- conducting research in psychiatry and mental health
- devising management plans
- other additional roles of a psychiatrist.

c. [Because a referral is needed to see a psychiatrist,[1]][Kassandra would have first seen a GP or a psychologist and shared her concerns.[2]][She would have then received a referral and made an appointment to see a psychiatrist, who diagnosed her with ASD.[3]]

✓ ✗ I have identified that a referral is needed to see a psychiatrist.[1]

✓ ✗ I have suggested that Kassandra would have seen a GP or psychologist first.[2]

✓ ✗ I have suggested that Kassandra would have then seen a psychiatrist, who diagnosed her.[3]

✓ ✗ I have referred to the character's name (Kassandra) in my response, and to the scenario.

7. a. [A mental health worker is a member of a mental health treatment team who assists in providing care and various services to patients with psychological or social problems,[1]][such as an occupational therapist.[2]]

✓ ✗ I have outlined what a mental health worker is.[1]

✓ ✗ I have provided an example of a mental health worker.[2]

b. [A mental health worker may have helped Kassandra develop and practice coping strategies to use when she is in a stressful situation, supporting her mental wellbeing.[1]]

✓ ✗ I have suggested one way in which a mental health worker may have supported Kassandra's mental wellbeing.[1]

✓ ✗ I have referred to the character's name (Kassandra) in my response, and to the scenario.

c. [A mental health worker may have helped Kassandra at school by providing assistance with challenging work that she struggled to complete independently, supporting her psychological development.[1]]

✓ ✗ I have suggested one way in which a mental health worker may have supported Kassandra's psychological development.[1]

✓ ✗ I have referred to the character's name (Kassandra) in my response, and to the scenario.

8. [Mental health organisations conduct workshops[1]] [and Kassandra may have gone to one which taught her techniques to calm down when she is experiencing sensory overload, due to her ASD.[2]]

    ✓ ✗   I have identified a service that a mental health organisation provides.[1]

    ✓ ✗   I have suggested how this service may have helped Kassandra manage her ASD.[2]

    ✓ ✗   I have referred to the character's name (Kassandra) in my response, and to the scenario.

    ✓ ✗   I have identified that this behaviour would be maladaptive for Kassandra.[1]

    ✓ ✗   I have explained why this behaviour would be maladaptive.[2]

    ✓ ✗   I have referred to the character's name (Kassandra) in my response, and to the scenario.

9. **a.** [Kassandra having to take a break would be adaptive[1]] [as the behaviour was helping her to adjust to the environment appropriately and function effectively.[2]]

    ✓ ✗   I have identified that Kassandra's behaviour would be adaptive.[1]

    ✓ ✗   I have explained why Kassandra's behaviour was adaptive.[2]

    ✓ ✗   I have referred to the character's name (Kassandra) in my response, and to the scenario.

  b. [As Kassandra said that 'somedays there's no explanation, [her brain] just can't cope,'[1]] [having a panic attack on a first date may be typical for Kassandra as that may be how she usually acts.[2]]

    ✓ ✗   I have referred to a quote from the scenario.[1]

    ✓ ✗   I have suggested that Kassandra's behaviour was typical.[2]

    ✓ ✗   I have referred to the character's name (Kassandra) in my response, and to the scenario.

10. **a.** [Kassandra being distracted by and stuck on a dog barking in the background while in the middle of a conversation would be typical as it may be how she usually acts.[1]]

    ✓ ✗   I have suggested that Kassandra's behaviour is typical.[1]

    ✓ ✗   I have referred to the character's name (Kassandra) in my response, and to the scenario.

  b. [This behaviour would be atypical for a neurotypical individual as they may not usually get distracted by and stuck on a dog barking in the background while in the middle of a conversation.[1]]

    ✓ ✗   I have suggested that this behaviour would be atypical for a neurotypical individual.[1]

  c. [This behaviour would be maladaptive for Kassandra[1]] [as it was not allowing her to adapt to the environment appropriately and function effectively.[2]]

4A Approaches to understanding the brain

Theory review

1. B. False. *Psychology is a dynamic field that is constantly changing.*

2. B. False. *Modern science has supported the assertion that the brain holds human emotional functioning, however the debate has contributed to modern approaches to understanding the brain, hence it was not a waste of time.*

3. B. False. *Although this finding supports the beliefs of monists (as it shows that the mind and body are connected), dualism cannot yet be falsified (proven to be false) as our understanding of concepts, such as the workings of unconsciousness are still incomplete.*

4. B. *Despite being inaccurate in his mapping, Gall was correct in establishing that different areas of the brain were primarily responsible for specific functions and processes.*

5. I; III. *Ablation and brain lesioning both fall under the category of either purposeful (e.g. surgery) or accidental (e.g. stroke patients or case of Phineas Gage). Both processes involve a sequence of 'cause and effect', enabling researchers to make inferences about brain functioning.*

6. B. False. *Although each hemisphere has specialised functions, the two hemispheres work together in a way that is interconnected by communication through the corpus callosum. No process is completely isolated.*

7. B. Structural neuroimaging techniques involve **capturing structural properties of the brain**, whereas functional neuroimaging techniques involve **capturing the functional activity of the brain**. *The distinction between structural and functional techniques is found in what they measure, rather than the technology that is used to measure this.*

Assessment skills

Perfect your phrasing

8. A   9. B   10. A

Text analysis

11. A   12. C   13. B

Exam-style

Remember and understand

14. B   15. A   16. B   17. C

18. [The main aim of psychology as a scientific discipline is to study human mental processes and behaviour.[1]]

✓ ✗ I have outlined the main aim of psychology as a scientific discipline.[1]

Other acceptable answers include:

- to understand the brain and its relationship with human behaviour and mental processes.

Apply and analyse

19. B

20. [It would be most appropriate for the doctors to either use a CT[1]] [or MRI scan to assess the damage on Sarah's brain.[2]]

✓ ✗ I have identified a structural neuroimaging technique.[1]

✓ ✗ I have identified another structural neuroimaging technique.[2]

✓ ✗ I have referred to the character's name (Sarah) in my response, and to the scenario.

21. [Dualism is the belief that the mind and body are separate and distinguishable from one another,[1]] [whereas monism is the belief that the mind and body are together one singular entity.[2]]

✓ ✗ I have explained the beliefs of dualism.[1]

✓ ✗ I have explained the beliefs of monism.[2]

✓ ✗ I have used comparison words, such as 'whereas'.

22. [Flouren's theory of localisation and the theory of phrenology both suggest that certain areas of the brain are responsible for specific functions.[1]] [However, phrenologists theorised this difference in function, whereas Flourens used scientific research through experimental ablation to come to this conclusion.[2]]

✓ ✗ I have explained one similarity between Flouren's theory and phrenology.[1]

✓ ✗ I have explained one difference between Flouren's theory and phrenology.[2]

Other acceptable answers include:

- other differences between Flouren's theory and phrenology, such as that phrenology mapped the localisation of personality in the brain, whereas Flouren's theory mapped areas of function in the brain.

23. **a.** [Despite being invasive to and irreversible for patients, this research could be deemed appropriate as the surgery was not performed to conduct the research, but to prevent uncontrollable epileptic seizures and therefore did not cause any unnecessary harm.[1]]

✓ ✗ I have justified why the research could be deemed ethical.[1]

b. [Sperry and Gazzaniga found that visual information was processed contralaterally.[1]]

✓ ✗ I have identified a main finding of Sperry and Gazzaniga's split-brain research in relation to visual perception.[1]

Other acceptable answers include:

- visual information received from the right eye was processed in the left hemisphere and vice versa.

c. [One limitation of Sperry and Gazzaniga's research is that convenience sampling was used, meaning the sample was likely not representative of the population.[1]] [As Sperry and Gazzaniga were the ones conducting the study, there was also a risk of experimenter bias.[2]]

✓ ✗ I have stated one limitation of Sperry and Gazzaniga's research.[1]

✓ ✗ I have stated another limitation of Sperry and Gazzaniga's research.[2]

Other acceptable answers include:
- small sample size due to the researchers only being able to study participants who had already undergone split-brain surgery.
- the presence of individual participant differences due to non-random sampling.

24. a. [The independent variable is the removal of a specific part of the nervous system.[1]] [The dependent variable is the behaviour and functioning of the animal.[2]]

✓ ✗ I have identified the independent variable.[1]

✓ ✗ I have identified the dependent variable.[2]

Note: You may choose to operationalise the variables or not.

b. [Flouren's research led to the general concept that different regions of the brain interacted and influenced each other.[1]] [In contrast, phrenology proposed that each mind organ was completely independent in its use.[2]] [Therefore, due to the fact that Flouren used the scientific method to conduct his research, his findings that contradicted those of phrenology's were accepted.[3]]

✓ ✗ I have explained the findings of Flourens' research.[1]

✓ ✗ I have explained the theory of phrenology.[2]

✓ ✗ I have explained how Flouren's research discounted phrenology, with reference to the scientific method.[3]

Questions from multiple lessons

25. [Surgical ablation is the removal of brain tissue.[1]] [In terms of nature, this often leads to certain functions being compromised or becoming unable to function as the structural qualities of the brain have been altered.[2]] [However, the brain works as an integrated whole and through environmental triggers (nurture), is able to compensate for the removed areas.[3]]

✓ ✗ I have demonstrated my understanding of what surgical ablation involves.[1]

✓ ✗ I have explained the effects of surgical ablation in terms of nature.[2]

✓ ✗ I have explained how the brain can recover functions in terms of nurture.[3]

4B Regions of the brain

Theory review

1. A. The brain is divided into **three** main regions. *The brain can be divided into three main regions: the hindbrain, midbrain, and forebrain.*

2. B. False. *While each brain region has a distinct role in behaviour and mental processes, different brain regions do not operate in isolation. Interaction occurs between different brain regions to enable the processing of information and coordination of activity.*

3. A. *The hindbrain and its structures, including the cerebellum, medulla, and pons, have an important role in coordinating basic survival functions, such as movement, breathing, heart rate, and digestion.*

4. A. The hindbrain contains the **cerebellum**, which is responsible for calculating and coordinating skeletal muscle movement. *After receiving information about the position of the body in space and motor commands regarding what movements should be made, the cerebellum then calculates how to move appropriately and communicates this motor information to the skeletal muscles, which then carry out the motor movement.*

5. I; III. *The midbrain is involved in many functions, including regulating sleep and physiological arousal, and relaying neural information to, from, and within the brain. The forebrain is the brain region that is responsible for coordinating sophisticated mental processes.*

6. B. False. *While the reticular formation is located predominantly in the midbrain, it is not strictly confined to this brain region. It extends along the brainstem and has pathways that project into the hindbrain and forebrain.*

7. B. The forebrain contains the **thalamus**, which is responsible for filtering sensory information, excluding olfactory information, and relaying this sensory information to higher brain areas. *The role of the thalamus resembles a 'post office' to which sensory 'letters' are sent from sensory receptors in the body. The thalamus acts as the 'mail sorter', filtering these sensory messages and relaying them to the appropriate brain areas for further processing.*

8. A. True. *Every region of the brain contributes to the process of motor movement. The hindbrain contains the cerebellum, which calculates and coordinates skeletal muscle movement. Every motor message is relayed by the midbrain from structurally higher brain areas to the spinal cord. The forebrain initiates voluntary motor movements.*

Assessment skills

Perfect your phrasing

9. A **10.** B **11.** B

Text analysis

12. A **13.** A **14.** C **15.** B

Exam-style

Remember and understand

16. D **17.** C **18.** A **19.** D

20. [The hindbrain has a role in coordinating basic, autonomic functions that are fundamental to survival, including movement, breathing rate, and heart rate.[1]] [In comparison, the forebrain has a role in sophisticated mental processes, including cognition, perception, and language, integrating and coordinating information to enable us to perform complex functions.[2]]

- ✓ ✗ I have explained the role of the hindbrain in behaviour and mental processes.[1]

- ✓ ✗ I have explained the role of the forebrain in behaviour and mental processes.[2]

- ✓ ✗ I have used comparison words, such as 'in comparison'.

21. a. [The midbrain has a role in regulating sleep and physiological arousal.[1]] [Furthermore, the midbrain has a role in coordinating motor movement relating to sensory stimuli, such as eye movements.[2]]

- ✓ ✗ I have outlined a role of the midbrain in behaviour and mental processes.[1]

- ✓ ✗ I have outlined another role of the midbrain in behaviour and mental processes.[2]

Other acceptable answers include:
- processing sensory information, such as auditory, visual, and tactile information
- other roles of the midbrain in behaviour and mental processes.

b. [The reticular formation is a brain structure that passes through the midbrain.[1]] [A function of the reticular formation is to filter and relay neural information that is travelling to the brain, directing these neural messages to various brain areas and brain structures.[2]]

- ✓ ✗ I have identified the reticular formation as the brain structure that passes through the midbrain.[1]

- ✓ ✗ I have explained one function of the reticular formation.[2]

Other acceptable answers include:
- other functions of the reticular formation for the second mark.

Apply and analyse

22. B

23. [The thalamus has an important role in attention, functioning as a filtering system and relay centre for sensory information, excluding olfactory information.[1]] [All incoming sensory information is analysed by the thalamus, and the most important and relevant information is extracted.[2]] [This filtered information is then relayed by the thalamus to various higher brain areas for further processing.[3]]

- ✓ ✗ I have described the role of the thalamus in attention.[1]

- ✓ ✗ I have described the role of the thalamus in attention in further detail by describing its role as a filtering system.[2]

- ✓ ✗ I have described the role of the thalamus in attention in further detail by describing its role as a relay centre.[3]

24. [Archie's reticular formation,[1]] [which is located in the midbrain,[2]] [would have been involved when Archie felt alert after looking at the audience, because it regulates physiological arousal and alertness based on environmental stimuli, as well as internal cues.[3]] [Archie's cerebrum,[4]] [which is located in the forebrain,[5]] [would have also been involved when Archie judged the number of people in the audience, because it has an important role when a person evaluates, judges, and performs other sophisticated mental processes.[6]]

- ✓ ✗ I have identified one brain structure that may have been involved when Archie was performing at the concert.[1]

- ✓ ✗ I have identified the brain region that this brain structure is located in.[2]

- ✓ ✗ I have explained how this brain structure may have been involved when Archie was performing at the concert.[3]

- ✓ ✗ I have identified another brain structure that may have been involved when Archie was performing at the concert.[4]

- ✓ ✗ I have identified the brain region that this brain structure is located in.[5]

- ✓ ✗ I have explained how this brain structure may have been involved when Archie was performing at the concert.[6]

- ✓ ✗ I have referred to the character's name (Archie) in my response, and to the scenario.

Other acceptable answers include:
- the thalamus, which is located in the forebrain, when Archie listens closely to the music, because this involves processing sensory information
- other brain structures that may have been involved when Archie was performing at the concert, so long as their involvement was adequately explained.

Questions from multiple lessons

25. a. [A brain lesion is when an area of brain tissue or a brain structure experiences damage due to disease or injury.[1]]

- ✓ ✗ I have explained what a brain lesion is.[1]

b. [The cerebellum is located in the hindbrain.[1]]

- ✓ ✗ I have identified that the cerebellum is located in the hindbrain.[1]

c. [The cerebellum has a role in calculating and coordinating skeletal muscle movement, ensuring that motor movements are fluid and smooth.[1]] [Therefore, if a person has a brain lesion in their cerebellum, this may mean that their motor movements are uncoordinated and disjointed, and their ability to move appropriately may be limited.[2]]

- ✓ ✗ I have described the function of the cerebellum.[1]

- ✓ ✗ I have described the likely impact on this function if a person has a brain lesion in their cerebellum.[2]

4C The cerebral cortex

Theory review

1. B. False. *The cerebral cortex is the outer layer of the cerebrum, not the cerebellum. These words are similar and easily confused.*

2. II; IV. *The two cerebral hemispheres are separated by the longitudinal fissure, not the reticular formation. Furthermore, while the two cerebral hemispheres are almost symmetrical, they are not identical. For example, Broca's area and Wernicke's area are only located in the left cerebral hemisphere.*

3. A. The cerebral cortex can be divided into **four** lobes. *The lobes of the cerebral cortex are: the frontal lobe, the parietal lobe, the occipital lobe, and the temporal lobe.*

4. I; III. *The primary somatosensory cortex is located in the parietal lobe, not the frontal lobe. Furthermore, despite being located in the frontal lobe, Broca's area is involved in speech production, not motor movement.*

5. B. False. *The primary somatosensory cortex has a role in receiving and processing sensory information related to touch, temperature, pressure, and pain. However, other regions of the cerebral cortex are responsible for receiving processing information related to vision, sound, smell, and taste.*

6. I; II; III. *The cerebral cortex is composed of three different types of functional areas. The primary motor cortex is a motor area. The prefrontal cortex and Wernicke's area are association areas. From the options, only the primary visual cortex is a sensory area.*

7. A. Broca's area and Wernicke's area are located in only the **left** cerebral hemisphere. *Broca's area and Wernicke's area are localised to the left cerebral hemisphere only.*

Assessment skills

Text analysis

8. A   9. A   10. C   11. B

Exam-style

Remember and understand

12. C   13. A

14. [The cerebral cortex is the thin outer layer of the cerebrum that covers the brain.[1]][It can be divided into four distinct lobes: the frontal lobe, the parietal lobe, the occipital lobe, and the temporal lobe.[2]]

    ✓ ✗ I have described the cerebral cortex.[1]

    ✓ ✗ I have described the cerebral cortex in further detail by providing another point of information.[2]

15. [Broca's area and Wernicke's area both have a role in language, specifically speech.[1]][However, Broca's area is primarily involved in the production of fluent and articulate speech, whereas Wernicke's area is involved in speech comprehension and the production of meaningful and coherent speech.[2]]

    ✓ ✗ I have outlined one similarity between the role of Broca's area and Wernicke's area in behaviour and mental processes.[1]

    ✓ ✗ I have outlined one difference between the role of Broca's area and Wernicke's area in behaviour and mental processes.[2]

    ✓ ✗ I have used comparison words, such as 'whereas'.

Apply and analyse

16. D   17. C   18. B

19. [If a person sustained damage to their primary visual cortex, they would likely have difficulty receiving and processing visual information, which may cause poor vision or blindness.[1]][This is because the primary visual cortex has a role in receiving and processing visual information from the visual field. If it is damaged, this function is likely to be impaired.[2]]

    ✓ ✗ I have predicted the likely impact on behaviour and mental processes if a person sustained damage to their primary visual cortex.[1]

    ✓ ✗ I have explained that this is because the primary visual cortex has a role in receiving and processing visual information.[2]

Questions from multiple lessons

20. C

Chapter 4 review

Multiple choice

1. B   2. A   3. B   4. D

5. C

Short answer

6. [The hypothalamus has a role in regulating internal processes, including hormone levels, hunger, thirst, body temperature, and blood pressure.[1]][The hypothalamus is located in the forebrain.[2]]

    ✓ ✗ I have outlined a role of the hypothalamus in behaviour and mental processes.[1]

    ✓ ✗ I have identified that the hypothalamus is located in the forebrain.[2]

Other acceptable answers include:
- performing pleasure-seeking or pain-averting behaviours that often relate to fulfilling needs, such as sex and feeding
- experiencing emotions, such as fear and anger, in response to environmental stimuli
- other roles of the hypothalamus in behaviour and mental processes.

7. [The prefrontal cortex,[1]] [the premotor cortex,[2]] [and the primary motor cortex are involved in motor movement.[3]]

✓ ✗ I have identified one region of the cerebral cortex that is involved in motor movement.[1]

✓ ✗ I have identified another region of the cerebral cortex that is involved in motor movement.[2]

✓ ✗ I have identified a third region of the cerebral cortex that is involved in motor movement.[3]

8. [The primary somatosensory cortex has an important role in receiving and processing sensory information relating to touch, temperature, pressure, and pain.[1]] [In comparison, the primary visual cortex has an important role in receiving and processing visual information from the visual field.[2]]

✓ ✗ I have explained the role of the primary somatosensory cortex in behaviour and mental processes.[1]

✓ ✗ I have explained the role of the primary visual cortex in behaviour and mental processes.[2]

✓ ✗ I have used comparison words, such as 'In comparison'.

9. [Structural neuroimaging techniques can only capture images of the structure of the brain,[1]] [whereas functional neuroimaging techniques can also capture brain activity.[2]] [A structural neuroimaging technique is computerised tomography (CT)[3]] [and a functional neuroimaging technique is function magnetic resonance imaging (fMRI).[4]]

✓ ✗ I have explained structural neuroimaging techniques.[1]

✓ ✗ I have explained functional neuroimaging techniques.[2]

✓ ✗ I have provided an example of a structural neuroimaging technique.[3]

✓ ✗ I have provided an example of a functional neuroimaging technique.[4]

✓ ✗ I have used comparison words, such as 'whereas'.

Other acceptable answers include:

- other structural neuroimaging techniques, such as magnetic resonance imaging (MRI)
- other functional neuroimaging techniques, such as positron emission tomography (PET).

10. [Amelie's temporal lobe was most likely damaged by the car accident.[1]] [This is because Amelie experienced memory loss following the accident, such as not recognising her friend, and the association area of the temporal lobe is involved in memory, specifically, the recognition of objects and faces.[2]]

✓ ✗ I have identified the temporal lobe as the lobe of the cerebral cortex that was most likely damaged by the car accident.[1]

✓ ✗ I have justified my response, with reference to the role of the temporal lobe in behaviour and mental processes.[2]

✓ ✗ I have referred to the character's name (Amelie) in my response, and to the scenario.

11. [The patient would likely be unable to verbalise that they had seen an image of a chicken.[1]] [This is because visual information presented to the left visual field is processed by the right non-verbal hemisphere.[2]] [Because the patient has undergone split-brain surgery, this visual information cannot be transferred via the corpus callosum to the left hemisphere to enable verbalisation.[3]]

✓ ✗ I have explained that the patient would be unable to verbalise the image of the chicken.[1]

✓ ✗ I have explained that information projected to the left visual is processed by the right non-verbal hemisphere.[2]

✓ ✗ I have explained that the information cannot be transferred to the left hemisphere to enable verbalisation due to the patient undergoing split-brain surgery.[3]

12. Students needed to display that they had a thorough understanding of the question by demonstrating:

- an effectively structured response
- that all parts of the question had been addressed
- that psychological terminology had been used in their answer.

In relation to the methods and procedures of the investigation, discussion of the following would be awarded marks:

- Identification of the independent variable as a damaged or undamaged primary motor cortex, and identification of the dependent variable as performance on the motor tasks (measured by speed, or number of minutes taken to complete the task, and accuracy, or the number of errors made during the task).
- Identification and explanation of convenience sampling, which is the sampling method used by Doctor Collopy.
- Identification and explanation of non-random allocation, which is the allocation method used by Doctor Collopy. Students may also explain why random allocation is an unsuitable allocation method for this research study.
- Identification and explanation of a between-subjects design, which is the experimental research design used by Doctor Collopy. Students may also explain why a within-subjects design is an unsuitable experimental research design for this research study.

In relation to the likely results of this research study and possible conclusions that may be drawn, discussion of the following would be awarded marks:

- That the participant with the intact primary motor cortex would likely complete the motor tasks more quickly and accurately than the participant with the damaged primary motor cortex.
- Students may explain why they have predicted these results by explaining the role of the primary motor cortex in behaviour and mental processes. Because the primary motor cortex has a role in initiating voluntary motor movements, an individual with a damaged primary motor cortex would likely have more difficulty completing motor tasks quickly and accurately than an individual with an intact primary motor cortex.

In relation to the limitations of this research study and how they may be overcome, discussion of the following would be awarded marks:

- The extremely small sample size of two people, as it reduces the generalisability of results to the general population. This limitation may be overcome by increasing the sample size so that the sample is more representative of the population.
- Identification of possible extraneous variables, such as participant-related variables, and how these may be controlled for.

5A Neuroplasticity

Theory review

1. C. In infancy, developmental plasticity functions mostly to **build** on their understanding of the world. *In infancy, we need lots of connections to learn important skills, such as language and motor coordination, for the first time.*

2. A. **Developmental plasticity** can involve changes to the neurons and their connections while **myelination** ensures communication between neurons is successful and efficient by protecting neurons. *It is important to remember that developmental plasticity is the umbrella term for all processes that underlie learning as we age, such as myelination and synaptic pruning.*

3. B. False. *Adaptive plasticity occurs in response to brain trauma whereas developmental plasticity occurs in response to experience.*

4. I; III. *Adaptive plasticity involves sprouting, where a neuron grows branches on the axon and dendrite, and rerouting, where a neuron seeks a new connection with another undamaged neuron. Importantly, it can occur as a result of different kinds of experiences, not just brain trauma, and occurs naturally without help from a psychologist.*

5. C. *Colouring your hair is not a researched way to maintain brain functioning. However, mental stimulation, diet, physical activity, and social support are ways that are promoted to maintain brain functioning.*

Assessment skills

Perfect your phrasing

6. B   7. B

Text analysis

8. D   9. D   10. B

Exam-style

Remember and understand

11. A   12. C

13. [During development, the role of myelination is to form a protective coating around axons which helps to protect and insulate developing neurons, allowing them to communicate.[1]] [Myelination also helps to lay the neural foundation for communication across neural networks that is required for different types of learning as we mature and develop.[2]]

   ✓ ✗ I have described a role of myelination in developmental plasticity.[1]

   ✓ ✗ I have described a second role of myelination in developmental plasticity.[2]

Other acceptable answers include:
- You may have identified slightly different roles of myelination, so long as there were two distinct roles of myelination specifically relevant to its role in developmental plasticity.

14. [One factor of adaptive plasticity is sprouting,[1]] [which involves a damaged neuron growing additional branches on its axon and dendrite to enhance its ability to reach other neurons and establish strong neural pathways.[2]] [Another factor of adaptive plasticity is rerouting,[3]] [which involves an undamaged neuron establishing a new connection with another undamaged neuron to ensure the neural pathway is more secure.[4]]

   ✓ ✗ I have identified sprouting as one factor of adaptive plasticity.[1]

   ✓ ✗ I have described this factor of adaptive plasticity.[2]

   ✓ ✗ I have identified rerouting as a factor of adaptive plasticity.[3]

   ✓ ✗ I have described this factor of adaptive plasticity.[4]

Apply and analyse

15. a. [Synaptogenesis is the factor that influences Davey's exponential brain growth in the first years of his lives.[1]] [In the process of synaptogenesis, the axons of neurons grow and form connections to nearby neurons creating synapses.[2]]

   ✓ ✗ I have identified synaptogenesis as the process that is responsible for Davey's exponential brain growth.[1]

   ✓ ✗ I have explained the process of synaptogenesis.[2]

   ✓ ✗ I have referred to the character's names in my response (Davey), and to the scenario.

  b. [A reason why synaptogenesis may occur for Davey is that there is so much new information to learn and incorporate into his brain, so he needs lots of synapses as the foundation for these new memories and skills.[1]]

   ✓ ✗ I have suggested a reason for why the process of synaptogenesis occurs.[1]

   ✓ ✗ I have referred to the character's names in my response (Davey), and to the scenario.

  c. [The process in which neural connections are cut is called synaptic pruning.[1]]

   ✓ ✗ I have identified the process in which neural connections are cut as synaptic pruning.[1]

  d. [Davey's brain may start pruning to eliminate unnecessary neural connections or refine existing ones.[1]]

   ✓ ✗ I have suggested a reason as to why Davey's brain prunes neural connections.[1]

   ✓ ✗ I have referred to the character's names in my response (Davey), and to the scenario.

16. a. [During the early years of life, the brain still has many synapses that were formed in infancy to help to form the basis for new learnings, such as language.[1]][In adolescence, there are fewer synapses, making it more difficult to lay the foundations for new languages.[2]][Because Gerry is still young, he'd have a greater neuronal basis to learn a new language than Jane who is an adolescent.[3]]

✓ ✗ I have explained what developmental plasticity looks like in Gerry's age group (early childhood).[1]

✓ ✗ I have explained what developmental plasticity looks like in Jane's age group (adolescence).[2]

✓ ✗ I have linked this difference to the siblings' different ability to learn German.[3]

✓ ✗ I have referred to the characters' names in my response (Gerry and Jane), and to the scenario.

b. [Synaptic pruning involves eliminating unnecessary connections between neurons in the brain.[1]][Because Jane is 17 and would already have had some synapses that make it easier to learn a new language trimmed away, it would be harder for her to form the necessary connections and networks required for learning German.[2]]

✓ ✗ I have explained what synaptic pruning involves.[1]

✓ ✗ I have explained how this would make German more difficult for Jane to learn.[2]

✓ ✗ I have referred to the character's name in my response (Jane), and to the scenario.

Questions from multiple lessons

17. A

18. [The frontal lobe is responsible for moderating personality and the expression of personality traits.[1]][When the frontal lobe is injured, it can therefore change a person's personality traits and make it more difficult to remain compatible with social connections formed before the injury, therefore impacting social functioning.[2]]

✓ ✗ I have identified the lobe of the cerebral cortex responsible for moderating personality.[1]

✓ ✗ I have explained how it can impact social functioning when injured.[2]

5B Acquired brain injuries

Theory review

1. C. *Given the frontal lobe's role in initiating voluntary movement, the impact of injury to this area of the brain can include difficulty initiating motor movement.*

2. B. False. *There are two types of acquired brain injuries but they are traumatic and non-traumatic brain injuries. Traumatic brain injury refers to damage caused to the brain by an external force whereas non-traumatic brain injury refers to damage caused to the brain by an internal force.*

3. I; IV. *Assault and sporting injuries are classified as traumatic brain injuries as they are caused by an external force. Stroke and alcohol abuse, however, are classified as non-traumatic brain injuries because they are caused by an internal force.*

4. A. True. *The effects of brain injury and the recovery needed afterwards differ between individuals. It can differ in terms of its permanence, intensity of symptoms, and the rate at which it develops. Therefore, it is important to treat each brain injury individually.*

5. A. *The impact of brain injury is usually determined by the brain area that was damaged. For example, if the occipital lobe was damaged, it would be assumed that the individual's vision would be affected.*

Assessment skills
Perfect your phrasing

6. A   **7.** B

Text analysis

8. C   **9.** C   **10.** C   **11.** B

Exam-style
Remember and understand

12. D   **13.** C

14. [Traumatic brain injury refers to damage to the brain caused by an external force,[1]][such as a sporting injury,[2]][whereas, a non-traumatic brain injury refers to damage to the brain caused by internal factors,[3]][such as a stroke.[4]]

✓ ✗ I have explained what a traumatic brain injury is.[1]

✓ ✗ I have given an example of a traumatic brain injury.[2]

✓ ✗ I have explained what a non-traumatic brain injury is.[3]

✓ ✗ I have given an example of a non-traumatic brain injury.[4]

✓ ✗ I have used comparison words, such as 'whereas'.

Apply and analyse

15. [A similarity between Nikitha's and her mother's brain injuries is that they would both impact their functioning.[1]][However, a difference is that Nikitha's brain injury was caused by an external force whilst her mother's brain injury was caused by an internal factor.[2]]

I have described a similarity between Nikitha's and her mother's brain injuries.[1]

I have described a difference between Nikitha's and her mother's brain injuries.[2]

I have referred to the character's name (Nikitha) in my response, and to the scenario.

Evaluate

16. [Doctors would have to consider Minori's and Samari's brain injuries individually as the effects of brain injury and the recovery needed afterwards differs among individuals.[1]] [Firstly, the rate at which symptoms develop is seen to be different – Minori immediately shows symptoms, through her memory loss, whilst Samari shows symptoms over time.[2]] [Secondly, the consequences of their brain injuries are different – Minori's biological functioning is seen to be impacted as she sustained a physical impairment whilst Samari's psychological functioning is seen to be impacted as she became very moody.[3]] [Finally, the impairments that are induced by their brain injuries were also different – Minori's physical impairment is suggested to be permanent whilst Samari's cognitive impairment was temporary.[4]]

I have justified why doctors would need to treat Minori's and Samari's brain injuries individually.[1]

I have explained the differences in the development of Minori's and Samari's symptoms.[2]

I have explained the differences in the consequences that Minori and Samari faced.[3]

I have explained the differences in the nature of the impairments induced by Minori's and Samari's brain injuries.[4]

I have referred to the characters' names (Minori and Samari) in my response, and to the scenario.

Questions from multiple lessons

17. A   **18.** D

19. [Jona may have demonstrated difficulty articulating speech[1]] [and his sentences may have consisted mainly of nouns and verbs, leading the doctor to her conclusion that Jona suffered damage to his Broca's area.[2]]

I have described a symptom that indicates damage to Broca's area.[1]

I have described another symptom that indicates damage to Broca's area.[2]

I have referred to the character's name (Jona) in my response, and to the scenario.

5C Research on neurological disorders

Theory review

1. C. *Neurological disorders are diseases that involve damage to or the malfunctioning of the nervous system.*

2. A. *Parkinson's is a neurological disorder, meaning that it is associated with impaired functioning of the nervous system.*

3. B. False. *Psychology is a dynamic field and contemporary research allows for our knowledge to constantly change and evolve.*

4. B. False. *Machine learning assists in the diagnosis of neurological disorders and can provide insights into demographic information. However, it is not used to directly treat neurological disorders.*

5. C. *Studies show that probiotics may decrease seizure frequency, but not eradicate it completely.*

6. A. **Contemporary** research assists in providing new approaches to and a greater understanding of neurological disorders. *Contemporary research can build upon previous research or can uncover new findings and treatments for neurological disorders.*

7. A. True. *Machine learning allows for neurological disorders to be diagnosed more accurately and on a wider scale.*

Assessment skills

Data analysis

8. D   **9.** B   **10.** A   **11.** B

12. A

Exam-style

Remember and understand

13. D   **14.** D   **15.** A   **16.** B

17. [Machine learning is an element of artificial intelligence that allows software to become more accurate at predicting outcomes by mimicking the way that humans learn.[1]] [Supervised machine learning and unsupervised machine learning both use algorithms to analyse data.[2]] [However, supervised machine learning involves the use of labelled data, whereas unsupervised machine learning involves the use of unlabelled data.[3]]

I have outlined the term 'machine learning'.[1]

I have identified a similarity between supervised and unsupervised learning.[2]

I have identified a difference between supervised and unsupervised learning.[3]

I have used comparison words in my answer, such as 'whereas'.

Apply and analyse

18. A   **19.** D

20. [Contemporary research suggests that Eric's Parkinson's could be treated through a faecal microbiota transplantation.[1]][This would involve Eric receiving a faecal matter transplant into his intestinal tract from a healthy donor in order to alter his gut microbiota.[2]]

✓ ✗ I have identified an applicable treatment in terms of contemporary research.[1]

✓ ✗ I have explained the treatment identified.[2]

✓ ✗ I have referred to the character's name (Eric) in my response, and to the scenario.

Evaluate

21. [Contemporary research is useful in contributing to the understanding of neurological disorders as it allows for the discovery of new, and perhaps more effective, treatments and diagnosis methods for these conditions.[1]][However, contemporary research may lack peer-reviewing or may not have been replicated, which can limit its accuracy.[2]][Overall, contemporary research is useful in contributing to the understanding of neurological disorders as even if the research is not adequate enough to draw a definitive conclusion, such studies can help to guide future research.[3]]

✓ ✗ I have evaluated the usefulness of contemporary research in regard to neurological disorders by considering its strengths.[1]

✓ ✗ I have evaluated the usefulness of contemporary research in regard to neurological disorders by considering its limitations.[2]

✓ ✗ I have concluded that contemporary research is useful for understanding neurological disorders.[3]

Questions from multiple lessons

22. A

5D Chronic traumatic encephalopathy

Theory review

1. B. False. *CTE is a progressive brain disease associated with repeated episodes of concussions, meaning that the loss of neurons and associated cognitive effects occur gradually and over time.*

2. B. CTE is typically associated with **contact sports**. *CTE is associated with contact sports in which there is an increased risk of repeated head injuries and concussions.*

3. I; II. *Impaired cognitive functioning and depressions are both symptoms of CTE while muscle sprains are not directly associated with CTE.*

4. A. *CTE is an emerging area of research, meaning that research is continuous and ongoing.*

Perfect your phrasing

5. B

Text analysis

6. A   **7.** I; III; V   **8.** B   **9.** C

Exam-style

Remember and understand

10. C   **11.** B

12. [Chronic traumatic encephalopathy (CTE) is a progressive and fatal brain disease associated with repeated blows to the head and concussions.[1]][Symptoms of CTE include memory loss[2]][and concentration difficulties.[3]]

✓ ✗ I have outlined what is meant by chronic traumatic encephalopathy (CTE).[1]

✓ ✗ I have identified one symptom of CTE.[2]

✓ ✗ I have identified another symptom of CTE.[3]

Other acceptable answers include:

- other symptoms of CTE, such as depression, anxiety, impaired executive functioning, impaired mood, and disturbances in behaviour.

Apply and analyse

13. C   **14.** C

15. a. [Marli may believe that Desmond is suffering from CTE as he is showing some of the symptoms, including erratic decision-making, impulsivity, and changes in mood.[1]][Marli might associate these symptoms with CTE as Desmond is a war veteran who may have been exposed to repeated head injuries and concussions as a result of battles or combat.[2]]

✓ ✗ I have explained that Marli may believe that Desmond is suffering from CTE due to his presentation of symptoms.[1]

✓ ✗ I have explained that Marli may believe that Desmond is suffering from CTE due to his experience as a soldier.[2]

✓ ✗ I have referred to the characters' names (Desmond and Marli) in my response, and to the scenario.

b. [Desmond cannot be diagnosed with CTE.[1]][This is because Desmond is still alive and CTE can only be diagnosed through a post-mortem examination in which abnormal brain pathology and tau can be detected.[2]]

√ ✗ I have stated that Desmond cannot be diagnosed with CTE.[1]

√ ✗ I have justified my answer by outlining how CTE can only be diagnosed through a post-mortem examination.[2]

√ ✗ I have referred to the character's name (Desmond) in my response, and to the scenario.

Evaluate

16. **a.** [The sample of American football players is appropriate for investigating concussion impacts.[1]][This is because American football players participate in a contact sport in which they may have an increased risk of experiencing repeated concussions and head injuries.[2]]

√ ✗ I have stated whether the sample is appropriate.[1]

√ ✗ I have justified whether the sample is appropriate.[2]

b. [A longitudinal study is a type of investigation in which data is collected from participants at different time intervals, over an extended period of time.[1]][A strength of using a longitudinal study for this study is that data about depressive symptoms and changes in physical functions can be collected across different points in time, allowing researchers to analyse long-term impacts of concussions.[2]][However, a limitation of this type of investigation for this study is that extraneous variables are difficult to control and can impact the results of the study.[3]][Therefore, while the use of a longitudinal study is appropriate in measuring the change in symptoms over time, the effect of extraneous variables may impact results.[4]]

√ ✗ I have outlined what is meant by a longitudinal study.[1]

√ ✗ I have evaluated the appropriateness of the use of a longitudinal study, with reference to a strength.[2]

√ ✗ I have evaluated the appropriateness of the use of a longitudinal study, with reference to a limitation.[3]

√ ✗ I have made a concluding evaluation of the appropriateness of using a longitudinal study.[4]

c. [It is not possible to make a conclusion about CTE from the results of this study.[1]][This is because this study is not specifically investigating CTE, but is rather investigating the impact of concussion history on depressive symptoms and physical functioning.[2]]

√ ✗ I have stated that it is not possible to make a conclusion about CTE from this study.[1]

√ ✗ I have justified why it is not possible to make a conclusion about CTE from this study, with reference to the variables being investigated.[2]

Other acceptable answers include:

- other justifications as to why it is not possible to make a conclusion about CTE from this study, such as the impact of life circumstances and other extraneous variables, on depressive symptoms over time.

d. [The results of this study suggest that those with greater concussion history had greater overall depressive symptom severity.[1]][Therefore, this contributes to our understanding of CTE by highlighting the link between concussion history and depression, which is a symptom of CTE.[2]]

√ ✗ I have stated the results of the study.[1]

√ ✗ I suggested how the results may contribute to our understanding of CTE.[2]

Other acceptable answers include:

- other suggestions as to how the results may contribute to our understanding of CTE, for example by highlighting the link between football players and susceptibility to concussion and depressive symptoms.

Questions from multiple lessons

17. **a.** [The four lobes of the cerebral cortex include the frontal lobe, parietal lobe, occipital lobe, and temporal lobe.[1]]

√ ✗ I have identified the four lobes of the cerebral cortex.[1]

b. [The prefrontal cortex is located in the frontal lobe and has an important role in coordinating complex mental processes, including decision-making, planning, and expression and regulation of emotions.[1]][The presence of p-tau in the prefrontal cortex may contribute to the degeneration and loss of neurons in this area, impairing the ability to complete these complex mental processes.[2]]

√ ✗ I have outlined the role of the prefrontal cortex.[1]

√ ✗ I have outlined how the presence of p-tau may affect the functioning of the prefrontal cortex.[2]

Chapter 5 review

Multiple choice

1. A   2. D   3. B   4. B

5. C

Short answer

6. [Developmental plasticity refers to the brain's ability to change in response to ageing and maturation[1]][while adaptive plasticity is the brain's ability to restore and enhance neural functioning over time due to experience.[2]]

√ ✗ I have explained what developmental plasticity is.[1]

√ ✗ I have explained what adaptive plasticity is.[2]

√ ✗ I have used comparison words in my answer, such as 'whereas'.

7. [Chronic traumatic encephalopathy (CTE) is a progressive and fatal brain disease associated with repeated head injuries and concussions.[1]] [Concussions are mild traumatic brain injuries as they result in damage to the brain caused by an external force.[2]] [Therefore, as traumatic brain injuries are a type of acquired brain injury, CTE can occur from an acquired brain injury.[3]]

✓ ✕   I have explained that CTE involves repeated concussions.[1]

✓ ✕   I have identified that concussions are a type of traumatic brain injury.[2]

✓ ✕   I have concluded that CTE can occur from an acquired brain injury.[3]

8. a. [Austin is worried that his father may have Parkinson's disease because Allen had become really shaky and struggled with his balance, which are motor symptoms of the disease.[1]]

✓ ✕   I have suggested why Austin is worried that his father may have Parkinson's disease.[1]

✓ ✕   I have referred to the characters' names in my response (Austin and Allen), and to the scenario.

b. [Following an acquired brain injury, neurons may reroute and form a new connection with another undamaged neuron in order to form a new neuronal connection and overcome a change in the brain that may have occurred.[1]] [However, this may not occur in Allen's brain as Parkinson's is a neurodegenerative disease meaning that neurons die and may not reroute.[2]]

✓ ✕   I have identified that neurons may reroute to overcome a change in the brain as a result of an acquired brain injury.[1]

✓ ✕   I have suggested that neurons in Allen's brain may not reroute as Parkinson's disease is a neurodegenerative condition.[2]

✓ ✕   I have referred to the character's name in my response (Allen), and to the scenario.

c. [Supervised machine learning may be used to track Allen's Parkinson's disease progression[1]] [as research suggests that machine learning can be effective in detecting which stage Allen may be in.[2]]

✓ ✕   I have identified that supervised machine learning can be used to track Allen's Parkinson's disease progression.[1]

✓ ✕   I have explained why supervised machine learning can be used to track Allen's Parkinson's disease progression.[2]

✓ ✕   I have referred to the character's name in my response (Allen), and to the scenario.

Other acceptable answers include:

- You could have also discussed the gut-brain axis in relation to contemporary research.

9. a. [Jackson may be suspected of having CTE as he is experiencing symptoms of the disease, such as memory loss.[1]]

✓ ✕   I have suggested why Jackson may be suspected of having CTE.[1]

✓ ✕   I have referred to the character's name in my response (Jackson), and to the scenario.

b. [The suspicion of Jackson having CTE can only be confirmed through a post-mortem examination, as brain scans do not have the capacity to detect the brain changes that characterise this disease.[1]]

✓ ✕   I have explained that the suspicion of Jackson having CTE can only be confirmed through a post-mortem examination.[1]

✓ ✕   I have referred to the character's name in my response (Jackson), and to the scenario.

c. [An impact on Jackson's biological functioning may be his disturbances in behaviour,[1]] [an impact on psychological functioning may be his memory loss,[2]] [and an impact on social functioning may be his difficulty with job productivity.[3]]

✓ ✕   I have identified an impact on Jackson's biological functioning.[1]

✓ ✕   I have identified an impact on Jackson's psychological functioning.[2]

✓ ✕   I have identified an impact on Jackson's social functioning.[3]

✓ ✕   I have referred to the character's name in my response (Jackson), and to the scenario.

d. [Jackson may maintain and/or maximise his brain functioning through mental stimulation,[1]] [as it promotes new neural connections and builds up a resistance to future cell loss.[2]]

✓ ✕   I have suggested a way in which Jackson may maintain and/or maximise his brain functioning.[1]

✓ ✕   I have explained how this method would maintain and/or maximise Jackson's brain functioning.[2]

✓ ✕   I have referred to the character's name in my response (Jackson), and to the scenario.

Other acceptable answers include:

- diet
- physical activity
- social support.

10. Students needed to display that they had a thorough understanding of the question by demonstrating:

- an effectively structured response
- that all parts of the question had been addressed
- that psychological terminology had been used in their answer.

Students will need to discuss the brain injury that Elizabeth sustained. Students will need to demonstrate an understanding of the type of brain injury that occurred. Discussion of the following would be awarded:

- Elizabeth sustained an acquired brain injury, but specifically a traumatic brain injury as it was damage to the brain caused by an external force.
- Possible impacts of Elizabeth's brain injury on her biological functioning, such as the seizures she experienced for months after.
- Possible impacts of Elizabeth's brain injury on her psychological functioning, such as memory loss or personality changes.
- Possible impacts of Elizabeth's brain injury on her social functioning, such as anti-social behaviour or changes in social support.

Students will need to discuss the neurological disorder of epilepsy. Students will need to demonstrate an understanding that Elizabeth may have developed epilepsy after sustaining her brain injury. Discussion of the following would be awarded:

- The causes of epilepsy, such as uncontrolled and unrestricted electrical discharging of neurons in Elizabeth's brain due to her brain injury.
- Symptoms of epilepsy that Elizabeth may have displayed, such as involuntary shaking, loss of consciousness, loss of awareness etc.
- Elizabeth's seizures may be recurrent due to epileptogenesis with a discussion of this process, such as structural and functional changes that occur in the brain.

Students will need to discuss actions that Elizabeth's doctors may take. Students will need to demonstrate an understanding of contemporary research on neurological disorders. Discussion of the following would be awarded:

- How machine learning could be used to screen for and identify which stage of epilepsy Elizabeth is in.
- How the gut-brain axis could be used to treat Elizabeth, such as using probiotics or recommending a ketogenic diet.

Students will need to discuss the risk of developing CTE that Elizabeth is in. Students will need to relate the possibility of developing CTE due to Elizabeth's sporting history and susceptibility to sporting injuries. Discussion of the following would be awarded:

- What CTE is and how it is diagnosed.
- Why CTE may be relevant to Elizabeth.

Students will need to discuss how neuroplasticity may be occurring in Elizabeth's brain. Discussion of the following would be awarded:

- How adaptive plasticity would take place in response to brain trauma.
- The factors that affect adaptive plasticity, such as sprouting and rerouting.
- Why adaptive plasticity may occur, such as to restore damaged neural functioning.

Unit 1 AOS 2 review

SAC assessment 1

1. Students will be awarded the full 9 marks for correctly answering all sections as indicated by the allocated spaces on the flowchart.

2

The mind-body problem is **the complex philosophical question as to whether our mind is separate and distinguishable from our body or whether they are one integrated entity**.

1

The brain versus heart debate is **a historical debate as to whether the heart or the brain is responsible for mental processes, such as thought, emotion, and behaviour**.

This idea can be split into the two views of:

Dualism   Monism

If an individual believes that their heart rate can be a direct product of their thoughts, they are likely to believe in **monism**, which holds the view that **the human mind and body are together a singular, complete entity**.

4

Neuroimaging techniques

An example of a structural neuroimaging technique is **(one of) MRI or CT**.

An example of a functional neuroimaging technique is **(one of) PET or fMRI**.

3

Phrenology is **the study of the shape and size of the human skull to determine personality and mental functioning**.

Phrenology has contributed to our modern understanding of the brain through the belief that **different areas of the brain are responsible for different functions**.

2. **a.** Students will be awarded half a mark for each lobe or region correctly labelled. If all lobes and regions are correctly labelled, students will be awarded the full 5 marks.

Primary motor cortex
Primary somatosensory cortex
Frontal lobe
Parietal lobe
Broca's area
Occipital lobe
Temporal lobe
Primary visual cortex
Primary auditory cortex
Wernicke's area
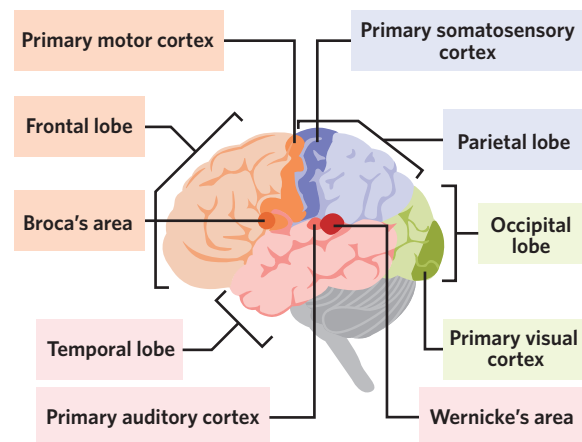
b. [The premotor cortex.[1]]

✓ ✗ I have identified a region of the frontal lobe that is not labelled in the completed diagram.[1]

Other acceptable answers include:

- the prefrontal cortex.

c. [The premotor cortex is a motor area.[1]][Its role in behaviour and mental processes is to receive planned motor movements from the prefrontal cortex and process this into an organised sequence of motions.[2]]

✓ ✗ I have outlined the type of functional area that the region identified in **part b** is.[1]

✓ ✗ I have outlined the role of the region identified in **part b** in behaviour and mental processes.[2]

Other acceptable answers include:

- if the prefrontal cortex was selected for **part b**, the answer for **part c** would include that it is an association area and that its role in behaviour and mental processes is to coordinate complex mental processes and voluntary motor movement.

3. a. Students will be awarded the full 10 marks for correctly answering all sections as indicated by their allocated locations on the flowchart.

Lukas' stroke caused a **non-traumatic** type of acquired brain injury.

→ As a result, he developed epilepsy, which is a type of neurological disorder. These disorders can be defined as **a disease characterised by any damage to or malfunctioning of the nervous system**.

↓

Using neuroimaging techniques, a doctor found that the damage was located in Lukas' frontal lobe. The doctor decided this part of the brain needed to be removed.

← To remove the damaged region of Lukas' frontal lobe, the surgeon would have used a method also known as the experimental technique of **ablation**.

↓

After this region of Lukas' brain was removed, he found that he had difficulty speaking. He was able to understand and interpret speech, but struggled to produce sentences.

→ As a result, we can predict that the likely region of Lukas' brain that was removed is **Broca's area**.

↓

Specifically, the type of neuroplasticity Lukas experienced was **adaptive plasticity**, which allowed his brain to **restore neural functioning over time following his injury**.

← After some time, Lukas began to recover his ability to speak. This was due to **neuroplasticity**, which is **the ability of the brain to change in response to experience or environmental stimulation**.

↓

Two processes influenced Lukas' plasticity, these were sprouting, which refers to **a neuron's ability to develop new branches on the dendrites or axons**, and rerouting, which refers to **a neuron's ability to form a new connection with another undamaged neuron**.

b. [The doctor could have used the neuroimaging technique of functional magnetic resonance imaging,[1]][to take two-dimensional and three-dimensional images of Lukas' brain and record areas with abnormal activity levels that may represent damage.[2]]

✓ ✗ I have identified a neuroimaging technique.[1]

✓ ✗ I have explained how it could have allowed the doctor to locate the damaged part of Lukas' brain.[2]

✓ ✗ I have referred to the character's name (Lukas) in my response, and to the scenario.

Other acceptable answers include:

- MRI, CT, or PET as neuroimaging techniques the doctor could have used, with an appropriate explanation of how they could allow the doctor to locate the damaged part of Lukas' brain.

c. [An impact of Lukas' acquired brain injury on his biological functioning is his experience of seizures.[1]][An impact on his psychological functioning could be personality changes.[2]] [An impact on Lukas' social functioning could be anti-social behaviour, such as avoiding other people, due to his difficulty speaking.[3]]

✓ ✗ I have suggested an impact on Lukas' biological functioning.[1]

✓ ✗ I have suggested an impact on Lukas' psychological functioning.[2]

✓ ✗ I have suggested an impact on Lukas' social functioning.[3]

✓ ✗ I have referred to the character's name (Lukas) in my response, and to the scenario.

4. a.

Forebrain
Midbrain
Hindbrain
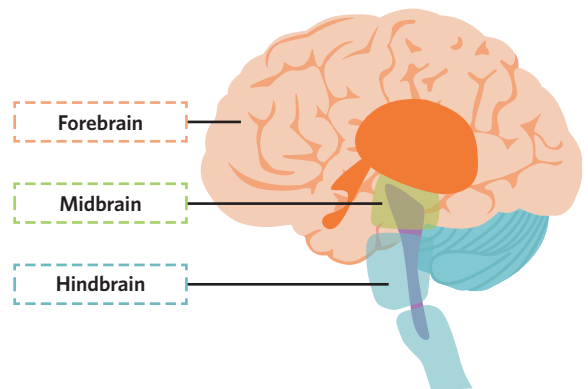
✓ ✗ I have labelled the forebrain.

✓ ✗ I have labelled the midbrain.

✓ ✗ I have labelled the hindbrain.

b.
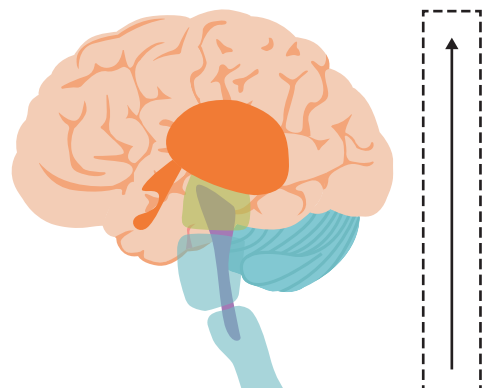
✓ ✗ I have identified the direction of the brain regions' increasing complexity as being from the hindbrain up to the forebrain.

c.

Cerebrum
Thalamus
Hypothalmus
Reticular formation
Pons
Medulla
Cerebellum
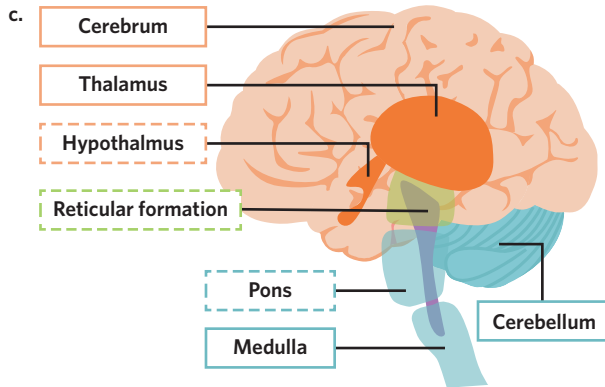
✓ ✗ I have labelled the forebrain's structures.

✓ ✗ I have labelled the midbrain's structure.

✓ ✗ I have labelled the hindbrain's structures.

d. [The pons relays information between the brain regions like a bridge.[1]]

✓ ✗ I have explained the role of a structure of the hindbrain.[1]

Other acceptable answers include:

- the medulla regulates autonomic processes, such as respiration, heart rate, blood pressure, and digestion
- the cerebellum monitors and coordinates skeletal muscle movement.

Unit 1 AOS 2 review

SAC assessment 2

1. a. [Neurodegenerative diseases refer to diseases characterised by the progressive loss of neurons in the brain over time,[1]] [whereas neurological disorders are characterised by any damage to or malfunctioning of the nervous system.[2]]

✓ ✗ I have briefly outlined neurodegenerative diseases.[1]

✓ ✗ I have briefly outlined neurological disorders.[2]

✓ ✗ I have used comparison words, such as 'whereas'.

b. [One neurodegenerative disease present in the sources is chronic traumatic encephalopathy (CTE).[1]] [CTE is a neurodegenerative disease as it involves damage to neurons occurring over time and the progressive worsening of brain functioning.[2]] [A second neurodegenerative disease present in the sources is Parkinson's disease.[3]] [This is a neurodegenerative disease as it involves neurodegeneration in the part of the brain that produces dopamine.[4]]

✓ ✗ I have outlined CTE as a neurodegenerative disease present in the sources.[1]

✓ ✗ I have explained why CTE is classified as a neurodegenerative disease.[2]

✓ ✗ I have outlined Parkinson's disease as a second neurodegenerative disease present in the sources.[3]

✓ ✗ I have explained why Parkinson's disease is classified as a neurodegenerative disease.[4]

2. [It was hypothesised that the more severe a person's acquired brain injury,[1]] [the more likely they are to[2]] [develop a neurodegenerative disease than a person with a less severe acquired brain injury.[3]]

✓ ✗ I have stated an independent variable.[1]

✓ ✗ I have stated a direction for my hypothesis.[2]

✓ ✗ I have stated a dependent variable.[3]

Other acceptable answers include:

- the frequency or number of acquired brain injuries a person sustains, as the independent variable.

Note: Any hypothesis that does not discuss the frequency or severity of acquired brain injury as the independent variable, or the risk or likelihood of discussing a neurodegenerative disease as the dependent variable, will not be awarded full marks. These were the only variables that could be discussed based on the findings presented in the sources regarding neurodegenerative diseases.

3. [Primary data refers to data collected first-hand by a researcher,[1]] [whereas secondary data refers to data sourced from others' prior research.[2]] [Of the three sources, source 1 predominantly consists of secondary data.[3]]

✓ ✗ I have briefly outlined primary data.[1]

✓ ✗ I have briefly outlined secondary data.[2]

✓ ✗ I have identified source 1 as predominantly consisting of secondary data.[3]

✓ ✗ I have used comparison words, such as 'whereas'.

4. a. [A post-mortem examination is an assessment of a dead body that occurs to determine the cause of death.[1]]

✓ ✗ I have outlined post-mortem examinations.[1]

b. [A post-mortem examination on somebody with CTE would expect to find the widespread build-up of p-tau,[1]] [and the resultant accumulation of this protein would result in neurofibrillary tangles.[2]] [This might occur in the cerebral cortex.[3]]

✓ ✗ I have explained that a post-mortem examination would find a p-tau build-up.[1]

✓ ✗ I have explained that a post-mortem examination would find neurofibrillary tangles.[2]

✓ ✗ I have explained a region of the brain where this abnormality might occur.[3]

Other acceptable answers include:

- the hippocampus, brainstem, or more specifically the frontal lobe or temporal lobe, as an area of the brain where the abnormality might occur.

c. [Brain scans do not have the capacity to detect CTE's characteristic brain changes.[1]] [These changes can only be detected by opening up and directly examining the brain, which cannot be done when the patient is alive.[2]]

✓ ✗ I have explained that brain scans do not have the capacity to detect CTE's characteristic brain changes.[1]

✓ ✗ I have explained that these changes can only be detected by opening up the brain, which is not done when the patient is alive.[2]

d. [The ethical consideration of non-maleficence is upheld by only inspecting the brains of potential CTE patients post-mortem,[1]] [as there would be risks to the patient's welfare that are disproportionate to the benefits of the inspection if it was done while they were still alive.[2]]

✓ ✗ I have suggested an ethical consideration that is upheld.[1]

✓ ✗ I have explained how this ethical consideration is relevant.[2]

5. a. [Source 2 outlines that 4% of their patients with mild CTE also had mild Parkinson's disease.[1]] [Therefore, an individual may have a higher risk of developing Parkinson's disease if they also have CTE.[2]]

✓ ✗ I have used information provided in one of the sources.[1]

✓ ✗ I have proposed a factor that could increase the risk of developing Parkinson's disease.[2]

b. [The prefrontal cortex.[1]]

✓ ✗ I have suggested a brain structure that plays a role in voluntary motor movement.[1]

Other acceptable answers include:

- premotor cortex
- primary motor cortex
- cerebellum.

c. [One way a person with Parkinson's disease might try to maintain or maximise their remaining brain functioning is through mental stimulation, such as doing a puzzle,[1]] [as this strengthens and slows down synaptic pruning of needed neuronal connections.[2]] [Another way is by eating a healthy and balanced diet,[3]] [such as eating leafy greens that are rich in 'brain-healthy' nutrients can help to slow the normal cognitive decline.[4]]

✓ ✗ I have identified a way of maintaining or maximising brain functioning.[1]

✓ ✗ I have described how this can help to maintain or maximise brain functioning.[2]

✓ ✗ I have identified another way of maintaining or maximising brain functioning.[3]

✓ ✗ I have described how this can help to maintain or maximise brain functioning.[4]

Other acceptable answers include:

- the identification and description of physical activity or social support as ways of maintaining or maximising brain function.

6. [The brain uses neuronal connections to receive, transmit, and process information communicated between its regions.[1]] [Brain trauma can lead to the death of neurons and the destruction of neuronal connections, which can prevent brain regions from communicating as they normally would.[2]]

✓ ✗ I have briefly described the way the brain communicates between its different regions.[1]

✓ ✗ I have explained that the effect of brain trauma on neuronal connections would prevent normal neuronal communication.[2]

7. a. [The frontal lobe's prefrontal cortex plays a role in complex mental processes, such as attention.[1]] [Source 2 found that cognitive symptoms, such as issues with attention, were found in 85% of the players with CTE they examined.[2]] [Therefore, future research may wish to investigate further the potential relationship between damage to areas of the frontal lobe and increased CTE risk or symptoms.[3]]

✓ ✗ I have described the role of the prefrontal cortex in behaviour and decision-making.[1]

✓ ✗ I have referred to the data in source 2.[2]

✓ ✗ I have suggested a potential relationship between the prefrontal cortex and CTE evident in the data that future research may wish to investigate.[3]

b. [Mez and colleagues' (2017) use of a convenience sample presents a potential limitation as convenience samples can produce an unrepresentative sample that makes it hard for researchers to generalise to the wider population.[1]]

✓ ✗ I have explained the use of a convenience sample as a potential limitation.[1]

8. [An extraneous variable is the greater variation in environmental factors between non-identical twins.[1]][This type of extraneous variable is situational.[2]]

✓ ✗   I have suggested a potential extraneous variable evident in source 3.[1]

✓ ✗   I have identified that it is a situational variable.[2]

9. [Psychological functioning involves changes in cognition, behaviour, and emotion.[1]][Biological functioning involves changes in physical behaviour, organ function, and cellular and neuronal function.[2]] [Source 2 states that 96% of the football players involved in the study displayed behavioural or mood symptoms and 85% of players with mild CTE displayed cognitive symptoms.[3]][Furthermore, many of the CTE symptoms involve cognitive or mood impairments.[4]][Therefore, while there is evidence for behavioural functioning impairments, more CTE symptoms seem to reflect psychological impairments, which can reflect a greater impact on psychological functioning.[5]]

✓ ✗   I have described psychological functioning.[1]

✓ ✗   I have described biological functioning.[2]

✓ ✗   I have accurately referred to information from one of the sources.[3]

✓ ✗   I have referred to the symptoms of CTE.[4]

✓ ✗   I have made an evaluative statement on which type of functioning is more impacted by CTE.[5]

Note: As it is not explicitly stated whether biological or psychological functioning is more impacted by CTE, either can be argued as having a greater impact. Students may also present a balanced argument acknowledging that CTE impacts both biological and psychological functioning, and one is not more impacted than the other. Students will achieve full marks as long as their evaluative statement makes logical sense based on the earlier information they have discussed in this answer.

6A Judging and perceiving others

1. C. *Person perception is a very broad term referring to any process, direct or indirect, that we use to make impressions of people.*

2. C. *Attribution refers to both the judgement and the process of making a judgement about the causes of behaviour.*

3. A. *Internal attributions are also known as personal attributions. This means that the cause of a behaviour is attributed to something occurring within the individual.*

4. A. *If you can notice a repeated pattern in the types of attribution someone tends to make, they may have an attributional style. The fundamental attribution error is when someone attributes another person's behaviour to internal causes, when instead their behaviour is caused by external factors.*

5. I; III. *Attitudes must be learnt and fairly stable. They involve assessments of anything ranging from positive to negative.*

6. II; III. *Affect means emotion, so statements only relating to feelings are correct.*

7. B. False. *The tri-component model suggests that all three components of our attitude must be present in order to hold an attitude. Our behaviour (not drinking lemonade) should match our feelings (feeling sick) and thoughts (believing it tastes bad). However, in reality many argue attitudes can exist with just two components.*

8. II; III; V. *Options I and IV do not refer to all members of a group, but instead generalise to a portion of the group. Whilst we can have an attitude towards them, we remember that stereotypes are oversimplified beliefs about an entire group.*

Assessment skills

Perfect your phrasing

9. A 10. A

Text analysis

11. B 12. C

Exam-style

Remember and understand

13. B 14. D 15. C

16. [A limitation of the tri-component model of attitudes is that not all three components have to be present for an attitude to exist.[1]] [For example, someone might not act on their negative attitude towards drinking if they are trying to impress their friends.[2]]

   ✓ ✗ I have outlined a limitation of the tri-component model of attitudes.[1]

   ✓ ✗ I have provided an example to illustrate the limitation.[2]

17. [If we use indirect information when deciding whether we like somebody or not, e.g. hearing someone else's opinion of them, we may be influenced by their opinion to feel similarly.[1]] [This can influence our interpersonal interactions as well, as if we meet the person we may react differently, depending on the indirect information we heard.[2]]

   ✓ ✗ I have provided an example of person perception in the context of decision-making.[1]

   ✓ ✗ I have provided an example of person perception in the context of interpersonal interactions.[2]

   ✓ ✗ I have referred to the appropriate terminology, including indirect or direct information, mental processes, or impressions of others.

18. a. [William's behaviour is not paying attention in English class,[1]] [which he attributes to an internal cause of his inability due to having a more mathematical thinking style meaning there is no point trying.[2]]

   ✓ ✗ I have correctly identified William's behaviour (as not paying attention in English class or not trying on his tests).[1]

   ✓ ✗ I have correctly identified William's attribution, referring to 'internal'.[2]

   ✓ ✗ I have referred to the character's name (William) in my response, and to the scenario.

   b. [William could attribute the cause of his behaviour to another internal factor which he could change, such as his effort in English class.[1]] [By attributing his lack of success to something that can be manipulated, he might change his attitude by thinking his English skills are able to be changed[2]] [and as a result of this attitude, his behaviour might change to putting in more effort.[3]]

   ✓ ✗ I have provided an alternative attribution William could make (internal or external).[1]

   ✓ ✗ I have explained how this new attribution could change William's attitude.[2]

   ✓ ✗ I have explained how this new attribution could alter William's future behaviour.[3]

   ✓ ✗ I have referred to the character's name (William) in my response, and to the scenario.

Apply and analyse

19. C

20. [Jess would have evaluated the situation as negative due to the frustration she experienced, which is a component of attitude formation.[1]] [Another component of attitude formation is her learnt evaluation through her direct negative experience with the removalists.[2]] [A reason Jess' evaluation may not be classified as an attitude is that it does not meet the criteria for being settled and stable, due to it quickly changing when the removalist called and apologised with a justifiable reason.[3]]

✓ ✗   I have provided a reason why it would be classified as an attitude, with reference to how Jess has evaluated her exchange with the removalist as negative.[1]

✓ ✗   I have provided another reason why it would be classified as an attitude, with reference to how Jess' evaluation is learnt.[2]

✓ ✗   I have provided a reason why it would not be classified as an attitude, with reference to how Jess' evaluation is not settled and stable.[3]

✓ ✗   I have referred to the character's name (Jess) in my response, and to the scenario.

Questions from multiple lessons

21. a. [Achmad may have inherited a genetic predisposition to be highly sensitive to sour or bitter foods.[1]] [This would mean he biologically cannot stand these foods.[2]] [As a result, Achmad could have negative cognitive thoughts about the bad taste of these, influencing his negative attitude.[3]]

✓ ✗   I have explained one biological factor that may have influenced Achmad's attitude.[1]

✓ ✗   I have explained how this biologically influenced Achmad to develop a negative attitude.[2]

✓ ✗   I have referenced the tri-component model of attitudes, making a link to either affective, behavioural, or cognitive components.[3]

✓ ✗   I have referred to the character's name (Achmad) in my response, and to the scenario.

Other acceptable answers include:

- how age may have biologically influenced Achmad's attitude.

b. [If Achmad ate the lollies despite not liking them, the behavioural component would not be consistent with Achmad's cognitive component, through the tri-component model of attitudes.[1]] [This demonstrates the tri-component model's limitation that our behaviour does not always reflect our attitudes.[2]]

✓ ✗   I have explained that Achmad's behaviour is inconsistent with the cognition for his attitude.[1]

✓ ✗   I have justified how this demonstrates the limitation of the tri-component model of attitudes, where behaviour does not always reflect cognition.[2]

✓ ✗   I have referred to the character's name (Achmad) in my response, and to the scenario.

6B Cognitive dissonance and cognitive biases

Theory review

1.   B. False. *Cognitive dissonance occurs when there is an inconsistency or misalignment between an individual's thoughts, feelings, and/ or behaviours.*

2.   A. Cognitive dissonance involves psychological **tension**. *An individual may feel uncomfortable when there is inconsistency in an individual's thoughts, feelings, and/or behaviours. This feeling relates to psychological tension and stress.*

3.   B. False. *Individuals may not experience cognitive dissonance if they are able to adequately justify their inconsistencies between their thoughts and behaviours.*

4.   B. False. *Individuals can alleviate cognitive dissonance by changing their behaviours, thoughts, or through the use of cognitive biases.*

5.   I; III; IV. *The confirmation, self-serving, and false-consensus bias are examples of cognitive biases. Although options II and V may seem like they are cognitive biases, the correct terms are the actor-observer bias and halo effect.*

Assessment skills

Perfect your phrasing

6.   A

Text analysis

7.   A   **8.**   C   **9.**   B

Exam-style

Remember and understand

10. [Cognitive dissonance is the psychological tension that occurs when either our thoughts, feelings, and/or behaviours do not align with one another.[1]]

✓ ✗   I have outlined what is meant by cognitive dissonance.[1]

11. C   **12.** B   **13.** B

14. [The confirmation bias may reduce cognitive dissonance as an individual might seek out information that justifies their inconsistent thoughts, feelings, or behaviours and ignore conflicting information.[1]] [For example, someone may believe it is wrong to harm animals, but continue to eat meat. As a result, they may pay attention to the health benefits of eating meat (such as increased iron and protein consumption) and ignore articles that explain the harmful nature of factory farming, thereby reducing cognitive dissonance in regards to their diet.[2]]

✓ ✗   I have explained how the confirmation bias can reduce cognitive dissonance.[1]

✓ ✗   I have provided an example of how the confirmation bias can reduce cognitive dissonance.[2]

Other acceptable answers include:

- other examples of confirmation bias, so long as you explained how it could be used to reduce cognitive dissonance.

Apply and analyse

15. C **16.** A **17.** B **18.** D

19. a. [Niamh has used the halo effect.[1]][This is because she has used the first impression of Ruth she formed about one quality (that she was loud and outspoken) to influence her beliefs about Ruth in other qualities, such as that she is also rude, annoying, and very dramatic.[2]]

✓ ✗	I have identified the halo effect as a cognitive bias used by Niamh.[1]	
✓ ✗	I have described how Niamh uses the halo effect.[2]	
✓ ✗	I have referred to the characters' names (Niamh and Ruth) in my response, and to the scenario.	

Other acceptable answers include:

- the confirmation bias, as Niamh seeks out information that confirms her initial beliefs about Ruth.

b. [Sadie is experiencing cognitive dissonance as she feels psychological tension about her behaviour to exclude Ruth as it does not align with her belief that it is bad to exclude others.[1]][In order to reduce this, Sadie may attribute her inconsistent behaviour to external factors, such as that they found a nicer place to sit.[2]][She may also further try to justify her behaviour and make herself feel better by attributing Niamh's behaviour to her internal character, such as she can sometimes be unkind, and that there is nothing Sadie can do to change her decision to exclude Ruth.[3]]

✓ ✗	I have described Sadie's experience of cognitive dissonance.[1]	
✓ ✗	I have suggested how Sadie might use the actor-observer bias to reduce her cognitive dissonance.[2]	
✓ ✗	I have further suggested how Sadie might use the actor-observer bias to reduce her cognitive dissonance.[3]	
✓ ✗	I have referred to the characters' names (Sadie, Niamh, and Ruth) in my response, and to the scenario.	

Questions from multiple lessons

20. a. [Attribution is an evaluation made about the causes of behaviour and the process of making this evaluation.[1]]

✓ ✗	I have outlined what is meant by attribution.[1]	

b. [Internal attribution occurs when we judge behaviour as being caused by something personal within an individual, such as thinking that Mr Jenshel is disorganised[1]][whereas external attribution occurs when we determine the cause of a behaviour as resulting from situational factors occurring outside the individual, such as thinking that Mr Jenshel's lateness is because there is not enough time to get from one class to another.[2]]

✓ ✗	I have outlined what is meant by internal attribution.[1]	
✓ ✗	I have outlined what is meant by external attribution.[2]	
✓ ✗	I have used comparison words, such as 'whereas'.	
✓ ✗	I have referred to the character's name (Mr Jenshel) in my response, and to the scenario.	

c. [The fundamental attribution error refers to our tendency to explain other people's behaviour in terms of internal factors, while ignoring possible external factors.[1]][Similarly, with the actor-observer bias, we tend to attribute other people's behaviour to internal factors and attribute our own behaviour to external factors.[2]]

✓ ✗	I have discussed the fundamental attribution error.[1]	
✓ ✗	I have discussed the actor-observer bias.[2]	
✓ ✗	I have used comparison words, such as 'similarly'.	

6C Heuristics

Theory review

1. B. False. *Heuristics are considered to be quick, easy strategies that help us make decisions and solve problems.*

2. I; III. *The anchoring and availability heuristics are two types of heuristics. In comparison, the stereotypical heuristic is not a type of heuristic, however, the representative heuristic can reinforce stereotypes. Additionally, the affect heuristic uses emotions to guide decision-making and judgements.*

3. A. True. *The anchoring heuristic involves the tendency to base initial judgements on information received prior to forming a judgement. Judgements made after these initial judgements are unlikely to move far from, or even change from, the initial judgement.*

4. A. True. *Using the availability heuristic, we rely on information readily brought to mind to make decisions and solve problems. Because we access information readily brought to mind, this process is quick.*

5. B. False. *Although the representative heuristic may lead to incorrectly categorising people based on the characteristics they present, it doesn't always lead to error.*

6. C. *The affect heuristic involves using our emotions and feelings to make a judgement or decision. Remember whenever a concept contains the word 'affect' or 'affective', it relates to our emotions.*

Assessment skills

Text analysis

7. B **8.** C **9.** A

Exam-style

Remember and understand

10. C **11.** B

12. [The affect heuristic is an information-processing strategy that involves using emotions to make a judgement or decision.[1]]

⎷ ✕   I have outlined the affect heuristic.[1]

13. [The availability heuristic is an information-processing strategy that enables individuals to make a decision based on information that is easily brought into mind.[1]][For example, an individual may read a media article about a plane crash before they board a plane. As this information is readily available, it may influence their decision and they may decide not to board the plane.[2]]

⎷ ✕   I have described how the availability heuristic can influence an individual's decision-making and problem-solving.[1]

⎷ ✕   I have used an example to describe how the availability heuristic can influence an individual's decision-making and problem-solving.[2]

Apply and analyse

14. B   **15.** A   **16.** B   **17.** B

18. a. [Connell has used the representative heuristic as he has categorised Mary as being unfit for the corporate position based on her eccentric fashion and physical characteristics.[1]] [This influenced his decision as based on this categorisation, he has decided not to hire her.[2]]

⎷ ✕   I have explained how Connell uses the representative heuristic.[1]

⎷ ✕   I have explained how Connells' use of the representative heuristic has influenced his decision-making and problem-solving.[2]

⎷ ✕   I have referred to the characters' names (Connell and Mary) in my response, and to the scenario.

b. [The base-rate fallacy is a type of bias in which decisions, social perceptions, and judgements are influenced more by vivid memories and experience as opposed to statistical fact.[1]] [This can have a negative influence on Connell's decision-making as Connell may overlook Mary's high score on her LSAT test and instead make the decision based on the information that categorises her as unfit for the role.[2]]

⎷ ✕   I have explained what the base-rate fallacy is.[1]

⎷ ✕   I have explained how the base-rate fallacy may have a negative influence on Connell's decision-making and problem-solving.[2]

⎷ ✕   I have referred to the characters' names (Connell and Mary) in my response, and to the scenario.

Evaluate

19. [The availability heuristic is a strategy that enables individuals to form a judgement, solve a problem, or make a decision based on information that is easily brought to mind.[1]][Bianca uses the availability heuristic as she makes the decision to decline the offer from the man based on her vivid memory of a news story about a girl who was on a night out.[2]][This could have a positive impact as her quick decision to decline his offer based on available information could potentially be adaptive if the man was dangerous.[3]] [However, Bianca's quick decision could potentially have a negative influence as the man may have been genuine and wanted to help her, but instead her quick decision lead to her continuing to be ill.[4]] [Therefore, Bianca's use of the availability heuristic can be both beneficial and disadvantageous.[5]]

⎷ ✕   I have outlined what the availability heuristic is.[1]

⎷ ✕   I have explained how Bianca uses the availability heuristic.[2]

⎷ ✕   I have evaluated the positive influence of Bianca's use of the availability heuristic.[3]

⎷ ✕   I have evaluated the negative influence of Bianca's use of the availability heuristic.[4]

⎷ ✕   I have made a concluding evaluation of Bianca's use of the availability heuristic.[5]

⎷ ✕   I have referred to the character's name (Bianca) in my response, and to the scenario.

Questions from multiple lessons

20. [The representative heuristic is a mental shortcut that involves making a judgement about a person or thing based on their similarity to other people or things in a certain category.[1]][In social psychology, the use of this heuristic is often informed by stereotypes, which are widely held generalisations about a certain group.[2]][For example, when there is news about a terrorist attack and it is highlighted that the attacker is Muslim, people may be incorrectly assume that all Muslims are terrorists simply due to their broadly belonging to the same religion.[3]]

⎷ ✕   I have explained the representative heuristic.[1]

⎷ ✕   I have explained how the representative heuristic is related to stereotypes.[2]

⎷ ✕   I have provided an example to demonstrate this relationship.[3]

6D Prejudice, discrimination, and stigma

1. A. Stigma stems from **prejudice** and can lead to **discrimination**. *Stigma results from negative opinions (prejudice) and can lead people to treat others unfairly (discrimination).*

2. B. False. *Prejudice is an often negative preconception held against people within a certain group or social category that can lead to discriminatory behaviour.*

3. B. *Prejudice is an often negative preconception held against people within a certain group or social category. Prejudice involves reflexive feelings that result from stereotypes, such as feeling scared of someone.*

4. B. False. *Prejudice, discrimination, and stigma can impact both group and personal mental wellbeing.*

Assessment skills

Perfect your phrasing

5. B   6. B

Text analysis

7. A   8. B   9. D

Exam-style

Remember and understand

10. B   11. A

12. ⌈Stigma is the feeling of embarrassment or shame experienced by an individual for a characteristic that distinguishes them from others,[1]⌉⌈whereas prejudice is a negative feeling held towards a certain social category.[2]⌉

    ✓ ✕ I have outlined what stigma is.[1]

    ✓ ✕ I have outlined what prejudice is.[2]

    ✓ ✕ I have used comparison words, such as 'whereas'.

13. ⌈Discrimination is the unjust treatment of people due to their membership within a certain social category.[1]⌉⌈An example of this is refusing to sit with someone because of the food they bring for lunch.[2]⌉⌈A way to reduce discrimination is through educating yourself on other people's cultures and traditions.[3]⌉

    ✓ ✕ I have explained discrimination.[1]

    ✓ ✕ I have provided an example of discrimination.[2]

    ✓ ✕ I have outlined a way to reduce discrimination.[3]

Other acceptable answers include:
- another example of discrimination is refusing to let a peer with a stutter be on your group project team. However, a way to reduce this discrimination is by talking to your peer and asking them if they feel more comfortable doing research rather than the public speaking aspect of the project.
- other examples of discrimination, so long as you could outline how the discrimination could be reduced.

Apply and analyse

14. C

15. ⌈Chris's approach to using social media platforms to share the experiences of LGBTQIA+ could be effective in reducing prejudice, as it could help change people's negative preconceptions about the LGBTQIA+ community.[1]⌉⌈This could in turn reduce the levels of discrimination LGBTQIA+ individuals face, such as removing barriers for the LGBTQIA+ community in gaining equal employment opportunities.[2]⌉

    ✓ ✕ I have explained how Chris's approach could be effective in reducing prejudice.[1]

    ✓ ✕ I have explained how Chris's approach could be effective in reducing discrimination.[2]

    ✓ ✕ I have referred to the character's name (Chris) in my response, and to the scenario.

16. A

17. ⌈Masie may be less confident in her public speaking abilities as a result of the stigma she experiences.[1]⌉⌈This may reduce her self-esteem, therefore affecting her mental wellbeing.[2]⌉

    ✓ ✕ I have outlined another impact on Masie's mental wellbeing.[1]

    ✓ ✕ I have explained how this impact affects Masie's mental wellbeing.[2]

    ✓ ✕ I have referred to the character's name (Masie) in my response, and to the scenario.

18. ⌈Direct discrimination is when treating someone unfairly due to their association with a particular group,[1]⌉⌈such as laughing at someone for having a speech impediment.[2]⌉⌈However, indirect discrimination occurs when a practice or rule applies to all people and unfairly disadvantages a group,[3]⌉⌈such as not having any non-meat products available at a restaurant, which disadvantages vegetarians.[4]⌉

    ✓ ✕ I have explained what direct discrimination is.[1]

    ✓ ✕ I have provided an example of direct discrimination.[2]

    ✓ ✕ I have explained what indirect discrimination is.[3]

    ✓ ✕ I have provided an example of indirect discrimination.[4]

    ✓ ✕ I have used comparison words, such as 'however'.

Questions from multiple lessons

19. [Prejudice is the affective component of the tri-component model of attitudes and describes negative feelings held against a particular social group,[1]][such as feeling disdain for transgender people.[2]][However, a stereotype is the cognitive component of the tri-component model of attitudes and may involve describing a generalisation about a particular social group,[3]][such as believing all transwomen are drag queens.[4]]

✓ ✗ I have explained what prejudice is and identified it as the affective component.[1]

✓ ✗ I have provided an example of a prejudice.[2]

✓ ✗ I have explained what a stereotype is and identified it as the cognitive component.[3]

✓ ✗ I have provided an example of a stereotype.[4]

✓ ✗ I have used comparison words, such as 'however'.

20. [The representative heuristic involves making decisions or forming judgements about other people based on their characteristics which can lead to prejudice towards certain individuals and groups of people.[1]][For example, an individual may encounter a person who is always dressed in designers brand and categorise them as rich and privileged, which may contribute to prejudice towards rich people.[2]]

✓ ✗ I have explained how the representative heuristic can lead to prejudice.[1]

✓ ✗ I have used an example to support my answer.[2]

Chapter 6 review

Multiple choice

1. A **2.** B **3.** D **4.** B

5. D

Short answer

6. [Discrimination is behaviour that excludes or unfairly treats members of certain social groups.[1]][For example, not allowing someone to sit next to you on a bus because they are from a certain ethnic group.[2]]

✓ ✗ I have outlined what is meant by discrimination.[1]

✓ ✗ I have provided an example of discrimination.[2]

7. a. [The researchers have used the representative heuristic as they have categorised Scarlett as a young bartender who doesn't know anything about marine biology based on the assumption that bartenders are not academic.[1]]

✓ ✗ I have described how the researchers used the representative heuristic to form a judgement about Scarlett.[1]

✓ ✗ I have referred to the characters' names (the researchers and Scarlett) in my response, and to the scenario.

b. [The affect heuristic is an information-processing strategy that involves using emotions to make a judgement or decision.[1]][Scarlett is very angry at the researchers and this anger informs her decision to overcharge them for drinks.[2]]

✓ ✗ I have outlined the affect heuristic.[1]

✓ ✗ I have discussed how Scarlett uses the affect heuristic to guide her decision-making.[2]

✓ ✗ I have referred to the characters' names (the researchers and Scarlett) in my response, and to the scenario.

8. [A prejudice is a negative feeling held against people within a certain group or social category.[1]][For example, a person who feels distrustful of Jewish people holds a prejudice.[2]][This could influence attributions as the negative feeling might serve to bias their attributions.[3]][For example, if a Jewish person was whispering to their friend, a prejudiced person might be more likely to attribute this behaviour to a negative internal factor, such as them wanting to conceal a bad secret, rather than a more positive or external attribution.[4]]

✓ ✗ I have discussed what prejudice involves.[1]

✓ ✗ I have provided an example of a prejudice.[2]

✓ ✗ I have explained how this prejudice could influence attribution.[3]

✓ ✗ I have provided an example of how the specific prejudice mentioned before might affect attribution.[4]

9. [It was hypothesised that greater levels of exposure to an ethnic group[1]][will reduce[2]][the prejudice held by outsiders.[3]]

✓ ✗ I have stated the independent variable (exposure to an ethnic group).[1]

✓ ✗ I have stated the direction of my hypothesis.[2]

✓ ✗ I have stated the dependent variable (prejudice levels).[3]

10. [Anna believed that Septic Splitends was the best band in the world, which is a positive evaluation and a component of attitude formation.[1]][Another component of attitude formation is her learnt evaluation through her positive experiences of listening to their music.[2]][However, Anna's positive evaluation of Septic Splitends does not meet the criteria for being settled and stable, due to it quickly changing after the disappointing concert.[3]][Therefore whilst Anna meets some of the criteria for attitude formation, she does not meet all the criteria, meaning that she may not hold an established attitude towards Septic Splitends.[4]]

✓	✗	I have evaluated whether Anna holds an established attitude towards Septic Splitends, with reference to how Anna has initially evaluated the band positively.[1]
✓	✗	I have evaluated whether Anna holds an established attitude towards Septic Splitends, with reference to how Anna's evaluation is learnt.[2]
✓	✗	I have evaluated whether Anna holds an established attitude towards Septic Splitends, with reference to how Anna's evaluation is not settled and stable.[3]
✓	✗	I have made a concluding evaluation of whether Anna holds an established attitude towards Septic Splitends.[4]
✓	✗	I have referred to the character's name (Anna) in my response, and to the scenario.

11. Students needed to display that they had a thorough understanding of the question by demonstrating:

- an effectively structured response
- that all parts of the question had been addressed
- that psychological terminology had been used in their answer.

Students will need to analyse Ash's experience of cognitive dissonance. Students will need to relate his cognitive dissonance to the tri-component model of attitudes by explaining the affective, behavioural, and cognitive components of Ash's attitude towards Adam. Discussion of the following would be awarded:

- An explanation of the cognitive component of Ash's attitude towards Adam, which is that Ash believes Adam is bad at sport.
- An explanation of the behavioural component of Ash's attitude towards Adam, which is that Ash excluded Adam from his netball team.
- An explanation of the affective component of Ash's attitude towards Adam, which is that Ash is good friends with Adam and likes spending time with him.
- An explanation of how the cognitive and behavioural components of Ash's attitude towards Adam do not align with the affective component, and therefore produces cognitive dissonance.

Students will need to discuss how Ash may reduce his cognitive dissonance through cognitive biases. Discussion of the following would be awarded:

- Actor-observer bias. Ash may have attributed his actions to external factors, such as the fact that he could only select seven members, while attributing the other team captain's actions to internal factors, such as that they are mean.
- Confirmation bias. Ash may have watched other overweight players and focused on their mistakes, which confirms his belief that overweight people are bad at sport.
- False-consensus bias. Ash may have assumed that his other team members held the same belief that he did about overweight people being unfit.
- Students could have selected any cognitive biases as long as they provided an adequate explanation of how they may have reduced Ash's cognitive dissonance.

Students will need to consider how Ash's actions reflect the concepts of stereotypes and discrimination. Discussion of the following would be awarded:

- An explanation of how Ash's cognitive component of his attitude (that Adam is bad at sport) reflects the stereotype that overweight people are unfit and bad at sport.
- As explanation of how Ash's behavioural component of his attitude (that Ash excludes Adam from his team) reflects discrimination.

Students will need to provide a brief discussion of the potential impact stereotypes and discimination has on Adam's mental wellbeing. Discussion of the following would be awarded:

- Adam may feel socially excluded and isolated, contributing to increased levels of stress and anxiety.
- Adam may have lowered self-confidence or self-esteem.

7A Social groups and culture

Theory review

1. B. False. *Individual behaviour is heavily influenced by an individual's environment and social circle, including social groups and culture.*

2. C. *Individuals often favour their in-group over out-groups and groups must consist of two or more people.*

3. A. *Norms are categorised as either formal or informal.*

4. B. *Individuals often experience a sense of worth and purpose when belonging to a group, therefore by protecting their in-group and rejecting out-groups, their sense of self-esteem is maintained.*

5. B. False. *Social loafing suggests that individuals tend to work harder when alone as opposed to in a group.*

6. A. **Individualist** cultures prioritise the needs and goals of a singular person as opposed to a group. *Collectivist cultures value the needs and goals of the larger society more than those of individuals.*

Assessment skills

Perfect your phrasing

7. A   8. B   9. B

Data analysis

10. C   11. A   12. B   13. I; IV

Exam-style

Remember and understand

14. A   15. B   16. D   17. A

18. [A culture may include an individual's ethnic background, such as an individual considering themselves as belonging to Indonesian culture.[1]][A person's friendship group would not be considered to be a culture.[2]]

   ✓ ✗   I have provided an example of a culture.[1]

   ✓ ✗   I have provided an example of something that is not a culture.[2]

Apply and analyse

19. B   20. A

21. [Individualist and collectivist are both terms that are used to describe cultures.[1]][However, individualist cultures value the goals and needs of individuals, whereas collectivist cultures value the goals and needs of the larger society.[2]]

   ✓ ✗   I have outlined a similarity between the terms.[1]

   ✓ ✗   I have outlined a difference between the terms.[2]

   ✓ ✗   I have used comparison words, such as 'whereas'.

22. a. [A group norm is a standard, value, or rule that outlines an appropriate behaviour or experience within a group.[1]][Rakim going to the train station is an informal norm as it is based on the implied idea that he must join his friends, rather than an explicit instruction.[2]]

   ✓ ✗   I have outlined what is meant by a group norm.[1]

   ✓ ✗   I have identified the scenario as depicting an informal norm.[2]

   ✓ ✗   I have referred to the character's name (Rakim) in my response, and to the scenario.

   b. [Rakim may continue to go to the train station even though it goes against his beliefs out of fear of being excluded from the group.[1]]

   ✓ ✗   I have provided an explanation as to why Rakim upholds this norm.[1]

   ✓ ✗   I have referred to the character's name (Rakim) in my response, and to the scenario.

Questions from multiple lessons

23. [Discriminating against an out-group as a result of the social identity theory is an example of direct discrimination.[1]][This is because out-group members are treated unfairly due to their association with said out-group, rather than as a result of a societal structure or rule.[2]]

   ✓ ✗   I have identified the discrimination as direct.[1]

   ✓ ✗   I have justified my response.[2]

24. [Marlin is not displaying atypical behaviour[1]][as his behaviour of being assertive and competitive in the workplace is consistent with how he would usually behave due to his cultural upbringing.[2]]

   ✓ ✗   I have identified that Marlin's behaviour is not atypical.[1]

   ✓ ✗   I have justified my response.[2]

   ✓ ✗   I have referred to the character's name (Marlin) in my response, and to the scenario.

7B The influence of obedience and conformity on behaviour

Theory review

1. C. Conformity involves an individual **aligning** their thoughts, feelings or behaviours to be **consistent** with the thoughts, feelings, or behaviours of an individual, group or societal expectations. *Individuals conform to be able to fit in with others as the act of conforming leads to them sharing similar thoughts, feelings and behaviours with others.*

2. B. Obedience refers to **complying** with the demands of an **authority figure**. *Obedience specifically refers to adhering to instructions from an authority figure or a system of authority in society. This is different to conforming to a group, although group pressure can increase the likelihood of obedience.*

3. B. False. *The main difference between obedience and conformity is that obedience involves direct commands from an authority figure whilst conformity involves indirect prompting from a social group.*

4. A. True. *Obedience is not inherently bad and can help to ensure a functioning society. Obedience allows for a smooth flow of action and it can inform individuals of how to behave in certain situations*

Assessment skills

Perfect your phrasing

5. B   6. A

Text analysis

7. C   8. B   9. I; II   10. D

11. A

Exam-style

Remember and understand

12. B   13. C   14. B   15. B

16. [Deindividuation involves individuals losing their sense of identity and individuality when in a group.[1]][Deindividuation causes individuals to believe that their behaviours, thoughts and feelings are invisible or anonymous, leading them to conform.[2]]

   ✓ ✗ I have defined deindividuation.[1]

   ✓ ✗ I have explained how deindividuation influences individual behaviour.[2]

Apply and analyse

17. C   18. C

19. [A factor that led to Alvina's obedience may have been relationship proximity (emotional closeness).[1]][As they are best friends, there is a greater relationship proximity between the individual (Alvina) and the person who made a command (Sona), leading to a greater likelihood of obedience.[2]]

   ✓ ✗ I have identified a factor that led to Alvina's obedience.[1]

   ✓ ✗ I have explained how this factor may have influenced Alvina obeying Sona's command.[2]

   ✓ ✗ I have referred to the characters' names (Sona and Alvina) in my response, and to the scenario.

Other acceptable answers include:

- Sona's status as a teacher, which may cause Alvina to view her as knowledgeable and therefore obey her command.

Evaluate

20. a [The no-harm principle is an ethical consideration that stipulates that participants must not experience any harm, whether physical or psychological.[1]][As participants received a mild (45 volt) electric shock at the beginning of the experiment, they were put in physical harm and therefore, the experiment would not be approved by an ethics committee.[2]]

   ✓ ✗ I have explained an ethical consideration.[1]

   ✓ ✗ I have evaluated whether Milgram's experiment would be approved by an ethics committee based on the ethical consideration.[2]

   Other acceptable answers include:

   - debriefing
   - withdrawal rights.

   b. [Withdrawal rights is an ethical consideration that states it is the right of the participant to leave the study at any point, without fear of consequence.[1]][Therefore, for Milgram's original experiment to meet current ethical guidelines, participants should be informed of this right at the beginning of the experiment and reminded of it throughout.[2]][Debriefing is an ethical consideration that occurs at the conclusion of an experiment, especially one that employs deception, and involves the researcher outlining the nature of the experiment to participants and includes ensuring that participants do not leave the experiment with lasting harm.[3]][To meet current ethical considerations, the experimenter, in the replication of Milgram's experiment, should inform participants that they did not actually administer real shocks to participants and that they were tested in terms of their obedience.[4]]

   ✓ ✗ I have described an ethical consideration.[1]

   ✓ ✗ I have explained how the experiment could be adjusted, according to the ethical consideration, so that it would be approved by an ethics commitee.[2]

   ✓ ✗ I have described another ethical consideration.[3]

   ✓ ✗ I have explained how the experiment could be adjusted, according to the ethical consideration, so that it would be approved by an ethics committee.[4]

   ✓ ✗ I have referred to Milgram's original experiment in my response.

Questions from multiple lessons

21. A

22. ⎡Conforming by standing in queues with others, such as while at a theme park waiting for a ride when it is busy,**¹**⎤⎡would be adaptive as it allows you to adjust to your fast-paced, and possibly hazardous, environment and contribute to a smoother-moving day.**²**⎤

✓ ✗ I have described a situation in which people conform.**¹**

✓ ✗ I have explained how conforming in this situation is adaptive.**²**

Other acceptable answers include:
- other examples of situations in which conforming would be an adaptive behaviour.

7C Media and behaviour

Theory review

1. I; II; V. *Information can be displayed on and communicated through the mediums of video games, advertisements in magazines, and YouTube, meaning that they are examples of media.*

2. A. Media's presence in our everyday lives inevitably causes us to change our behaviour. While immediate access to reliable online information represents a **positive** effect of media on group behaviour, feeling self-conscious about our appearance when comparing ourselves to others online represents a **negative** effect. *The media is not inherently positive or negative in its effects; the way that the media is used can have either positive or negative effects on behaviour.*

3. I; II. *Widespread feelings of isolation and low self-esteem could be considered as negative influences of the media on group behaviour, particularly when these feelings lead to frequent comparisons to others, whereas charities using their advertising reach to raise awareness for a particular issue could be considered as a positive influence of media on group behaviour.*

4. A. *If an online community is experienced as being respectful and rewarding for its members, then this could be considered as being a positive influence of media on group behaviour.*

5. A. *Impaired functioning involves being unable to individually meet the demands of everyday life, which is therefore a negative influence of social media.*

6. A. **Addictive behaviour** can only be considered as a negative influence of media on individual behaviour, whereas **social connection** could be considered as either a positive or negative influence of media on individual behaviour, depending on the kinds of relationships that are formed. *Addictive behaviours caused by media engagement are likely to impair daily functioning and wellbeing in a negative way. However, social connections in terms of media engagement can be positive, such as by increasing support networks, or can be negative, such as an increase in conformity.*

Assessment skills

Text analysis

7. B   **8.** A   **9.** B

Perfect your phrasing

10. A   **11.** B

Exam-style

Remember and understand

12. C   **13.** C

14. ⎡Information access refers to how easily information can be accessed by different people.**¹**⎤⎡It can be considered as a positive influence of media on individual behaviour because it enables people to obtain relevant and valuable information about a particular topic of research or personal interest.**²**⎤

✓ ✗ I have explained what is meant by information access.**¹**

✓ ✗ I have explained how information access can be considered as a positive influence of media on individual behaviour.**²**

15. ⎡Social connections refer to the network of people available to someone for support and engagement.**¹**⎤⎡For example, social connections commonly involve friends and family members that people feel comfortable asking for support during a personal crisis.**²**⎤⎡By contrast, social comparison is a psychological theory according to which humans measure their self-worth in relation to the people around them.**³**⎤⎡For example, this could involve feeling self-conscious about appearance because of the beauty standards represented in the media.**⁴**⎤

✓ ✗ I have explained what is meant by social connections.**¹**

✓ ✗ I have provided an example of social connections.**²**

✓ ✗ I have explained what is meant by social comparison.**³**

✓ ✗ I have provided an example of social comparison.**⁴**

✓ ✗ I have used comparison words, such as 'by contrast.'

Other acceptable answers include:
- you may have used other examples of social connections and social comparison in your response.

Apply and analyse

16. D   **17.** A

18. ⎡The expansion of social connections made possible by certain forms of media represents a positive influence of media on group behaviour.**¹**⎤⎡This is because it ensures that large groups of people can feel a sense of connection to an online community that shares their interests, despite not being able to meet frequently in person, which may enable them to engage in activities together, such as playing games online.**²**⎤

✓ ✗ I have stated whether the expansion of social connections represents a positive or negative influence of media on group behaviour.[1]

✓ ✗ I have used an example to justify my response.[2]

Other acceptable answers include:

- you could also argue that increased social connections are a negative influence of media on group behaviour, or both a positive and negative influence, so long as your example justified this position.

19. [Social media has a positive influence on group behaviour[1]][because it has the capacity to increase social connections.[2]][For example, prior to social media, someone may have only had a limited amount of people that they could reach out to during a time of need, whereas social media now makes it possible for many users to receive emotional support from a wider range of people online.[3]]

✓ ✗ I have stated whether social media has a positive or negative influence on group behaviour.[1]

✓ ✗ I have provided a reason for why social media has a positive or negative influence on group behaviour.[2]

✓ ✗ I have provided a relevant example to justify my response.[3]

Other acceptable answers include:

- you could also argue that social media has a negative influence on group behaviour, so long as your example justified this position.

Questions from multiple lessons

20. C   **21.** C

7D Empowering individual decision-making

Theory review

1. A. True. *Independent people derive their decisions and attitudes from their own beliefs, and not those of others.*

2. C. *Self-determination increases a person's sense of control over their lives and ability to make their own decisions so that they can behave without the influence of others.*

3. I; IV; V. *Under self-determination theory, the three basic psychological needs are autonomy, competence, and relatedness.*

4. B. False. *Through self-determination theory, it is believed that the most optimal independence occurs when all three basic psychological needs are met. This optimal independence would be more empowering for individual decision-making.*

5. A. Anti-conformity is a **deliberate act of rebellion** that goes against social norms. *For an act to be anti-conforming it has to be intentionally and effectively defying social norms.*

6. A. *Desire to promote change, reactance, social support, and individuation, are all factors encouraging anti-conformity*

7. II; III; IV. Anti-conformity is achieved by encouraging people to go against social norms or standards with their behaviour deliberately. *This does not include accidental resistance to these norms, or situations where the norms have changed to match the behaviour as then the behaviour would be conforming to the norms.*

Assessment skills

Perfect your phrasing

8. A   **9.** A   **10.** B   **11.** B

Problem-solving

12. C   **13.** I; IV   **14.** C

Exam-style

Remember and understand

15. B   **16.** C

17. [Independence refers to being free from the control or influence of others,[1]][whereas anti-conformity refers to a deliberate refusal to comply with social norms or standards for thoughts, feelings, or behaviours.[2]]

✓ ✗ I have described independence.[1]

✓ ✗ I have described anti-conformity.[2]

✓ ✗ I have used comparison words, such as 'whereas'.

18. [A deviant subgroup is a group that holds values and norms that exist outside the dominant norms in society.[1]][They are associated with social support, as they involve people who hold a similar attitude or perspective coming together.[2]][They can empower an individual to make individual decisions in a group by weakening perceptions that there is unanimity in the group which may encourage people to conform.[3]]

✓ ✗ I have described deviant subgroups.[1]

✓ ✗ I have explained that they are associated with social support.[2]

✓ ✗ I have explained how social support empowers individuals to make individual decisions.[3]

Other acceptable answers include:

- reference to deviant subgroups as weakening groupthink which is a factor encouraging conformity.

Apply and analyse

19. D

20. [Sally is more likely to be independent than Thiago.[1]][This is because she demonstrates intrinsic motivation which reflects that she has likely achieved self-determination, as she chooses behaviours based on her own desires rather than those of others. Whereas, Thiago demonstrates that he is externally motivated.[2]]

✓ ✗ I have identified Sally as being more likely to be independent.[1]

✓ ✗ I have justified my answer with reference to self-determination.[2]

✓ ✗ I have referred to the characters' names (Sally and Thiago) in my response and to the scenario.

21. [Being independent involves being free from the influence or control of others,[1]][however this does not mean that people will always act against social norms to display anti-conformity, as they may freely choose to act in a way that aligns with conformity.[2]]

✓ ✗ I have described independence.[1]

✓ ✗ I have explained that people who act free from influence may still choose to conform.[2]

22. [Cody has only fulfilled his basic psychological needs of relatedness, through his strong friendships, and autonomy, through feeling like he can make his own decisions.[1]][As Cody has not fulfilled the psychological need of competence, he does not feel skilled enough to overcome various challenges.[2]][He would therefore not be able to display as much independence as if he had achieved all three psychological needs where he would feel he could act on his choices in a meaningful way.[3]]

✓ ✗ I have described that Cody has fulfilled the basic psychological needs of autonomy and relatedness.[1]

✓ ✗ I have described that Cody has not fulfilled the basic psychological need of competence.[2]

✓ ✗ I have explained how this reflects the notion that all three psychological needs must be met for an individual to display full independence.[3]

✓ ✗ I have referred to the character's name (Cody) in my response and to the scenario.

Evaluate

23. a. [An example is Owlman's uniform,[1]][as it makes his identity as a superhero extremely noticeable, highlighting his perceived responsibility to restore justices instead of leaving it to the police.[2]]

✓ ✗ I have identified an example of individuation in the scenario.[1]

✓ ✗ I have explained how it would encourage the display of anti-conformity.[2]

✓ ✗ I have referred to the character's name (Owlman) in my response and to the scenario.

Other acceptable answers include:

- the flashing of the searchlight as an example, with the explanation that it directly singles out Owlman as being responsible to act.

b. [Peter shows the fulfilment of the psychological needs of competence through being skilled at what he does, and relatedness, through feeling connected to his friends and family, however, he does not appear to display autonomy, as he does not feel he can always act how he wants.[1]][In contrast, Owlman displays fulfilment of all three psychological needs; autonomy through acting based on his morals rather than what others think, competence through being able to effectively carry out his actions to defend others, and relatedness, through being loved and supported by many.[2]][Therefore, Owlman is likely to be more independent than Peter, due to fulfilling more psychological needs, allowing him a greater capacity to act without the influence of others and make his own decisions.[3]]

✓ ✗ I have described Peter's level of independence with reference to whether all three basic psychological needs are fulfilled.[1]

✓ ✗ I have described Owlman's level of independence with reference to whether all three basic psychological needs are fulfilled.[2]

✓ ✗ I have made a concluding statement about who is more independent.[3]

✓ ✗ I have referred to the characters' names (Peter and Owlman) in my response and to the scenario.

Questions from multiple lessons

24. [As a result of the factor 'the desire to promote change', Ren will be motivated to anti-conform if, in a certain situation, it is more important to him to seek justice and change rather than conform to social norms and the way things currently are.[1]][As collectivist cultures prioritise social norms and group cohesion, Ren may only be motivated to overcome this barrier when his family member is threatened because collectivist cultures prioritise family over the individual.[2]][This desire to prioritise his family may increase the likelihood of anti-conformity, whereas he may be less likely to anti-conform for the acquaintance who he is not close to.[3]]

✓ ✗ I have described factor that encourages anti-conformity.[1]

✓ ✗ I have described a value of collectivist cultures that would motivate Ren's anti-conformity in this situation.[2]

✓ ✗ I have explained how these would lead to anti-conformity for a close family member and not a distant acquaintance.[3]

✓ ✗ I have referred to the character's name (Ren) in my response and to the scenario.

Chapter 7 review

Multiple choice

1. D   2. B   3. A   4. C

5. B

Short answer

6. [In Milgram's research, a confederate was used to act as a 'student', whom the participants believed they were administering electrical shocks to.[1]][Researchers may choose to use confederates to create research scenarios in which it would be unethical to use a real participant.[2]]

   ✓ ✗ I have identified the role of a confederate in Milgram's research.[1]

   ✓ ✗ I have explained why researchers may choose to use confederates.[2]

7. [Social loafing and conformity are both more likely to occur when deindividuation is present.[1]][However, social loafing involves changes to an individual's effort, whereas, conformity involves changes to an individual's thoughts, beliefs, or behaviours.[2]]

   ✓ ✗ I have outlined a similarity between social loafing and conformity.[1]

   ✓ ✗ I have outlined a difference between social loafing and conformity.[2]

   ✓ ✗ I have used comparison words in my answer, such as 'whereas'.

   Other acceptable answers include:
   - social loafing and conformity both influence individual behaviour
   - social loafing and conformity both involve adjusting one's behaviour in response to others.

8. [According to the self-determination theory, independence may develop through the achievement of self-determination[1]][which is the act of engaging in behaviours without the influence of other people.[2]][In order for self-determination, and therefore independence to develop, an individual must fulfil the three associated psychological needs: competence, relatedness, and autonomy.[3]]

   ✓ ✗ I have outlined what the self-determination theory proposes about independence.[1]

   ✓ ✗ I have explained what is meant by self-determination.[2]

   ✓ ✗ I have explained that self-determination and independence require the fulfilment of basic psychological needs.[3]

9. [Social connections as a result of media would likely be the most appealing influence to individuals from collectivist cultures.[1]][Social connections involve the network of people available to someone for support and engagement.[2]][This would likely appeal to individuals from collectivist cultures as collectivist cultures value the strength and harmony of the group, and therefore would likely find value in strengthening this connection through media.[3]]

   ✓ ✗ I have outlined social connections as the relevant influence of media.[1]

   ✓ ✗ I have explained what is meant by social connections.[2]

   ✓ ✗ I have justified my response.[3]

10. [Asch's study involved observing whether, when in a group, participants conformed to the opinions of others, even if they did not agree with them.[1]][This conformity may have not occurred if there was a deviant subgroup.[2]][A deviant subgroup is a group that holds values and norms that exist outside of the dominant group norms.[3]][The presence of a deviant subgroup may have prevented participants form conforming as it would have decreased the perceived unanimity of the group.[4]]

    ✓ ✗ I have briefly described Asch's study.[1]

    ✓ ✗ I have identified a factor that may have prevented conformity.[2]

    ✓ ✗ I have described the relevant factor.[3]

    ✓ ✗ I have explained how this factor may have prevented conformity.[4]

    Other acceptable answers include:
    - reactance
    - the desire to promote change
    - individuation would not be an acceptable answer as the study already involved the participants giving their answers in an identifiable way.

11. [Emidio is experiencing the negative influence of media known as, 'addictive behaviours', as demonstrated by his behaviour surrounding video games.[1]][Addictive behaviours are behaviours that are associated with a dependence upon a particular stimulus, despite negative consequences.[2]]

    ✓ ✗ I have outlined the negative influence of media that Emidio is experiencing.[1]

    ✓ ✗ I have explained this negative influence of media.[2]

    ✓ ✗ I have referred to the character's name (Emidio) in my response, and to the scenario.

12. Students needed to display that they had a thorough understanding of the question by demonstrating:
    - an effectively structured response
    - that all parts of the question had been addressed
    - that psychological terminology had been used in their answer.

    Students will need to analyse Luis' behaviours before his move to Australia. Students will need to discuss the influences that may have led to these behaviours. Discussion of the following would be awarded:
    - Japan as a collectivist culture, including relative cultural norms and how they align with his previous behaviours.
    - Factors that may have influenced Luis' conformity to these norms, including groupthink and deindividuation.
    - Factors that may have influenced Luis' obedience to authority, such as group pressure due to collectivist cultural norms.

Students will need to analyse Luis' behaviours after his move to Australia. Students will need to discuss the influences that may have led to these behaviours. Discussion of the following would be awarded:

- Factors that may have influenced Luis' lack of obedience, including proximity and group pressure.
- The influence of cultural norms on Luis' behaviours, with reference to individualist cultures.
- The influence of group norms on Luis' behaviours, with reference to the social identity theory, in-groups, and out-groups.
- The influence of Luis' friends acting as a deviant subgroup.

Students will need to discuss the factors that could be addressed by Luis' parents and teachers to change Luis' behaviours. Discussion of the following would be awarded:

- The development of independence through the self-determination theory, including the ways in which Luis' parents and teachers could help to fulfil the associated psychological needs.
- The factors that would assist Luis in engaging in anti-conformity towards his friends, including individuation, social support, and the desire to promote change.
- How Luis' teachers may increase his obedience through addressing factors, such as status, proximity, and group pressure.

Unit 2 AOS 1 review

SAC assessment 1

1. **a.** [One reason the year 10 students constitute a group is because they can influence each other's thoughts and behaviours.[1]] [Another reason they constitute a group is because they share the common purpose of being a school student.[2]]

   ✓ ✗ I have provided one requirement for a collection of people to be considered a group.[1]

   ✓ ✗ I have provided a second requirement for a collection of people to be considered a group.[2]

   ✓ ✗ I have referred to the scenario in my response.

   Other acceptable answers include:
   - the requirement that there are two or more individuals or 'members' in the year 10 group
   - the requirement that the year 10 students are interacting with each other.

   b. [Social norms are society's unofficial rules and expectations regarding how individuals should act.[1]] [Social norms played a role in initiating Dewey's cyberbullying as Dewey (as a male) was bullied for going against the social norm of cheerleading being for girls only.[2]]

   ✓ ✗ I have outlined social norms.[1]

   ✓ ✗ I have explained that Dewey was bullied because cheerleading as a male goes against social norms.[2]

   ✓ ✗ I have referred to the character's name (Dewey) in my response, and to the scenario.

2. [I agree with this statement.[1]] [This is because social media allowed the students to quickly spread misinformation about Dewey's cheerleading.[2]]

   ✓ ✗ I have stated whether I agree with the statement.[1]

   ✓ ✗ I have justified my response with reference to misinformation in Dewey's cyberbullying.[2]

   ✓ ✗ I have referred to the character's name (Dewey) in my response, and to the scenario.

3. **a.** [Being able to easily connect with other students online may make the other year 10 students more likely to participate in Dewey's cyberbullying to match the online behaviours of their peers.[1]]

   ✓ ✗ I have suggested a negative influence of the changing nature of social connections.[1]

   ✓ ✗ I have referred to the character's name (Dewey) in my response, and to the scenario.

   b. [Dewey may be better able to access support for his bullying through social connections online, which may help him cope.[1]]

   ✓ ✗ I have suggested a positive influence of online social connections that could help Dewey to cope.[1]

   ✓ ✗ I have referred to the character's name (Dewey) in my response, and to the scenario.

   Other acceptable answers include:
   - that Dewey might be able to form social connections outside of school through the internet enabling him to establish and maintain new friendships.

4. [The availability heuristic is an information-processing strategy that enables individuals to form a judgement, solve a problem, or make a decision based on information that is easily accessible.[1]] [It might be used by Dewey when he judges his school experience as negative as the information regarding his bullying experience in the last few months is easily accessible for him.[2]]

   ✓ ✗ I have explained what is meant by the availability heuristic.[1]

   ✓ ✗ I have suggested how Dewey might be using the availability heuristic.[2]

   ✓ ✗ I have referred to the character's name (Dewey) in my response, and to the scenario.

5. **a.** [Dewey quitting cheerleading may mean that he feels he cannot help his bullying due to being driven by external factors out of his control, which is him displaying learned helplessness.[1]]

   ✓ ✗ I have suggested how Dewey might be displaying learned helplessness.[1]

   ✓ ✗ I have referred to the character's name (Dewey) in my response, and to the scenario.

b. [A greater sense of independence would assist Dewey to feel less influenced by others and encourage him to continue cheerleading despite their opinions.[1]]

✓ ✗ I have outlined that independence may enable Dewey to be free from the influence of others and their opinions.[1]

✓ ✗ I have referred to the character's name (Dewey) in my response, and to the scenario.

c. [According to the self-determination theory, Dewey has not fulfilled the basic psychological need of autonomy.[1]] [If he achieved autonomy he could feel more inclined to act authentically and continue cheerleading regardless of others' opinions.[2]] [Dewey has also not fulfilled the basic psychological need of relatedness.[3]] [If he achieved relatedness he could feel more supported to continue cheerleading as he feels this will not affect his relationship with those he is connected to.[4]]

✓ ✗ I have identified a basic psychological need.[1]

✓ ✗ I have explained how its achievement assists Dewey to continue cheerleading.[2]

✓ ✗ I have identified another psychological need.[3]

✓ ✗ I have explained how its achievement assists Dewey to continue cheerleading.[4]

✓ ✗ I have referred to the character's name (Dewey) in my response, and to the scenario.

Other acceptable answers include:
- that Dewey has not fulfilled the basic psychological need of competence, and that the fulfilment of this need may lead him to feel less social influence when completing tasks within his personal capabilities, such as cheerleading.

d. [Dewey is not displaying anti-conformity.[1]] [This is because despite going against the social norm of males not being cheerleaders, this is not a deliberate refusal to comply with social norms.[2]]

✓ ✗ I have stated that Dewey is not displaying anti-conformity.[1]

✓ ✗ I have justified my answer with reference to the fact that anti-conformity must be a deliberate refusal to comply with social norms.[2]

✓ ✗ I have referred to the character's name (Dewey) in my response, and to the scenario.

6. a. [Direct discrimination is when someone is treated unfairly because of their association with a particular group,[1]] [whereas indirect discrimination occurs when a practice or rule applies to all people and unfairly disadvantages a group.[2]] [Dewey is facing direct discrimination.[3]]

✓ ✗ I have described direct discrimination.[1]

✓ ✗ I have described indirect discrimination.[2]

✓ ✗ I have identified that Dewey is facing direct discrimination.[3]

✓ ✗ I have referred to the character's name (Dewey) in my response, and to the scenario.

✓ ✗ I have used comparison words, such as 'whereas'.

b. [Stereotypes are evident in Dewey's cyberbullying through the students' generalisations that all cheerleaders are girly,[1]] [forming the cognitive component of the tri-component model of attitudes.[2]] [Prejudice is evident in the students' feelings of annoyance at Dewey for being a male cheerleader,[3]] [forming the affective component of the tri-component model of attitudes.[4]] [Discrimination is evident in the students bullying behaviour towards Dewey,[5]] [forming the behavioural component of the tri-component model of attitudes.[6]]

✓ ✗ I have suggested how stereotypes are evident in Dewey's cyberbullying.[1]

✓ ✗ I have explained that stereotypes form the cognitive component of the tri-component model of attitudes.[2]

✓ ✗ I have suggested how prejudice is evident in Dewey's cyberbullying.[3]

✓ ✗ I have explained that prejudice forms the affective component of the tri-component model of attitudes.[4]

✓ ✗ I have suggested how discrimination is evident in Dewey's cyberbullying.[5]

✓ ✗ I have explained that discrimination forms the behavioural component of the tri-component model of attitudes.[6]

✓ ✗ I have referred to the character's name (Dewey) in my response, and to the scenario.

7. a. [One factor that affects obedience is the status of the authority figure,[1]] [and another is group pressure.[2]]

✓ ✗ I have identified one factor that affects obedience.[1]

✓ ✗ I have identified a second factor that affects obedience.[2]

Other acceptable answers include:
- proximity.

b. [The status of the authority figure could lead the students to obey the principal's instructions to stop cyberbullying due to the principal's high status in the school.[1]] [Group pressure could also reduce cyberbullying as if other students obey the principal then the remaining students may also feel inclined to do so.[2]]

✓ ✗ I have suggested how the first factor identified in **part a** could lead the students to obey the principal's instructions.[1]

✓ ✗ I have suggested how the second factor identified in **part a** could lead the students to obey the principal's instructions.[2]

✓ ✗ I have referred to the scenario in my response.

Other acceptable answers include:

- discussion of proximity as a factor that affects obedience by leading the students to obey if they feel physically or socially close to the principal.

Note: Discussion of a factor in **part b** that was not mentioned in **part a** will not receive full marks.

8. [Dewey is experiencing many negative factors that can influence a person's mental wellbeing, such as daily conflict with his parents.[1]] [He is also not displaying all of the characteristics of optimal wellbeing, such as having low stress and anxiety.[2]] [Therefore, Dewey is likely to be experiencing poor mental wellbeing.[3]]

✓ ✗ I have referred to a factor that can influence a person's mental wellbeing.[1]

✓ ✗ I have referred to a characteristic of optimal mental wellbeing.[2]

✓ ✗ I have made an evaluative statement that Dewey is likely to be experiencing poor mental wellbeing.[3]

✓ ✗ I have referred to the character's name (Dewey) in my response, and to the scenario.

Note: It is not correct to evaluate Dewey's mental wellbeing as optimal, as there are no examples that can be found in the scenario to support this.

9. a. [One approach that could be used to reduce the student's prejudice, discrimination, and stigma is education.[1]] [This could be used to reduce Dewey's cyberbullying as providing information about male cheerleading could help to correct the misinformation the students have about the sport.[2]] [Another approach could be inter-group contact.[3]] [This could be used to reduce Dewey's cyberbullying by having open discussions with male cheerleaders to open the minds of his peers at school.[4]]

✓ ✗ I have suggested an approach to reducing prejudice, discrimination, and stigma.[1]

✓ ✗ I have explained how this approach could reduce Dewey's cyberbullying.[2]

✓ ✗ I have suggested a second approach to reducing prejudice, discrimination, and stigma.[3]

✓ ✗ I have explained how this approach could reduce Dewey's cyberbullying.[4]

✓ ✗ I have referred to the character's name (Dewey) in my response, and to the scenario.

Other acceptable answers include:

- social media and laws as approaches to reducing prejudice, discrimination, and stigma, as long as they are accurately explained.

b. [The students may now believe that acting on their prejudice is wrong but are still behaving in a way that conflicts with this belief.[1]] [This can lead to cognitive dissonance as their behaviours, thoughts, or feelings are not in alignment with one another.[2]]

✓ ✗ I have explained that the students who are still cyberbullying are now acting against their beliefs.[1]

✓ ✗ I have explained how this might lead them to experience cognitive dissonance.[2]

✓ ✗ I have referred to the scenario in my response.

Unit 2 AOS 1 review

SAC assessment 2

1. [The results show that for all of the stigmatised statements, less than half of the participants agreed.[1]] [This may mean that while some people have stigmatised attitudes, many do not.[2]]

✓ ✗ I have described the results.[1]

✓ ✗ I have suggested what they might say about people's attitudes towards those with anxiety.[2]

2. a. [9 people out of 35 either agreed or strongly agreed.[1]]

✓ ✗ I have identified that 9 people out of 35 either agreed or strongly agreed.[1]

b. [Stigma is the result of negative stereotypes.[1]]

✓ ✗ I have explained how stereotypes are related to stigma.[1]

c. [Social stigma.[1]]

✓ ✗ I have identified social stigma as the type of stigma evident in the statements.[1]

d. [A stereotype is a widely held belief and generalisation about a group, such as people, animals, or objects,[1]] [whereas an attitude is an evaluation of something, such as a person, object, event, or idea.[2]]

✓ ✗ I have described stereotypes.[1]

✓ ✗ I have described attitudes.[2]

✓ ✗ I have used comparison words, such as 'whereas'.

e. [For something to be an attitude, it must be an evaluation of something, settled and stable, and learnt through experience.[1]] [Not all of the stigmatised statements may have been learnt through experience, meaning the criteria are not met.[2]]

✓ ✗ I have explained that there are three criteria for something to be classified as an attitude.[1]

✓ ✗ I have suggested one criterion that was not met by the stigmatised statements as a reason they do not all reflect an attitude.[2]

Other acceptable answers include:

- that the statements may not all be settled and stable if they are not relatively permanent.

Note: Any answer that suggests the criterion that 'an attitude must be an evaluation of something' is incorrect. This is because stigma is based upon a negative stereotype which involves a negative evaluation of something.

f. [Stigma can negatively influence mental wellbeing for groups of people with anxiety by increasing their feelings of isolation from other communities and groups.[1]] [Negative labels around anxiety can also create barriers to accessing treatment to improve their mental wellbeing.[2]]

✓ ✗ I have provided one way in which stigma can negatively influence the mental wellbeing of people as a group.[1]

✓ ✗ I have provided another way stigma can negatively influence the mental wellbeing of people as a group.[2]

3. [This statement is false,[1]] [as the data shows fewer than half of the people (out of 35) either agreed or strongly agreed with the stigmatised statements.[2]]

✓ ✗ I have suggested that the statement is false.[1]

✓ ✗ I have justified my suggestion by referring to the data.[2]

4. [Individualist cultures are those that prioritise the needs and goals of individuals and values independence,[1]] [whereas collectivist cultures are those that prioritise the needs and goals of groups.[2]] [The sample is more likely to represent an individualist culture as western cultures are typically individualist cultures.[3]]

✓ ✗ I have outlined individualist cultures.[1]

✓ ✗ I have outlined collectivist cultures.[2]

✓ ✗ I have suggested that the sample is likely to represent an individualist culture, with reference to western cultures.[3]

5. a. [The data is quantitative[1]] [and subjective.[2]]

✓ ✗ I have identified the data as being quantitative.[1]

✓ ✗ I have identified the data as being subjective.[2]

b. [A strength of quantitative data is that it can undergo statistical analysis and be represented numerically, allowing comparisons to be made.[1]] [A limitation of subjective data is that participants may respond with what they think the researchers want to hear, rather than what they believe.[2]]

✓ ✗ I have outlined a strength or limitation of quantitative data.[1]

✓ ✗ I have outlined a strength or limitation of subjective data.[2]

Other acceptable answers include:

- a limitation of quantitative data being that it may not provide researchers with a holistic or detailed understanding of what they are researching.
- a strength of subjective data being that it allows for researchers to better understand the perspective of participants
- a strength of subjective data being that it provides researchers with an insight into unobservable phenomena, such as an individual's motivation, perception, interpretation etc.
- other limitations and/or strengths of subjective data or quantitative data.

c. [The participants least agreed with the statement 'People with anxiety are just lazy'.[1]]

✓ ✗ I have identified the statement the participants least agreed with to be that 'People with anxiety are just lazy'.[1]

d. [Social identity theory outlines the tendency for people to favour their in-group over an out-group in order to enhance their sense of self-esteem.[1]] [Participants who do not have anxiety might perceive their in-group to be people who do not experience anxiety, and their out-group to be people who do experience anxiety unlike themselves.[2]] [This could have led them to agree with the statements, as agreeing with negative statements about their out-group could enhance their self-esteem by favouring their in-group.[3]]

✓ ✗ I have explained social identity theory.[1]

✓ ✗ I have suggested the potential in-group and out-group of the participants without anxiety.[2]

✓ ✗ I have suggested why these participants may have agreed with the statements.[3]

e. [The sample used in the survey is not representative of the entire Australian population, as people under the age of 18 years were not involved in the study.[1]]

✓ ✗ I have provided a reason that the results are not generalisable to all Australian citizens.[1]

6. a. [The statement that 'People with anxiety do not make suitable employees'[1]] [demonstrates the representative heuristic as it categorises all people with anxiety as poor employees, due to their anxiety deeming them similar to other people with anxiety who may be poor employees.[2]]

✓ ✗ I have accurately referred to a statement from the survey.[1]

✓ ✗ I have described how the representative heuristic is evident in this statement.[2]

b. [These judgements may be inaccurate due to not being based on the reality of the situation, but instead on fitting people into pre-existing categories.[1]]

✓ ✗ I have explained why judgements using the representative heuristic might be inaccurate.[1]

c. [The actor-observer bias is a type of cognitive bias involving the tendency to attribute our own actions to external factors and situational causes while attributing other people's actions to internal factors.[1]]

✓ ✗ I have briefly outlined the actor-observer bias.[1]

d. [The fundamental attribution error refers to our tendency to explain other people's behaviour in terms of internal factors, while ignoring possible external factors.[1]][People with the actor-observer bias also tend to attribute other people's behaviours to internal factors rather than external factors.[2]][Therefore, I agree with the statement,[3]][as the actor-observer bias will lead people to judge people with anxiety as acting due to internal factors and ignore external factors.[4]]

✓ ✗ I have outlined the fundamental attribution error.[1]

✓ ✗ I have explained how the actor-observer bias acts similarly to the fundamental attribution error.[2]

✓ ✗ I have stated that I agree with the statement.[3]

✓ ✗ I have justified why I agree, with reference to judgements made about people with anxiety.[4]

Note: It is not correct to disagree with the statement. The effects of the fundamental attribution error and actor-observer bias share a degree of similarity that makes it more likely than unlikely that a person will experience both.

7. [Self-determination theory explains that people can achieve self-determination, and thus independence, when their three basic psychological needs of autonomy, competence, and relatedness, are met.[1]][Reducing stigma could lead people with anxiety to feel less ashamed and different from others around them.[2]][This could help them to achieve the basic psychological need of relatedness, as it could enhance their sense of belonging with their peers.[3]][As a result of achieving one of their basic psychological needs, they could feel a greater sense of self-determination, and therefore independence.[4]]

✓ ✗ I have explained that through self-determination theory, independence is achieved when the three basic psychological needs are met.[1]

✓ ✗ I have suggested how reducing stigma could allow people to feel less differentiated from those around them.[2]

✓ ✗ I have suggested how this could assist them to achieve the basic psychological need of relatedness.[3]

✓ ✗ I have explained that achieving one more of the basic psychological needs can allow them to feel a greater sense of independence.[4]

8. [Groupthink refers to a psychological phenomenon in which assumed group unanimity overrules individuals' realistic appraisal of consequences.[1]][A smaller proportion of the participants in the survey agreed with the statements displaying stigma compared to those that did not agree.[2]][In person, groupthink is likely to influence those who do display stigma to instead disagree with the statements to better match the visible group majority.[3]]

✓ ✗ I have outlined groupthink.[1]

✓ ✗ I have referred to the data.[2]

✓ ✗ I have explained that in person, groupthink is likely to influence stigmatised participants to match the unstigmatised group majority.[3]

8A Attention

Theory review

1. A. True. *Three types of attention (sustained, divided, and selective) are outlined within this lesson, all with different roles in allowing us to make sense of the world around us.*

2. I; III; IV. *The three main types of attention are selective attention, divided attention, and sustained attention. An acronym for remembering the three types of attention is DSS fashion — divas (divided) select (selective) sustainable (sustained) fashion.*

3. B. Internal stimuli are information or sensations that originate **within the individual**, whereas external stimuli are information or sensations that originate **in the world around us**. *Internal stimuli always originate internally from within the individual and are typically sensations, such as feeling unwell, having an idea, or pain. External stimuli originate from outside the individual, such as events occurring in the world around us that we can see or hear.*

4. B. False. *Selective attention involves paying attention to only one stimulus or task at a time while excluding all others and therefore can not involve multitasking by paying attention to two or more tasks.*

Assessment skills

Perfect your phrasing

5. A   6. B

Problem-solving

7. C   8. I; III   9. B   10. A

Exam-style

Remember and understand

11. C   12. B   13. B

14. [Divided attention can allow us to process two sources of information at one time to finish tasks more efficiently.[1]]

   ✓ ✗ I have provided one benefit of divided attention.[1]

   Other acceptable answers include:
   - any other benefit such as increasing the efficiency of a task, enhanced learning due to processing more information at one time, or preventing us from getting bored

15. [Our attention is a limited resource, so if we sustain attention for too long we start to get fatigued.[1]]

   ✓ ✗ I have explained that our attention is a limited resource, where sustaining attention for too long can cause fatigue.[1]

16. [Selective attention refers to exclusively focusing attention on a specific stimulus or task while ignoring all other stimuli or tasks,[1]] [whereas, sustained attention refers to focusing on one stimulus or task across a prolonged continuous period of time.[2]]

   ✓ ✗ I have explained that selective attention refers to exclusively focusing attention on a specific stimulus or task while ignoring all other stimuli or tasks.[1]

   ✓ ✗ I have explained that sustained attention refers to focusing on one stimulus or task across a prolonged continuous period of time.[2]

   ✓ ✗ I have used comparison words, such as 'whereas'.

17. [An example of a task where divided attention is inevitable is when you take notes in class while listening to the teacher.[1]] [This can have negative implications for the performance of that task as these tasks are unrelated where listening in class might be effortful and complex, so taking notes simultaneously means that not everything will be understood properly.[2]]

   ✓ ✗ I have provided one example of a task where divided attention is inevitable.[1]

   ✓ ✗ I have described why multitasking has decreased performance for that task.[2]

   Other acceptable answers include:
   - any appropriate example of multitasking where a relevant decrease in performance has been described and justified (such as stopping a task that is not easy to resume, that the tasks are less related, or that the tasks are more effortful and complex).

Apply and analyse

18. C

19. a. [The predictive principle of attentional allocation is most relevant, as things that are more meaningful are deemed as more important.[1]] [As Sarah finds the conversations with her friends more meaningful, she is more likely to selectively attend to the conversation over her phone that she deems less meaningful.[2]]

   ✓ ✗ I have identified the predictive principle of attentional allocation.[1]

   ✓ ✗ I have suggested a reason for conversations maintaining Sarah's selective attention in the context of the predictive principle.[2]

   ✓ ✗ I have referred to the character's name (Sarah) in my response, and to the scenario.

   b. [The uncertainty principle of attentional allocation would be most relevant for Sarah's shifting attention to her phone.[1]] [This is because her being texted with exciting information provided a source of unpredictable stimuli that allowed it to be deemed more important.[2]]

   ✓ ✗ I have identified that it is the uncertainty principle of attentional allocation.[1]

   ✓ ✗ I have explained that this principle involves attention being captured by the most unpredictable or unfamiliar stimuli.[2]

   ✓ ✗ I have referred to the character's name (Sarah) in my response, and to the scenario.

c. [Multitasking performance is higher when one or more of the tasks being performed are easier and lower when one or more of the tasks being performed are difficult.[1]][As walking is an easy, automatic task, it allows Sarah to successfully multitask when talking to her friends.[2]][As writing an essay is a more complex task, it is harder for Sarah to multitask as she writes.[3]]

✓ ✗ I have explained that performance on multitasking differs when the tasks are easy and hard.[1]

✓ ✗ I have explained that walking is an easy task that allows for more successful multitasking.[2]

✓ ✗ I have explained that writing an essay is a more complex task that makes it harder to multitask.[3]

✓ ✗ I have referred to the character's name (Sarah) in my response, and to the scenario.

20. [During the process of scoring a goal, Caitlin would sustain attention so that she can put all of her mental energy into fulfilling the task.[1]][She would find it easier to sustain attention during this process as it is likely to be both challenging and interesting,[2]][and this would mean that she finds it easier to avoid distraction as the act of scoring a goal is engaging.[3]]

✓ ✗ I have suggested the role of sustained attention in Caitlin scoring a goal.[1]

✓ ✗ I have justified whether Cailtin would find it easier to sustain attention during the process of scoring a goal.[2]

✓ ✗ I have referenced how distraction would be less likely to occur due to Caitlin being engaged in the task.[3]

✓ ✗ I have referred to the character's name (Caitlin) in my response, and to the scenario.

Questions from multiple lessons

21. a. [Charlie is displaying the cognitive bias of confirmation bias.[1]]

✓ ✗ I have identified that the cognitive bias Charlie displays is the confirmation bias.[1]

✓ ✗ I have referred to the character's name (Charlie) in my response, and to the scenario.

b. [Selective attention would be used to allow Charlie to only focus on information that describes meat as unhealthy, and ignore information that claims meat is healthy.[1]][This could maintain Charlie's confirmation bias as he selectively only attends to information that supports his belief that meat-eating is bad for your health.[2]]

✓ ✗ I have explained that Charlie could use selective attention to only focus on information that describes meat as unhealthy, and ignore information that claims meat is healthy.[1]

✓ ✗ I have explained that this could maintain Charlie's confirmation bias as he selectively attends to information that supports his belief that meat-eating is bad for your health exclusively.[2]

✓ ✗ I have referred to the character's name (Charlie) in my response, and to the scenario.

8B Perception

Theory review

1. B. False. *Perception occurs after sensation because in sensation sensory data is converted into a neural impulse. Following this, in perception, the brain receives the sensory message in a form that it can process.*

2. II; III; V. *Perception has three stages: selection, organisation, and interpretation.*

3. A. Stimuli that are more **salient** to the current context are more likely to be **perceived**. *Salient stimuli tend to grab our attention more easily as they are more important to the current context than other irrelevant stimuli, making them more likely to be selected during perception.*

4. B. False. *The primary visual cortex is the site of visual perception, but when the information first arrives here it has only undergone sensation.*

5. B. False. *Gustatory perception can include the influence of all of the five senses, not just taste. For example, the perception of a food's flavour may also involve information regarding its smell and appearance.*

6. B. False. *Tongue maps do not best represent the individual gustatory receptors specialised for each of the five basic flavours. Instead, they are better understood as being dispersed all over the tongue.*

7. A. True. *Bottom-up processing is used for unfamiliar stimuli due to individuals not having prior experience or expectations when perceiving the stimulus. Top-down processing is used for familiar stimuli, as there are already expectations based upon previously perceived, similar stimuli.*

8. A. *Prior knowledge does not directly influence bottom-up processing because bottom-up processing does not draw upon previous experiences, and only includes real-time processing of the way stimuli are organised.*

Assessment skills

Perfect your phrasing

9. A 10. A 11. B

Text analysis

12. A 13. B 14. A 15. A

Exam-style

Remember and understand

16. D 17. C 18. A 19. B

20. C 21. A

Apply and analyse

22. [During bottom-up processing, perception is driven by the way the stimulus is organised.[1]] [As interpretation involves assigning meaning to sensory information, the stimuli will be understood and interpreted purely based on the way it is organised through bottom-up processing.[2]]

✓ ✗ I have explained the function of bottom-up processing.[1]

✓ ✗ I have described how bottom-up processing is involved in the interpretation stage of perception.[2]

23. a. [The stage of perception responsible for this difference is selection.[1]]

✓ ✗ I have identified that selection is the stage of perception that is responsible.[1]

b. [Eman's sensory organs send his brain more messages about these sensory stimuli on his bike ride than he can reasonably pay attention to.[1]]

✓ ✗ I have explained that Eman's brain would receive more messages about sensory stimuli than he can reasonably pay attention to.[1]

✓ ✗ I have referred to the character's name (Eman) in my response, and to the scenario.

c. [An example of bottom-up processing is Eman noticing how fast the river is travelling by visually observing it.[1]] [An example of top-down processing is Eman's perception of the upcoming turns at night.[2]]

✓ ✗ I have provided an example of bottom-up processing evident in Eman's scenario.[1]

✓ ✗ I have provided an example of top-down processing evident in Eman's scenario.[2]

✓ ✗ I have referred to the character's name (Eman) in my response, and to the scenario.

Other acceptable answers include:

- Eman picking up on the colours of the leaves or hearing the sounds of owls and crickets as examples of bottom-up processing only if these are described as unfamiliar stimuli in the response.
- Eman hearing the sounds of owls and crickets and being able to recognise what animals they are due to his historical experience with these animals, as an example of top-down processing.

Questions from multiple lessons

24. D

8C Visual perception

Theory review

1. B. False. *Visual perception can be influenced by a range of factors, including those classified as biological, psychological, or social factors. As such, any experience or event that interacts with the wide scope of these components and the individual can influence visual perception.*

2. C. *Visual perception relies on the interactions of biological, psychological, and social factors, and is seldom completed using just one of these components.*

3. B. False. *Visual colour perception involves cones only. Rods are responsible for responding to visual stimuli in low levels of light and do not process colour.*

4. C. *Psychological factors encompass perceptual set, which includes historical experiences, and visual perception principles; such as Gestalt principles and visual constancies.*

5. II; III. *Visual perception principles are applied during perception and generally occur automatically (i.e. unconsciously) to help us create meaningful wholes out of fragmented visual signals.*

6. II; V. *A cultural norm is a standard, value, or rule that outlines an appropriate behaviour or experience within a culture. Thinking a meal looks tastier when hungry or being scared of sausage dogs are more unique to the person's individual context than a culture.*

Assessment skills

Perfect your phrasing

7. B   **8.** A   **9.** B

Text analysis

10. D   **11.** B

Exam-style

Remember and understand

12. D   **13.** B   **14.** D   **15.** C

16. [Retinal disparity is a binocular depth cue referring to the difference or 'disparity' between the different images received on the retina of either eye.[1]]

✓ ✗ I have explained retinal disparity as a binocular depth cue.[1]

17. [The monocular depth cue of texture gradient[1]] [allows a person to judge depth because the more detailed texture they can see, the closer they know something in their environment is. Likewise, the less detail they can see, the further away something is.[2]]

✓ ✗ I have identified a monocular depth cue.[1]

✓ ✗ I have explained how this monocular cue allows a person to judge depth.[2]

Other acceptable answers include:

- the discussion of accommodation or motion parallax, as long as adequately explained.
- the discussion of other pictorial depth cues, such as relative size or linear perspective, as long as adequately explained.

Apply and analyse

18. A

19. [The Gestalt principle of closure[1]][allows us to perceive the zebra crossing on the road sign as we mentally complete the incomplete image. We do this by seeing the yellow gaps between the black stripes as completing and being a part of the zebra crossing.[2]] [The figure-ground principle is also used,[3]][in that we are able to see most of the yellow of the signing as forming the more distant background, and the black figures of the crossing and children as being in the closer foreground.[4]]

		I have identified a relevant Gestalt principle.[1]
		I have explained how this Gestalt principle allows a person to perceive the completed image on the sign, referring to specific details of the sign.[2]
		I have identified another relevant Gestalt principle.[3]
		I have explained how this Gestalt principle allows a person to perceive the completed image on the sign, referring to specific details of the sign.[4]

Evaluate

20. [A negative influence of Maxine's perceptual set on her visual perception is that her historical experience prevents her from noticing other foods that are out of date. She became predisposed to visually perceive spilled items, and ignore non-spilled items that are past their use-by date.[1]][In contrast, Maxine's perceptual set has a positive influence in that it allows her to locate lots of spilled items that she may have generally missed, due to an increased vigilance based on her historical experience with spotting them at the start of the clean-out.[2]][Considering these influences, I believe Maxine's perceptual set had a more negative influence on her visual perception, as she may now assume the remaining food is safe to eat when it is not.[3]]

		I have evaluated a positive influence of perceptual set on Maxine's visual perception.[1]
		I have evaluated a negative influence of perceptual set on Maxine's visual perception.[2]
		I have made a concluding statement regarding whether I believe in Maxine's scenario, her perceptual set had a more positive or negative influence.[3]
		I have referred to the character's name (Maxine) in my response, and to the scenario.

21. a. [Cultural norms are most relevant to Kody and Yuko's different perceptions of the visual paintings.[1]]

		I have identified cultural norms as most relevant.[1]

b. [Cultural norms are specific to the environment and culture in which they have been learnt, acting as an external influence,[1]][whereas biological factors are more related to internal influences specific to the body and physiology.[2]]

		I have explained that cultural norms are specific to the environment and culture in which they have been learnt.[1]
		I have highlighted that cultural norms do not reflect biological factors as biological factors are more internal.[2]

c. [Visual constancies are an ability to perceive visual objects as staying the same, even though they may appear to change or do change in our sensation.[1]][The visual constancy for size would have allowed Kody and Yuko to perceive the size of the paintings as the same, despite the sensation of the paintings changing.[2]]

		I have outlined what visual constancies are.[1]
		I have explained how visual constancies are involved in Kody and Yuko's ability to perceive the size of the paintings as constant from different perspectives.[2]
		I have referred to the characters' names (Kody and Yuko) in my response, and to the scenario.

Questions from multiple lessons

22. B

23. a. [If somebody gets into a car crash, they might form a negative attitude afterwards that cars are dangerous.[1]]

		I have provided an example of a historical experience leading to the development of an attitude.[1]

b. [Having an attitude that cars are dangerous could lead an individual to be predisposed to perceive stimuli that confirm that cars are dangerous, and ignore stimuli that challenge their attitude due to being seen as less relevant.[1]][For example, someone who has been in a car crash might perceive visual stimuli relating to dangerous drivers as being more salient, such as cars that are speeding, and perceive stimuli representing safety as being less salient, such as drivers perfectly following the road rules, less saliently.[2]]

		I have suggested how this attitude could guide an individual's perceptual set.[1]
		I have provided an example where this perceptual set can influence visual perception.[2]

24. [During selection, Rohan's feature detectors may cause certain visual features or stimuli to be attended to or ignored, depending on his predisposition.[1]][This can be influenced by perceptual set, as if Rohan is predisposed to perceive certain features of visual stimuli, during selection he will typically filter and choose these stimuli.[2]] [Rohan's perceptual set is influenced by the historical experience of falling off of his bike, so during selection, he might preferentially select visual stimuli that signal a slippery part of a bike path.[3]]

✓	✗	I have explained the selection stage of visual perception.[1]
✓	✗	I have explained how selection interacts with perceptual set.[2]
✓	✗	I have explained an example of how Rohan falling off his bike could influence his perceptual set, and how this could further influence the stimuli he selects.[3]
✓	✗	I have referred to the character's name (Rohan) in my response, and to the scenario.

8D Gustatory perception

Theory review

1. A. True. *Gustatory perception involves the interaction of biological, psychological, and social factors, as they tend not to act in isolation.*

2. B. *The number of sensory receptors on a person's tongue is biologically determined by genetics or other bodily functions, such as age or illness, that have led to their decline. Food colour or familiarity interacts with perceptual set, as a psychological factor.*

3. B. False. *The number of taste buds a person has is genetically determined, meaning different people will have the genes for different amounts of taste buds.*

4. I; II; III. *A person's perceptual set for flavour includes all the factors which make them predisposed to perceive flavour in a certain way due to their expectations.*

5. B. Food packaging can influence gustatory perception due to its interactions with factors including **perceptual set** and **cultural norms**. *Expectations due to food packaging may be influenced by historical experiences with certain foods, and cultural norms including those surrounding the social values being advocated on the external packaging.*

Assessment skills

Perfect your phrasing

6. A

Data analysis

7. C   8. B   9. A   10. I

Exam-style

Remember and understand

11. D   12. D

13. [A sense other than taste is vision.[1]] [This can influence gustatory perception through an individual's perceptual set, as if they expect food to taste better or worse based on the way it looks, they might be more likely to perceive its flavour in line with these expectations.[2]]

| ✓ | ✗ | I have identified a sense other than taste.[1] |
| ✓ | ✗ | I have suggested how it can influence gustatory perception by shaping an individual's perceptual set.[2] |

Other acceptable answers include:
- any of the other senses excluding taste (e.g. hearing, smell, touch), with an explanation of how they can influence gustatory perception through shaping their perceptual set.

14. [Age can influence a person's taste perception biologically because as we age, our physiological sensitivity to flavour decreases and this, therefore, changes the amount of flavour we perceive.[1]] [Because of this, we may become less sensitive or fussy when it comes to perceiving different flavours.[2]]

| ✓ | ✗ | I have explained how age is a biological factor that influences taste perception.[1] |
| ✓ | ✗ | I have explained how age may specifically affect the way we perceive flavour.[2] |

Apply and analyse

15. B

16. [A person's culture can socially influence their taste perception by making them more or less likely to tolerate or enjoy certain flavours that they are used to in their culture.[1]] [For example, a person who grew up in Thailand will have grown up with exposure to spicy food[2]] [and therefore will be more likely to perceive spicy food as enjoyable as compared to individuals from cultures that do not use spice often.[3]]

✓	✗	I have explained how culture can act as a social factor which influences taste perception.[1]
✓	✗	I have provided an example of a cultural influence on flavour perception.[2]
✓	✗	I have explained how this example might specifically influence a person's taste perception.[3]

17. [One biological factor is age.[1]] [As the number of gustatory receptors peaks during childhood and declines with age, children are far more sensitive to flavours, such as bitterness than adults.[2]] [A social factor is culture.[3]] [If children grow up in a culture where coffee is only consumed by adults, they may not be used to the bitter flavours but as they grow older and begin to make more of their own decisions, they might feel inclined to try coffee more frequently, leading them to become accustomed to the bitter flavours.[4]]

✓	✗	I have identified age as a biological factor.[1]
✓	✗	I have explained how this could lead to children disliking coffee, and then liking it more as adults, as the number of gustatory receptors decreases with age.[2]
✓	✗	I have identified culture as a social factor.[3]
✓	✗	I have explained how culture could lead children to dislike coffee, and then as adults grow to like it more, where there is a cultural norm for adults to drink coffee.[4]

18. a. [Jemma and Davide might have different preferences for coriander as a result of their distinct historical experiences influencing their future expectations of flavours, as a psychological factor.[1]]

✓ ✗ I have provided a reason why Jemma and Davide might perceive the flavour of coriander differently, with reference to a biological, psychological, or social factor influencing gustatory perception.[1]

✓ ✗ I have referred to the characters' names (Jemma and Davide) in my response and to the scenario.

Other acceptable answers include:

- any other relevant biological factor, including differences in sensitivity to certain flavours due to different amounts of taste buds between Jemma and Davide (either genetically or as a result of one being older than the other).
- any other relevant psychological factor, including the packaging or appearance of the food they typically find coriander to be an ingredient in.
- any other relevant social factor, including cultural differences in the types of flavours that are usually in the foods Jemma and Davide eat, or differences in the foods they ate when growing up.

b. [If the pastry is more angular it is more likely to be perceived as savoury.[1]][If the pastry is also a golden brown colour, it is more likely to be perceived as well-baked. It will therefore be more enjoyed by Jemma due to interactions between her perceptual set and expectations for what a tasty pastry looks like.[2]]

✓ ✗ I have identified angular or cornered shapes as being perceived as more savoury and less sweet.[1]

✓ ✗ I have identified a colour that interacts with Jemma's perceptual set for what an enjoyable pastry looks like.[2]

✓ ✗ I have referred to the character's name (Jemma) in my response, and to the scenario.

c. [Cultural norms can include the foods that people typically eat, such as whether food is spicy or not.[1]][Jemma might have come from a culture where spicy food is not usually consumed, leading her to not enjoy it as she is not used to it.[2]]

✓ ✗ I have explained that cultural norms can include the foods people typically eat.[1]

✓ ✗ I have explained that Jemma's culture may not typically involve spicy foods, leading her to not be used to this flavour and be less likely to enjoy it.[2]

✓ ✗ I have referred to the character's name (Jemma) in my response, and to the scenario.

Evaluate

19. [As the taste testers are supertasters, they will experience different gustatory sensations than the general population, due to their greater number of gustatory receptors.[1]][This means that the general population is unlikely to share the taste tester's opinion of the menu item's flavour and enjoyability,[2]][as they may not perceive the foods with as much sensitivity as a supertaster.[3]]

✓ ✗ I have explained that supertasters experience different gustatory sensations from the general population.[1]

✓ ✗ I have evaluated whether I believe the opinion of the taste testers is likely to be shared by the rest of the population.[2]

✓ ✗ I have justified my statement.[3]

Other acceptable answers include:

- an evaluation that the general population will share the opinion of these taste testers, for example, if the opinion is regarding whether the food tastes fresh or looks appetising. This may be explained with reference to these opinions not depending upon flavour intensity, which would be the only identifiable difference due to different numbers of gustatory receptors.

Questions from multiple lessons

20. [Nature could be represented by Liam's genetics as a biological factor.[1]][leading him to dislike lots of foods if he has a genetic preference for only a few foods.[2]][Nurture could be represented by Liam's perceptual set as a psychological factor,[3]][where he may have had a bad experience with lots of foods leading him to expect the same bad experiences with many foods in the future.[4]]

✓ ✗ I have suggested a biological factor as a source of nature.[1]

✓ ✗ I have explained how the biological factor plays a role in Liam being a picky eater.[2]

✓ ✗ I have suggested a psychological or social factor as a source of nurture.[3]

✓ ✗ I have explained how this psychological or social factor could play a role in Liam being a picky eater.[4]

✓ ✗ I have referred to the character's name (Liam) in my response, and to the scenario.

Chapter 8 review

Multiple choice

1. B   **2.** C   **3.** D   **4.** C

5. A

Short answer

6. [Historical experiences can cause a person to expect the same experiences to happen in the future.[1]][Selective attention involves filtering out irrelevant stimulus information and attending to relevant information.[2]][If someone expects to see something based on their historical experiences, they might selectively attend to visual stimuli that align with their expectations and ignore visual stimuli that do not align with their expectations.[3]]

✓ ✗ I have explained historical experiences.[1]

✓ ✗ I have explained the role of selective attention.[2]

✓ ✗ I have explained how they interact to influence an individual's visual perception.[3]

7. [An example of top-down processing in gustatory perception is the influence of the food's appearance.[1]][This is because the way the food looks may cause people to expect it to taste a certain way, based on their prior understandings of what food should appear like.[2]][An example of bottom-up processing is the perception of flavour intensity as a result of the number of taste buds an individual has.[3]][If they have more taste buds, they should have a greater amount of gustatory receptors, and perceive things as more flavoursome due to this heightened reception.[4]]

- ✓ ✗ I have identified an example of top-down processing in gustatory perception.[1]
- ✓ ✗ I have explained my example.[2]
- ✓ ✗ I have identified an example of bottom-up processing in gustatory perception.[3]
- ✓ ✗ I have explained my example.[4]

8. [If Joe is engaged in divided attention, he may be able to successfully apply the Gestalt principles when one of his tasks involves visually searching a room for his phone.[1]][Gestalt principles are applied automatically and immediately, typically without us even realising.[2]][As using divided attention to multitask is easier when one of the tasks is automatic, Joe is, therefore, likely to apply Gestalt principles without much difficulty.[3]]

- ✓ ✗ I have stated that Joe may be able to successfully apply the Gestalt principles while multitasking.[1]
- ✓ ✗ I have explained that Gestalt principles are applied automatically.[2]
- ✓ ✗ I have justified my answer with reference to multitasking.[3]
- ✓ ✗ I have referred to the character's name (Joe) in my response, and to the scenario.

9. [A person's perceptual set is a predisposition to perceive certain features of sensory stimuli and ignore other features of the stimulus that are deemed irrelevant,[1]][whereas their schemas are their collection of basic knowledge about a concept or stimuli.[2]]

- ✓ ✗ I have outlined perceptual set.[1]
- ✓ ✗ I have outlined schemas.[2]
- ✓ ✗ I have used comparison words, such as 'whereas'.

10. [Selection involves attending to certain sensory stimuli, or features of stimuli and ignoring others, based on their relevance.[1]][Selection, therefore, is related to attention through determining where our attention is directed.[2]][Without selection, it would be relatively impossible to pay attention to anything as there would be no filtering out of the irrelevant stimuli, and we would constantly have our attention interrupted by lots of other sensory stimuli.[3]]

- ✓ ✗ I have described the perceptual stage of selection.[1]
- ✓ ✗ I have explained how it relates to attention.[2]
- ✓ ✗ I have suggested an outcome for our ability to pay attention if the stage of selection was removed.[3]

11. Students needed to display that they had a thorough understanding of the question by demonstrating:

- an effectively structured response
- that all parts of the question had been addressed
- that psychological terminology had been used in their answer.

Students will need to discuss the roles and mechanisms of Luca's attention when navigating. Discussion of the following would be awarded marks:

- Identification that Luca was using divided attention when he was driving while trying to navigate and listen to music, which is a form of multitasking.
- Discussion of the effect of distraction on Luca's ability to sustain attention to notice the turn-off sign, with reference to the noises of the road as an external stimulus, and his emotional distress as an internal stimulus, that may have effectively distracted him.
- Explaining that Luca used selective attention when trying to find the nearest town, as his hunger or fear that it was getting dark caused him to prioritise relevant stimuli and ignore others that were not helpful for him to find the town.
- Reference to attentional allocation, either through the predictive principle, or the uncertainty principle, as guiding his selective attention to the various stimuli relevant or salient to his travels.
- An explanation that Luca did not attend to the sign despite it being in his field of vision, because attention is a limited resource and his attentional capacity was already occupied by other more salient stimuli.

Students will need to discuss the role of perception when Luca is processing his environment. Discussion of the following would be awarded marks:

- Discussion of the use of unconscious selection for salient stimuli, such as when Luca was distracted or when he noticed he was hungry.
- Discussion of the use of conscious selection, such as when Luca was attempting to locate specific navigational features.
- The identification of bottom-up perceptual processing being used by Luca. This may include the use of depth cues, such as accommodation as a monocular depth cue, to judge his distance from upcoming turns or landmarks when driving.
- The identification of top-down perceptual processing being used by Luca, such as when he perceived the song as sad due to it reminding him of his historical experience.
- Identification that Luca would have used bottom-up processing for unfamiliar or complex stimuli, and top-down processing for familiar or easy-to-understand stimuli.
- Explanation of the role of Luca's perceptual set, as causing him to expect to perceive his environment in a way that is specific to his context.
- The role of Luca's schemas as an expression of his perceptual set, such as when the steak did not meet his expectations causing him to dislike it.

Students will need to discuss any biological, psychological, and social factors that may have influenced Luca's visual and/or gustatory perception. Discussion of the following would be awarded marks:

- Identification of any biological factors influencing Luca's visual perception, such as the use of Gestalt principles, with further explanation of their effect on what he saw or noticed.
- Discussion of feature detectors filtering through only the relevant visual stimuli during Luca's drive. This may also include that the stimuli deemed relevant would have changed across the day with the changes in context through Luca's perceptual set.

- Identification of any psychological factors influencing Luca's visual perception, such as historical experiences causing him to expect a nearby town to have food and petrol as he may have come across this many times before. Additionally, students may have suggested Luca used visual constancies when driving, with further explanation of their effect on what he saw or noticed.
- Identification of any social factors influencing Luca's visual perception, such as the cultural norms surrounding road signs and other navigational symbols in Australia.
- Identification of any biological factors influencing Luca's gustatory perception, such as the role of genetics in providing his taste buds used to perceive the steak, and their interaction with his sense of smell.
- Identification of any psychological factors influencing Luca's gustatory perception, such as the appearance of the steak, with reference to its colour, and how it caused him to expect it to taste strange due to his schemas and/or perceptual set for what a steak should look like.
- Identification of any social factors influencing Luca's gustatory perception, such as cultural expectations for how a steak should appear and taste in an Australian pub.

9A Errors of sight

Theory review

1. B. False. *Visual perception is fallible, meaning that it is prone to error and therefore not always reliable or accurate.*

2. A. *Most errors in sight occur during perception in which visual information is processed and interpreted.*

3. C. *Errors in visual perception are normal and do not mean that visual perception is always wrong. Visual illusions are often designed to 'trick' our perception and even people with agnosia still experience normal visual perception in many contexts.*

4. II; III; IV. *You can remember that there are three 'sources' for visual illusions: environmental (including social/cultural aspects), biological (within perception only), and psychological.*

5. B. False. *People with agnosia have otherwise normal functioning in their visual perception.*

Assessment skills

Perfect your phrasing

6. B   7. A   8. A

Text analysis

9. C   10. A   11. B   12. C

Exam-style

Remember and understand

13. C   14. A   15. B

16. [One visual illusion is the Müller-Lyer illusion[1]][which occurs when you have two parallel lines. One has an inverted arrowhead and looks longer than the other one with a regular arrowhead even though they are the same length.[2]][One explanation for why this occurs suggests that we automatically apply the arrows to our perception of lines we see in the world such as those in rooms. We therefore misapply depth cues and perceive the outward corners of a building as extending toward us and therefore being closer to us, whereas we perceive the line representing the inward corners of a room as being further away because the corners extend outwards and away from us.[3]]

   ✓ ✗ I have identified one visual illusion.[1]

   ✓ ✗ I have described this visual illusion.[2]

   ✓ ✗ I have provided one explanation for why the illusion might occur.[3]

   Other acceptable answers include:
   - the Ames Room illusion, including a description and explanation of how it works.

Apply and analyse

17. A   18. B

19. [When viewing the drink bottle, Anika would likely be able to see the bottle clearly and be able to recognise its shape and colour.[1]][However, Anika would be unable to identify that the object she is viewing is a drink bottle.[2]]

   ✓ ✗ I have described the abilities Anika would demonstrate.[1]

   ✓ ✗ I have described the difficulties Anika would demonstrate.[2]

   ✓ ✗ I have referred to the character's name (Anika) in my response, and to the scenario.

Evaluate

20. [The process of visual perception is prone to error, this is evident through phenomena, such as visual illusions and individuals with agnosia.[1]][However, this does not mean that visual perception can never be trusted, as experiencing errors are normal for humans.[2]][Therefore, visual perception is a helpful and often reliable process, despite being prone to error.[3]]

   ✓ ✗ I have evaluated visual perception by considering its limitations.[1]

   ✓ ✗ I have evaluated visual perception by considering it's strengths.[2]

   ✓ ✗ I have made a concluding evaluation of visual perception as a process.[3]

Questions from multiple lessons

21. C

22. [A schema is the collection of basic knowledge about a concept or stimuli, that guide interpretation within our perceptual set.[1]][Schemas can be used to explain the Ames room illusion as individuals may have a schema that all rooms have right angles, therefore the shape of the Ames room is likely to be misinterpreted.[2]]

   ✓ ✗ I have outlined what is meant by a schema.[1]

   ✓ ✗ I have explained how schemas may be involved in the Ames room illusion.[2]

9B Errors of taste

Theory review

1. B. False. *Although the process of sensation is physiologically based, gustatory perception is still prone to error and is therefore not always completely reliable.*

2. C. *Supertasters have a greater amount of papillae, which detect taste, therefore they have a lower threshold for taste sensation.*

3. B. *Miraculin interacts with the sweet detecting taste receptors to induce a sweet taste when an acidic environment is created in the mouth, as it ensures the sweet detecting taste receptors are active.*

4. A. *The influences on an individual's judgement of flavour can be remembered through the acronym 'PIT'; Perceptual set, Intensity (of colour), and Texture.*

5. A. True. *Errors or distortions in gustatory perception can be biological (such as supertasters), caused by purposeful manipulation (such as the exposure to miraculin), or could be a result of an individual's previous experience or beliefs (perceptual set).*

Assessment skills

Data analysis

6. A   **7.** C   **8.** D   **9.** B

Exam-style

Remember and understand

10. D   **11.** A   **12.** B

13. [An example of colour intensity influencing flavour perception can be seen in the difference between a bright red strawberry and a slightly pink strawberry.[1]] [In this example, individuals may expect the brighter strawberry to be more ripe and therefore have a better flavour, which may influence their judgement of its flavour.[2]]

   ✓ ✗   I have identified an example of colour intensity influencing flavour perception.[1]

   ✓ ✗   I have explained how the example can influence flavour perception.[2]

Apply and analyse

14. D   **15.** B

16. [A perceptual set is a predisposition to perceive certain sensory stimulus features, and ignore other features of the stimulus deemed irrelevant.[1]] [Perceptual sets can cause perceptual distortions when they cause us to taste something that isn't really there, or cause us to taste something more or less intensely than it truly is in our food.[2]] [For example, if the packaging of food looks expensive, it may be perceived as tasting better or being of better quality than a cheap-looking food, even if in reality they were the same.[3]]

   ✓ ✗   I have described the concept of perceptual set.[1]

   ✓ ✗   I have explained how perceptual set can lead to perceptual distortions in taste.[2]

   ✓ ✗   I have provided an example of a perceptual set leading to a perceptual distortion in taste.[3]

17. [The experience of supertasters is not a perceptual distortion.[1]] [Supertasters experience a difference in their taste due to biological differences, such as their number of papillae and therefore gustatory receptors that alter their detection of taste stimuli during sensation.[2]] [Whereas, perceptual distortions occur when there is an error in the judgement or interpretation of sensory stimuli.[3]]

   ✓ ✗   I have identified that the experience of supertasters is not a perceptual distortion.[1]

   ✓ ✗   I have explained the experience of supertasters as a difference in sensation.[2]

   ✓ ✗   I have explained the difference between perceptual distortions and changes within sensation that occur with supertasters.[3]

Questions from multiple lessons

18. A   **19.** B

20. [Being a supertaster is a biological difference and therefore is attributed to nature,[1]] [whereas, an individual's judgement of flavour being influenced by their perceptual set is attributed to nurture because it is based on their environmental experiences.[2]]

   ✓ ✗   I have discussed supertasters as relating to nature.[1]

   ✓ ✗   I have compared this with the influence of perceptual set on taste as being attributed to nurture.[2]

   ✓ ✗   I have used comparison words, such as 'whereas'.

9C Perceptual distortions

Theory review

1. B. False. *Perceptual distortions are a normal experience for individuals with healthy, functioning brains.*

2. A. *Perceptual distortions occur during the process of perception, not the process of sensation. A damaged pupil refers to sensation as it involves the eye during the detection of visual information.*

3. B. False. *During synaesthesia, one sensory system detects sensory information and another integrates perceptual information without detecting sensory stimuli.*

4. A. Individuals with spatial neglect fail to **perceive** sensory information located within one side of space. *Individuals with spatial neglect have normal visual abilities and instead, their differences are in their perception of visual stimuli.*

5. C. *Spatial neglect is not genetically inherited and does not involve intellectual issues.*

Assessment skills

Data analysis

6. B   **7.** C   **8.** C   **9.** C

Exam-style

Remember and understand

10. A   **11.** B   **12.** D   **13.** D

14. [Spatial neglect occurs contralaterally, which means that the hemisphere of the brain that is damaged creates a visual deficit in the field of vision that is opposite to that side of the brain.[1]]

   ✓ ✗   I have explained what is meant by spatial neglect occurring contralaterally.[1]

15. [One explanation the occurrence of synaesthesia is that synaesthetes experience a different amount of synaptic pruning to a non-synaesthete.[1]] [This means that synaesthetes are proposed to have a lower level of synaptic pruning, which leaves unpruned connections to activate in an unusual way.[2]]

Other acceptable answers include:

- discussion of other explanations for synaesthesia, such as a sensitivity to neural associations or synaesthetes having a structurally unique brain.

Apply and analyse

16. A　　　　**17.** B

18. [Drew's family may have also noticed that she bumps into objects that are in her left visual field.[1]][It is often common for the family of individuals with spatial neglect to notice the condition before the patient does as because it is a perceptual distortion, the patient is often unable to recognise that their perception differs from reality.[2]]

19. [Synaesthesia and spatial neglect both cause those with the conditions to experience perceptual distortions.[1]][However, synaesthesia is a condition that involves multiple sensory systems, whereas spatial neglect only involves the one sensory system of vision.[2]]

Questions from multiple lessons

20. [Daryl is not displaying atypical behaviour[1]][as he has been experiencing spatial neglect for 10 years, this behaviour is in line with how he would usually behave and is therefore typical for him.[2]]

21. [Spatial neglect can be attributed to nurture[1]][as it is a condition that results from environmental influences, such as brain damage.[2]] [Synaesthesia can be attributed to nature[3]][as it is an innate genetic condition, meaning that individuals are born with it.[4]]

Chapter 9 review

Multiple choice

1. C　　　　**2.** D　　　　**3.** A　　　　**4.** B

5. C

Short answer

6. [Individuals with apperceptive and associative visual agnosia both experience a difficulty in identifying or categorising objects.[1]] [However, individuals with apperceptive agnosia cannot identify objects due to difficulties in perceiving visual elements of an object, whereas individuals with associative agnosia cannot identify objects due to an inability to link prior experience to the object they are viewing.[2]]

7. [Visual illusions can be considered to be a perceptual distortion[1]] [as they do not involve any alterations to the physiological way in which sensory information is received, and instead they lead to errors in the judgement of sensory information during perception.[2]]

8. [A food's texture can influence the intensity of flavour of a food because the texture of food determines how much of it is received by gustatory receptors and how long it stays in the mouth.[1]] [This is therefore not a perceptual distortion as the changes in flavour intensity are a result of physiological mechanisms in the detection of sensory information.[2]][Whereas, the influence of texture on the enjoyment of food is a perceptual distortion[3]][as this enjoyment is often informed by our expectations of how said food should feel and our past experiences with specific food items.[4]]

✓ ✗ I have outlined how the texture of food can influence flavour intensity.[1]

✓ ✗ I have outlined that the influence of texture on flavour intensity is not a perceptual distortion.[2]

✓ ✗ I have outlined that the influence of texture on flavour enjoyment is a perceptual distortion.[3]

✓ ✗ I have outlined how the texture of food can influence the enjoyment of flavour.[4]

✓ ✗ I have used comparison words, such as 'whereas'.

9. [One characteristic of synaesthesia is that it is a one-way process.[1]] [This means that if taste is activated as a secondary sensory system when sight is activated, then sight will not act as a secondary sensory system when taste is activated.[2]] [For example, if an individual tastes garlic when they see the colour blue, they will not perceive the colour blue whilst eating garlic.[3]] [Another characteristic of synaesthesia is that it is consistent.[4]] [This means that an individual will continue to experience the same associations between senses.[5]] [For example, if an individual perceives the number 1 as being pink, they will always associate it with the same pink colour.[6]]

✓ ✗ I have outlined one characteristic of synaesthesia.[1]

✓ ✗ I have explained the characteristic.[2]

✓ ✗ I have provided an example of the characteristic.[3]

✓ ✗ I have identified another characteristic of synaesthesia.[4]

✓ ✗ I have explained the characteristic.[5]

✓ ✗ I have provided an example of the characteristic.[6]

10. Students needed to display that they had a thorough understanding of the question by demonstrating:

- an effectively structured response
- that all parts of the question had been addressed
- that psychological terminology had been used in their answer.

In relation to the experimental design, sampling method, and variables used in the investigation, discussion of the following would be awarded marks:

- Identification of the independent variable as experiencing either spatial neglect or visual agnosia, and identification of the dependent variable as visual perception.
- Identification and explanation of convenience sampling, which is the sampling method used by Dr Levine.
- Identification and explanation of a between-subjects design, as the experimental research design used by Dr Levine.

In relation to the likely results of this research study and possible conclusions that may be drawn, discussion of the following would be awarded marks:

- That both groups would likely have otherwise normally functioning senses.
- That the spatial neglect group would have difficulty in attending to the side of their visual field that is contralateral to the hemisphere in which the lesion occurred, whereas the visual agnosia group would not.

- That the visual agnosia group would have difficulty in identifying objects, whereas the spatial neglect group would not.

In relation to the limitations of this research study and how they may be overcome, discussion of the following would be awarded marks:

- The extremely small sample size of six people, as it reduces the generalisability of results to the general population. This limitation may be overcome by increasing the sample size so that the sample is more representative of the population.
- The use of convenience sampling, as this means the results can't be generalised to the population as the sample does not represent the population. This limitation may be overcome by choosing a different sampling method, such as stratified sampling, where the sample represents the proportions of certain characteristics in the population.
- Identification of possible extraneous variables, such as individual participant differences between conditions, and how these may be controlled for.

Unit 2 AOS 2 review

SAC assessment 1

1. a. [The aim of the study was to determine whether age influences gustatory perception.[1]]

✓ ✗ I have outlined what the aim of the study was.[1]

b. [The independent variable is the age of the participants[1]] [and the dependent variable is the participant's gustatory perception.[2]]

✓ ✗ I have identified the independent variable.[1]

✓ ✗ I have identified the dependent variable.[2]

Other acceptable answers include:

- the variables being written as operationalised or not.

c. [It is hypothesised that younger individuals[1]] [will demonstrate more[2]] [accurate gustatory perceptions than older individuals.[3]]

✓ ✗ I have included the independent variable.[1]

✓ ✗ I have stated a direction (predicted effect of the IV on the DV) for my hypothesis.[2]

✓ ✗ I have included the dependent variable.[3]

2. [Dr Sinclair utilised the method of convenience sampling.[1]] [Convenience sampling can be beneficial as it is quicker and less complex than other methods.[2]] [However, by using convenience sampling, it is unlikely that Dr Sinclair's sample will be representative of the population.[3]] [Instead, Dr Sinclair could have used stratified sampling, which involves dividing the population into strata, and ensuring that the sample taken from each stratum is representative of the population.[4]] [This method would better allow Dr Sinclair to be able to generalise her results to the population.[5]]

|		
✓	✗	I have identified the sampling method used.[1]
✓	✗	I have evaluated the sampling method by considering its strengths.[2]
✓	✗	I have evaluated the sampling method by considering its limitations.[3]
✓	✗	I have made a recommendation on how to improve the sampling method.[4]
✓	✗	I have justified my recommendation.[5]
✓	✗	I have referred to the character's name (Dr Sinclair) in my response, and to the scenario.

3.

Accuracy of taste perception based on age
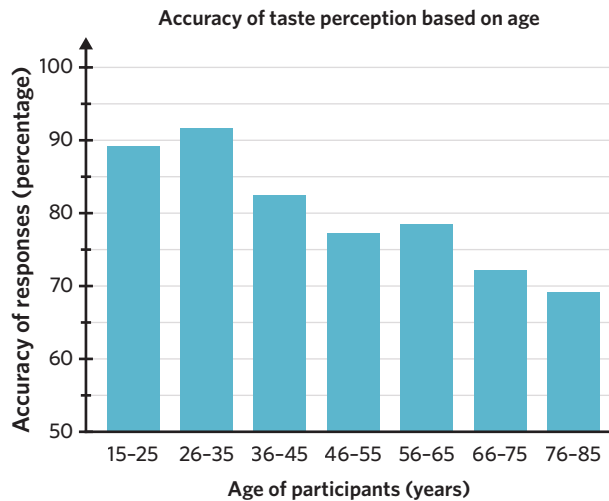
✓	✗	I have added a relevant title to the graph.
✓	✗	I have labelled the x-axis in relation to the independent variable.
✓	✗	I have labelled the y-axis in relation to the dependent variable.
✓	✗	I have correctly mapped the data on the graph.

4. a. [Dr Sinclair's study is a correlational study because she does not manipulate any variables of the study, and is, instead, observing a relationship between the variables.[1]] [Correlational studies are beneficial in that there is no manipulation of variables required,[2]] [however, the results of correlational studies cannot prove causation.[3]] [Therefore, correlational studies are useful in providing ideas for future research, but are not appropriate when studying a cause and effect relationship.[4]]

✓	✗	I have justified why the investigation is correlational.[1]
✓	✗	I have evaluated correlational studies by considering their strengths.[2]
✓	✗	I have evaluated correlational studies by considering their limitations.[3]
✓	✗	I have made a concluding evaluation of the investigation methodology.[4]
✓	✗	I have referred to the character's name (Dr Sinclair) in my response, and to the scenario.

b. [The hypothesis that younger participants would demonstrate more accurate gustatory perceptions than older participants was supported by the results.[1]] [In terms of biological influences on taste that support this, it has been previously stated that the number of taste buds an individual has declines with age.[2]]

✓	✗	I have stated that the hypothesis was supported.[1]
✓	✗	I have provided a biological influence on taste that supports the results.[2]

Other acceptable answers include:

- the papillae on the tongue becoming less sensitive to the chemicals in food responsible for taste perception with age.
- an age-related decline in other senses that contribute to taste perception.

5. a. [Schemas are the collection of basic knowledge about a concept or stimuli.[1]] [The influence of schemas on perception is an example of top-down processing, in which perception is driven by prior knowledge and expectations.[2]] [This may have influenced the results of the study as participants may have a schema that clear liquids are tasteless, therefore this expectation may have driven their perception and made them less likely to detect the sugar.[3]]

✓	✗	I have explained what is meant by a schema.[1]
✓	✗	I have described the relationship between schemas and top-down processing.[2]
✓	✗	I have explained how schemas may have impacted the results of the study.[3]

b. [An individual's culture can influence their perception and enjoyment of flavour.[1]] [This may have impacted the results of the study, as participants who come from a culture that traditionally eats a lot of sweet foods may be less likely to recognise the trace amounts of sugar in the water as opposed to those whose culture traditionally does not consume a lot of sugar.[2]]

✓	✗	I have outlined that culture can influence taste perception.[1]
✓	✗	I have explained how this may have impacted the results of the study.[2]

6. [Fallibility refers to the quality of being prone to error or experiencing difficulties in judgement.[1]] [In terms of biological influences, the fallibility of gustatory perception can be demonstrated through the instance of supertasters, as their increased number of taste buds alters their taste perception.[2]] [Whereas, a biological influence that demonstrates the fallibility of visual perception is visual agnosia, in which damage to the brain disrupts the process of visual perception in sufferers.[3]] [A non-biological example of the fallibility of gustatory perception is the influence of one's perceptual set, which refers to the errors in taste perception that arise from one's expectations or previous experiences.[4]] [Whereas, a non-biological example of the fallibility of visual perception is the Müller-Lyer illusion, which is a visual illusion in which an individual's perception is altered by psychological and social factors.[5]] [Therefore, these examples demonstrate that both visual and gustatory perception are prone to errors and are, therefore, fallible.[6]]

✓ ✗ I have explained the notion of fallibility.[1]

✓ ✗ I have outlined a biological instance of the fallibility of gustatory perception.[2]

✓ ✗ I have outlined a biological instance of the fallibility of visual perception.[3]

✓ ✗ I have outlined a non-biological instance of the fallibility of gustatory perception.[4]

✓ ✗ I have outlined a non-biological instance of the fallibility of visual perception.[5]

✓ ✗ I have made a concluding statement about the fallibility of visual and gustatory perception.[6]

7. a. [In terms of vision, the first process of perception is selection, in which feature detectors select and filter out visual signals according to certain perceptually important features.[1]] [Following this, during organisation, the visual signals are regrouped and organised to reflect an accurate image of reality.[2]] [Finally, during interpretation, the primary visual cortex works with other brain areas to interpret and make sense of the visual stimuli.[3]] [In terms of taste, there is less known about the process of perception as compared to the process of perception for vision.[4]] [However, we do know that the first step involves the sensory regions of the cerebral cortex processing the incoming sensory information.[5]] [Secondly, different types of processed sensory information are combined to inform taste perception.[6]]

✓ ✗ I have explained the first step of visual perception, selection.[1]

✓ ✗ I have explained the second step of visual perception, organisation.[2]

✓ ✗ I have explained the third step of visual perception, interpretation.[3]

✓ ✗ I have compared the difference in information between the process of perception in vision and taste.[4]

✓ ✗ I have explained the first step of taste perception.[5]

✓ ✗ I have explained the second step of taste perception.[6]

b. [One way that the senses of taste and vision may overlap is in the experience of synaesthesia.[1]] [Synaesthesia is characterised by the experience of unusual perceptions in one sensory system after another sensory system has been activated. This may involve the sense of taste being activated when certain words are viewed.[2]]

✓ ✗ I have identified one way in which gustatory and visual perception may overlap.[1]

✓ ✗ I have explained this example.[2]

Other acceptable answers include:

- the colour intensity of a food influencing an individual's judgement of flavours.

Unit 2 AOS 2 review

SAC assessment 2

1. a. [This task would likely negatively impact the duration of one's sustained attention.[1]] [This is because sustained attention is more difficult to maintain when a task is intellectually easy, such as reciting the alphabet.[2]]

✓ ✗ I have outlined the task's impact on the duration of sustained attention.[1]

✓ ✗ I have justified my response.[2]

b. [One possible distraction for this investigation could be the noise made by other students in the classroom.[1]] [This could be minimised by ensuring that the experiment follows standardised procedures, such as being done in a private classroom.[2]]

✓ ✗ I have identified a possible distraction.[1]

✓ ✗ I have suggested a change to the experimental design.[2]

2. a. [Attention refers to actively focusing on particular information while simultaneously ignoring other information.[1]] [Whereas, perception refers to the process of selecting, organising, and interpreting sensory information.[2]]

✓ ✗ I have outlined what is meant by attention.[1]

✓ ✗ I have outlined what is meant by perception.[2]

✓ ✗ I have used comparison words, such as 'whereas'.

b. [In order to be able to count the number of letters or digits recorded, the visual sensory stimuli would first be selected, allowing the brain to only tend to salient sensory features, such as the letters or digits.[1]] [Then, the selected sensory information would be organised so they are able to be interpreted.[2]] [Finally, during interpretation, the individual would be able to make sense of the information and consciously be able to see and to count the letters or digits recorded.[3]]

✓ ✗ I have explained the first step of perception.[1]

✓ ✗ I have explained the second step of perception.[2]

✓ ✗ I have explained the final step of perception.[3]

c. [The primary visual cortex is associated with the final stage of visual perception.[1]]

✓ ✗ I have identified the area of the brain that is associated with the final stage of visual perception.[1]

3. [The data being collected can be considered to be primary data.[1]] [Primary data is data that is collected first-hand by the researcher.[2]] [The data can also be considered to be subjective data,[3]] [as it is informed by personal opinion, perception, or interpretation.[4]]

✓ ✗ I have identified one way that the data can be categorised.[1]

✓ ✗ I have described this categorisation.[2]

✓ ✗ I have identified another way that the data can be categorised.[3]

✓ ✗ I have described this categorisation.[4]

Other acceptable answers include:

- discussion of the data being quantitative.

4. a. [When the senses of smell and taste are combined, the primary gustatory cortex[1]][will work with the olfactory cortex.[2]]

✓ ✗ I have identified one area of the brain that is used during this process.[1]

✓ ✗ I have identified another area of the brain that is used during this process.[2]

b. [The primary somatosensory cortex provides information about the texture of food, which is integrated by the primary gustatory cortex in order to influence flavour perception.[1]]

✓ ✗ I have outlined the role of the somatosensory cortex in flavour perception.[1]

5. [Whilst eating a jelly bean normally, it is likely that top-down processing would occur[1]][as the colour of the jelly bean, and our past experiences of that colour would inform our perception of its flavour.[2]][Whereas, whilst completing part two of the investigation, it is likely that bottom-up processing would occur.[3]][This is because without the sense of sight, our perception would likely stem from the sensory information being detected by our taste receptors, rather than any expectation or previous experience.[4]]

✓ ✗ I have identified the type of processing used when eating a jelly bean normally.[1]

✓ ✗ I have explained this type of processing.[2]

✓ ✗ I have identified the type of processing used during part two of the investigation.[3]

✓ ✗ I have explained this type of processing.[4]

6. a. [When viewing the Müller-Lyer illusion, prior to perception, the visual stimuli would be received by the eye in the form of light.[1]][Then, that light would be received by receptors in the retina[2]][where the light would then be converted into a neural message.[3]][This neural message would then be sent to the brain so that perception can begin.[4]]

✓ ✗ I have described the first stage of this physiological process.[1]

✓ ✗ I have described the second stage of this physiological process.[2]

✓ ✗ I have described the third stage of this physiological process.[3]

✓ ✗ I have described the final stage of this physiological process.[4]

b. [When viewing the Müller-Lyer illusion, the fallibility of the process of vision occurs during perception.[1]][This is evident as the Müller-Lyer illusion does not occur due to any physiological deficits, but instead manipulates cues that alter our interpretation of visual information.[2]]

✓ ✗ I have identified the stage of the visual process in which the fallibility occurs.[1]

✓ ✗ I have justified my response.[2]

7. a. [The Ames room illusion relies on monocular depth cues as it is viewed through a peephole using only one eye.[1]]

✓ ✗ I have identified the Ames room illusion as being dependent on monocular depth cues.[1]

b. [The deceptive shape of the Ames room means that even though we can see a person inside of the room 'shrinking', we are unable to identify their change in distance and are, therefore, unable to apply size constancy.[1]][Similarly, individuals are likely to misuse shape constancy when viewing the Ames room and assume that it is maintaining a constant rectangular shape, as they are unaware that it is a trapezoid.[2]]

✓ ✗ I have explained how one visual constancy impacts the Ames room illusion.[1]

✓ ✗ I have explained how another visual constancy impacts the Ames room illusion.[2]

8. [Counting the number of papillae that an individual has would require sustained attention[1]][as it requires the counter to focus on one stimulus for a prolonged period of time in order to complete the count.[2]]

✓ ✗ I have identified the type of attention used.[1]

✓ ✗ I have justified my response.[2]

9. a. [Prior to sensation, our saliva breaks our food down into tastants, which are chemical molecules that can be tasted.[1]][Following this, the tastants are received by the gustatory receptors which are located in the taste buds within the papillae.[2]][Finally, the tastants are converted into a neural impulse that is sent to the brain to begin the process of perception.[3]]

✓ ✗ I have explained the first stage of sensation in taste.[1]

✓ ✗ I have explained the second stage of sensation in taste.[2]

✓ ✗ I have explained the final stage of sensation in taste.[3]

b. [The experience of a supertaster first differs when the tastants in food are received by the gustatory receptors in the taste buds, supertasters have a higher number of these and therefore, experience a greater level of incoming sensory information.[1]]

✓ ✗ I have outlined the stage of the process in which the experience of a supertaster first differs.[1]

10. a. [This type of study would be classified as a correlational study.[1]] [This is because the variables of gender and supertaster status are not being manipulated, but are instead being measured in order to investigate if there is a correlational relationship between the variables.[2]]

✓ ✗   I have outlined the type of study.[1]

✓ ✗   I have explained my response.[2]

b. [One other individual difference that can influence taste perception is culture, as one's culture often influences the types of foods that are considered enjoyable and the ability to detect certain flavours.[1]] [For example, someone from a culture that incorporates large quantities of spice in their food would likely be less susceptible to spiciness in food as compared to an individual from a culture that rarely uses spice in foods.[2]]

✓ ✗   I have explained another individual difference that can influence taste perception.[1]

✓ ✗   I have used an example.[2]

GLOSSARY

A

Ablation the surgical removal, destruction, or cutting of a region of brain tissue p. 191

Abnormality the state of deviating from the norm, usually in a way that is undesirable p. 144

Accuracy how close a measurement is to the true value of the quantity being measured p. 60

Acquired brain injury all types of brain injury that occur after birth p. 238

Actor-observer bias the tendency to attribute our own actions to external factors and situational causes while attributing other people's actions to internal factors p. 306

Adaptive plasticity the brain's ability to restore adequate neural functioning over time after sustaining injury p. 232

Adaptive being able to adjust to the environment appropriately and function effectively p. 147

Addictive behaviours behaviours that are associated with a dependence upon a particular stimulus, despite negative consequences p. 366

Affect heuristic an information-processing strategy that involves using emotions to make a judgement or decision p. 316

Affective component our emotions and intuitive feelings towards something, reflected in our attitude p. 297

Agnosia a disorder involving the loss or impairment of the ability to recognise familiar stimuli through the use of one or more senses, despite the senses functioning normally otherwise p. 449

Aim a statement outlining the purpose of an investigation p. 6

Allocation the process of assigning participants to experimental conditions or groups p. 33

Anchoring (adjustment) heuristic an information-processing strategy that involves forming judgements based on the first information received about an idea or concept p. 314

Anti-conformity a deliberate refusal to comply with social norms or standards for thoughts, feelings, or behaviours p. 375

Attachment a long-lasting emotional bond between two individuals p. 110

Attention-deficit/hyperactivity disorder (ADHD) a neurological condition characterised by persistent inattention or hyperactivity that disrupts social, academic, or occupational functioning p. 157

Attention actively focusing on particular information while simultaneously ignoring other information p. 394

Attitude an evaluation of something, such as a person, object, event, or idea p. 295

Attribution an evaluation made about the causes of behaviour and the process of making this evaluation p. 293

Attributional style tendencies and repeated patterns in the way someone makes attributions p. 294

Atypical behaviour an activity that is unusual or unnatural according to how an individual usually behaves p. 134

Autism spectrum disorder (ASD) a neurodevelopmental condition characterised by impaired social interactions, verbal and non-verbal communication difficulties, narrow interests, and repetitive behaviour p. 156

Autonomy (in relation to self-determination theory) the need to be able to act authentically, based on individual choice and intrinsic motivation p. 373

Availability heuristic an information-processing strategy that enables individuals to form a judgement, solve a problem, or make a decision based on information that is easily accessible p. 314

B

Bar chart a graph displaying the relationship between at least two variables using rectangular bars with heights or lengths proportional to the values they represent p. 53

Base-rate fallacy a type of bias in which decisions, social perceptions, and judgements are influenced more by vivid memories and experiences than statistical fact p. 313

Behavioural component our outward and observable actions that reflect our point of view about something p. 297

Beneficence the commitment to maximising benefits and minimising the risks and harms involved in taking a particular position or course of action p. 71

Between-subjects design (also known as independent-groups design or between-groups design) an experimental design in which individuals are divided into different groups and complete only one experimental condition p. 22

Binocular depth cues rely on visual information from both eyes p. 418

Biological factors internal genetic and/or physiologically based factors p. 100, 416

Biopsychosocial model a holistic, interdisciplinary framework for understanding the human experience in terms of the influence of biological, psychological, and social factors p. 99

Bottom-up processing perception is determined by incoming sensory stimuli, moving from specific stimulus information to general knowledge p. 407

Brain lesioning the practice of inducing and/or studying the effects of damage to an area of the brain p. 191

Brain trauma damage to the brain that is caused by an external force p. 231

Brain versus heart debate a historical debate as to whether the heart or the brain is responsible for mental processes, such as thought, emotion, and behaviour p. 189

Brain a complex organ contained within the skull that coordinates mental processes and behaviour, and regulates bodily activity p. 200

Brainstem an extension of the spinal cord that is made up of the medulla, pons, and midbrain p. 201

C

Case study an in-depth investigation of an individual, group, or particular phenomenon (activity, behaviour, event, or problem) that contains a real or hypothetical situation and includes the complexities that would be encountered in the real world p. 16

Cerebral cortex the outer layer of the cerebrum that covers the brain p. 210

Cerebral hemispheres the symmetrical halves of the cerebrum in the brain p. 193

Chronic traumatic encephalopathy (CTE) a progressive and fatal brain disease associated with repeated head injuries and concussions p. 255

Classification the arrangement of phenomena, objects, or events into manageable sets p. 18

Cognitive biases unconscious, systematic tendencies to interpret information in a way that is neither rational nor based on objective reality p. 305

Cognitive component our thoughts and beliefs towards something p. 297

Cognitive development the continuous, lifelong development of the ability to think, comprehend, and organise information from the internal and external environment p. 112

Cognitive dissonance the psychological tension that occurs when our thoughts, feelings, and/or behaviours do not align with one another p. 304

Collectivist culture a culture that prioritises the needs and goals of groups p. 339

Competence (in relation to self-determination theory) the need to feel as though you have the skills required to meaningfully carry out behaviours that affect your environment p. 373

Computerised tomography (CT) a neuroimaging technique that involves taking continuous two-dimensional x-ray images of the brain which are then stacked to create a comprehensive three-dimensional image of the brain p. 194

Conclusion a statement that summarises the findings of a study, including whether the hypothesis was supported or rejected p. 64

Concussion a mild traumatic brain injury that temporarily disrupts brain function p. 255

Cones photoreceptors that allow someone to see colour and fine details in well-lit conditions p. 416

Confidentiality the privacy, protection and security of a participant's personal information in terms of personal details and the anonymity of individual results, including the removal of identifying elements p. 73

Confirmation bias the tendency to search for and accept information that supports our prior beliefs or behaviours and ignore contradictory information p. 306

Conformity adjusting one's thoughts, feelings, or behaviours to match those of others, a social group, or a social situation p. 352, 375

Confounding variable a variable that has directly and systematically affected the dependent variable, apart from the independent variable p. 38

Control group the group of participants in an experiment who receive no experimental treatment or intervention in order to serve as a baseline for comparison p. 21

Controlled experiment a type of investigation in which the causal relationship between two variables is tested in a controlled environment; more specifically, the effect of the independent variable on the dependent variable is tested while aiming to control all other variables p. 7, 15

Controlled variables variables other than the IV that a researcher holds constant (controls) in an investigation, to ensure that changes in the DV are solely due to changes in the IV p. 8

Convenience sampling any sampling technique that involves selecting readily available members of the population, rather than using a random or systematic approach p. 31

Correlational study a type of non-experimental study in which researchers observe and measure the relationship between two or more variables without any active control or manipulation of them p. 16

Counterbalancing a method to reduce order effects that involves ordering experimental conditions in a certain way p. 41

Critical periods the narrow, rigid developmental period in which a specific function or skill must be learnt p. 122

Cultural norm a standard, value, or rule that outlines an appropriate behaviour or experience within a culture p. 423

Cultural perspectives the influence of society and community on one's thoughts p. 135

Culturally responsive practices acting in ways that respond to the needs of diverse communities and demonstrating an openness to new ideas that may align with different cultural ideas, beliefs, and values p. 170

Culture the customs, behaviours, and values of a particular group in society p. 339

D

Data information used as part of or generated by an investigation p. 47

Debriefing a procedure that ensures that, at the end of the experiment, the participant leaves understanding the experimental aim, results and conclusions p. 73

Deception the act of intentionally misleading participants about the true nature of a study or procedure p. 73

Deindividuation the tendency for individuals to lose their sense of identity and individuality within a group p. 353

Demand characteristics cues in an experiment that may signal to a participant the intention of the study and influence their behaviour p. 40

Dependent variable (DV) the variable the researcher measures in an experiment for changes it may experience due to the effect of independent variable p. 7

Depth cues visual clues that allow someone to perceive the world in three dimensions and judge the distance and position of objects in their environment p. 418

Descriptive statistics statistics that summarise, organise, and describe data p. 49

Developmental plasticity changes in the brain that occur in response to ageing and maturation p. 230

Deviant subgroups groups that hold values and norms that exist outside the dominant social norms in society p. 376

Discrimination the unjust treatment of people due to their membership within a certain social category p. 322

Distractions internal or external stimuli that draw attention away from the current task p. 395

Divided attention splitting attention across two or more stimuli at one time p. 396

Dopamine a neurotransmitter that is responsible for the coordination of voluntary movement and the experience of pleasure and pain p. 247

Double-blind procedure a procedure in which both participants and the experimenter do not know which conditions or groups participants are allocated to p. 42

Dualism the belief that the human mind and body are separate and distinguishable from one another p. 190

Dyslexia a neurologically based learning difficulty manifested as severe challenges in reading, spelling, writing words, and sometimes in arithmetic p. 158

E

Emotional development the continuous, lifelong development of skills that allow individuals to control, express, and recognise emotions in an appropriate way p. 110

Empirical evidence information obtained through direct and systematic observation or experimentation p. 3

Environmental factors factors that influence development and arise from an individual's physical and social surroundings p. 91

Epilepsy a neurological disorder that is associated with abnormal electrical activity in the brain and is categorised by recurrent seizures p. 247

Ethical concepts the broad, moral guiding principles that people should consider when conducting research, practising psychology, or when analysing a psychological issue or debate p. 71

Ethical guidelines (also known as participants' rights) the procedures and principles used to ensure that participants are safe and respected p. 72

Experimental group the group of participants in an experiment who are exposed to a manipulated independent variable (i.e. a specific intervention) p. 21

Experimenter effect (also known as experimenter bias) when the expectations of the researcher affect the results of an experiment p. 40

External attribution (also known as situational attribution) occurs when we determine the cause of a behaviour as resulting from situational factors occurring outside the individual p. 294

External stimuli information or sensations that originate from outside the body p. 394

External validity the extent to which the results of an investigation can be applied to similar individuals in different settings p. 63

Extraneous variable any variable that is not the independent variable but may cause an unwanted effect on the dependent variable p. 38

Extrinsic motivation engaging in activities or behaviours for their external benefits p. 373

F

Fallibility the quality of being prone to error or experiencing difficulties in judgement p. 446

False-consensus bias the tendency to overestimate the degree to which other people share the same ideas and attitudes as we do p. 307

Feature detectors specialised cells along the neural pathway connecting to, and found within, the primary visual cortex p. 405

Fieldwork any research involving observation and interaction with people and environments in real-world settings, conducted beyond the laboratory p. 18

Forebrain a large and prominent brain region that is located at the top and front of the brain p. 204

Frontal lobe the largest and frontmost lobe of the cerebral cortex that is composed of motor and association areas p. 212

Functional magnetic resonance imaging (fMRI) a neuroimaging technique that uses magnetic and radio fields to take two and three-dimensional images of the brain and record its activity levels p. 195

Fundamental attribution error our tendency to explain other people's behaviour in terms of internal factors, while ignoring possible external factors p. 294

G

Generalisable (also known as generalisability) the ability for a sample's results to be used to make conclusions about the wider research population p. 30

Genetic predisposition the increased likelihood to develop certain traits, including diseases, if certain conditions are met p. 92

Gestalt principles the guiding rules of perception that allow us to organise and group separate visual stimuli into a meaningful whole p. 420

Group shift a condition in which the influence of the group causes an individual to adopt a more extreme position p. 353

Group two or more people who interact and influence each other and share a common objective p. 336

Groupthink a psychological phenomenon in which assumed group unanimity overrules individuals' realistic appraisal of consequences p. 353

Gustatory perception the process of becoming consciously aware of flavour p. 405

Gustatory receptors the sensory receptors for taste p. 405

Gut the long flexible tube from mouth to anus that is the passageway involved in digestion p. 249

Gut-brain axis the bidirectional connection between the gut and the brain through multiple parts of the nervous system p. 249

Gut microbiota all of the microorganisms that live in the gut p. 249

H

Halo effect the tendency for the impression we form about one quality of a person to influence our overall beliefs about the person in other respects p. 307

Hemispheric specialisation the difference in functioning between the left and right hemispheres of the brain when performing a specific behaviour or task p. 193

Hereditary factors factors that influence development and are genetically passed down from biological parents to their offspring p. 91

Heuristics information-processing strategies or 'mental shortcuts' that enable individuals to form judgements, make decisions, and solve problems quickly and efficiently p. 312

Hindbrain a region at the base of the brain, located around and including some of the brainstem p. 201

Historical experiences lived events from the past p. 423

Hypothesis a testable prediction about the outcome of an investigation p. 6

I

Identification a process of recognition of phenomena as belonging to particular sets or possibly being part of a new or unique set p. 18

In-group a group that an individual belongs to or identifies with p. 337

Independence being free from the control or influence of others p. 372

Independent variable (IV) the variable for which quantities are manipulated (controlled, selected, or changed) by the researcher, and the variable that is assumed to have a direct effect on the dependent variable p. 7

Individualist culture a culture that prioritises the needs and goals of individuals and values independence p. 339

Individuation when an individual's identity and contributions to a group are noticeable p. 376

Information access how easily information can be accessed by different people p. 367

Informed consent procedures processes that ensure participants understand the nature and purpose of the experiment, including potential risks (both physical and psychological), before agreeing to participate in the study p. 73

Integrity the commitment to searching for knowledge and understanding, and 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 p. 71

Internal attribution (also known as personal attribution) occurs when we judge behaviour as being caused by something personal within an individual p. 293

Internal stimuli information or sensations that originate from within the body p. 394

Internal validity the extent to which an investigation truly measures or investigates what it claims to p. 63

Interpretation (in relation to perception) the process of understanding and assigning meaning to sensory information p. 403

Intrinsic motivation engaging in activities or behaviours for their internal benefits p. 373

Investigation methodologies (also known as research methodologies) any of the different processes, techniques and/or types of studies researchers use to obtain information about psychological phenomena p. 15

J

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 p. 71

L

Line graph a graph displaying the relationship between at least two variables using a straight line to connect data points p. 54

Literature review the process of collating and analysing secondary data related to other people's scientific findings and/or viewpoints in order to answer a question or provide background information to help explain observed events, or as preparation for an investigation to generate primary data p. 19

M

Machine learning an element of artificial intelligence that allows software to become more accurate at predicting outcomes by mimicking the way that humans learn p. 248

Magnetic resonance imaging (MRI) a neuroimaging technique that uses magnetic and radio fields to take detailed two-dimensional and three-dimensional images of the brain p. 195

Maladaptive behaviour an action that impairs an individual's ability to meet the changing demands of their everyday life p. 136

Maladaptive being unable to adapt to the environment appropriately and function effectively p. 147

Maturation the biologically programmed process of growth that has a fixed sequence and facilitates all aspects of our development as we grow p. 121

Mean a measure of central tendency that describes the numerical average of a data set, expressed as a single value p. 50

Measures of central tendency descriptive statistics that summarise a data set by describing the centre of the distribution of the data set with a single value p. 50

Measures of variability statistics that summarise and describe the spread and distribution of a data set p. 52

Media the forms in which information is communicated and spread throughout society p. 363

Median a measure of central tendency that is the middle value in a data set ordered from lowest to highest p. 51

Mental health organisation a company or group that works to address or advocate for mental health, such as through providing support or specialised services p. 169

Mental health workers members of a mental health treatment team who assist in providing a wide range of services and care for patients with psychological or social problems p. 164

Mental wellbeing an individual's current psychological state, involving their ability to think, process information, and regulate emotions p. 101, 164, 323

Midbrain a region at the centre of the brain, between the hindbrain and forebrain, and is part of the brainstem p. 202

Mind-body problem the complex philosophical question as to whether our mind is separate and distinguishable from our body or whether they are one integrated entity p. 190

Miraculin a type of protein extracted from the 'miracle berry' which alters taste perception in humans p. 456

Mixed design an experimental design which combines elements of within-subjects and between-subjects designs p. 23

Mode a measure of central tendency that is the most frequently occurring value in a data set p. 51

Model a representation of a concept, process, or behaviour, often made to simplify or make something easier to understand p. 5

Modelling 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 know, understand, or simulate the system p. 19

Monism the belief that the human mind and body are together a singular complete entity p. 190

Monocular depth cues rely on visual information perceived by just one eye p. 418

Multitasking the act of working on multiple tasks at one time p. 396

Myelination the formation and development of myelin around the axon of a neuron p. 230

Myopia short-sightedness due to the focal point of one or both eyes being located in front of, instead of on, the retina p. 417

N

Neurodegenerative disease a disease characterised by the progressive loss of neurons in the brain p. 247, 255

Neurodivergent individuals who have a variation in neurological development and functioning p. 153

Neurodiversity variations in neurological development and functioning within and between groups of people, such as those experienced by people with autism p. 145, 153

Neurofibrillary tangles an accumulation of the protein tau that forms insoluble tangles within neurons, which then inhibit the transportation of essential substances and eventually kill the neuron entirely p. 257

Neuroimaging a range of techniques used to capture images of the brain's structure, function, and activities p. 193

Neurological disorders diseases characterised by any damage to or malfunctioning of the nervous system p. 246

Neuron a nerve cell that receives and transmits neural information p. 228

Neuroplasticity the ability of the brain to change in response to experience or environmental stimulation p. 229

Neurotypicality a term used to describe individuals who display neurological and cognitive functioning that is typical or expected p. 145, 153

Non-maleficence (also known as the no-harm principle) the principle of avoiding causing harm p. 72

Non-science ideas formed without empirical evidence or the use of scientific methods or principles p. 3

Non-standardised instructions and procedures when directions and procedures differ across participants or experimental conditions p. 40

Norm a standard, value, or rule that outlines an appropriate behaviour or experience p. 337

Normality the state of having thoughts, feelings, and behaviours that are considered common and acceptable p. 144

O

Obedience complying with commands which are often given by a source of authority p. 346

Objective data factual data that is observed and measured independently of personal opinion p. 48

Occipital lobe the rearmost lobe of the cerebral cortex, located behind the parietal lobe, and is composed of sensory and association areas p. 215

Order effects the tendency for the order in which participants complete experimental conditions to have an effect on their behaviour p. 39

Organisation (in relation to perception) the process of regrouping selected features of sensory stimuli in order to form a cohesive and meaningful understanding p. 403

Out-group a group that individual does not belong to or identify with p. 337

Outlier a value that differs significantly from other values in a data set p. 51

P

Parietal lobe the lobe of the cerebral cortex, located behind the frontal lobe, and is composed of sensory and association areas p. 214

Parkinson's disease a progressive disease of the nervous system characterised by both motor and non-motor symptoms p. 247

Participant-related variables (also known as individual participant differences) characteristics of a study's participants that may affect the results p. 39

Perception the process of selecting, organising, and interpreting sensory information p. 402

Perceptual distortion an error in the judgement or interpretation of sensory stimuli p. 446

Perceptual set a predisposition to perceive certain features of sensory stimuli and ignore other features that are deemed irrelevant p. 422, 432

Person perception the different mental processes used to understand and form impressions of other people p. 292

Personal distress an aversive and often self-oriented emotional reaction p. 136

Photoreceptors the sensory receptors of the eye which receive light and convert this sensory information into a form that can be sent to the brain p. 416

Phrenology the study of the shape and size of the human skull to determine personality and mental functioning p. 190

Placebo effect when participants respond to an inactive substance or treatment as a result of their expectations or beliefs p. 39

Placebo an inactive substance or treatment p. 39

Plasticity the brain's ability to physically change shape in response to experience and learning p. 121

Population (also known as research population) the group of people who are the focus of the research and from which the sample is drawn p. 6, 29

Positron emission tomography (PET) a neuroimaging technique that uses a scanning device to take coloured images of the brain, showing its functional activity by tracing the levels of a radioactive substance in the brain p. 195

Post-mortem examination an assessment of a dead body that occurs to determine the cause of death p. 257

Precision how closely a set of measurement values agree with each other p. 60

Prejudice an often negative preconception held against people within a certain group or social category p. 321

Primary data data collected first-hand by a researcher p. 48

Primary gustatory cortex a sensory area in the parietal lobe responsible for receiving and processing tastes p. 405

Product, process, or system development the 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 p. 19

Pseudoscience beliefs, theories, and practices that are mistakenly regarded as, or claim to be scientific, but are not because they do not use the methods of science p. 3

Psychiatrist a doctor who specialises in the diagnosis, treatment, prevention, and study of mental, behavioural, and personality disorders p. 168

Psychological criteria (in relation to typicality) standards against which a judgement can be made about a person's behaviour and abilities p. 135

Psychological development an individual's changes in functioning across multiple domains, including the lifelong growth across emotional, cognitive, and social domains p. 90, 102, 164

Psychological factors internal factors pertaining to an individual's mental processes, including their cognition, affect, thoughts, beliefs, and attitudes p. 100, 420

Psychologist an individual who is professionally trained in one or more branches or subfields of psychology p. 166

Psychology the scientific study of human mental states and behaviour p. 2, 188

Q

Qualitative data data that is expressed non-numerically p. 48

Quantitative data data that is expressed numerically p. 48

R

Random errors errors in data that are unsystematic and occur due to chance p. 60

Random sampling any sampling technique that uses a procedure to ensure every member of the population has the same chance of being selected p. 31

Range a measure of variability that is a value obtained by subtracting the lowest value in a data set from the highest value p. 52

Reactance a motivational state of distress and resistance, caused by a desire to regain personal freedom after it has been removed or threatened by external sources p. 376

Refractory errors defects in the eye causing it not to bend light as it is supposed to, resulting in reduced visual acuity p. 417

Relatedness (in relation to self-determination theory) the need to feel a sense of attachment, connection to, and belonging with other people p. 373

Repeatability the extent to which successive measurements or studies produce the same results when carried out under identical conditions within a short period of time (e.g. same procedure, observer, instrument, instructions, and setting) p. 62

Representative heuristic an information-processing strategy that involves making a categorical judgement about an idea, event, or person based on their similarity to other items in that category p. 315

Reproducibility the extent to which successive measurements or studies produce the same results when repeated under different conditions (e.g. different participants, time, observer, and/or environmental conditions) p. 62

Rerouting a neuron's ability to form a new connection with another undamaged neuron p. 232

Respect the 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 p. 72

Rods photoreceptors that allow someone to see in low levels of light p. 416

S

Salient distinctive, prominent, or important p. 403

Sample a subset of the research population who participate in a study p. 30

Sampling technique the way a sample is selected from the population for a study p. 31

Schemas the collection of basic knowledge about a concept or stimuli p. 408

Science a field and practice that obtains knowledge and generates theories through observation and experiment p. 2

Secondary data data sourced from others' prior research p. 48

Seizures brief episodes of uncontrolled and unrestricted electrical discharging of neurons in the brain p. 247

Selection the process of attending to certain features of sensory stimuli and excluding others p. 403

Selective attention exclusively focusing attention on a specific stimulus or task while ignoring all other stimuli or tasks p. 396

Self-determination theory the concept that people achieve self-determination when three basic psychological needs are met: autonomy, competence, and relatedness p. 373

Self-determination engaging in behaviours without the influence of other people as an external force p. 373

Self-serving bias the tendency to attribute positive success to our internal character and actions and attribute our failures to external factors or situational causes p. 306

Sensation the process of receiving and detecting raw sensory stimuli via sensory organs and sending this information to the brain p. 402

Sensitive periods the optimal developmental period for a specific function or skill to be learnt in the fastest and easiest way p. 122

Sensory stimuli the raw pieces of information that are detected by the five senses p. 402

Simulation a process of using a model to study the behaviour of a real or theoretical system p. 19

Single-blind procedure a procedure in which participants are unaware of the experimental group or condition they have been allocated to p. 42

Situational variables any environmental factor that may affect the dependent variable p. 40

Social comparison a proposal that humans measure their self-worth in relation to the people around them, playing a significant role in mental wellbeing p. 365

Social connections the network of people available to someone for support and engagement p. 364

Social development the continuous, lifelong development of certain skills, attitudes, relationships, and behaviours that enable an individual to interact with others and to function as a member of society p. 114

Social factors external factors relating to an individual's interactions with others and their external environment, including their relationships and community involvement p. 100

Social identity theory the tendency for people to favour their in-group over an out-group in order to enhance their sense of self-esteem p. 338

Social loafing an individual's reduction in effort when work is performed in a group as compared to individually, due to the belief that others will put in the effort p. 338

Social norms society's unofficial rules and expectations regarding how individuals should act p. 135

Social support (in relation to anti-conformity) when others hold a similar attitude or perspective to an individual p. 376

Spatial neglect an inability to perceive, report, or orient sensory information located within one side of space p. 465

Sprouting a neuron's ability to develop new branches on the dendrites or axons p. 232

Standard deviation a measure of variability, expressed as a value that describes the spread of data around the mean p. 52

Statistical rarity something that lies outside the range of statistical normality and is also unusual enough to be considered significant p. 136

Stereotype a widely held belief and generalisation about a group, such as people, animals or objects p. 299

Stigma the feeling of shame or disgrace experienced by an individual for a characteristic that differentiates them from others p. 323

Stratified sampling any sampling technique that involves selecting people from the population in a way that ensures that its strata (subgroups) are proportionally represented in the sample p. 32

Subjective data data that is informed by personal opinion, perception, or interpretation p. 48

Supertasters individuals who have significantly low thresholds for taste stimuli and an unusually high number of taste buds p. 456

Sustained attention focusing on one stimulus or task across a prolonged, continuous period of time p. 395

Synaesthesia a perceptual phenomenon characterised by the experience of unusual perceptions in one sensory system after another sensory system has been activated p. 462

Synapse the region that includes the axon terminals of the presynaptic neuron, the synaptic gap, and the dendrites of the postsynaptic neuron p. 229

Synaptic pruning the elimination of underused synapses p. 230

Synaptogenesis the formation of synapses between neurons as axon terminals and dendrites grow p. 230

Systematic errors errors in data that differ from the true value by a consistent amount p. 60

T

Table a presentation of data arranged into columns and rows p. 53

Tastants the sensory stimuli received in the form of chemical molecules that can be tasted p. 405

Taste buds clusters of gustatory receptors p. 405

Temporal lobe the lowest lobe of the cerebral cortex, located beneath the parietal lobe, and is composed of sensory and association areas p. 216

The scientific method a procedure used to obtain knowledge that involves hypothesis formulation, testing, and retesting through processes of experimentation, observation, measurement, and recording p. 4

Theory a proposition or set of principles that is used to explain something or make predictions about relationships between concepts p. 5

Top-down processing perception is driven by prior knowledge and expectations, moving from general knowledge to specific stimulus information p. 407

Tri-component model of attitudes a model which illustrates the relationship between the affective, behavioural, and cognitive components of our attitudes p. 296

True value the value, or range of values, that would be found if the quantity could be measured perfectly p. 60

Typical behaviour an activity that is consistent with how an individual usually behaves p. 134

U

Uncertainty the lack of exact knowledge relating to something being measured due to potential sources of variation in knowledge p. 61

V

Validity the extent to which psychological tools and investigations truly support their findings or conclusions p. 63

Variable a condition or component of an experiment that can be measured or manipulated p. 6

Visual acuity the level of detail and clarity of vision p. 416

Visual constancies our ability to perceive visual objects as staying the same, even though they may appear to change or do change in our sensation p. 422

Visual illusion the perception of a visual stimulus that conflicts with how it is in physical reality p. 447

Visual perception principles guiding rules that apply to incoming visual signals and determine how they are organised and interpreted p. 420

Visual perception the process of becoming consciously aware of visual stimuli as a result ofthe process of becoming consciously aware of visual stimuli as a result of the interactions between the visual sensory system, and the individuals internal and external environments p. 404

Visual sensory system the network that is involved in the sensation and perception of visual stimuli, including the eyes, the brain, and the neural pathways connecting them p. 404

Voluntary participation a principle that ensures there is no coercion or pressure put on the participant to partake in an experiment, and they freely choose to be involved p. 74

W

Withdrawal rights the right of participants to be able to discontinue their involvement in an experiment at any time during, or after the conclusion of, an experiment without penalty p. 74

Within-subjects design (also known as repeated measures or within-groups design) an experimental design in which participants complete every experimental condition p. 22

ACKNOWLEDGEMENTS

Images

Figure 8/https://commons.wikimedia.org/wiki/File:Sensory_Homunculus-en.svg/OpenStax College **p. 215**

Additional images used under licence from Shutterstock.com

Text

Abbasi, B., & Goldenholz, D. M. (2019). Machine learning applications in epilepsy. *Epilepsia, 60*(10), 2037-2047. https://doi.org/10.1111/epi.16333

ABC. (2019, September 21). *Global climate strike sees 'hundreds of thousands' of Australians rally across the country*. https://www.abc.net.au/news/2019-09-20/school-strike-for-climate-draws-thousands-to-australian-rallies/11531612

Abner, E. L., Nelson, P. T., Schmitt, F. A., Browning, S. R., Fardo, D. W., Wan, L., Jicha, G. A., Cooper, G. E., Smith, C. D., Caban-Holt, A. M., Van Eldik, L. J., & Kryscio, R. J. (2014). Self-reported head injury and risk of late-life impairment and AD pathology in an AD center cohort. *Dementia and Geriatric Cognitive Disorders, 37*(5-6), 294–306. https://doi.org/10.1159/000355478

Abrahamsson, N., & Hyltenstam, K. (2009). Age of onset and nativelikeness in a second language: Listener perception versus linguistic scrutiny. *Language Learning, 59*(2), 249–306. https://doi.org/10.1111/j.1467-9922.2009.00507.x

Agnew-Blais, J. C., Wertz, J., Arseneault, L., Belsky, D. W., Danese, A., Pingault, J. B., Polanczyk, G. V., Sugden, K., Williams, B., & Moffitt, T. E. (2022). Mother's and children's ADHD genetic risk, household chaos and children's ADHD symptoms: A gene-environment correlation study. *Journal of Child Psychology and Psychiatry, 63*(10), 1153-1163. https://doi.org/10.1111/jcpp.13659

Ahluwalia, A. (1978). An intra-cultural investigation of susceptibility to 'perspective' and 'non-perspective' spatial illusions. *British Journal of Psychology, 69*(2), 233–241. https://doi.org/10.1111/j.2044-8295.1978.tb01653.x

Allen, M. W., Gupta, R., & Monnier, A. (2008). The interactive effect of cultural symbols and human values on taste evaluation. *Journal of Consumer Research, 35*(2), 294–308. https://doi.org/10.1086/590319

Alosco, M. L., Healy, R. C., & Stern, R. A. (2019). Chronic traumatic encephalopathy and the long-term consequences of repetitive head impacts in sports. In P. A. Arnett (Ed.), *Neuropsychology of sports-related concussion* (pp. 151–182). American Psychological Association. https://doi.org/10.1037/0000114-007

Amaze. (2022). *Shaping the future of autism*. https://www.amaze.org.au/

American Academy of Family Physicians. (n.d.). *Managing adult ADHD*. https://www.aafp.org/dam/AAFP/documents/patient_care/adhd_toolkit/adhd19-patient-handout.pdf

American Psychiatric Association. (2013). Attention-deficit and disruptive behavior disorders. *Diagnostic and Statistical Manual of Mental Disorders*, (5th ed.). Arlington, VA: American Psychiatric Association.

American Psychiatric Association. (2022). *Diagnostic and statistical manual of mental disorders* (5th ed., text rev.). https://doi.org/10.1176/appi.books.9780890425787

American Psychiatric Association. (2022). *DSM History*. https://www.psychiatry.org/psychiatrists/practice/dsm/history-of-the-dsm

American Psychological Association. (2020, March 4). *Working out boosts brain health*. https://www.apa.org/topics/exercise-fitness/stress

American Psychological Association. (2022). *APA dictionary of psychology: Comorbidity*. https://dictionary.apa.org/comorbidity

Arain, M., Haque, M., Johal, L., Mathur, P., Nel, W., Rais, A., Sandhu, R., & Sharma, S. (2013). Maturation of the adolescent brain. *Neuropsychiatric Disease and Treatment, 9*, 449–461. https://doi.org/10.2147/NDT.S39776

Asch, S. E. (1952). Effects of group pressure upon the modificarion and distortion of judegements. In H. Guetzkow (Ed.), *Groups, leadership and men; reseearch in human relations* (pp. 222-236). Carniege Press.

Ashinoff, B. K., & Abu-Akel, A. (2019). Hyperfocus: the forgotten frontier of attention. *Psychological Research, 85*(1), 1-19. https://doi.org/10.1007/s00426-019-01245-8

Australian Bureau of Statistics. (2018). *Mental health*. https://www.abs.gov.au/statistics/health/mental-health/mental-health/2017-18

Australian Bureau of Statistics. (2022). *National study of mental health and wellbeing*. https://www.abs.gov.au/statistics/health/mental-health/national-study-mental-health-and-wellbeing/2020-21

Australian Government Department of Health and Aged Care (2021, May 6). *For children and young people (5 to 17 years)*. https://www.health.gov.au/health-topics/physical-activity-and-exercise/physical-activity-and-exercise-guidelines-for-all-australians/for-children-and-young-people-5-to-17-years#being-active.

Autism SA. (2022). *The differences in autism based on gender*. https://thespectrum.org.au/autism-diagnosis/gender-differences/

Barr, W. B. (2020). Believers versus deniers: The radicalization of sports concussion and chronic traumatic encephalopathy (CTE) science. *Canadian Psychology/Psychologie canadienne, 61*(2), 151–162. https://doi.org/10.1037/cap0000210

Bartholomew, K., & Horowitz, L. M. (1991). Attachment styles among young adults: A test of a four-category model. *Journal of Personality and Social Psychology, 61*(2), 226–244. https://doi.org/10.1037/0022-3514.61.2.226

Bartoshuk, L. M. (1993). The biological basis of food perception and acceptance. *Food Quality and Preference, 4*(1-2), 21–32. https://doi.org/10.1016/0950-3293(93)90310-3

Bartoshuk, L., M., Dubby, V., B., & Miller, I., J. (1995). PTC/PROP tasting: anatomy, psychophysics, and sex effects. *Physiology & Behaviour, 56*(6), 1165-1171. https://doi.org/https://doi.org/10.1016/0031-9384(94)90361-1

Bates, M. (2013). *Dyslexia statistics and myth busting facts*. Dyslexia Reading Well. https://www.dyslexia-reading-well.com/dyslexia-statistics.html

Baum, G. (2021, January 23). *'He knew something was wrong with his brain': Shane Tuck had severe CTE*. The Age. https://www.theage.com.au/sport/afl/shane-tuck-had-severe-cte-brain-bank-reveals-20210122-p56w3n.html

Baumer, N., & Frueh, J. (2021, November 23). *What is neurodiversity?* Harvard Health. https://www.health.harvard.edu/blog/what-is-neurodiversity-202111232645

Behrmann, M., Moscovitch, M., & Winocur, G. (1994). Intact visual imagery and impaired visual perception in a patient with visual agnosia. *Journal of Experimental Psychology. Human Perception and Performance. 20*(5): 1068–1087. https://doi.org/10.1037/0096-1523.20.5.1068

Bellizzi, J., A., & Martin, W., S. (1982). The influence of national versus generic branding on taste perceptions. *Journal of Business Research, 10*(3), 385-396. https://doi.org/10.1016/0148-2963(82)90041-8

Better Health Channel (2013, July 31). *Aneurysm*. Victorian Government. https://www.betterhealth.vic.gov.au/health/conditionsandtreatments/aneurysm

beyondblue. (2015, August). beyondblue Information Paper: *Stigma and discrimination associated with depression and anxiety*. https://www.beyondblue.org.au/docs/default-source/about-beyond-blue/policy-submissions/stigma-and-discrimination-associated-with-depression-and-anxiety.pdf?sfvrsn=92367eea_4

Blanco, C., Rubio, J., Wall, M., Wang, S., Jiu, C. J., & Kendler, K. S. (2014). Risk factors for anxiety disorders: Common and specific effects in a national sample. *Depression and Anxiety, 31*(9), 756–764. https://doi.org/10.1002/da.22247

Bond, R., & Smith, P. B. (1996). Culture and conformity: A meta-analysis of studies using Asch's (1952b, 1956) line judgment task. *Psychological Bulletin, 119*(1), 111–137. https://doi.org/10.1037//0033-2909.119.1.111

Boyce, J. M., & Shone, G. R. (2006). Effects of ageing on smell and taste. *Postgraduate Medical Journal, 82*(966), 239–241. https://doi.org/10.1136/pgmj.2005.039453

Bradley, J. (2005). *Dogs bite: But balloons and slippers are more dangerous*. James & Kenneth Publishers.

Brain Injury Association of America. (2022). *What is the difference between an acquired brain injury and a traumatic brain injury?* https://www.biausa.org/brain-injury/about-brain-injury/nbiic/what-is-the-difference-between-an-acquired-brain-injury-and-a-traumatic-brain-injury

Brehm J. W., & Brehm S. S. (1981). *Psychological reactance – a theory of freedom and control*. New York: Academic Press.

Brett, B. L., Kerr, Z. Y., Walton, S. R., Chandran, A., Defreese, J. D., Mannix, R., Echemendia, R. J., Meehan, W. P., Guskiewicz, K. M., & McCrea, M (Reproduced). (2022). Longitudinal trajectory of depression symptom severity and the influence of concussion history and physical function over a 19-year period among former National Football League (NFL) players: An NFL-LONG Study. *Journal of Neurology, Neurosurgery & Psychiatry, 93*(3), 272–279. https://doi.org/10.1136/jnnp-2021-326602

Bukowski, W. M., Buhrmester, D., & Underwood, M. K. (2011). Peer relations as a developmental context. In M. K. Underwood & L. H. Rosen (Eds.), *Social development: Relationships in Infancy, Childhood, and Adolescence* (pp. 153–179). Guilford Publications.

Burger, J. M. (2009). Replicating Milgram: Would people still obey today? *American Psychologist, 64*(1), 1–11. https://doi.org/10.1037/a0010932

Byrne, D. (1961). Interpersonal attraction and attitude similarity. *The Journal of Abnormal and Social Psychology, 62*(3), 713–715. https://doi.org/10.1037/h0044721

Carlson, C., & Devinsky, O. (2009). The excitable cerebral cortex. *International Classics in Epilepsy and Behavior, 15*(2), 131–132. https://doi.org/10.1016/j.yebeh.2009.03.002

Carroll, L., & Ward, M. (2022, May 15). *Lockdown toll: One in eight has new mental health condition*. The Sydney Morning Herald. https://www.smh.com.au/national/nsw/lockdown-toll-one-in-eight-have-new-mental-health-condition-20220513-p5al4v.html

Carvalho, F. M., & Spence, C. (2018). The shape of the cup influences aroma, taste, and hedonic judgements of specialty coffee. *Food Quality and Preference, 68*, 315–321. https://doi.org/10.1016/j.foodqual.2018.04.003

Caspar, E. A., Christensen, J. F., Cleeremans, A., & Haggard, P. (2016). Coercion changes the sense of agency in the human brain. *Current Biology, 26*(5), 585–592. https://doi.org/10.1016/j.cub.2015.12.067

Charnallet, A., Carbonnel, S., David, D., & Moreaud, O. (2008). Associative visual agnosia: A case study. *Behavioural Neurology, 19*, 41-44. https://doi.org/10.1155/2008/241753

Chatzikonstantinou, S., Gioula, G., Kimiskidis, V. K., McKenna, J., Mavroudis, I., & Kazis, D. (2020). The gut microbiome in drug-resistant epilepsy. *Epilepsia Open, 6*(1), 28-37. https://doi.org/10.1002%2Fepi4.12461

Cherry, K. (2020, April 10). *Left brain vs right brain dominance*. Verywellmind. https://www.verywellmind.com/left-brain-vs-right-brain-2795005

Chomsky, N. (1965). *Aspects of the theory of syntax*. MIT Press.

Concussion Legacy Foundation. (n.d.). *What is CTE?* https://concussionfoundation.org/CTE-resources/what-is-CTE

Cormier, K., Quinto-Pozos, D., Sevcikova, Z., & Schembri, A. (2012). Lexicalisation and de-lexicalisation processes in sign languages: Comparing depicting constructions and viewpoint gestures. *Language & communication, 32*(4), 329-348. https://doi.org/10.1016/j.langcom.2012.09.004

Cronkleton, E. (2021, August 12). *What are the differences between an ADHD brain and a neurotypical brain*. Medical News Today. https://www.medicalnewstoday.com/articles/adhd-brain-vs-normal-brain#structure

Curtiss, S., Fromkin, V., Krashen, S., Rigler, D., & Rigler, M. (1974). The linguistic development of Genie. *Language, 50*(3), 528–554. https://doi.org/10.2307/412222

Dahlin, M. & Prast-Nielsen, S. (2019). The gut microbiome and epilepsy. *eBioMedicine, 44*, 741-746. https://doi.org/10.1016/j.ebiom.2019.05.024

de Villiers, J. G., & de Villiers, P. A. (2014). The role of language in theory of mind development. *Topics in Language Disorders, 34*(4), 313-328. https://doi.org/10.1097/TLD.0000000000000037

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. Springer Science & Business Media.

DeKeyser, R., Alfi-Shabtay, I., & Ravid, D. (2010). Cross-linguistic evidence for the nature of age effects in second language acquisition. *Applied Psycholinguistics, 31*(3), 413–438. https://doi.org/10.1017/S0142716410000056

Diamond, D. (2013, June 27). *NBA draft: is being 7 feet tall the fastest way to get rich in America?* Forbes. https://www.forbes.com/sites/dandiamond/2013/06/27/nba-draft-is-being-7-feet-tall-the-fastest-way-to-get-rich-in-america/?sh=3ac50b136522

Dieter, J. N., & Engel, S. D. (2019). Traumatic brain injury and posttraumatic stress disorder: Comorbid consequences of war. *Neuroscience Insights, 14*. https://doi.org/10.1177/1179069519892933

Dimuro, C. (2022, June 8). *Florida man mistakes 7-foot alligator for dog, gets bitten in leg*. The Patriot-News. https://www.pennlive.com/life/2022/06/florida-man-mistakes-7-foot-alligator-for-dog-gets-bitten-in-leg.html

Dittmar, H., & Howard, S. (2004). Professional hazards? The impact of models' body size on advertising effectiveness and women's body-focused anxiety in professions that do and do not emphasize the cultural idealof thinness. *British Journal of Social Psychology, 43*(4), 477–497. https://doi.org/10.1348/0144666042565407

Dog Owners' Liability Act 1990 (RSO) c. D16 (CA.).

Engel, G. (1977). The need of a new medical model: a challenge for biomedicine. *Science, 196*(4286), 129–136. https://doi.org/10.1126/science.847460

Englander, J., Cifu, D. X., & Diaz-Arrastia, R. (2014). Seizures and traumatic brain injury. *Archives of Physical Medicine and Rehabilitation, 95*(6), 1223–1224. https://doi.org/10.1016/j.apmr.2013.06.002

Erikson, E. H. (1950). *Childhood and society*. W. W. Norton & Co.

Evans, B, & Chaney, S. (2017, April 5). *Autism, neurodiversity and the 'neurotypicals'*. The History of Emotions Blog. https://emotionsblog.history.qmul.ac.uk/2017/04/autism-neurodiversity-and-the-neurotypicals/

Exceptional Individuals. (2020). *Neurodiversity & neurodivergent: Meanings, types & examples*. apahttps://exceptionalindividuals.com/neurodiversity/

Festinger, L. (1954). A theory of social comparison processes. *Human Relations, 7*(2), 117-140. https://doi.org/10.1177/001872675400700202

Firmin, M. W., Hwang, C., Copella, M., & Clark, S. (2004). Learned helplessness: The effect of failure on test taking. *Education, 124*(4), 688–693.

Fischl, B., & Dale, A. M. (2000). Measuring the thickness of the human cerebral cortex from magnetic resonance images. *Proceedings of the National Academy of Sciences, 97*(20), 11050-11055. https://doi.org/10.1073/pnas.200033797

Fotuhi, O., Fong, T. G., Zanna, M. P., Borland, R., Young, H., & Cummings, K. M. (2013). Patterns of cognitive dissonance-reducing beliefs among smokers: a longitudinal analysis from the International Tobacco Control (ITC) Four Country Survey. *Tobacco Control, 22*(1), 52-58. https://doi.org/10.1136/tobaccocontrol-2011-050139

Fu, O., Iwai, Y., Narukawa, M., Ishikawa, A. W., Ishii, K. K., Murata, K., Yoshimura, Y., Touhara, K., Misaka, T., Minokoshi, Y., & Nakajima, K. (2019). Hypothalamic neuronal circuits regulating hunger-induced taste modification. *Nature Communications, 10*(4560). https://doi.org/10.1038/s41467-019-12478-x

Gamlin, C. (2017). When Asperger's disorder came out. *Psychiatria Danubina, 29*(3), 214–218. https://pubmed.ncbi.nlm.nih.gov/28953765/

Gazzaniga, M. S., & Sperry, R. W. (1967). Language after section of the cerebral commissures. *Brain, 90*(1), 131–148. https://doi.org/10.1093/brain/90.1.131

Gearhart, S. (2022, June 27). *Phineas Gage*. Britannica. https://www.britannica.com/biography/Phineas-Gage

Geddes, L. (2022, April 7). *Covid linked to 33-fold increase in risk of potentially fatal blood clot*. The Guardian. https://www.theguardian.com/world/2022/apr/06/covid-linked-33-fold-increase-risk-pulmonary-embolism-dvt

Gernigon, C., Fleurance, P., & Reine, B. (2000). Effects of uncontrollability and failure on the development of learned helplessness in perceptual-motor tasks. *Research Quarterly for Exercise and Sport, 71*(1), 44–54. https://doi.org/10.1080/02701367.2000.10608879

Glanz, K., Basil, M., Maibach, E., Goldberg, J., & Snyder, D. (1998). Why Americans eat what they do: Taste, nutrition, cost, convenience, and weight control concerns as influences on food consumption. *Journal of American Dietetic Association, 98*(10), 1118-1126. https://doi.org/10.1016/S0002-8223(98)00260-0

Goetz, C. G. (2011). The history of Parkinson's disease: Early clinical descriptions and neurological therapies. *Cold Spring Harbor Perspectives in Medicine, 1*(1). https://doi.org/10.1101%2Fcshperspect.a008862

Goldman, S. M., Tanner, C. M., Oakes, D., Bhudhikanok, G. S., Gupta, A., & Langston, J. W. (2006). Head injury and Parkinson's disease risk in twins. *Annals of Neurology, 60*(1), 65–72. https://doi.org/10.1002/ana.20882

Gomez-Eguilaz, M., Ramon-Trapero, J. L., & Blanco, J. R. (2018). The beneficial effect of probiotics as a supplementary treatment in drug-resistant epilepsy: a pilot study. *Beneficial Microbes, 9*(6), 875-881. https://doi.org/10.3920/bm2018.0018

Grant, A. (2015, January 6). *10 heartbreaking stories of feral children*. TopTenz. https://www.toptenz.net/top-10-feral-children.php

Gregory, R. L. (1968). Visual illusions. *Scientific American, 219*(5), 66–76. https://doi.org/10.1038/scientificamerican1168-66

Gregory, R. L. (1997). Visual illusions classified. *Trends in Cognitive Sciences, 1*(5), 190–194. https://doi.org/10.1016/S1364-6613(97)01060-7

Grochowska, M., Laskus, T., & Radkowski, M. (2019). Gut microbiota in neurological disorders. *Archivum Immunologiae et Therapiae Experimentalis, 67*(6), 375-383. https://doi.org/10.1007/s00005-019-00561-6

Guenther, F. H. (1994). A neural network model of speech acquisition and motor equivalent speech production. *Biological Cybernetics, 72*, 43-53.

Ha, S., Sohn, I.-J., Kim, N., Sim, H. J., & Cheon, K.-A. (2015). Characteristics of brains in Autism Spectrum Disorder: Structure, function and connectivity across the lifespan. *Experimental Neurobiology, 24*(4), 273-284. https://doi.org/10.5607/en.2015.24.4.273

Haberstroh, S., & Schulte-Körne, G. (2019). The diagnosis and treatment of dyscalculia. *Deutsches Aerzteblatt International, 116*(7), 107-114. https://doi.org/10.3238/arztebl.2019.0107

Habtewold, T. D., Islam, A., Radie, Y. T., & Tegegne, B. S. (2016). Comorbidity of depression and diabetes: an application of biopsychosocial model. *International Journal of Mental Health Systems, 10*(74). https://doi.org/10.1186/s13033-016-0106-2

Haddad P., & Haddad I. (2015, March 13). Mental health stigma. *British Association for Psychopharmacology*. https://www.bap.org.uk/articles/mental-health-stigma/

Haidt, J. (2012). *The righteous mind: Why good people are divided by politics and religion*. Knopf Doubleday Publishing Group.

Hall, E. B., & Mufson, L. (2009). Interpersonal psychotherapy for depressed adolescents (IPT-A): A case illustration. *Journal of Clinical Child & Adolescent Psychology, 38*(4), 582-593. https://doi.org/10.1080/15374410902976338

Harvard Health Publishing. (2021, March 6). *Foods linked to better brainpower*. https://www.health.harvard.edu/healthbeat/foods-linked-to-better-brainpower

Harvard Health Publishing. (2022, May 13). *12 ways to keep your brain young*. https://www.health.harvard.edu/mind-and-mood/12-ways-to-keep-your-brain-young

Health Direct (2020). *A balanced diet*. https://www.healthdirect.gov.au/balanced-diet

Healthdirect. (2022, January). *Emergency apps and online tools*. https://www.healthdirect.gov.au/emergency-apps-and-online-tools

Hendren, R. L., Haft, S. L., Black, J. M., White, N. C., & Hoeft, F. (2018). Recognizing psychiatric comorbidity with reading disorders. *Frontiers in Psychiatry, 9*(101). https://doi.org/10.3389/fpsyt.2018.00101

HiHo Kids. (2017, August 14). *Kids try miracle berries | Kids try | HiHo kids* [Video]. YouTube. https://www.youtube.com/watch?v=eWLpdlFqa3s&t=1s

Hofstede, G. (1984). *Culture's consequences: International differences in work-related values*. Sage.

Holmes, G. L., Milh, M., & Dulac, O. (2012). Maturation of the human brain and epilepsy. In H. Stefan & W. H. Theodore (Eds.), *Handbook of Clinical Neurology: Epilepsy, 107* (pp. 135-143). American Psychological Association.

Hornbuckle, W., E., Simpson, K., W. & Tennant, B., C. (2008). Gastrointestinal Function. *Clinical Biochemistry of Domestic Animals*, 413-457

Hornsey, M. J., Smith, J. R., & Begg, D. (2007). Effects of norms among those with moral conviction: Counter-conformity emerges on intentions but not behaviors. *Social Influence, 2*(4), 244–268. https://doi.org/10.1080/15534510701476500

Howell, J., Costanzo, R. M., & Reiter, E. R. (2018). Head trauma and olfactory function. *World Journal of Otorhinolaryngology - Head and Neck Surgery, 4*(1), 39–45. https://doi.org/10.1016/j.wjorl.2018.02.001

Huttenlocher, P. R. (1990). Morphometric study of human cerebral cortex development. *Neuropsychologia, 28*(6), 517-552. https://doi.org/10.1016/0028-3932(90)90031-I

IBM (2020, July 15). *Machine learning*. https://www.ibm.com/cloud/learn/machine-learning

Iliopoulou, M. A., Carleton, C. L., & Reese, L. A. (2019). Beloved companion or problem animal, *Society & Animals, 27*(3), 327–346. https://doi.org/10.1163/15685306-12341529

Iqbal, S. (2022, July 20). *GOT's Emilia Clarke revealed she's 'missing' lots of brain tissue bc of 2 traumatic aneurysms*. Pedestrian. https://www.pedestrian.tv/entertainment/emilia-clarke-aneurysm/

Johnson, J., & Clydesdale, F. M. (1982). Perceived sweetness and redness in colored sucrose solutions. *Journal of Food Science, 47*(3), 747–752. https://doi.org/10.1111/j.1365-2621.1982.tb12706.x

Kaakinen, M., Sirola, A., Savolainen, I. and Oksanen, A. (2020). Impulsivity, internalizing symptoms, and online group behavior as determinants of online hate. *PLoS One, 15*(4), https://doi.org/10.1371/journal.pone.0231052

Kawabata, N. (1982). Visual information processing at the blind spot. *Perceptual and Motor Skills, 55*(1), 95-104. https://doi.org/10.2466/pms.1982.55.1.95

Kedmey, D. (2014, May 15). *This chart shows what happened to Malaysia airlines after missing flight*. Time. https://time.com/100823/malaysia-airlines-decline/

Kerr, N. L. (1998). HARKing: Hypothesizing after the results are known. *Personality and Social Psychology Review, 2*(3), 196-217. https://doi.org/10.1207/s15327957pspr0203_4

Koestner, R., & Hope, N. (2014). A self-determination theory approach to goals. In M. Gagné (Ed.), *The Oxford handbook of work engagement, motivation, and self-determination theory* (pp. 400–413). Oxford University Press.

Koizumi, A., Tsuchiya, A., Nakajima, K., & Abe, K. (2011). Human sweet taste receptor mediates acid-induced sweetness of miraculin. *PNAS, 108*(40), 16819-16824. https://doi.org/10.1073/pnas.1016644108

Kumar, A., & Wroten, M. (2022). *Agnosia*. StatPearls Publishing.

LaLiberte, M. (n.d.). *Think Einstein was smart? Here are 8 people with higher IQs*. Reader's Digest Australia. https://www.readersdigest.com.au/true-stories-lifestyle/thought-provoking/think-einstein-was-smart-here-are-8-people-higher-iqs

Langner, R., & Eickhoff, S. B. (2013). Sustaining attention to simple tasks: A meta-analytic review of the neural mechanisms of vigilant attention. *Psychological Bulletin, 139*(4), 870–900. https://doi.org/10.1037/a0030694

Li, K., & Malhotra, P. A. (2015). Spatial neglect. *Practical Neurology, 1*(5), 333–339. https://doi.org/10.1136/practneurol-2015-001115

Lipatova, O. & Campolattaro, M., M. (2016). The miracle fruit: An undergraduate laboratory exercise in taste sensation and perception. *Journal of Undergraduate Neuroscience Education, 15*(1), A56-A60.

Lucas, T., Alexander, S., Firestone, I. J., & Baltes, B. B. (2006). Self-efficacy and independence from social influence: Discovery of an efficacy–difficulty effect. *Social Influence, 1*(1), 58–80. https://doi.org/10.1080/15534510500291662

Lunke, K., & Meier, B. (2019). Creativity and involvement in art in different types of synaesthesia. *British Journal of Psychology, 110*(4), 727-744. https://doi.org/10.1111/bjop.12363

Ma, Q., Xing, C., Long, W., Wang, H. Y., Liu, Q., & Wang, R. (2019). Impact of microbiota on central nervous system and neurological diseases: the gut-brain axis. *Journal of neuroinflammation, 16*(53). https://doi.org/10.1186%2Fs12974-019-1434-3

Mac Donald, C. L., Barber, J., Jordan, M., Johnson, A. M., Dikmen, S., Fann, J. R., & Temkin, N. (2017). Early clinical predictors of 5-year outcome after concussive blast traumatic brain injury. *JAMA Neurology, 74*(7), 821–829. https://doi.org/10.1001/jamaneurol.2017.0143

MacDonald, G., Nail, P. R., & Harper, J. R. (2011). Do people use reverse psychology? An exploration of strategic self-anticonformity. *Social Influence, 6*(1), 1–14. https://doi.org/10.1080/15534510.2010.517282

Malik, F., & Marwaha, R. (2022). *Developmental stages of social emotional development in children*. StatPearls Publishing.

Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review, 98*(2), 224–253. https://doi.org/10.1037/0033-295X.98.2.224

Marsh, S. (2021, October 28). *Treasury minister praised for divulging his agoraphobia*. The Guardian. https://www.google.com/url?q=https://www.theguardian.com/society/2021/oct/28/treasury-minister-praised-for-divulging-his-agoraphobia&sa=D&source=docs&ust=1652337621547561&usg=AOvVaw2-MeeZzlZbfJh35gQOxsGH

Marshall, K. (2021, April 24). *What are CTE and concussion and how do they affect athletes?* The Sydney Morning Herald. https://www.smh.com.au/sport/what-are-cte-and-concussion-and-how-do-they-affect-athletes-20200310-p548p1.html

Martland, H. S. (1928). Punch drunk. *JAMA Network, 91*(15), 1103-1107. https://doi.org/10.1001/jama.1928.02700150029009

Mauer, L. K. (2011). *Genetic Determinants of Cilantro Preference* [Unpublished doctoral dissertation]. University of Toronto.

McAllister, T. W. (2011). Neurobiological consequences of traumatic brain injury. *Dialogues in Clinical Neuroscience, 13*(3), 287–300. https://doi.org/https://doi.org/10.31887/DCNS.2011.13.2/tmcallister

McCutcheon, L. E. (1991). A new test of misconceptions about psychology. *Psychological Reports, 68*(2), 647–653. https://journals.sagepub.com/doi/10.2466/pr0.1991.68.2.647

McKee A. C., Stein, T. D., Nowinski, C. J., Stern, R. A., Daneshvar, D. H., Alvarez, V. E., Lee, H.-S., Hall, G., Wojtowicz, S. M., Baugh, C. M., Riley, D. O., Kubilus, C. A., Cormier, K. A., Jacobs, M. A., Martin, B. R., Abraham, C. R., Ikezu, T., Reichard, R. R., Wolozin, B. L., … Cantu, R. C. (2013). The spectrum of disease in chronic traumatic encephalopathy. *Brain, 136*(1), 43–64. https://doi.org/10.1093/brain/aws307

McKee, A. C., Cairns, N. J., Dickson, D. W., Folkerth, R. D., Keene, C. D., Litvan, I., Perl, D. P., Stein, T. D., Vonsattel, J. P., Stewart, W., Tripodis, Y., Crary, J. F., Bieniek, K. F., Dams-O'Connor, K., Alvarez, V. E., Gordon, W. A., & the TBI/CTE group (2016). The first NINDS/NIBIB consensus meeting to define neuropathological criteria for the diagnosis of chronic traumatic encephalopathy. *Acta neuropathologica, 131*(1), 75–86. https://doi.org/10.1007/s00401-015-1515-z

Mei, J., Desrosiers, C., & Frasnelli, J. (2021). Machine learning for the diagnosis of Parkinson's disease: A review of literature. *Frontiers in Aging Neuroscience, 13*. https://doi.org/10.3389/fnagi.2021.633752

Mez, J., Daneshvar, D. H., Kiernan, P. T., Abdolmohammadi, B., Alvarez, V. E., Huber, B. R., Alosco, M. L., Solomon, T. M., Nowinski, C. J., McHale, L., Cormier, K. A., Kubilus, C. A., Martin, B. M., Murphy, L., Baugh, C. M., Montenigro, P. H., Chaisson, C. E., Tripodis, Y., Kowall, N. W., … McKee, A. C. (2017). Clinicopathological evaluation of chronic traumatic encephalopathy in players of American football. *JAMA, 318*(4), 360–370. https://doi.org/10.1001/jama.2017.8334

Milgram, S. (1963). Behavioral study of obedience. *The Journal of Abnormal and Social Psychology, 67*(4), 371–378. https://doi.org/10.1037/h0040525

Molenberghs, P., & Sale, M. V. (2011). Testing for spatial neglect with line bisection and target cancellation: Are both tasks really unrelated?. *PLoS One, 6*(7). https://doi.org/10.1371/journal.pone.0023017

Morrow, J. (2002). Demonstrating the anchoring-adjustment heuristic and the power of the situation. *Teaching of Psychology, 29*(2), 129–132. https://doi.org/10.1207/S15328023TOP2902_11

Nail, P. R., & Ruch, G. L. (1992). Social influence and the diamond model of social response: Toward an extended theory of informational influence. *British Journal of Social Psychology, 31*(3), 171–187. https://doi.org/10.1111/j.2044-8309.1992.tb00963.x

National Health and Medical Research Council. (2022). *Applicable laws and obligations.* https://www.nhmrc.gov.au/applicable-laws-and-obligations#5

National Institutes of Health. (2021, April 19). *What are the treatments for autism?* https://www.nichd.nih.gov/health/topics/autism/conditioninfo/treatments

Neckar, M., & Bob, P. (2014). Neuroscience of synesthesia and cross-modal associations. *Reviews in the Neurosciences, 25*(6), 833–840. https://doi.org/10.1515/revneuro-2014-0033

Netflix. (2021, August 25). *Love on the spectrum season 2 | Offical trailer | Netflix* [Video]. Youtube. https://www.youtube.com/watch?v=0jInNe4ZTBk

Neyret, S., Navarro, X., Beacco, A., Oliva, R., Bourdin, P., Valenzuela, J., Barberia, I., & Slater, M. (2020). An embodied perspective as a victim of sexual harassment in virtual reality reduces action conformity in a later Milgram obedience scenario. *Scientific Reports, 10*(1). https://doi.org/10.1038/s41598-020-62932-w

Nguyen, J. D., & Duong, H. (2021). *Neurosurgery, sensory homunculus.* StatPearls Publishing.

Nisbett, R. E., & Miyamoto, Y. (2005). The influence of culture: Holistic versus analytic perception. *Trends in Cognitive Sciences, 9*(10), 467–473. https://doi.org/10.1016/j.tics.2005.08.004

Nolin, E. (2012, November 28). *Case study of Isabelle.* Critical Period Hypothesis. https://sites.google.com/site/criticalperiodhypothesis/case-study-of-isabelle

Nowinksi, C. (2018, April). *Can I have your brain? The quest for truth on concussions and CTE* [Video]. TED conferences. https://www.ted.com/talks/chris_nowinski_can_i_have_your_brain_the_quest_for_truth_on_concussions_and_cte/transcript?language=en

Nyilasy, G. (n.d.) *Fake News in the Age of COVID-19.* https://fbe.unimelb.edu.au/newsroom/fake-news-in-the-age-of-covid-19

Omalu, B. I., DeKosky, S. T., Minster, R. L., Kamboh, M. I., Hamilton, R. L., & Wecht, C. H. (2005). Chronic traumatic encephalopathy in a National Football League player. *Neurosurgery, 57*(1), 128-134. https://doi.org/10.1227/01.neu.0000163407.92769.ed

Paasovaara, R., Luomala, H. T., Pohjanheimo, T., & Sandell, M. (2011). Understanding consumers' brand-induced food taste perception: A comparison of 'brand familiarity' – and 'consumer value – brand symbolism (in)congruity' – accounts. *Journal of Consumer Behaviour, 11*, 11-20. https://doi.org/10.1002/cb.356

Paasovaara, R., Luomala, H. T., Pohjanheimo, T., & Sandell, M. (2012). Understanding consumers' brand-induced food taste perception: A comparison of 'brand familiarity' – and 'consumer value – brand symbolism (in)congruity' – accounts. *Journal of Consumer Behaviour, 11*(1), 11-20. https://doi.org/10.1002/cb.356

Park, M., Ross, G. W., Petrovitch, H., White, L. R., Masaki, K. H., Nelson, J. S., Tanner, C. M., Curb, J. D., Blanchette, P. L., & Abbott, R., D. (2005). Consumption of milk and calcium in midlife and the future risk of Parkinson disease. *Neurology, 64*(6), 1047-1051. https://doi.org/10.1212/01.WNL.0000154532.98495.BF

Pavlidis, P., Gouveris, H., Anogeianaki, A., Koutsonikolas, D., Anogianakis, G., & Kekes, G. (2013). Age-related changes in electrogustometry thresholds, tongue tip vascularization, density, and form of the fungiform papillae in humans. *Chemical Senses, 38*(1), 35–43. https://doi.org/10.1093/chemse/bjs076

Pekna, M., & Pekny, M. (2012). The neurobiology of brain injury. *Cerebrum: the Dana forum on brain science.* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3574788/

Pessoa, L., & Engelmann, J. B. (2010). Embedding reward signals into perception and cognition. *Frontiers in Neuroscience, 4*(17). https://doi.org/10.3389/fnins.2010.00017

Pfundmair, M., Graupmann, V., Frey, D., & Aydin, N. (2015). The different behavioral intentions of collectivists and individualists in response to social exclusion. *Personality and Social Psychology Bulletin, 4*(3), 363-378. https://doi.org/10.1177/0146167214566186

Piaget, J. (1936). *Origins of intelligence in the child.* (1st ed.). Routledge & Kegan Paul.

Piqueras-Fiszman, B., & Spence, C. (2015). Sensory expectations based on product-extrinsic food cues: An interdisciplinary review of the empirical evidence and theoretical accounts. *Food Quality and Preference, 40*, 165-179. https://doi.org/10.1016/j.foodqual.2014.09.013

Piuva, K. (2010). The Meaning of normality: the controversy about the mental health campaign in Sweden 1969. *Scandinavian Journal of History, 35*(2), 198–216. https://doi.org/10.1080/03468751003718217

Queensland Health. (2022, July 12). *What is Acquired Brain Injury (ABI).* https://www.health.qld.gov.au/abios/asp/what_is_abi

Ractliffe, D., Butt, C., Lama, R., & Stehle, M. (2021, September 18). *Head on: Rising concussion rates in community footy exposed amid calls for action on youngsters.* The Age. https://www.theage.com.au/interactive/2021/sports-injuries/

Raman, R., & Sarkar, S. (2016). Predictive coding: A possible explanation of filling-in at the blind spot. *PLoS One, 11*(3). https://doi.org/10.1371/journal.pone.0151194

Raschle, N. M., Chang, M., & Gaab, N. (2011). Structural brain alterations associated with dyslexia predate reading onset. *NeuroImage, 57*(3), 742–749. https://doi.org/10.1016/j.neuroimage.2010.09.055

Rizzo, G., Copetti, M., Arcuti, S., Martino, D., Fontana, A., & Logroscino, G. (2016). Accuracy of clinical diagnosis of Parkinson disease: A systematic review and meta-analysis. *Neurology, 86*(6). https://doi.org/10.1212/wnl.0000000000002350

Ro, T., & Rafal, R., D. (1996). Perception of geometric illusions in hemispatial neglect. *Neuropsychologia, 34*(10), 973-978. https://doi.org/10.1016/0028-3932(96)00018-8

Robinson, T. N., Borzekowski, D. L., Matheson, D. M., & Kraemer, H. C. (2007). Effects of fast food branding on young children's taste preferences. *Archives of Pediatrics and Adolescent Medicine, 161*(8), 792–797. https://doi.org/10.1001/archpedi.161.8.792

Rogers, O. (2020, November 17). *Battling a bad reputation: Why do so many people dislike pit bulls?* Faunalytics. https://faunalytics.org/battling-a-bad-reputation-why-do-so-many-people-dislike-pit-bulls/

Romm, C. (2015, January 28). *Rethinking one of psychology's most infamous experiments.* The Atlantic. https://www.theatlantic.com/health/archive/2015/01/rethinking-one-of-psychologys-most-infamous-experiments/384913/

Roth, H. A., Radle, L. J., Gifford, S. R., & Clydesdale, F. M. (1988). Psychophysical relationships between perceived sweetness and color in lemon and lime-flavored drinks. *Journal of Food Science, 53*(4), 1116-1119. https://doi.org/10.1111/j.1365-2621.1988.tb13543.x

Rothen, N., & Meier, B. (2010). Higher prevalence of synaesthesia in art students. *Perception, 39*(5), 718-720. https://doi.org/10.1068/p6680

Rutter, M., O'Connor, T. G., & English and Romanian Adoptees (ERA) Study Team. (2004). Are there biological programming effects for psychological development? Findings from a study of Romanian adoptees. *Developmental Psychology, 40*(1), 81-94. https://doi.org/10.1037/0012-1649.40.1.81

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68

Sacks, O. (1985). *The man who mistook his wife for a hat.* Summit Books.

Safak, B., Altunan, B., Topcu, B., & Topkaya, A. E. (2020). The gut microbiome in epilepsy. *Microbial Pathogenesis, 139.* https://doi.org/10.1016/j.micpath.2019.103853

Salinas, J., O'Donnell, A., Kojis, D. J., Pase, M. P., DeCarli, C., Rentz, D. M., Berkman, L. F., Beiser, A., & Seshadri, S. (2021). Association of social support with brain volume and cognition. *JAMA Network Open, 4*(8). https://doi.org/10.1001/jamanetworkopen.2021.21122

Salovey, P., Mayer, J. D. (1990). Emotional intelligence. *Imagination, Cognition and Personality, 9*(3), 185–211. https://doi.org/10.2190/DUGG-P24E-52WK-6CDG

Sanbonmatsu, D. M., Strayer, D. L., Medeiros-Ward, N., & Watson, J. M. (2013). Who multi-tasks and why? Multi-tasking ability, perceived multi-tasking ability, impulsivity, and sensation seeking. *PLoS One, 8*(1). https://doi.org/10.1371/journal.pone.0054402

Sarwar, A., & Emmady, P., D. (2022). *Spatial neglect*. StatPearls Publishing.

Scharfman, H. E. (2007). The Neurobiology of Epilepsy. *Current Neurology and Neuroscience Reports, 7*(4), 348-354. https://doi.org/10.1007%2Fs11910-007-0053-z

Seery, M. D., Gabriel, S., Lupien, S. P., & Shimizu, M. (2016). Alone against the group: A unanimously disagreeing group leads to conformity, but cardiovascular threat depends on one's goals. *Psychophysiology, 53*(8), 1263–1271. https://doi.org/10.1111/psyp.12674

Segal, N. L. (2017). Twins reared together and apart: The science behind the fascination. *Proceedings of the American Philosophical Society, 161*(1), 1–17.

Sellers, R., Harold, G. T., Smith, A. F., Neiderhiser, J. M., Reiss, D., Shaw, D., Natsuaki, M. N., Thapar, A., & Leve, L. D. (2019). Disentangling nature from nurture in examining the interplay between parent-child relationships, ADHD, and early academic attainment. *Psychological Medicine, 51*(4), 645-652. https://doi.org/10.1017/S0033291719003593

Shepherd, G., M. (2012). *Neurogastronomy: How the brain creates flavor and why it matters*. Columbia University Press.

Sherlis, J. (2001). *Thickness of a piece of paper*. The Physics Factbook. https://hypertextbook.com/facts/2001/JuliaSherlis.shtml

Shively, S. B., Priemer, D. S., Stein, M. B., & Perl, D. P. (2021). Pathophysiology of traumatic brain injury, chronic traumatic encephalopathy, and neuropsychiatric clinical expression. *Psychiatric Clinics of North America, 44*(3), 443–458. https://doi.org/10.1016/j.psc.2021.04.003

Sicherer, S. H., Furlong, T. J., Maes, H. H., Desnick, R. J., Sampson, H. A., & Gelb, B. D. (2000). Genetics of peanut allergy: A twin study. *Journal of Allergy and Clinical Immunology, 106*(1), 53-56. https://doi.org/10.1067/mai.2000.108105

Siipola, E. M. (1935). A group study of some effects of preparatory set. *Psychological Monographs, 46*(6), 27–38. https://doi.org/10.1037/h0093376

Simms, A., & Nichols, T. (2014). Social loafing: A review of the literature. *Journal of Management Policy and Practice, 15*(1), 58-66.

Simner, J., & Haywood, S. L. (2009). Tasty non-words and neighbours: The cognitive roots of lexical-gustatory synaesthesia. *Cognition, 110*(2), 171–181. https://doi.org/10.1016/j.cognition.2008.11.008

Singer, H. (1998). *Odd people in: The birth of community amongst people on the autistic spectrum. A personal exploration based on neurological diversity*. University of Technology, Sydney. https://www.academia.edu/27033194/Odd_People_In_The_Birth_of_Community_amongst_people_on_the_Autistic_Spectrum_A_personal_exploration_based_on_neurological_diversity

Snowling, M. J., Hulme, C., & Nation, K. (2020). *Defining and understanding dyslexia: past, present and future*. Oxford Review of Education, 46(4), 501–513. https://doi.org/10.1080/03054985.2020.1765756

Spence, C. (2013). Unraveling the mystery of the rounder, sweeter chocolate bar. *Flavour, 2*(1), 1-3. https://doi.org/10.1186/2044-7248-2-28

Spence, C. (2015). Eating with our ears: assessing the importance of the sounds of consumption on our perception and enjoyment of multisensory flavour experiences. *Flavour, 4*(3), 1-14. https://doi.org/10.1186/2044-7248-4-3

Spence, C. (2015). Just how much of what we taste derives from the sense of smell?. *Flavour, 4*(30). https://doi.org/10.1186/s13411-015-0040-2

Spence, C., & Ngo, M. K. (2012). Assessing the shape symbolism of the taste, flavour, and texture of foods and beverages. *Flavour, 1*(12). https://doi.org/10.1186/2044-7248-1-12

Stein, M. B., Jain, S., Giacino, J. T., Levin, H., Dikmen, S., Nelson, L. D., Vassar, M. J., Okonkwo, D. O., Diaz-Arrastia, R., Robertson, C. S., Mukherjee, P., McCrea, M., Mac Donald, C. L., Yue, J. K., Yuh, E., Sun, X., Campbell-Sills, L., Temkin, N., Manley, G. T., & and the TRACK-TBI Investigators. (2019). Risk of posttraumatic stress disorder and major depression in civilian patients after mild traumatic brain injury: A TRACK-TBI study. *JAMA Psychiatry, 76*(3), 249–258. https://doi.org/10.1001/jamapsychiatry.2018.4288

Stein, R., & Swan, A. (2018, May 24). *Personality tests with deep-sounding questions provide shallow answers about the 'true' you*. The Conversation. https://theconversation.com/personality-tests-with-deep-sounding-questions-provide-shallow-answers-about-the-true-you-95735

Stiensmeier-Pelster, J., & Schürmann, M. (1990). Performance deficits following failure: Integrating motivational and functional aspects of learned helplessness. *Anxiety Research, 2*(3), 211–222. https://doi.org/10.1080/08917779008249337

Still Watching Netflix. (2021, October 8). *Michael's most romantic moments from love on the spectrum | Netflix* [Video]. Youtube. https://www.youtube.com/watch?v=mVsC-7V3XPY

Stip, E., Thibault, A., Beauchamp-Chatel, A., & Kisely, S. (2016). Internet addiction, hikikomori syndrome, and the prodromal phase of psychosis. *Frontiers in Psychiatry, 7*, 6-6. https://doi.org/10.3389/fpsyt.2016.00006

Sullivan, P. F., Wells, J. E., Joyce, P. R., Bushnell, J. A., Mulder, R. T., & Oakley-Browne, M. A. (1996). Family history of depression in clinic and community samples. *Journal of Affective Disorders, 40*(3), 159–168. https://doi.org/10.1016/0165-0327(96)00056-0

Sun, S., & Yu, R. (2016). Social conformity persists at least one day in 6-year-old children. *Scientific Reports, 6*(1). https://doi.org/10.1038/srep39588

Suter, C. M., Affleck, A. J., Lee, M., Pearce, A. J., Iles, L. E., & Buckland, M. E. (2022) Chronic traumatic encephalopathy in Australia: the first three years of the Australian Sports Brain Bank. *Medical Journal of Australia, 216*(10), 530-531. https://doi.org/10.5694/mja2.51420

Synapse. (n.d.). *Catherine's Advocacy Journey*. https://synapse.org.au/personal-story/catherines-advocacy-journey/

Tajfel, H., & Turner, J. C. (1979). An integrative theory of intergroup conflict. In W. G. Austin, & S. Worchel (Eds.), *The Social Psychology of Intergroup Relations* (pp. 33-47). Monterey, CA: Brooks/Cole Publishing Co.

Tamaray, P. (2022, April 13). *Victorian Supreme Court hears case on "systemic" gender discrimination*. Human Resources Director. https://www.hcamag.com/au/specialisation/employment-law/victorian-supreme-court-hears-case-on-systemic-gender-discrimination/402374

Tan, R. D. A., Pañares, E. J. A., Pañares, F. J. A., Pagonzaga, E. D., Jumawid, J. A. M., Hinampas, R. T., & Tan, D. A. (2021). Investigating the effects of social media on students' academic performance and well-being during the pandemic. *International Journal of Scientific & Technology Research, 10*(7),145-151.

Teo, A. R., & Gaw, A. C. (2010). Hikikomori, a Japanese culture-bound syndrome of social withdrawal?: A proposal for DSM-5. *The Journal of Nervous and Mental Disease, 198*(6), 444–449. https://doi.org/10.1097/NMD.0b013e3181e086b1

Theadom, A., Barker-Collo, S., Jones, K., Kahan, M., Te Ao, B., McPherson, K., Starkey, N., Feigin, V., Feigin, V., Theadom, A., Barker-Collo, S., McPherson, K., Kydd, R., Barber, P. A., Parag, V., Brown, P., Starkey, N., Dowell, A., Kahan, M., & Ameratunga, S. (2017). Work limitations 4 years after mild traumatic brain injury: A cohort study. *Archives of Physical Medicine and Rehabilitation, 98*(8), 1560–1566. https://doi.org/10.1016/j.apmr.2017.01.010

Thomson, K., Hunter, S.C., Butler, S.H., Robertson, D.J. (2021). Social media 'addiction': The absence of an attentional bias to social media stimuli. *Journal of Behavioral Addictions, 10*(2), 302-313. https://doi.org/10.1556/2006.2021.00011

Tistarelli, N., Fagnani, C., Troianiello, M., Stazi, M. A., & Adriani, W. (2020). The nature and nurture of ADHD and its comorbidities: A narrative review on twin studies. *Neuroscience & Biobehavioral Reviews, 109*, 63-77. https://doi.org/10.1016/j.neubiorev.2019.12.017

Tomaszewski, W., Buliński, L., Mirski, A., Rasmus, A., Kowalczyk, J., Bazan, M., & Pąchalska, M. (2014). An evaluation of antisocial behaviour in children after traumatic brain injury: The prospect of improving the quality of life in rehabilitation. *Annals of Agricultural and Environmental Medicine, 21*(3), 649–653. https://doi.org/10.5604/12321966.1120620

Turner, R. C., Lucke-Wold, B. P., Robson, M. J., Omalu, B. I., Petraglia, A. L., & Bailes, J. E. (2013). Repetitive traumatic brain injury and development of chronic traumatic encephalopathy: a potential role for biomarkers in diagnosis, prognosis, and treatment?. *Frontiers in Neurology, 3*, 186. https://doi.org/10.3389/fneur.2012.00186

Tversky, A., & Kahneman, D. (1974). Judgement under uncertainty: heuristics and biases. *Science, 185*(4157), 1124–1131. https://doi.org/10.1126/science.185.4157.1124

Twilley, N. (2015, October 26). *Accounting for taste: How packaging can make food more flavorful*. The New Yorker. https://www.newyorker.com/magazine/2015/11/02/accounting-for-taste

Unnamalai, T., & Gopinath, R. (2020) Brand preference and level of satisfaction in consuming noodles. *International Journal of Management, 11*(11), 2909-2917. https://doi.org/10.34218/IJM.11.11.2020.274

Van Essen, D. C., Donahue, C. J., & Glasser, M. F. (2018). Development and evolution of cerebral and cerebellar cortex. *Brain, Behaviour and Evolution, 91*(3), 158–169. https://doi.org/10.1159/000489943

VanItallie T. B. (2019). Traumatic brain injury (TBI) in collision sports: Possible mechanisms of transformation into chronic traumatic encephalopathy (CTE). *Metabolism: Clinical and Experimental, 100S*, 153943. https://doi.org/10.1016/j.metabol.2019.07.007

Vendrik, K. E. W., Ooijevaar, R. E., de Jong, P. R. C., Laman, J. D., van Oosten, B. W., van Hilten, J. J., Ducarmon, Q. R., Keller, J. J., Kuijper, E. J., & Contarino, M. F. (2020). Fecal microbiota transplantation in neurological disorders. *Frontiers in Cellular and Infection Microbiology, 10*. https://doi.org/10.3389/fcimb.2020.00098

Victorian Curriculum and Assessment Authority. (2022). *VCE Psychology Study Design Units 1 and 2: 2016-2022; Units 3 and 4: 2017-2022*. https://www.vcaa.vic.edu.au/Documents/vce/psychology/2016PsychologySD.pdf

Vidyasagar, T. (2016). *We mightn't like it, but there are ethical reasons to use animals in medical research*. The Conversation. https://theconversation.com/we-mightnt-like-it-but-there-are-ethical-reasons-to-use-animals-in-medical-research-58878

Wahlquist, C. (2021, July 12). *Australian ad showing Covid patient gasping for air 'could increase vaccine hesitancy'*. The Guardian. https://www.theguardian.com/australia-news/2021/jul/12/australian-ad-showing-covid-patient-gasping-for-air-could-increase-vaccine-hesitancy

Westby, C., & Robinson, L. (2014). A developmental perspective for promoting theory of mind. *Topics in Language Disorders, 34*(4), 362-382. https://doi.org/10.1097/TLD.0000000000000035

Weston, J. (Director). (2002). *Wild child: The story of feral children* [Film]. Optomen Television.

Wilson, K., & Korn, J. H. (2007). Attention during lectures: Beyond ten minutes. *Teaching of Psychology, 34*(2), 85–89. https://doi.org/10.1080/00986280701291291

Wright, R. A., Agtarap, S. D., & Mlynski, C. (2015). Conversion of reactance motives into effortful goal pursuit: Implications of Brehm's theory of motivation intensity. *Zeitschrift für Psychologie, 223*(4), 267–276. https://doi.org/10.1027/2151-2604/a000228

Zampini, M., & Spence, C. (2004). The role of auditory cues in modulating the perceived crispness and staleness of potato chips. *Journal of Sensory Studies, 19*, 347-363. https://doi.org/10.1111/j.1745-459x.2004.080403.x

Zampini, M., Sanabria, D., Phillips, N., & Spence, C. (2007). The multisensory perception of flavor: Assessing the influence of color cues on flavor discrimination responses. *Food Quality and Preference, 18*(7), 975–984. https://doi.org/10.1016/j.foodqual.2007.04.001

Zverev, Y. P. (2004). Effects of caloric deprivation and satiety on sensitivity of the gustatory system. *BMC Neuroscience, 5*(5). https://doi.org/10.1186/1471-2202-5-5