Edrolo

VCE PSYCHOLOGY

Units 1 & 2

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Edrolo

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Our mission is simple: to improve education.

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USING THIS RESOURCE TO TEACH AND LEARN

Student tip

LEARN THE THEORY

Every dot-point in your study design is covered in our video lessons and textbook theory – perfect to use for pre-learning, during class, and as revision.

1

Teacher tip

EVALUATE STRENGTHS AND AREAS FOR IMPROVEMENT

Teachers see class-level data and individual student responses – use this to provide feedback, differentiate student learning, plan future lessons, and inform the revision program of your students.

4

2C The neuron

23 questions

Q4

I have correctly labelled point 1 as dendrites.	8/13 5/13
I have correctly labelled point 2 as axon.	5/13 8/13
I have correctly labelled point 3 as myelin.	8/13 5/13
I have correctly labelled point 4 as axon terminals.	5/13 8/13

Need help? Email the Edrolo School Support at:
help@edrolo.com.au.

CHECK FOR UNDERSTANDING

Each lesson has theory-review questions, skills questions, and exam-style questions so you can apply your knowledge in different ways and consolidate your learning. You'll also find tests/exams within each area of study.

Student tip

3

SELF-ASSESS AND GET FEEDBACK

At the back of your textbook you'll find exemplar responses and checklists for every exam-style question. In your Edrolo account, you'll find video solutions as well as the interactive checklists and exemplar responses. Use these answers to target your revision and get the greatest impact from your study time. This enables you to focus on the parts of the theory you struggled with, and ask your teacher for support if you get totally stuck!

FEATURES OF THIS BOOK

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

Hooks pose thought-provoking questions that you should be able to solve by the end of the lesson.

Study design dot points from the VCAA curriculum provide explicit links between our lessons and the syllabus.

Key knowledge units break down the theory into smaller chunks and can be used to help navigate the corresponding theory lesson videos online.

Activities include class experiments, class discussions, quizzes, surveys, or questionnaires, a model to fill in, or a video or article to read or watch and respond to.

Explore boxes include want to know more, useful tips, analogies, memory devices, lesson links, psychology in practice, psychology applied, and research spotlights.

Theory-review questions test if students can remember the basic theory and overcome common misconceptions. They are stepping stones between the content and exam-style questions.

Exam-style questions reflect the style of your end-of-year exam in Year 12. These include questions from both within the lesson and from multiple lessons, plus questions that test key science skills in the context of the theory that you just learned.

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

Checklists break down exam-style questions to highlight what is required to earn each mark. Checklists also include items that are not awarded a mark, but are things that students should include to improve the quality and coherency of their responses.

Skills questions develop students' practical skills that are required for examinations, such as unpacking a scenario, developing the most correct and appropriately nuanced phrasing and understanding research methods when applied to research literature or scenarios.

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

Chapter summaries are one-page outlines of the knowledge from the entire chapter that use models and diagrams to emphasise key theory details. They also show connections between lessons to help you zoom out and see the big picture.

Chapter review activities help to revise chapter concepts and develop your understanding of content throughout the whole chapter so as to prepare you for the chapter test that follows and any assessments you have at school.

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368   CHAPTER 7: SOCIAL COGNITION

CHAPTER 7 REVIEW

CHAPTER SUMMARY

This chapter was all about social cognition. As you now know, we use a range of cognitive tools and processes to interpret and make sense of other people and the social world around us.

In **7A**, we covered the range of factors that influence the formation of our attitudes. This was covered through the tri-component or A-B-C model of attitudes. The components include:

- Affective components
- Behavioural components
- Cognitive components

In **7B**, we learnt about person perception and how the tri-component model of attitude can be used to explain how we analyse other people. Specifically, we learnt that

- Stereotypes form the cognitive component
- Prejudices form the affective component
- Discrimination forms the behavioural component

In **7C**, we applied our knowledge of social cognition to explain the cognitive process of attribution and how it helps us make sense of our own and other people's behaviour. We also learnt that it is influenced by biases and our own personal attitude formation.

Understanding the world through social cognition

CHAPTER REVIEW ACTIVITIES

Review activity 1: Example bank

For the following key terms from the chapter, write a definition and provide an example in your own notes.

- Attitude
- Affective component (of attitudes)
- Behavioural component (of attitudes)
- Cognitive component (of attitudes)
- Person perception
- Stereotype
- Prejudice
- Discrimination
- Internal attribution
- External attribution
- Cognitive bias

The **chapter test** includes exam-style questions from content throughout the chapter, including multiple-choice questions, short-answer questions, and key science skills questions in order to provide thorough preparation for upcoming SACs. The chapter test also includes questions from multiple chapters so as to continue to develop a more holistic understanding of content throughout the Units 1 & 2 Psychology.

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370   CHAPTER 7: SOCIAL COGNITION

CHAPTER 7 TEST

Multiple-choice questions

Question 1   (1 MARK)

The actor-observer bias involves the tendency to

A attribute others' actions to internal factors, and our own to external factors.
B attribute others' actions to external factors, and our own to internal factors.
C attribute other people's and our own actions to internal factors.
D attribute other people's actions and our own to external factors.

Question 2   (1 MARK)

Enjoying classical music because it makes you feel relaxed is an example of

A a positive stereotype towards classical music.
B a negative stereotype towards classical music.
C a positive attitude towards classical music.
D a negative attitude towards classical music.

Question 3   (1 MARK)

Which of the following is an example of an internal attribution for someone being late to school?

A the month of the year
B mood
C the weather
D the traffic

Use the following information to answer Questions 4-6.

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 4   (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 5   (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

REVIEW   371

Short-answer questions

Question 6   (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 7   (4 MARKS)

Leo is a very tall man with broad shoulders. He has a big beard and often wears a big black hoodie covering his head. At night, whenever he sees a woman walking on her own towards him, he takes off his hood, smiles, and skips across the road. He does this to avoid intimidating women because he knows he looks like a strong and possibly threatening man.

a Explain how Leo's behaviour might reflect an attitude he holds towards women. (2 MARKS)
b Describe how stereotypes of men might have influenced Leo's behaviour. (2 MARKS)

Question 8   (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 an argument between researchers about a species of sea turtle at her bar while working. Having happened to have just completed an assignment on this species, Scarlett chimed in with an opinion. The researchers looked up at Scarlett annoyed, and smiling condescendingly, asked her what a pretty, young bartender could possibly know about sea turtles.

Describe how the researchers in the bar demonstrated discrimination and explain how it could be informed by a stereotype.

Key science skills

Question 9   (1 MARK)

In a study on stereotyping, a researcher asked participants to say whether they believe they fit into a stereotype, and if so, what characteristics of the stereotype they adhere to. The type of data collected was

A numerical.
B quantitative.
C objective.
D qualitative.

Question 10   (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.

Questions from multiple chapters

Question 11   (6 MARKS)

Jun is a Japanese boy who loves acting. He is currently on exchange in Australia, and is very excited to take drama class as this is not offered at his school at home. In drama class, when it was Jun's time to perform, he got up and played a very eccentric old man. He noticed the class begin to laugh at him and make faces as though he was weird.

Afterwards, they told him they were so surprised because they thought Japanese people were quiet and reserved. After this, even though Jun still loved drama and acting, he felt uncomfortable and upset and no longer volunteered to perform for the class. Instead, he believed he should stay quiet so as not to challenge his class's beliefs regarding how he should behave.

a Explain how stereotypes in this scenario acted as a social factor and explain how this may have impacted Jun's mental health. (3 MARKS)
b Identify Jun's affective component of his original attitude towards acting, and explain whether his behaviour over time was consistent with this component. (3 MARKS)

Science skills and research methods

1A   Aims, hypotheses and variables

1B   Scientific research methodologies

1C   Population, sample and sampling

1D   Sources of error and prevention

1E   Ethical considerations

1F   Collection of data

1G   Data organisation and interpretation

1H   Evaluation of research

This chapter will develop your knowledge of research methods, as well as the scientific skills you need to conduct and interpret research investigations in both year 11 and year 12 Psychology. This will build the foundation of knowledge that you will use to conduct the research investigation assessment for Unit 1 AOS3 and the practical investigation assessment for Unit 2 AOS 3. To do this, you will examine the key knowledge dot points related to research methods from Units 1 & 2 AOS 3 in combination with the key science skills outlined in the study design.

Units 1-4: Key science skills

- Develop aims and questions, formulate hypotheses and make predictions
  - determine aims, research hypotheses, questions and predictions that can be tested
  - identify and operationalise independent and dependent variables
- Plan and undertake investigations
  - determine appropriate type of investigation: experiments (including use of control and experimental groups); case studies; observational studies; self-reports; questionnaires; interviews; rating scales; access secondary data, including data sourced through the internet that would otherwise be difficult to source as raw or primary data through fieldwork, a laboratory or a classroom
  - use an appropriate experimental research design including independent groups, matched participants, repeated measures and cross-sectional studies

- – minimise confounding and extraneous variables by considering type of sampling procedures, type of experiment, counterbalancing, single and double blind procedures, placebos, and standardised instructions and procedures
- – select appropriate sampling procedures for selection and allocation of participants including random sampling, stratified sampling, convenience sampling and random allocation of participants to groups
- Comply with safety and ethical guidelines
  - – understand the role of ethics committees in approving research
  - – apply ethical principles when undertaking and reporting investigations, including consideration of the role of the experimenter, protection and security of participants' information, confidentiality, voluntary participation, withdrawal rights, informed consent procedures, use of deception in research, debriefing and use of animals in research
- Conduct investigations to collect and record data
  - – systematically generate, collect, record and summarise both qualitative and quantitative data
- Analyse and evaluate data, methods and scientific models
  - – process quantitative data using appropriate mathematical relationships and units
  - – organise, present and interpret data using tables, bar charts, line graphs, percentages, calculations of mean as a measure of central tendency and understanding of standard deviation as a measure of variation around the mean
  - – recognise the difference between statistics that describe a specific sample and the use of statistics to make inferences about the population from which the data were drawn
  - – use basic principles of reliability and validity in evaluating research investigations undertaken
  - – explain the merit of replicating procedures and the effects of sample sizes in obtaining reliable data
  - – evaluate investigative procedures and possible sources of bias, and suggest improvements, with reference to identification of potential extraneous and confounding variables including individual participant differences, non-standardised instructions and procedures, order effects, experimenter effect and placebo effects
  - – distinguish between scientific and non-scientific ideas
- Draw evidence-based conclusions
  - – determine to what extent evidence from an investigation supports the purpose of the investigation, and make recommendations, as appropriate, for modifying or extending the investigation
  - – draw conclusions consistent with evidence and relevant to the question under investigation
  - – identify, describe and explain the limitations of conclusions, including identification of further evidence required

1A AIMS, HYPOTHESES AND VARIABLES

Does smell affect your ability to recall certain memories? Why is it that different people respond to the same situation differently? What is the best way to teach an old dog new tricks? How do we start answering any of these questions?

One way to find an answer is through using the scientific method, which you will learn about in this lesson. Scientists, including psychologists, use this method to develop an aim and hypothesis which are created to conduct experiments to find these answers.

1A Aims, hypotheses and variables	1B Scientific research methodologies	1C Population, sample and sampling	1D Sources of error and prevention	1E Ethical considerations	1F Collection of data	1G Data organisation and interpretation	1H Evaluation of research

Key science skills

- develop aims and questions, formulate hypotheses and make predictions:
    - determine aims, research hypotheses, questions and predictions that can be tested
    - identify and operationalise independent and dependent variables
- analyse and evaluate data, methods and scientific models:
    - distinguish between scientific and non-scientific ideas

Key knowledge units

Introduction to research	SS 1.1.1
Aims and hypotheses	SS 1.1.2
Independent and dependent variables	SS 1.2.1
Operationalising variables	SS 1.2.2

Aims, hypotheses and variables

Introduction to research SS 1.1.1	Aims and hypotheses SS 1.1.2	Independent and dependent variables SS 1.2.1	Operationalising variables SS 1.2.2

Introduction to research SS 1.1.1

OVERVIEW

Research in the field of psychology is conducted using the scientific method. This involves conducting experiments to test hypotheses in order to either validate or counter them.

THEORY DETAILS

Modern psychology is studied as a science. This means that psychologists use the *scientific method* to study psychological phenomena. The scientific method involves developing testable predictions that scientists can test, either through direct observation or carefully controlled and planned experiments, in order to validate or invalidate them. Through these forms of research, scientists collect **empirical evidence** and draw conclusions, contributing to the wider understanding of psychological phenomena.

Empirical evidence data that is collected through direct observation or through experiments

In this chapter, you will learn about the research methods involved in psychological research in order to conduct your own experiment and apply this knowledge to different areas of the course.

In this lesson, you will begin by looking at aims, hypotheses, and variables: the foundations for conducting a research experiment.
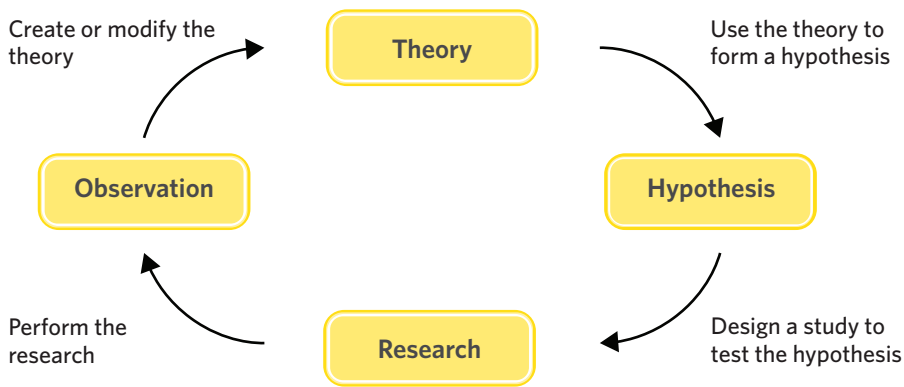
Figure 1 The scientific method involves testing a hypothesis in order to collect empirical evidence that informs a theory
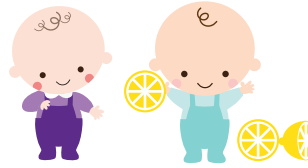
Image: JungleOutThere/Shutterstock.com

Figure 2 Even babies know the scientific method

Aims and hypotheses SS 1.1.2

OVERVIEW

When investigating a psychological concept, you must first develop an aim for your experiment and a hypothesis to test.

THEORY DETAILS

When scientists conduct research, they start with a research question that they will try to answer through their study. The research question can be restated as an **aim**, which is a statement outlining the purpose of a study.

Some examples of research aims include:

- The aim of this study is to explore the influence of gender on the motivation to play team sports.
- The aim of this study is to establish a relationship between stress and the retrieval of episodic long-term memory.

By outlining the purpose of an experiment or study in this way, researchers can clearly identify the scope of the research, and communicate this to their peers and colleagues.

From the aim of an experiment, researchers will develop a **hypothesis**, which is a testable prediction about the outcome of an experiment. There are two main components of a hypothesis that you need to be familiar with: the variables, which can be further broken down into the independent and dependent variables, and the population of interest being researched.

Aim a statement outlining the purpose of the study

Hypothesis a testable prediction about the outcome of an experiment; it is written in the form of a statement and includes the variables that will be tested

Variables are the components of the research that will be manipulated and measured in order to test the hypothesis. You will learn more about the types of variables in research in the next part of this lesson. As psychology is the study of the human mind and behaviour, research is usually conducted on human participants. Research in psychology may focus on different groups of people, rather than all humans. The group of people who are of interest to the research is called the **population**.

Variable a factor or element of an experiment that may be manipulated or measured

Population the group of people of interest to an experiment, to which the results of the experiment are generalised to

🧩 *Lesson link*

It is often not possible to have an entire research population participate in an experiment. As such, researchers usually use a subset of the population, called a sample, to conduct their research on. The results of the experiment are then generalised to the population, even though not every member of the population took part in the experiment. You will learn more about this in lesson *1C: Population, sample and sampling*.

Hypotheses are written as a statement and indicate the direction of the relationship between the variables in the experiment. Hypotheses need to be *testable*, that is, written in a way that can be supported or rejected through research.

Some examples of hypotheses include:

- It was hypothesised that males will report higher levels of motivation to play team sports than females.
- It was hypothesised that people who experience high levels of distress are less likely to be able to recall specific episodic long-term memories than people with low levels of distress.

① *Useful tip*

It is important to remember that hypotheses are written in the form of a statement. One way to structure your hypotheses is to start it with the following phrase 'It was hypothesised that…' (if the research has taken place) or 'It is hypothesised that…' (if the research needs to be conducted). Using this phrase will ensure that your hypothesis is written as a statement, and not a question.

🖋 *Memory device*

One way of remembering these components is with the acronym **iPad** standing for:

- **I**ndependent and dependent variable
- **P**opulation
- **a**nd
- **D**irection of hypothesis.

① *Useful tip*

The things you need to include in your hypothesis are:

- The variables (independent and dependent)
- The direction of your hypothesis

Although it is not necessary to include the population of the study in your hypothesis, you won't lose marks if you choose to include it.

ACTIVITY 1

Can you turn these research questions into aims?

Rewrite the following research questions as aims; remember that research aims are written as a statement outlining the purpose of a study.

- Are children with siblings more empathetic than children with no siblings?
- Is there a genetic component to personality?
- What is the role of mindset in academic achievement?

Independent and dependent variables SS 1.2.1

OVERVIEW

In scientific experiments, researchers try to establish a causal relationship between two variables. These variables are the independent variable and the dependent variable.

THEORY DETAILS

A key component of the scientific method is that a theory is tested in a carefully controlled environment in order to collect empirical data, that is, data that has been collected through either observation or experimentation. One way of controlling the environment is through the manipulation and measurement of variables.

In an experiment,

- the **independent variable (IV)** is the variable that is manipulated in order to see the effects it has on the dependent variable.
- the **dependent variable (DV)** is the variable that is then measured, to see if it was affected by a change in the independent variable. That is, it is dependent/reliant on the independent variable.

For example, a researcher wanting to test the effect of caffeine consumption on concentration may manipulate how much caffeine participants consume (the independent variable) and then measure if this affected participants' ability to concentrate (the dependent variable). By carefully controlling, manipulating and measuring variables in this way, researchers can either support or reject their hypothesis and contribute to the wider body of psychological knowledge and understanding. Table 1 outlines the relationship between the aim, hypothesis, independent and dependent variables in this example.

Independent variable (IV) the variable that the experimenter manipulates in order to observe the effect it has on something (i.e. the dependent variable)

Dependent variable (DV) the variable that is being measured in an experiment for changes it experiences due to the effect of something (i.e. the independent variable)

Table 1 The relationship between the aim, hypothesis, independent and dependent variables in an experiment

Research question	Does drinking coffee affect levels of concentration?
Aim	The aim of this study is to establish a relationship between caffeine consumption and increased levels of concentration.
Hypothesis	It was hypothesised that participants who consume caffeine will display higher levels of concentration than participants who don't.
Independent variable	Whether participants consume caffeine or do not consume caffeine.
Dependent variable	Concentration levels.

✏️ Memory device

Have you ever seen those big old TVs from the 80s and 90s? They have antennas on top of them that, when moved, affect what appears on the screen.

One way of remembering independent and dependent variables is by thinking of an "IV DV TV". The independent variable (IV) is like the antenna on top of the TV: experimenters modify the IV in order to see the effect that it has on the dependent variable (DV) (the image that appears on the TV screen).

Figure 3 You can think of "IV DV TV" to remember the difference between IV and DV

✏️ Memory device

Another way of remembering the IV and DV is through m&m:

- IV is **m**anipulated to cause an effect
- DV is **m**easured for a change that has occurred

Image: Roman Samokhin/ Shutterstock.com

Figure 4 You can use m&m's to remember that the IV is manipulated and the DV is measured

ACTIVITY 2

Can you identify independent and dependent variables?

Identify the IV and DV for the following studies.

a   It was hypothesised that smokers who underwent cognitive behavioural therapy were more likely to quit smoking than those who tried to quit using hypnosis.

IV: _____   DV: _____

b   It was hypothesised that women over the age of 40 who reported having strong social connections would have a higher brain mass density than those who reported having weaker social connections.

IV: _____   DV: _____

c   It was hypothesised that children who experience bullying will have poorer academic outcomes than children who are not bullied.

IV: _____   DV: _____

Operationalising variables SS 1.2.2

OVERVIEW

Operationalising variables involves precisely defining how they will be manipulated and measured, specific to the experiment.

THEORY DETAILS

When deciding upon the variables that need to be manipulated and measured, researchers also need to decide upon *how* this will be done. It is necessary for researchers to define the variables to this level of detail, as often the psychological concepts in research are broad and can be manipulated and measured in many different ways.

In the previous example, wherein the researcher wants to test the effects of caffeine consumption on concentration, there are many ways that the consumption of caffeine can be manipulated (number and types of coffees participants have consumed, number and types of soft drinks participants have consumed, a measure of caffeine concentration in participant's blood) and there are a number of ways that concentration can be measured (through the use of eye-tracking on a task, reaction times, etc.).

Deciding on how these variables are manipulated and measured for a particular experiment is called **operationalisation**.

Operationalisation the process of defining variables in terms of how they will be manipulated or measured in the experiment

- The operationalised independent variable is then a statement of how the independent variable will be *manipulated*.
- The operationalised dependent variable is a statement of how the dependent variable will be *measured*.

Table 2 Examples of operationalised variables

Hypothesis	Independent variable	Operationalised independent variable	Dependent variable	Operationalised dependent variable
It was hypothesised that people who meditate more report lower levels of stress	How often people meditate	The number of minutes people spend meditating per week	Reported stress levels	Participants' self-reported rating of stress, on a scale of 1 to 10
It was hypothesised that people who use more screens in their daily activity are less able to concentrate on tasks	Use of screens	The number of hours spent on screens per day	Ability to concentrate on tasks	Participants' number of correct responses or percentage of correct responses on a concentration activity
It was hypothesised that people who have more fresh air are more motivated to complete their homework	Exposure to fresh air	Whether participants are sitting by an open window or not	Motivation to complete homework	Participant's self-reported rating of motivation

Theory summary

Modern psychology is studied using the scientific method, in which researchers may conduct an experiment or observe phenomena to collect empirical data to either support or refute their hypothesis.

The key components of the scientific method that you have learnt in this lesson include:

- The aim is a statement summarising the purpose of the research.
- The hypothesis is a statement, written in the form of a testable prediction; it is important that the hypothesis is testable, otherwise scientists can't conduct an experiment to collect empirical data.
- The hypothesis in an experiment predicts the relationship between the independent and dependent variables.
- The independent variable is the variable that the experimenter manipulates in order to test the hypothesis.
- The dependent variable is the variable that is measured in order to test the hypothesis.

1A QUESTIONS

Question 1

The aim of an experiment is *(Select one)*

A a testable prediction about the relationship between the variables in an experiment.

B a statement outlining the purpose of a study.

Question 2

A hypothesis is *(Select one)*

A a testable prediction about the relationship between the variables in an experiment.

B a statement outlining the purpose of a study.

Question 3

Which of the following statements about a hypothesis is true? *(Select all that apply)*

I It is a statement outlining the purpose of a study

II It includes the independent and dependent variables

III It predicts the direction of the relationship between the independent and dependent variables

IV It is written as a question

V It must be testable

Question 4

Fill in the blanks using the following terms.

- Measure
- Manipulate

In an experiment, researchers _____, the independent variable in order to _____ the effect it has on the dependent variable.

Question 5

Operationalising variables involves *(Select one)*

A choosing which variables to study in an experiment.

B defining in detail how variables will be measured and manipulated.

Skills

Understanding research

Question 6

Read the following abstract and identify the study's aim, hypothesis and experimental research design.

> **Contagious yawning, empathy, and their relation to prosocial behaviour**
>
> Yawning can be contagious. Former studies have suggested that about 40% to 60% of humans are susceptible to contagious yawning (e.g.,Gallup, Church, Miller, Risko, & Kingstone, 2016),.. Moreover, some studies have suggested that the susceptibility of contagious yawning is linked to the degree of empathy (Lehmann, 1979; Norscia et al., 2016b; Palagi et al., 2009). Yawning is also more contagious among individuals with close social ties, compared to strangers (Norscia et al., 2016b).
>
> In this article... we investigate whether the susceptibility of contagious yawning is also an indicator of individuals' baseline empathy level. We hypothesised that...those who show contagious yawning are also more likely to have greater levels of empathy. Subjects were randomized into either a treatment group or a control group. In the treatment group, subjects watched videos of laughing faces, people scratching or touching their face or hair, and yawning faces. In the control group, subjects watched only laughing and scratching subjects. This experimental procedure allowed us to determine the natural occurrence of spontaneous yawning in comparison to contagious yawning. Moreover, it also allowed us to test whether other forms of mimicry (scratching and laughing) are related to empathy. We also measured prosocial behavior... by giving subjects the opportunity to donate some (or all) of their experimental payment to a charitable organization.
>
> (Franzen et al., 2018).

Aim: _____

Hypothesis: _____

Experimental research design: _____

Exam-style questions

Multiple-choice questions

Question 7   (1 MARK)

In an experiment, the independent variable

A   is the variable that is measured.

B   is the variable that is manipulated by experimenters.

C   is the data that researchers collect.

D   is the data that researchers report on.

Question 8   (1 MARK)

What is an operationalised variable?

A   A variable that the researcher manipulates.

B   A variable that the researcher measures.

C   A variable that has been defined in terms of how it will be either measured or manipulated.

D   A variable that determines the outcome of the study.

Question 9   (1 MARK)

Dr Brown wanted to research whether the birth order of siblings (that is, if they are the oldest, youngest or middle child) affected the coping techniques people used in stressful situations.

The independent and dependent variables for this study would be

	Independent variable	Dependent variable
A	The coping strategies participants used	How well participants coped in stressful situations
B	The coping strategies participants used	Whether participants were the eldest or youngest child
C	Birth order	Whether participants were the eldest or youngest child
D	Whether participants were the eldest or youngest child	The type of coping strategies they used

Short-answer questions

Question 10   (3 MARKS)

Ola has noticed that after spending a lot of time on social media, she has been finding it difficult to talk to people in person. She wants to see if other people feel the same way, so she set up an experiment with her classmates.

Write a possible research hypothesis for Ola's experiment.

Question 11   (6 MARKS)

Kenny is a researcher who wants to study the effect of smell on mood. In order to test this, he had participants do a quiz in two separate rooms. In one room, there was a sweet rose-scented candle burning, and in the other room there was no added scent. After the quiz, Kenny asked participants to fill in a questionnaire about their experience in the study, including asking questions about what mood they were feeling and whether they would recommend a study to a friend.

a   Write a possible aim for this experiment. (1 MARK)

b   Identify the independent and dependent variables in this experiment. (2 MARKS)

c   Write a possible hypothesis for this experiment. (3 MARKS)

1B SCIENTIFIC RESEARCH METHODOLOGIES

Let's say that you are interested in researching sleep patterns. Specifically, you want to know why babies sleep so much. How might you go about constructing an experiment to test this?

You could collect the sleep data of babies under observation in a sleep clinic, or maybe whilst they're still in the hospital after birth. You could study one baby in particular, and follow their sleep patterns and the changes in these patterns over the first five years of their life. Or maybe you can ask the mothers of newborns to tell you how much and how often their child sleeps.

These are all different ways of conducting research, and as you will learn in this lesson, scientists need to make decisions about which method of research to use, as each has its own strengths and limitations.

Image: Natalia Zelenina/Shutterstock.com

1A Aims, hypotheses and variables	1B Scientific research methodologies	1C Population, sample and sampling	1D Sources of error and prevention	1E Ethical considerations	1F Collection of data	1G Data organisation and interpretation	1H Evaluation of research

Key science skills

- plan and undertake investigations:

    - determine appropriate type of investigation: experiments (including use of control and experimental groups); case studies; observational studies; self-reports; questionnaires; interviews; rating scales; access secondary data, including data sourced through the internet that would otherwise be difficult to source as raw or primary data through fieldwork, a laboratory or a classroom

    - use an appropriate experimental research design including independent groups, matched participants, repeated measures and cross-sectional studies

Key knowledge units

Types of investigations	SS 2.1.1
Experimental research designs	SS 2.2.1

Scientific research methodologies

Types of investigation SS 2.1.1   Experimental research designs SS 2.2.1

Types of investigations SS 2.1.1

OVERVIEW

There are many different types of investigations that a researcher can conduct in order to collect data for their study. In this section, you will learn about the different types of scientific investigations researchers can choose from, as well as the benefits and limitations of each.

THEORY DETAILS

In the previous lesson, you learnt about how researchers formulate an aim and hypothesis for an area of research that they are interested in. Once these and the variables of interest are decided upon, researchers must then choose the type of investigation they want to conduct. You may have encountered different research methodologies before, such as participating in an experiment yourself or filling out a questionnaire. Each form of investigation has its own strengths and limitations. Choosing what type of investigation you want to conduct depends on the hypothesis you are trying to test, and the type of data that you want to collect.

Table 1 outlines the scientific research methodologies (different types of scientific investigations) you need to be familiar with for this course. Each of these methodologies follow the scientific method in order to obtain empirical data. The strengths and limitations of each research methodology are outlined in table 2.

Table 1 Types of research methodologies

	Description	Example	
Experiments	An **experiment** measures a cause and effect relationship between variables within a controlled setting.	• A researcher is interested in the effect of dogs on self-reported happiness. • They set up an experiment within a controlled setting, where one group of participants played with a dog for five minutes before completing a questionnaire assessing their level of happiness. • Another group completed the questionnaire without playing with any dogs. The researcher then compared the happiness results of the two groups.	**Experiment** a study conducted in a carefully controlled environment to measure the cause and effect relationship between variables
Self-report	**Self-report** methodologies involve participants providing their own account of an experience. Therefore the data collected is subjective. Self-report data can be collected through a variety of means, including questionnaires, interviews and rating scales.	• At the end of your semester, you may fill in a questionnaire about how you felt about the class, the assignments that were set and your teacher. • These are subjective reports of your experience of the class and are an example of a self-report.	**Self-report** a participant's subjective account of an experience; this type of investigation can be conducted through the use of a questionnaire, interview or rating scale
Questionnaires (a form of self-report)	**Questionnaires** include a list of questions created by the researcher for participants to respond to. They can be administered in a variety of ways including paper-and-pencil questionnaires, electronic or online questionnaires. Questions can be open (in which participants write their response without constraints) or closed (in which participants choose from a predetermined list of responses).	• When you use a service online, you may be emailed a questionnaire. afterwards asking for your response to questions about your experience. • Open questions may include 'do you have any feedback that you'd like to share with us?'. • Closed questions may include 'were you satisfied with the service provided?' to which you could choose either 'yes' or 'no'.	**Questionnaire** a list of questions that participants can respond to in a variety of formats
Interviews (a form of self-report)	**Interviews** are another form of self-report and are usually conducted verbally, with the researcher asking questions of the participants and recording their responses. Interviews may come in many forms, and can be structured (involving a set of predetermined questions) or free-form/unstructured (wherein the researcher may change, adapt or add questions during the interview or have no set questions at all).	• A policeman asks an eye-witness a series of questions about the events that led up to a crime. • The responses the eye-witness provides may change the next question the policeman asks, reflecting that interviews can be free-form.	**Interview** a type of questionnaire that is usually conducted verbally, involving the researcher asking participants questions and recording their responses
Rating scales (a form of self-report)	**Rating scales** are another form of self-report in which participants indicate their response to a set of questions using a scale. This most commonly involves participants selecting a numerical score on a scale, but can also involve non-numerical scales (such as strongly agree to strongly disagree).	• The rating out of five stars that you give your Uber driver after completing a trip is an example of a rating scale. *cont'd*	**Rating scale** a form of questionnaire collecting numerical data from participants' responses

Table 1 Continued

	Description	Example	
Observational studies	An **observational study** is when behaviour is observed and recorded by the researcher. Behaviour can be observed through physical, real-time observations, as well as observing behaviour which has been recorded. This can be preferable to using self-report when researching concepts in which there may be a discrepancy between participants' responses and their actions.	• A researcher is interested in whether people will help a distressed person in a public space. • They set up a situation where a *confederate* (a person who is secretly a part of the experiment) falls and appears to be unconscious. • The researcher observes the actions of the people around the confederate and records how many people attend to them. • This may provide more accurate results than a self-report, wherein the participants' response is influenced by how they believe or wish they would respond.	**Observational study** a type of study in which data is collected through careful monitoring of participants
Case studies	**Case studies** involve focusing on one person or just a few individuals, looking at the variables relevant to the study in detail. Data can be collected in many formats (subjective self-report data, objective quantitative data) and from many different sources (through interviews, medical records, observation). Case studies are used when large sample sizes are not easily obtainable, or the phenomenon being studied is rare or difficult to replicate. This is often the case when participants have a rare condition of interest to a researcher.	• The case study of Phineas Gage may be one that you are familiar with. • Phineas was a railway worker who survived being impaled by a metal rod through his frontal lobe. • His case study helped psychologists to understand the functions of the frontal lobe.	**Case study** an in-depth study of an individual or a very small group of individuals
Longitudinal studies	A **longitudinal study** gathers data from the same participants over an extended time period in order to see differences or changes in specific variables over time.	• The 'Up' documentary series is an example of a longitudinal study in which data was collected from fourteen British children every seven years, beginning in 1964 when they were seven years old. • The study followed up every seven years and the latest installment in the series, *63 Up,* was released in 2019. (Lewis, 2019).	**Longitudinal study** a type of investigation in which data is gathered from participants over an extended period of time, and the participants are followed up after specific time intervals
Cross-sectional studies	**Cross-sectional studies** involve a researcher measuring different variables in a population at a single point in time. Often, this involves gathering data from groups of participants of different ages (called *cohorts*) in order to compare trends in different age groups in an efficient manner, rather than performing a longitudinal study spanning decades. This provides a 'snapshot' of data at a specific point in time.	• A researcher is interested in the dietary habits of different age groups. • They study a group of people in their 20s and compare them to groups of people in their 30s and a group of people in their 40s.	**Cross-sectional study** when data is collected from participants from different segments of the population (pre-existing cohorts) to represent a 'snapshot' in time

Want to know more?

A common type of rating scale that you may have seen before is called the *Likert scale*.

The Likert scale asks participants to respond to statements with 'strongly disagree, disagree, neutral, agree or strongly agree' and assigns a numerical value (such as a value of 1-5) to each of these responses in order to obtain quantitative data that can be easily measured and compared.

| Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
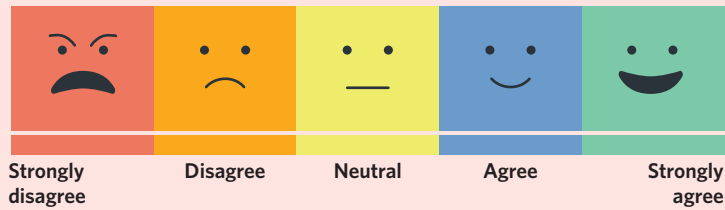
Figure 1 Example of a Likert scale

Table 2 Benefits and limitations of different research methodologies

	Benefits	Limitations
Experiments	• Variables can be carefully controlled, manipulated, and measured so that a cause-effect relationship can be determined. • Experiments can also be replicated by other researchers in order to ensure the reliability of the results.	• Despite being conducted in a carefully controlled environment, sometimes other variables (confounding variables) can still affect the dependent variable, invalidating the results. • Depending on what is being studied, sometimes the variables aren't easily manipulated or measured, or there are too many variables to do so accurately. • Some phenomena cannot be measured in a controlled environment.
Self-report	• Self-reports are useful as some behaviours and opinions cannot be directly observed. • Participant accounts of these through a self-report can allow researchers to obtain data they otherwise couldn't access.	• The data collected is subjective data, which can be difficult to compare and analyse. • People don't always provide accurate responses. They may instead respond with what they think researchers would want, and so the validity of responses is difficult to establish.
***Questionnaires* (a form of self-report)**	• Questionnaires can often be completed in a short time frame and can be administered in large numbers. • Lots of data can be collected and can be easily compared between participants.	• The data collected may not be as detailed as other forms of investigation, such as in an interview, especially if closed questions are used.
***Interviews* (a form of self-report)**	• Researchers can obtain lots of qualitative data as responses are open. • They can change/adapt questions as they go, dependent on the participants' responses, allowing for a more holistic understanding of the participants' experience.	• Interviews can be time-consuming and costly to conduct for large samples. • It is difficult to ensure standardised procedures for each participant, especially if there are multiple interviewers, and as such errors in the data collected can make it difficult to compare across participants.
***Rating scales* (a form of self-report)**	• Fixed responses on rating scales means that the data collected can be easily measured and compared.	• Without qualitative data in participants' self-report, it is difficult for researchers to develop a holistic understanding of participants' responses, such as understanding the motivation behind specific responses.

cont'd

Table 2 Continued

	Benefits	Limitations
Observational studies	• Observational studies can allow researchers to collect data in a naturalistic setting so that the behaviours they observe are more representative of what would occur, rather than in a controlled experimental setting. • Observational studies can also occur in controlled, laboratory settings, allowing the researcher to have an active involvement in the conditions of the setting and the procedures involved. • Researchers are not required to manipulate variables or intervene with participant's behaviours.	• It is difficult for researchers to establish a causal relationship between variables, because they are unable to intervene to manipulate variables. The interpretation and recording of data is subjective and therefore prone to experimenter bias.
Case studies	• Very detailed data can be collected, and researchers can gain a lot of insight into specific cases. • This allows researchers to have a deeper understanding of the individual/s and the particular phenomenon being studied.	• Case studies only focus on an individual, or a small group of people, and as such it makes the findings of the case study difficult to generalise to a larger population. This is because there are fewer people in the case study, which are therefore not representative of a larger group of people. • Some individuals studied through case studies often represent extreme cases which may not accurately represent normal functioning, e.g. a case study of those with significant brain injuries don't represent brain functioning of individuals without injuries.
Longitudinal studies	• A lot of detailed data can be collected about individuals over a long period of time. • Data about long-term change can be collected whilst minimising individual differences between participants, as it is the same participants that are followed up over the period of the study.	• Longitudinal studies can be expensive, as well as being difficult to conduct. • Many extraneous variables are more difficult to control over the long period of the study. • Due to being conducted over a long period of time, there is a heightened level of *attrition* (when participants drop out of the study)
Cross-sectional studies	• Data on long-term trends and changes over time can be collected in the short term. • This type of study is more efficient and less costly than conducting a longitudinal study.	• There can be extraneous variables in the different cohorts (age groups) that aren't related to age, such as different social or cultural experiences. • This makes it difficult to make comparisons across the cohorts and come to valid conclusions based on the data collected.

Sometimes researchers use a range of different methods for one study. For example, a researcher may conduct a case study on migraines involving three individuals. As a part of this study, the researcher may conduct interviews with the participants, as well as asking participants to record a daily pain score using a rating scale. This rating scale may be a part of a larger questionnaire, in which participants also respond to questions about their subjective pain experience.

As seen in this example, researchers make decisions about what types of investigations they want to conduct based on the type of data they want to collect, and the benefits and limitations of each research method.

Experimental research designs SS 2.2.1

OVERVIEW

A common type of investigation that is conducted by researchers is experiments. There are three types of experimental designs with which you need to be familiar: independent groups design, repeated measures design, and matched participants design.

THEORY DETAILS

It is often common for researchers to conduct research through experiments, as they have more control over the variables. This means that they are able to more accurately manipulate and measure variables when conducting experiments.

There are three types of experimental designs that you should be familiar with: independent groups design, repeated measures design and matched participants design. Each experimental design has its own strengths and limitations. Choosing the type of experimental design should depend on the phenomena you are interested in and the type of data you wish to collect. Table 3 outlines these different experimental designs.

In each of these experimental designs there are control and experimental groups:

- The **control group** serves as a baseline or 'control' for the experiment, as the participants are not exposed to the independent variable. The control group allows for the researcher to establish a causal relationship between the independent and dependent variable. The comparison between the results of the control and experimental groups helps to validate that the changes to the dependent variable have resulted from the independent variable and not something else.

- The **experimental group/s** are exposed to the independent variable in order to test the effect that it has. In experiments, there may be one or more experimental groups depending on the research that is being conducted.

The strengths and limitations of each experimental design are outlined in table 4.

Control group a group that is used as a basis for comparison; participants are not exposed to the experimental condition/s (the IV)

Experimental group the group within an experiment that are exposed to experimental condition/s (the IV)

PARTICIPANTS

Control group — Not exposed to the IV

Experimental group — Exposed to the IV
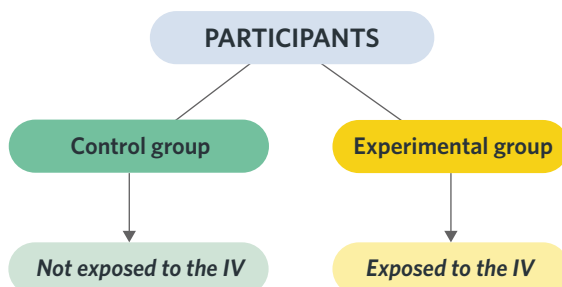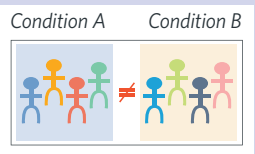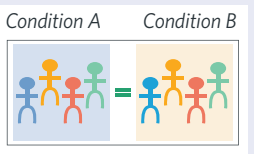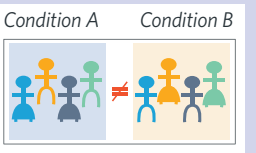
Figure 2 The control group are not exposed to the independent variable

Table 3 Experimental research designs

	Independent groups design (between-groups design)	Repeated measures design (within-groups design)	Matched participants design
Description	Participants in the study are split through random allocation into two or more groups. This most commonly involves the participants being split into the control group (participants are not exposed to the IV) and one or more experimental groups (participants are exposed to the IV).	The same participants are in both the control and experimental condition. They will participate in one condition first, and then the other/s.	Participants are matched based upon key characteristics relevant to the investigation, such as age, gender, or height. Each pair is split between the control and experimental group, to ensure an even distribution of the characteristics for which they have been matched. This split involves one participant in the pair being allocated to the control condition, and the other participant being allocated to the experimental condition.
Diagram	*Condition A Condition B*	*Condition A Condition B*	*Condition A Condition B*
Example	• A researcher is investigating the effects of listening to music on concentration. • A coin is flipped between all participants in the sample to decide who is allocated to the control group (who don't listen to music while studying) and who is allocated to the experimental group (who listen to music while studying).	• All participants study for one hour listening to music, and then study for another hour without music.	• Participants in the control and experimental conditions are matched based upon their age and previous SAC score before being allocated into either the music or non-music condition.

Independent groups design (also known as between-groups design) an experimental design in which participants are split into two or more groups; typically a control group and an experimental group/s

Repeated measures design (also known as within-groups design) an experimental design in which the same participants are in every condition of the experiment

Matched participants design an experimental design in which participants are paired based upon relevant characteristics, where one member of the pair is tested in one condition, and the other member is tested in the other

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🧠 *Want to know more?*

It is important to remember that some experiments do not have a control group, and instead have two or more experimental groups (with participants in each group being exposed to different variations of the IV). In such a way, the experimental research designs may involve participants being split into two or more experimental groups instead of a control and experimental group.

Table 4 Strengths and limitations of different experimental designs

	Strengths	Limitations
Independent groups design (between-groups design)	• Efficient and cost effective, as participants do not need to be matched on relevant characteristics (matched participants) and the experiment does not need to be repeated (repeated measures). • No order effects occur.	• Individual participant differences can affect results, especially if it is a small sample. • Requires more participants (than a repeated measures design) as each participant is only in one condition.
Repeated measures design (within-groups design)	• Requires fewer participants, as each participant is involved in multiple groups. • Reduces individual participant differences between the control and experimental groups, as the same participants are in both conditions.	• Order effects may occur, due to the order in which participants partake in either the control or experimental conditions. • Can often be higher attrition rates as the study occurs over a more prolonged period of time.
Matched participants design	• Decreases the individual differences between participants, as participants are matched upon relevant characteristics between the control and experimental groups. • Reduces potential for order effects (compared to matched participants design), while still minimising the individual differences between participants.	• More time-consuming as characteristics relevant to the study must first be identified, and participants must be matched according to them. • Could be more expensive to conduct the experiment, as there is an added step of identifying the characteristic and matching participants.

Lesson link

You will learn more about the limitations of the different experimental research designs in lesson *1D: Sources of error and prevention*, in which you will also learn about how the effects of these limitations can be minimised when designing an experiment.

Theory summary

In this lesson, you have learnt about different scientific research methodologies that researchers can use when conducting a study. Each methodology has its benefits and limitations. Researchers must consider these, as well as the type of data they are trying to collect, when deciding which methodology to use. You should now be able to explain each of these methodologies, and be able to distinguish between them. Figure 3 provides an overview of these different methods.
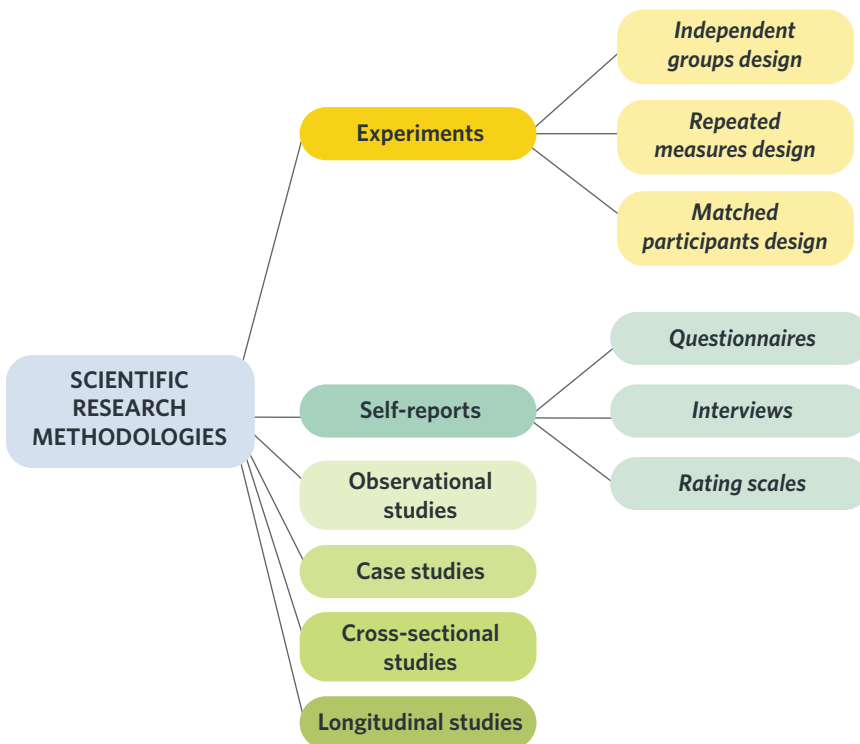
Figure 3 Summary of scientific research methodologies

1B QUESTIONS

Theory-review questions

Question 1

Scientific research methodologies *(Select one)*

A   are the way/s in which researchers collect empirical evidence to conduct research.

B   are different methods through which researchers can conduct research.

C   follow the scientific method.

D   all of the above.

Question 2

Fill in the blanks with three of the following terms.

- Experiment
- Self-report
- Observational study
- Longitudinal study
- Interview
- Benefits and limitations

When considering which methodology to use, researchers must consider which method best suits their research question, as well as the _____ of each method. For example, conducting a/n _____ allows the researcher to collect data under carefully controlled settings, however, if the researcher wants to study people in their natural settings a/n _____ might better suit the purposes.

Question 3

In an experiment, researchers *(Select one)*

A   carefully control variables to determine the effect that an independent variable has on the dependent variable.

B   conduct research focusing on a few individuals, collecting detailed data on their experiences.

Question 4

True or false? Questionnaires, rating scales and interviews are all forms of self-report data.

A   true

B   false

Skills

Unpacking the scenario

Use the following information to answer Questions 5 and 6.

Jonas is studying individuals who have perfect pitch, which means that they can accurately and consistently name a musical note from the sound of the note alone. He wanted to research whether perfect pitch had a genetic component, or if it could be learnt, as well as whether people with perfect pitch were better musicians. For his study, he interviewed two music students at Swinburne University who self-identified as having perfect pitch. These were the only two students at the entire university who self-identified themselves as having perfect pitch. He conducted hour-long interviews over the course of the university semester and asked them about their experiences with music growing up, how having perfect pitch has affected their music studies and performance, and whether they intended to become professional musicians.

Jonas uses more than one research method in his study. Specifically, there are elements of a case study, and interviews which are a form of self-report.

Question 5

Which of the following sentences from the scenario best indicates that Jonas is using a case study methodology?

A   For his study, he interviewed two music students at the Swinburne University who self-identified as having perfect pitch.

B   He conducted hour-long interviews over the course of the university semester and asked them about their experiences with music growing up, how having perfect pitch has affected their music studies and performance, and whether they intended to become professional musicians.

Question 6

Which of the following sentences best indicates that Jonas is also using elements of self-report?

A   For his study, he interviewed two music students at Swinburne University who self-identified as having perfect pitch.

B   He conducted hour-long interviews over the course of the university semester and asked them about their experiences with music growing up, how having perfect pitch has affected their music studies and performance and whether they intended to become professional musicians.

Exam-style questions

Multiple-choice questions

Question 7   (1 MARK)

An advantage of using a repeated-measures experimental design is that

A   it produces highly detailed results.

B   participant variables are reduced, as the same participants are in both conditions.

C   conclusions can be easily drawn about the effect of the IV on the DV.

D   the results are easily generalised.

Question 8   (1 MARK)

One disadvantage of a case study is that

A   it is efficient and easy to run.

B   the researchers do not get meaningful insights into specific individuals.

C   the results are easily generalised.

D   the results are not easily generalised.

Question 9   (1 MARK)

Mark is researching cognitive development in children between birth and five years of age. He originally wanted to follow the same children as they developed, however, his funding doesn't allow him to conduct this research for five years. Instead, Mark works with participants in different age groups and compares their cognitive development. He has five groups of participants:

- Birth to one year olds
- One to two year olds
- Two to three year olds
- Three to four year olds
- Four to five year olds

Which type of research methodology is Mark using?

A   cross-sectional study

B   longitudinal study

C   case study

D   observational study

Short-answer questions

Question 10   (2 MARKS)

In an experimental design, what is a control group? Explain the purpose of a control group.

Question 11   (2 MARKS)

Outline one advantage and one disadvantage of using a self-report methodology.

Question 12   (2 MARKS)

Margot is conducting a study on the social interactions of young children. She got permission to watch primary school-aged students interact on their lunch break. She watched groups of students for 10 minutes at a time, and took notes on what she saw.

What type of study is Margot conducting? Outline a benefit of this research methodology.

1C POPULATION, SAMPLE AND SAMPLNG

So far in this chapter, you have started to learn about research methodology in psychology. You have learnt that you must first come up with an aim and hypothesis for a study, and then choose how you will conduct your research. Once you have decided all of this, the next step is to find participants to take part in your study. There are many ways in which you can find participants for a study: asking for volunteers, putting an advertisement online, and randomly selecting people in your class, school or community. Of course, each of these different methods of selecting people for your study comes with benefits and limitations, which you will learn about in this lesson.

Image: peart.ru/Shutterstock.com

1A Aims, hypotheses and variables	1B Scientific research methodologies	1C Population, sample and sampling	1D Sources of error and prevention	1E Ethical considerations	1F Collection of data	1G Data organisation and interpretation	1H Evaluation of research

Study design dot point

- Plan and undertake investigations:
    - select appropriate sampling procedures for selection and allocation of participants including random sampling, stratified sampling, convenience sampling and random allocation of participants to groups

Key knowledge units

Population and sample	SS 2.5.1
Sampling procedures	SS 2.5.2
Allocation	SS 2.5.3

Population, sample and sampling

- Population and sample SS 2.5.1
- Sampling procedures SS 2.5.2
    - Convenience sampling
    - Random sampling
    - Stratified sampling
- Allocation SS 2.5.3

Population and sample SS 2.5.1

OVERVIEW

In psychological research, it is often unrealistic to work with everyone who is of interest. As such, it is necessary to instead find a smaller subset of people to conduct the research with and then generalise the results back to the wider population of interest. In this section, you will learn about research populations and how researchers go about finding this subset of participants called the sample.

THEORY DETAILS

In an experiment, researchers aim to discover trends or learn new information about a group of people. This group of people who are of interest to the study is called the **population**. However, it is often not possible for everyone within the population that you are interested in to participate in the experiment.

Population (also known as the research population) the group of interest to the study, from which the sample is drawn

For example, you might be interested in studying trends in the Australian population, or the population of a specific high school. In both of these examples, the number of people in the population would exceed a researcher's ability to conduct an experiment involving the entire population. Can you imagine how long it would take to conduct research on the 25 million people who live in Australia? Or even the hundreds of students who are in a high school?

As such, researchers work with a smaller group of people that are meant to represent the population. This subset of people is called the **sample**. An ideal sample of people should reflect the population in regards to characteristics that are relevant to the study, so that the results of the experiment can be generalised back to the population. This is called a *representative* sample because the sample of participants represents the population accurately.

Sample a subset of the population, commonly referred to as the research participants

A representative sample is dependent on:

- The size of the sample: the larger the sample, the more likely it is to be representative of the population.
- Whether the methods used to select the sample are biased or unbiased.
- Whether the characteristics of participants relevant to the particular study (such as their age, gender, and level of education) are represented in the sample in proportion to how they appear in the population.
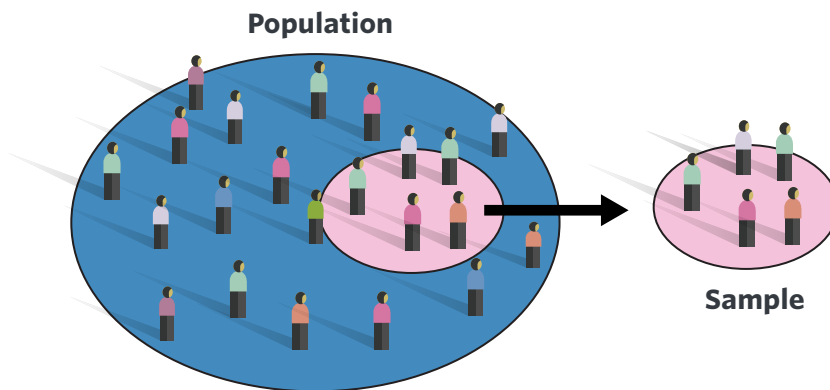
Image: Bakhtiar Zein/Shutterstock

Figure 1 The sample is a subset of the population of interest

Sampling procedures SS 2.5.2

OVERVIEW

There are many different ways in which the researcher can select the participants to be in the sample. Each of these procedures have their own strengths and limitations, which should be weighed up when deciding which procedure to use for a particular experiment.

THEORY DETAILS

Once researchers have identified their research population, they must then select participants to be a part of the sample for the study; this process is known as **sampling**.

Sampling the process through which the participants for a study are selected from the population of interest

There are different methods of choosing these participants with which you need to be familiar:

- **Convenience sampling**
- **Random sampling**
- **Stratified sampling**

These sampling procedures are summarised in table 1, and the benefits and limitations of each are summarised in table 2.
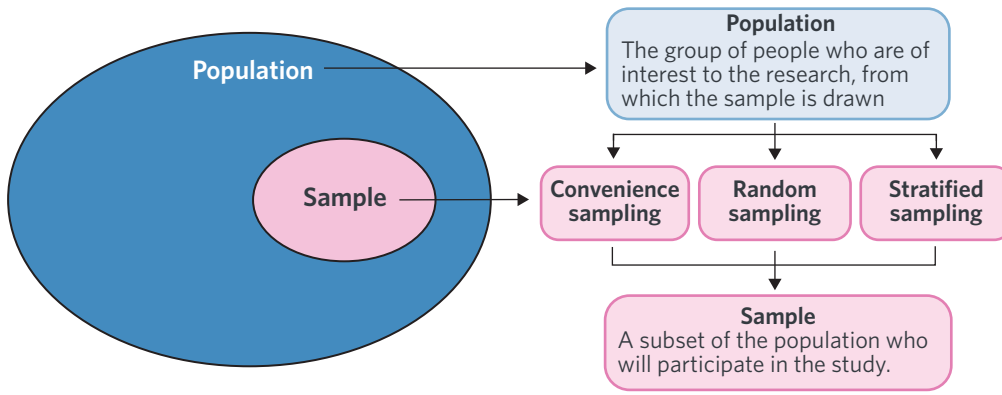
Figure 2 There are three different methods to select the sample from the population

Table 1 Types of sampling methods

Sampling method	Description	Example
Convenience sampling	• A sample is selected in the quickest and easiest (that is, the most convenient) way possible by recruiting the most readily available people from the population.	• A researcher using her class of students as participants for a study. • In this case, the participants were readily available and it was efficient and simple for her to recruit participants.
Random sampling	• A method of sampling in which every member of the population has an *equal chance* of being selected for the sample.	• A researcher is interested in conducting a study in which the population is all of the students at the local high school. • She generates a list of all student names based on enrollment records, and puts them through a random number generator in order to select 50 students to participate in her experiment.
Stratified sampling	• This sampling method involves dividing the population into groups based on characteristics relevant to the study, such as gender, age, or year level. • These groups are called *strata*, and each group is called a *stratum*. • The researcher then selects a sample from each of the strata in the same proportion that they occur in the population.	• A highschool population is divided into year levels. • Participants are selected from each year level proportionate to the population. • For example, if there are 100 year 12 students, but only 50 year 7 students, the number of participants in the study from year 12 would be double that of the number of participants in year 7.

Convenience sampling when a sample is selected using the quickest and easiest means possible, selecting people who are readily available from the population

Random sampling when every member of the population has an equal chance of being selected for the sample

Stratified sampling when the population is divided into groups based upon relevant characteristics, and participants are selected from each group in proportion to how they appear in the population

Table 2 Benefits and limitations of sampling methods

Sampling method	Benefits	Limitations
Convenience sampling	• This method is time-efficient and cost-saving.	• It is likely that the sample selected is not representative of the population. This means that the characteristics of the participants in the study don't reflect the characteristics of the population of interest. • This compromises the ability for the results to achieve a valid generalisation about the population. *cont'd*

Table 2 Continued

Sampling method	Benefits	Limitations
Random sampling	• May reduce bias in the sample. • It is more likely to accurately represent a population when samples are very large due to further reducing bias in the sample.	• It can be time-consuming and difficult to identify every member of the population in order to ensure everyone has an equal chance of participating. • For smaller populations, it may not produce a representative sample.
Stratified sampling	• It is more likely that the sample is representative of the population, as compared to convenience or random sampling.	• Strata (the groups within the population) can be difficult to define, depending on the research being conducted. • It can be time-consuming and expensive to ensure the strata are defined accurately and that participants are selected in the correct proportions.

> **⚠ Useful tip**
>
> A common type of SAC or exam question scenario is when the researcher puts an advertisement in a newspaper. This is an example of *convenience sampling* because not everyone in the population has an equal chance of being a part of the study; the people who are more likely to read the newspaper have a higher chance.

> **⚠ Useful tip**
>
> It is really important to remember the definition of random sampling is that *every member of the population has an equal chance of being in the sample*. This *equal chance* is very important, and sometimes a detail that students forget. If not every single person in the population had the same chance of being in the sample, then it is not random sampling.

ACTIVITY 1 – CLASS ACTIVITY

Let's use your class as the population for a research study. For your sample, you will need five participants.

• Using convenience sampling, pick five classmates to be a part of your study.
• Using random sampling, pick five classmates to be a part of your study. Remember, random sampling involves every member of the population having an equal chance of being in the sample. One way of doing this is to have everyone's name in a hat and drawing out five names.
• Using stratified sampling, pick five classmates to be a part of your study. You may want to work as a class to work out different strata (based on relevant characteristics such as gender) to divide up the class population to make sure your sample is representative of the population.

Afterwards, discuss the following questions as a class:

• Which method was the most efficient and effective?
• Which method created the most representative sample?

Allocation SS 2.5.3

OVERVIEW

Once the participants for the study are selected, researchers must assign them to the different conditions within the study. This process is called allocation.

THEORY DETAILS

Once you have selected the sample of participants, you need to assign them to the different conditions within the experiment. This process is called **allocation**. The ideal type of allocation is **random allocation**, in which every member of the sample has an equal chance of being assigned to each experimental condition.

Allocation the process of assigning participants to conditions in the experiment for the research

Random allocation when every member of the sample has an equal chance of being assigned to each condition in an experiment

An example of random allocation is when participants are allocated to the conditions of an experiment through the flip of a coin. Without random allocation, the conditions may be biased with some characteristics being over-represented in one condition over another.

Example

In a study of high school students and sleeping patterns, the year 8 and year 12 class were selected to participate using convenience sampling. All students in the year 8 class were allocated to one condition, and all students in the year 12 class were allocated to another condition. These groups are biased, as the age of participants may affect the results. In random allocation, all students (both year 8 and year 12) would have an equal chance of being allocated to each condition, increasing the likelihood that the distribution of participant characteristics are evenly spread across the experimental and control condition. Using random allocation, the conditions comprised of:

- Condition 1: 10 year 8 students and 12 year 12 students
- Condition 2: 14 year 8 students and 9 year 12 students

ACTIVITY 2

How can you achieve random allocation?

A common way of random allocation involves flipping a coin. Can you think of other ways that random allocation could be achieved? Discuss with a partner and compare your ideas.

Image: Kalimanorah/Shutterstock.com

Theory summary

In this lesson, you have learnt:

- The group of people that a researcher wants to study is called the population.
- From the population, a sample of people are selected to participate in a study.
- The method of selecting these participants is called sampling.
- There are three types of sampling methods: convenience sampling, random sampling, and stratified sampling. Each method has benefits and limitations.
- Once the sample has been selected, participants need to be allocated to the experimental groups.
- Random allocation is a method of allocation that decreases the bias in groups.

So far in this chapter, you have learnt about how researchers set up their experiments, in regards to the aim, hypothesis, population and sampling. The relationship between these concepts is outlined in figure 3.
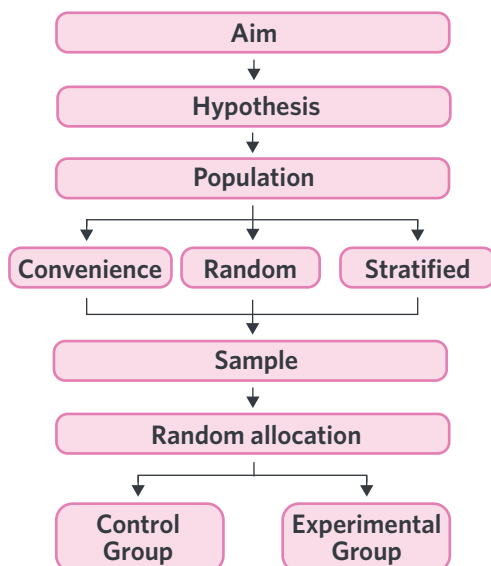
Figure 3 The process of designing an experiment

1C QUESTIONS

Theory-review questions

Question 1

True or false? In all studies, every member of the population can participate in the research.

A   true

B   false

Question 2

The participants in a study are known as the *(Select one)*

A   population.

B   sample.

Question 3

Which of the following considerations should researchers take into account when selecting a sample? *(Select all that apply)*

I   That the sample is representative of the population.

II   That the sample has as many participants as possible.

III   That the sample is unbiased.

Question 4

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

A   convenience sampling

B   stratified sampling

Question 5

Allocation involves *(Select one)*

A   selecting the participants from the population.

B   assigning the participants to the different experimental conditions.

Skills

Perfect your phrasing

Question 6

Which of the following sentences is most correct?

A   Random sampling ensures every member of the population has a fair chance to participate in the study.

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

Exam–style questions

Multiple-choice questions

Question 7   (1 MARK)

When a sample reflects the key characteristics of the research population, this is known as a

A   biased sample.

B   true sample.

C   representative sample.

D   research sample.

Question 8   (1 MARK)

One benefit of convenience sampling is that

A   it produces a representative sample.

B   it reduces bias in the sample.

C   it is not cost-effective.

D   it is cost-effective.

Question 9   (1 MARK)

To recruit participants for his study, Dr Moeller puts an advertisement up on his local university's social media pages. This is an example of what type of sampling method?

A   convenience sampling

B   random sampling

C   stratified sampling

D   targeted sampling

Question 10   (1 MARK)

Random allocation involves

A   every member of the population having an equal chance of being selected to participate in the study.

B   every member of the sample having an equal chance of being assigned to the experimental conditions.

C   selecting participants from different strata proportionate to how they appear in the population.

D   selecting participants in the most cost and time-effective manner possible.

Short-answer questions

Question 11   (2 MARKS)

Signe wants to research exercise habits using her class as the research population. Describe how Signe could use random sampling to select a sample for her study.

Question 12   (4 MARKS)

Using examples, explain how convenience and stratified sampling gather participants from the population in different ways.

1D SOURCES OF ERROR AND PREVENTION

In an experiment, how do you know that you've actually demonstrated a true cause and effect relationship? Could something else have snuck in and ruined your experiment? In all experiments, there can be many opportunities for error which researchers must try and identify and control before conducting their experiment. In this lesson, you will learn about these different types of errors and how researchers can identify and try to prevent them from affecting the results of their study.

1A Aims, hypotheses and variables	1B Scientific research methodologies	1C Population, sample and sampling	1D Sources of error and prevention	1E Ethical considerations	1F Collection of data	1G Data organisation and interpretation	1H Evaluation of research

Key science skills

- Plan and undertake investigations:
  - minimise confounding and extraneous variables by considering type of sampling procedures, type of experiment, counterbalancing, single and double blind procedures, placebos, and standardised instructions and procedures
- Analyse and evaluate data, methods and scientific models
  - evaluate investigative procedures and possible sources of bias, and suggest improvements, with reference to identification of potential extraneous and confounding variables including individual participant differences, non-standardised instructions and procedures, order effects, experimenter effect and placebo effects

Key knowledge units

Extraneous and confounding variables	SS 2.4.1
Sources of error	SS 2.4.2
Prevention of error	SS 5.6.1

Sources of error and prevention

Extraneous and confounding variables SS 2.4.1

Sources of error SS 2.4.2

Prevention of error SS 5.6.1

Extraneous and confounding variables SS 2.4.1

OVERVIEW

The purpose of a scientific experiment is to establish a causal relationship between the independent and dependent variables. In order to do this, other variables that might affect the dependent variable must be controlled. These variables are referred to as either extraneous or confounding variables.

THEORY DETAILS

Imagine you are conducting a study looking at the relationship between screen time and concentration levels. You predict that high school students who spend more time in front of screens, such as their laptop, phone or TV, will perform worse in a concentration task that you administer. When you run the experiment though, you are surprised to see no difference between participants who spend a lot of time and those who spend very minimal time in front of screens! Can you think of any other factors that could have had an effect on participants' concentration, other than their screen time? Perhaps things like the participants' motivation that day, or how much sleep they had, what mood they were in, or what they were actually doing when they were using their screens.

The scenario demonstrated here is a very common dilemma that researchers face when conducting their studies. Despite scientific experiments being conducted in a carefully controlled environment, it is not possible to control for all variables that might have an effect on the dependent variable. **Extraneous variables** are variables other than the independent variable that have the potential to cause unwanted effects or results in an experiment. In designing investigations, researchers want to identify as many of these extraneous variables as they can and control for them when they conduct the study if possible in order to minimise the effect they have on the results.

Let's take a look at another example. In a study on the effect of class attendance on test scores, extraneous variables would be any factor other than attendance that could affect test performance. These might include how much the student has studied in the lead up to the test, whether they had learnt the material before, their level of motivation, and if they enjoy the subject. A researcher may control for some of these variables by studying students in the same class who had not learnt the topic before, and getting students to complete a questionnaire prior to the test on how many hours of study they did, their level of motivation, and enjoyment of the class. Researchers may then only compare students who had similar responses on the questionnaire.

Despite researchers' best efforts, not all variables can be controlled for. Even if researchers identify some potential extraneous variables, constraints such as time, cost, and difficulty may not allow them to control for all of these variables. If the variables were not controlled for and did consistently (e.g. each trial, round, test etc.) have an effect on the dependent variable, these variables have become **confounding variables** because they have *confounded* the results. In the above example, a confounding variable may be students' age, *only* if their age has been shown to have systematically and directly have affected the dependent variable of test scores. This can only be known at the conclusion of the experiment when a researcher analyses the results. In this case, they would have had to have detected a definite pattern of age affecting results; for example, the older a participant is, the higher their test scores. This could have occurred because older students may have developed more cognitively and therefore performed better on the test.

This confounding variable interferes between the independent and dependent variables, making it unclear if changes in the dependent variable were due to the independent variable or the confounding variable. Therefore, a clear cause and effect relationship within the study cannot be identified. Researchers want to control for extraneous variables so that confounding variables don't cause errors in the research, and a cause and effect relationship between the independent and dependent variables can be established.

> **Extraneous variables** variables other than the independent variable that may produce unwanted results in an experiment

> **Confounding variables** variables other than the independent variable that have directly and systematically had an effect on the dependent variable

> 🧩 **Lesson link**
>
> The extent to which the independent variable causes the observed change in the dependent variable is referred to as *internal validity*. You will learn more about this concept in lesson
> **1H: Evaluation of research.**
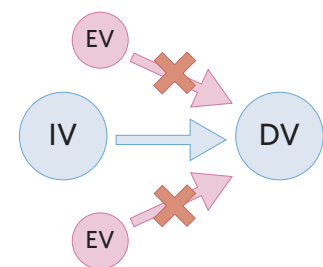
Figure 1 Extraneous variables are any variables that have the potential to impact the dependent variable other than the independent variable. In designing an experiment, researchers want to control for their effects

---

ⓘ *Useful tip*

Extraneous and confounding variables may refer to the same variables. However, while all *confounding* variables are *extraneous* variables in that they refer to uncontrolled for and unwanted variables in an experiment, not all *extraneous* variables are *confounding*.

An extraneous variable may be identified as confounding only if it can be shown that it systematically affected the dependent variable in an unwanted way. For example, if a fire alarm went off in the first trial of a test this would be an extraneous variable. However, if it did not go off for all trials of that same test, it could not be considered confounding, as it has not systematically (repeatedly or consistently) affected the dependent variable (e.g. test performance).

When asked about extraneous and confounding variables, it is important that you read the given scenarios carefully in order to accurately distinguish what type of variable it is.

ACTIVITY 1

Can you identify any extraneous variables?

Imagine that you are participating in a study, where a researcher has asked you to complete a maths test. She wants to see if there is a relationship between how much study you completed the night before and the scores on your test.

Other than how much study you completed the night before, can you think of other variables that might have affected your score?

For example, perhaps you were running late to the experiment, felt frazzled and couldn't concentrate well on the test.

List as many variables as you can think of.

These are examples of extraneous variables.

Sources of error SS 2.4.2 and Prevention of error SS 5.6.1

OVERVIEW

There are a number of potential sources of error in which variables other than the independent variable can affect the dependent variable. In designing an experiment, researchers must identify and control as many as possible in order to ensure a valid conclusion can be made.

THEORY DETAILS

Extraneous and confounding variables can also be thought of as sources of error, as they may affect the results, making it difficult for researchers to establish a cause and effect relationship between the independent and dependent variables.

Sources of error and the corresponding method to prevent the error are outlined in table 1.

Table 1 Sources and prevention of error

Source of error	Prevention of error	Example
Participant-related variables • Participant-related variables can be understood as individual participant differences that can affect the results. • In a large sample size, these participant differences are more likely to reflect the differences in the population but if a sample is biased or too small, individual participant differences can introduce a source of error as they are not representative of the population. • Participant-related errors can also be introduced due to the sampling technique; convenience sampling is likely to produce a biased sample that is not reflective of the research population.	**Sampling procedures** • One way to reduce a biased sample is to choose an appropriate sampling procedure that will select a representative sample. • Random sampling and stratified sampling will produce less bias in samples as compared to the use of convenience sampling. • Using a large sample size will also help to reduce participant-related variables affecting the investigation. **Choosing an experimental research design** • Another way of minimising the confounding effects of participant variables is through choosing an appropriate experimental research design. • In a repeated measures design, the same participants are used in both conditions and this eliminates participant differences between conditions. • In a matched participants design, participants are matched on relevant characteristics to the study, therefore minimising the effect of participant differences between conditions.	• A researcher is studying the effects of a new concentration medication in young adults aged 18 to 25. • Participant-related variables in this study may include participants' baseline level of concentration, any existing medical conditions related to concentration such as attention-deficit disorder, and how much familiarity they have had with the experimental concentration task prior to the experiment. • If the researcher had used convenience sampling to select 20 participants, the sample may be biased. For example, the number of 18 year olds in the study may be overrepresented, as well as an overrepresentation of people who had an abnormally high baseline of concentration ability. • In order to control for this, the researcher may instead use stratified sampling to select a sample of 500 participants. • This larger sample size selected through stratified sampling is less likely to be biased due to participant-related variables. • Another way to control for this may involve the researcher choosing to use a matched participants design instead of an independent groups design, matching participants based on the relevant characteristic of baseline concentration levels to reduce this as a participant related confounding variable. *cont'd*

Participant-related variables individual participant differences that can affect the results

Sampling procedures the different methods through which a sample can be drawn from a population

Choosing an experimental research design the process of choosing an appropriate experimental research design in order to reduce possible extraneous and confounding variables

Table 1 Continued

Source of error	Prevention of error	Example
Order effects • Order effects are a type of confounding variable relevant to repeated measures experimental designs, and occur due to the order in which participants participate in the control and experimental conditions. • They are also known as practice effects because they are errors due to the participants having 'practiced' the condition or task before. • Fatigue effects can also occur, which involves performance on a task gradually declining over time due to fatigue.	**Choosing an experimental research design** • Instead of using a repeated measures design, choosing another experimental research design, such as matched-participants, would have the same benefits of reducing participant variables, without order effects. **Counterbalancing** • If conducting a matched participants design is not possible due to costs or other constraints, counterbalancing in a repeated measures design can also reduce order effects. • Counterbalancing involves half of the participants participating in the experimental condition first and then the control condition, and the other half of the participants doing it in the reverse order. • This controls for order effects as the two halves of participants participate in the conditions in alternating orders, cancelling out this effect. • It is easier, more convenient and cheaper than designing a matched participants experiment.	• If the researcher used a repeated measures design for this study, this would involve all of the 500 participants completing the concentration task first without being administered the concentration medication (condition 1), and then completing the task again with the medication (condition 2). • In this instance, order effects may occur as participants' improved concentration scores in the second condition may be due to them having already completed the task, rather than the medication itself. • One way of addressing this is to use a matched participants experimental design instead. • This would involve the researcher matching participants on key relevant characteristics such as age, baseline levels of concentration, and existing medical conditions, and allocating one of each matched pair to the experimental or control condition. • If the researcher is unable to conduct a matched participants design, they could instead use counterbalancing in the repeated measures design. • This would involve half (250) of the participants completing condition 1 followed by condition 2, while the other half complete condition 2 followed by condition 1. • This would 'balance out' or negate any practice effects that may occur.
Placebo effect • The placebo effect occurs when a participant's expectations of something occurring due to the presence of a medication or treatment actually makes them feel the effect of that something happening. • Participant expectations can affect their behaviour and mental processes, resulting in them behaving differently or reporting different mental processes than they otherwise would as a consequence of their expectations.	**Placebo** • A placebo is an inactive medication, procedure or treatment which participants believe to have an active or effective component. • Administering a placebo in an experiment controls for participant expectations because if there is a significant difference in the results of the active and placebo medication groups, the researcher can infer that the medication had an effect. • Conversely, if there is no significant difference between the results of the placebo group and the group who were administered the real treatment, researchers would be able to conclude that the medication is not more effective than the placebo effect.	• The placebo effect might occur if participants knew that they would be receiving treatment for concentration, as their expectation of having increased concentration due to the medication may in turn actually improve their concentration. • In order to control for this, the researcher can use a single-blind procedure so that participants are unaware if they have been allocated to the control or experimental group. • The control group receives a placebo and the experimental group receives the concentration medication. *cont'd*

Order effects (also known as practice effects) a source of error in repeated measures designs due to the order the participants participate in the experimental and control conditions

Counterbalancing a method used in repeated measures experimental designs to reduce order effects

Placebo effect when an inactive treatment or procedure has an effect due to the participants' expectations

Placebo an inactive medication, procedure or treatment that is used to control for participant expectations

> ⓘ *Useful tip*
>
> It is important to distinguish between a placebo and the placebo effect. A placebo is an inactive treatment, such as a sugar pill, whereas the placebo effect is an effect that occurs due to participants' expectations.

Image: rzstudio/Shutterstock.com

Figure 2 A placebo involves the use of an inactive treatment, such as a sugar pill

Table 1 Continued

Source of error	Prevention of error	Example
Placebo effect *cont'd*	**Single-blind procedures** • One way to reduce participant expectations is to use a single-blind procedure. • This involves the participant being unaware of what condition they have been allocated to; that is, they don't know whether they are receiving the placebo or the active treatment. • This decreases the likelihood of participant expectations affecting results.	
Experimenter effects • Experimenter bias refers to the expectations that experimenters may have, whether about the participants or the results, possibly influencing how they conduct the research or interpret the results. • Often these biases are not conscious, but as they can affect the results of the experiment, they are an example of an extraneous variable that can become a confounding variable.	**Double-blind procedures** • In order to address experimenter bias, a double-blind procedure can be used, which addresses both the participant and experimenter bias. • This involves neither the participants nor the conductor of the experiment knowing the condition that participants are allocated to, ensuring their expectations don't affect their behaviour or interpretation of the results.	• Experimenter bias may occur if the experimenter treats participants differently or inaccurately reports on results based on their knowledge of if they are receiving an active medication or not. • For example, when asking participants to report on their levels of concentration, the experimenter may inadvertently ask more leading questions to the experimental group than the control group, affecting the results. • In order to control for this, a double-blind procedure may be used. • This could involve a research assistant administering the medication and placebo, without knowledge of which is which. • The research assistant may then do the follow up testing, and without knowledge of which condition each participant is in, it is less likely that errors will be introduced due to their expectation bias.
Non-standardised instructions and procedures • Errors can be introduced when procedures and instructions are not standardised for each participant. • If there are multiple experimenters each conducting the experiment with varying procedures and instructions, it can affect the participant's behaviour and the results.	**Standardised instructions and procedures** • Standardised instructions and procedures involve having clear and methodical instructions to ensure that the testing conditions and procedures are the same for all participants in each group in order to reduce confounding variables.	• Non-standardised testing and procedures may mean that some participants receive the medication in the morning, and others receive it in the evening. • This can affect the results as participants' baseline level of concentration may differ throughout the day and so a valid comparison between participants cannot be made. • In order to standardise the instructions and procedures, researchers may administer the medication at a specific time to participants each morning. • When following up with participants, researchers may also standardise the questions they ask, following an exact script and not asking any further follow up questions.

Single-blind procedure
a procedure in which participants are unaware of which condition they have been allocated to in order to reduce participant expectations

Experimenter effects when an experimenter's expectations about the study influence the results

Double-blind procedure
a procedure in which both the participants and the person conducting the experiment are unaware of which condition participants have been allocated to in order to reduce experimenter bias and participant expectations

Non-standardised testing procedures when instructions and procedures in an experiment are not consistent for all participants, therefore affecting the results obtained

Standardised instructions and procedures the consistent use of instructions and procedures for all participants

Theory summary

In this lesson, you have learnt about extraneous and confounding variables, and the need for researchers to control for them when designing an experiment. You should be able to identify and explain a range of sources of error, as well as suggest appropriate measures to control for them. You should also be able to identify these in a given scenario and describe each source of error.

Table 2 Summary of sources of error and corresponding prevention method

Source of error	Corresponding method to minimise error
• Participant-related variables (individual participant differences)	• Selecting an appropriate sampling procedure • Choosing an appropriate experimental research design
• Order (practice) effects	• Choosing another experimental research design • Counterbalancing
• Participant expectations (placebo effect)	• Using a placebo • Single-blind procedures
• Experimenter effects (experimenter bias)	• Double-blind procedures
• Non-standardised testing procedures	• Standardised instructions and procedures

1D QUESTIONS

Theory-review questions

Question 1

Fill in the blanks with the following key terms.

- Extraneous
- Confounding

In experiments, researchers must try to identify and control variables, other than the independent variable, that might affect the dependent variable. These variables are known as _____, variables. Unfortunately, not all variables can be controlled. When these other variables have had an effect on the dependent variable, they are known as _____ variables.

Question 2

Which of the following are examples of potential sources of error? *(Select all that apply)*

I   individual-participant differences

II   the use of a placebo

III order effects

IV non-standardised instructions and procedures

V   counterbalancing

Question 3

Choosing an appropriate experimental design minimises which potential sources of error? *(Select all that apply)*

I   participant expectations

II   experimenter expectations

III participant-related variables

IV order effects

Question 4

Experimenter effects occur due to *(Select one)*

A   the expectations of the experimenter, therefore affecting their mental processes and behaviours in line with their expectations.

B   the expectations of the participants, therefore affecting their mental processes and behaviours in line with their expectations.

Skills

Perfect your phrasing

Question 5

Which of the following sentences is most correct?

A   A placebo is an inactive treatment, used for the purposes of controlling for participant expectations.

B   A placebo is participant expectations, used for the purposes of controlling for inactive treatments.

Question 6

Which of the following sentences is most correct?

A   The placebo effect is when results are inaccurate due to participants' expectations.

B   The placebo effect is when participants take a placebo pill.

Exam–style questions

Multiple-choice questions

Question 7   (1 MARK)

Double-blind procedures are used to control for

A   the placebo effect.

B   order effects.

C   participant-related variables.

D   the placebo effect and the experimenter effect.

Question 8   (1 MARK)

Order effects can occur in a

A   matched participant experimental design, because the order in which participants are matched could affect results.

B   matched participant experimental design, because the conditions aren't counterbalanced adequately.

C   repeated measures design, because the order in which participants participate in the conditions could affect results.

D   repeated measures design, because participants repeat experimental conditions.

Question 9   (1 MARK)

A researcher is interested in testing the effects of a new vaccination. In her study, the experimental group received the trial medication and the control group received saline water, which had no active ingredients.

What was the purpose of using the saline water for the control group in this study?

A   To control for the placebo effect.

B   To control for experimenter effects.

C   To eliminate all confounding variables.

D   To control for experimenter error.

Short-answer questions

Question 10   (2 MARKS)

Describe how counterbalancing can be used to control for order effects in a repeated measures experimental design.

Question 11   (3 MARKS)

Ms Banks conducted a study exploring the effect of sleep on mood in high school students. She used her year 11 class as her sample and asked her students to self report on how many hours they slept each night and their mood each day for 30 days.

a   Identify and explain one possible confounding variable in Ms Banks' study. (2 MARKS)

b   Describe one method Ms Banks could have used in setting up her experiment to control for this confounding variable. (1 MARK).

1E ETHICAL CONSIDERATIONS

How do you know what is right and wrong? Is your understanding of right and wrong the same as everyone else's? In this lesson, you will be learning about the idea of what is right and wrong, and what is acceptable and unacceptable in research. Specifically, you will learn about the ethical guidelines that psychologists must adhere to when conducting research.

Image: TK 1980/Shutterstock.com

1A Aims, hypotheses and variables	1B Scientific research methodologies	1C Population, sample and sampling	1D Sources of error and prevention	1E Ethical considerations	1F Collection of data	1G Data organisation and interpretation	1H Evaluation of research

Key science skills

- Comply with safety and ethical guidelines:

    – understand the role of ethics committees in approving research

    – apply ethical principles when undertaking and reporting investigations, including consideration of the role of the experimenter, protection and security of participants' information, confidentiality, voluntary participation, withdrawal rights, informed consent procedures, use of deception in research, debriefing and use of animals in research

Key knowledge units

Ethics and ethical values	SS 3.1.1
Participant rights	SS 3.2.1
Use of animals in research	SS 3.2.2

Ethical considerations

Ethics and ethical values SS 3.1.1   Participant rights SS 3.2.1   Use of animals in research SS 3.2.2

Ethics and ethical values SS 3.1.1

OVERVIEW

All research in modern psychology must adhere to the ethical guidelines in designing and conducting investigations in order to ensure the safety of all participants.

THEORY DETAILS

Is it okay to cause brain damage to a person if it helps them to control their previously uncontrollable seizures? Is it okay for scientists to test the side effects of a new drug on mice? How about on dogs? It is important when conducting research with human and animal participants to make sure that researchers are doing so safely and in a way that is 'right'. Historically, there hasn't been an agreed upon understanding of what is right or wrong in research, and so different researchers made their own judgments. As you can imagine, this allowed for some pretty controversial studies to take place, which you will learn about later in this course.

In response to some of these questionable studies, modern psychologists must now consider the role of *ethics* in research and follow **ethical guidelines**, which are a set of rules and considerations that all researchers must abide by in order to ensure the safety and wellbeing of participants.

In Australia, the Australian Psychological Society (APS) have set a code of ethics that all psychologists in Australia need to abide by. They draw from a range of sources, including the National Health and Medical Research Council (NHRMC) to create a code of ethics.

Ethical guidelines a set of rules and considerations that researchers must abide by when conducting research

This code of ethics outlines the guiding values for research, as well as the ethical standards that researchers must adhere to.The NHRMC is an Australian government body that develops and maintains health standards in research. The NHMRC outlines four key guiding values for ethical research, summarised in table 1.

Table 1 Ethical values in research (NHMRC, 2019)

Ethical value	Description
Research merit and integrity	Research that has merit includes the following characteristics: • it is justifiable by its potential benefit. • it is designed and developed based upon thorough study of current literature and previous studies concerning the intended research area. • it is designed to ensure that respect for participants is not compromised. • it is conducted and supervised by qualified and experienced researchers.
Justice	The value of justice refers to fairness within the investigation. This means that: • the process of recruiting participants is fair. • there is no unfair burden of participation in research on particular groups; the risks and benefits of the research should be fairly spread amongst groups. • there is no exploitation of participants. • there is fair access to the benefits of the research.
Beneficence	With some psychological research, there may be potential risks for the participants. Beneficence refers to when the potential benefit of the research findings outweighs any potential risks for the participants. This makes the research justified. With regard to beneficence, researchers are responsible for: • designing research to minimise the risk of participant harm or discomfort. • ensuring participants understand both the potential benefits and risks of the research. • the welfare of the participants in the research context.
Respect for human beings	Respect for human beings is at the core of all research involving participants. It requires that the researchers have regard for participants' welfare, beliefs, perceptions, customs, and cultural heritage.

When designing a psychological investigation, researchers must show how they have incorporated these ethical considerations, and submit their proposal to an ethics committee for approval before conducting their research. The **ethics committee** is a group of people who consider the details of the investigation and use the ethical values to determine whether the research is ethical to conduct or not. Often decisions have to be made about the associated risks and whether the risks are outweighed by the potential benefits of the investigation.

Ethics committee a group of people who review research proposals and consider the potential risks, benefits and implications in order to either approve or disapprove them for research

For example, when trialling new medication, there are potential risks involved for participants as the effects of the medication are unknown at this point. However, the benefits of trialling the medication, and the potential benefits it may have for a wider population of people, mean that the ethics committee might deem the research as ethical and approve it to proceed, despite the associated risks.

An ethical consideration that researchers must always keep in mind is the no-harm principle. The **no-harm principle** stipulates that participants must not experience any harm, whether physical or psychological. This is applicable in both the short term (e.g. during the experimental trial), as well as in the long term (e.g. participants shouldn't have any lasting negative effects due to the investigation). It is the role of the researcher to ensure this principle is upheld, in line with the other guiding values of research, when designing and conducting psychological studies.

No-harm principle the role of the researcher to ensure that all participants within an investigation do not experience mental or physical harm

Participant rights SS 3.2.1

OVERVIEW

There are specific ethical considerations related to the participants and their rights within a psychological investigation. These are referred to as participant rights and include: voluntary participation, informed consent, withdrawal rights, confidentiality, and debriefing.

THEORY DETAILS

A specific type of ethical consideration that is important in psychological study is *participants' rights*, as psychological studies are unique in the sciences as they use human participants. When in a study, participants have rights that they can exercise. These are outlined in table 2. Along with ensuring their research is in line with the ethical values and guidelines, the researchers must also ensure that participants are aware of and are able to exercise their rights in research.

Table 2 Participants' rights

Ethical consideration	Description
Voluntary participation	• Participants should freely choose to participate in research and not be coerced or put under pressure in any way to do so.
Informed consent	• Informed consent involves participants having a thorough understanding of the scope and details of the study, including potential risks, research implications and benefits and their rights as participants before agreeing to participate. • Often informed consent is given through signing a form, in which a written description of the study is provided for participants prior to the commencement of the study. • For participants under the age of 18, their parents or legal guardians must give informed consent on their behalf, as well as the participant themselves (if they are able). • For participants who are unable to give consent for other reasons, legal guardians are also able to give informed consent on their behalf. • For example, a person who has a mental illness that interferes with their ability to understand what they are consenting to may have their guardian provide consent on their behalf.
Withdrawal rights	• Participation in a study can be discontinued at any time without penalty. • Participants should be aware of this right, and feel that they are able to withdraw from the study at any point. • Withdrawal rights can also occur after the conclusion of a study, and can involve participants removing their results from the study if they choose.
Confidentiality	• Participant details should be kept private (confidential) in all research. • This may involve ensuring participants' anonymity when publishing research, or ensuring that the results of the study and the data collected are de-identified. • This also includes keeping individual results or data about a participant private, and ensuring that the data collected is stored in a safe and secure manner.
Deception	• Deception involves purposefully misleading the participants in regards to some aspects related to the investigation. • This is used when participants' knowledge of the true purpose or details of the study may affect their behaviour, and therefore the validity of the results. • In most studies, the use of deception is deemed unethical as it breaches the participants' right of informed consent. • However, if the potential benefits of the research outweigh the potential associated risks, an ethics committee may deem that it is ethical to conduct a study which uses deception. • For all studies involving deception, thorough debriefing must occur afterwards.
Debriefing	• Debriefing occurs at the conclusion of a study and involves the researcher outlining the details of the study to the participants. • It may also involve researchers sharing any relevant findings or results from the study with participants, and allowing participants to obtain additional information about the study if they wish. • Thorough debriefing must occur in a study that involves deception. In these cases, this involves revealing the true nature and purpose of the study to participants and explaining why the use of deception was necessary. • Debriefing can involve follow up over a period of time, rather than just a once off at the conclusion of a study. • Debriefing ensures that participants do not leave the study with lasting harm due to their experiences. If there is any unforeseen harm experienced by participants, this is addressed as a component of debriefing.

Voluntary participation the right of the participant to willingly choose to participate

Informed consent the right of the participant to have a thorough understanding of the nature of the study, before agreeing to participate

Withdrawal rights the right of the participant to leave the study at any point, without fear of consequence

Confidentiality the right of the participant for their personal details to remain private

Deception when the participant is unaware of the true nature of the study

Debriefing a process which occurs at the conclusion of a study and involves the researcher outlining the nature of the study to participants and includes ensuring that participants do not leave the study with lasting harm

Use of animals in research SS 3.2.2

OVERVIEW

There are some instances in which it may be more appropriate to use animals for psychological research, rather than human participants. Ethical considerations must also be taken into account when researchers use animals in their study.

THEORY DETAILS

Although the majority of psychological research is conducted with people, there are some instances when it is conducted using animals instead. There are many reasons why researchers may choose to use animals in investigations, rather than humans:

- it may be that human participants are unavailable for the research, or the risks posed to human participants are too high.
- when researching the effects of ageing, animals generally have a shorter life span and as such, the effects of ageing can be studied more effectively than with human participants.
- when researching genetics, it may be better to use animals as they have shorter *gestation periods* (development from conception until birth), allowing for genetic studies to be conducted more efficiently.
- due to the similarities that some animals have to humans in their mental processes and behaviours, research on animals can be a starting point for the initial research before testing with human participants.

Some advantages of working with animals rather than people include:

- For large sample sizes, it is generally more efficient to conduct tests using animals rather than humans as it can be costly and time-consuming to accurately select an appropriate and large sample of human participants.
- Generally, the behaviours of animals can be more controlled than when working with people, which can be beneficial depending on the study.

However, some disadvantages of working with animals include:

- Only behaviours can be studied, as animals are unable to report on their mental processes.
- The generalisability of results from studies using animals to humans is relatively low as animals are different to humans in many ways.

When using animals in research, researchers must still take ethics into consideration. Similarly to studies with people, the value of beneficence must be considered. Researchers need to weigh up the potential benefits of the study and the potential harm it can cause the animal in order to decide whether the study is justified. Likewise, harm to animals must be minimised and research should be conducted with research merit and integrity.

> ⊕ *Want to know more?*
>
> The NHRMC also have a code of conduct that guide research using animals. You can find the *Australian Code for the Care and Use of Animals for Scientific Purposes* on the NHRMC website at *nhmrc.gov.au* (National Health and Medical Research Council, 2013).

Theory summary

In this lesson, you learnt that:

- all psychological research must adhere to ethical guidelines.
- before conducting any research, a researcher must submit a proposal to an ethics committee, who will weigh up the risks and potential benefits and decide whether the study is ethical to conduct or not.
- participants' rights are a specific type of ethical consideration. These involve the rights for the participant to give informed consent, participate voluntarily, be able to withdraw from the study at any time, have their confidentiality upheld and for debriefing to occur at the conclusion of the study, explaining any deception that was used.
- psychological research may be conducted on animals, with animal research having multiple advantages and disadvantages which need to be considered. When working with animals, researchers must still adhere to ethical considerations.

1E QUESTIONS

Theory-review questions

Question 1

Which of the following statements about ethical guidelines is correct? *(Select all that apply)*

I   Researchers must adhere to ethical guidelines when planning and conducting research.

II   Ethical guidelines protect the safety and wellbeing of participants.

III   All psychological research that has been conducted has always adhered to these guidelines.

IV   What is right and wrong is always easily discernible.

Question 2

The no-harm principle outlines that *(Select one)*

A   the researcher must not put themselves in any harm, whether psychological or physical, when conducting research.

B   the researcher must not cause participants any harm, whether psychological or physical when conducting research.

Question 3

For each of the following statements, circle whether they are **true** or **false**.

I   Participants under the age of 18 can give informed consent to participate in a study without needing a parent/guardian's consent. T/F

II   Participants may choose to withdraw from a study at any time without any penalty. T/F

III   Animals must never be used in psychological research. T/F

IV   Participants' details such as their name, age and study data must be kept confidential. T/F

Question 4

Which of the following statements about the use of deception is correct?

A   Deception must never be used in studies, as it can cause psychological harm to participants.

B   In some studies, deception may be used if it is deemed necessary and appropriate debriefing occurs afterwards.

Skills

Unpacking the scenario

Use the following information to answer Questions 5 and 6.

Remi is doing an assignment for his Psychology class at school. He wants to study why some people are more likely to help a stranger than others. To research this, he set up a hidden camera in his school corridor. During the day he would walk past the camera and pretend to fall over, spilling his books all over the floor. He continued recording as some people helped him, whilst others didn't. In his presentation to his class, he wanted to play video footage from his experiment, but his teacher said this was unethical as the passersby shouldn't be identified.

Question 5

In his experiment, Remi breached some ethical considerations, including the participants' rights to give informed consent.

Which sentence in the scenario indicates that informed consent was breached?

A   To research this, he set up a hidden camera in his school corridor.

B   During the day, he would walk past the camera and pretend to fall over, spilling his books all over the floor.

Question 6

Remi also breached the ethical consideration of confidentiality. Which of the following sentences indicates that confidentiality could have been breached?

A   To research this, he set up a hidden camera in his school corridor.

B   In his presentation to his class, he wanted to play video footage from his experiment, but his teacher said this was unethical as the passersby shouldn't be identified.

Exam-style questions

Multiple-choice questions

Question 7   (1 MARK)

A participant's right to informed consent means that participants

A   willingly participate in the study and are not coerced in any way to do so.

B   agree to participate by signing a form, or having their legal guardian sign the form if they are under the age of 18.

C   are given information about the nature and purpose of the study, and understand the potential risks and benefits before agreeing to participate.

D   can decide to leave the study at any point, and their data will also be removed.

Use the following information to answer Questions 8 and 9.

Xena participated in an experiment in which deception was used. She was unaware that the other participants in the experiment were actually confederates, and that she was the only real participant. Halfway through the study, Xena started feeling sick and left the experiment to go home. Afterwards, she realised that she hadn't filled in her contact details correctly on the study form and couldn't get back in touch with the researchers to update them.

Question 8   (1 MARK)

By leaving before the conclusion of the experiment, which participant right did Xena act upon?

A   confidentiality

B   withdrawal rights

C   voluntary participation

D   debriefing

Question 9   (1 MARK)

By leaving before the conclusion of the experiment, which ethical consideration may have been breached?

A   confidentiality

B   withdrawal rights

C   voluntary participation

D   debriefing

Short-answer questions

Question 10   (1 MARK)

Outline one advantage of using animals in some psychological research.

Question 11   (2 MARKS)

Dr Krishna conducted an experiment on the effect of alcohol consumption on memory. He published his work in Science Journal and anonymised the data in his results, so that each of the participants were represented with a number instead of their name.

Identify and describe the ethical consideration that Dr Krishna upheld in anonymising his data.

1F COLLECTION OF DATA

How do researchers decide the type of data to collect? When is it better to collect numerical data compared to descriptive data? What are the strengths and limitations of each data type?

So far in this chapter, you have learnt about the ways in which researchers design investigations and the factors they take into consideration, including sampling procedures, ethical considerations and the identification and prevention of errors. When conducting an investigation, researchers must also make decisions concerning the type of data they will collect and whether the type of data will allow them to answer their research question. In this lesson, you will learn about the different types of data that researchers can collect.

Images: yut548, matsabe/Shutterstock.com

1A Aims, hypotheses and variables	1B Scientific research methodologies	1C Population, sample and sampling	1D Sources of error and prevention	1E Ethical considerations	1F Collection of data	1G Data organisation and interpretation	1H Evaluation of research

Key science skills

- Conduct investigations to collect and record data:
    - systematically generate, collect, record and summarise both qualitative and quantitative data

Key knowledge units

Types of data   SS 4.2.1

Collection of data

Types of data SS 4.2.1

Types of data SS 4.2.1

OVERVIEW

When collecting data for an investigation, researchers must decide what type of data will best help them test their hypothesis. The types of data you should be familiar with include qualitative and quantitative data, as well as subjective and objective data.

THEORY DETAILS

In research, data refers to the information collected for a study. There are different ways in which researchers can collect this data. The main method of data collection that you need to be familiar with is **primary data collection**, which involves the researcher directly collecting the data for an investigation. This data may be collected through various means of investigation, including experimentation, questionnaires, cross-sectional studies and so on, as explored in lesson 1B: Scientific research methodologies.

Primary data collection a method of data collection involving data being collected directly by the researcher

🧠 Want to know more?

Primary data collection involves the researcher directly collecting the data. *Secondary data collection* involves the researcher using data collected from elsewhere, or by someone else, for their research. Examples of this would be a meta-analysis, in which the researcher would analyse the findings from other studies. You do not need to know secondary data collection methods for the VCAA Psychology study design, but it may be useful to deepen your understanding of primary data.

Through investigations, researchers can collect many different types of data.
When designing their investigations, researchers must make a decision about what type
of data will be the most useful in their research. The types of data and examples of each
are summarised in table 1. The strengths and limitations of these types of data are outlined
in table 2.

Table 1 Types of data

Data type	Description	Example	
Quantitative data	• Quantitative data concerns quantities and is therefore more easily measurable. • It is data that can be represented through the use of numbers.	• Data collected from a rating scale or closed questions on a questionnaire. • Data collected through a study in which the researcher counts each time a behaviour is observed.	**Quantitative data** data concerning numerical amounts and is expressed numerically
Qualitative data	• Qualitative data concerns concepts that cannot be expressed numerically. • This data is often collected through descriptions, observations, or through the use of verbal language.	• Data collected from open-ended questions on questionnaires. • Responses to interview questions. • Descriptions of the researcher's observations written down in a log.	**Qualitative data** data of concepts that is measured or expressed non-numerically
Subjective data	• Subjective data concerns the individual or personal experience of participants. • In this way, it cannot be directly observed and is often collected through self-report. • This data is based on a person's opinion.	• Data collected through a participant's self-report on a questionnaire about their experience of an event. • It can be data collected about a participant's experience, their perspective, feelings, beliefs or attitudes.	**Subjective data** data that relies on personal opinion or self-report
Objective data	• Objective data is data that is collected through direct observation or measurement and should obtain the same results regardless of who is conducting the measurement. • It does not rely on the researcher's interpretation. • It is often understood as 'fact', that is, this data doesn't change based on the person viewing the data.	• Data that can be collected the same way by multiple researchers, such as the measurement of a person's height in centimetres.	**Objective data** data that does not rely on personal opinion and is independent of the interpreter; it can be observed or measured by multiple people and obtain the same results

ACTIVITY 1

Don't confuse your Qs!

Working in pairs or individually, decide whether each of the following
is an example of qualitative or quantitative data:

	Qualitative	Quantitative
• The number of times a student says 'um' during an oral presentation	☐	☐
• A student's notes that they have taken in Psychology class	☐	☐
• The average age of a netball team	☐	☐
• The distance a student travels on their way to school	☐	☐
• A description of how a student travels to school	☐	☐

Table 2 Strengths and limitations of different types of data

Data type	Strengths	Limitations
Quantitative data	• Quantitative data can undergo statistical analysis and then be represented numerically, easily allowing for comparisons to be made, trends to be seen and conclusions to be more readily drawn.	• Only analysing quantitative data means that researchers may not have a holistic or very detailed understanding of the phenomenon they are researching.
Qualitative data	• Qualitative data can give researchers a more thorough and holistic understanding of the context in which the quantitative, or other, data was collected. • It can provide background information, or context to the quantitative data.	• Qualitative data is difficult to statistically analyse (though it is not impossible). • This makes it difficult to manipulate the data in order to compare findings across groups and participants. • Qualitative data is often more time consuming to obtain and analyse.
Subjective data	• Subjective data allows for researchers to better understand the perspective of participants. • It provides researchers with an insight into unobservable phenomena such as an individual's motivation, perception, interpretation etc.	• Subjective data is difficult to validate and can be unreliable. • Sometimes participants may respond with what they think researchers want to hear, rather than what they truly believe. • Subjective data is more difficult to systematically analyse and compare compared to objective data.
Objective data	• Objective data does not rely on researcher interpretation, and so there is more chance that the data is valid.	• Using only objective data doesn't allow researchers to understand the perspectives of the participants, which might provide more insight into the research area they are trying to understand.

ACTIVITY 2

Which data type should be collected?

Read the following scenarios and complete the table to identify which data collection type is the most suitable.

Scenario 1:

A researcher is interested in investigating how new mothers found their experience during labour. The researcher wants to know whether the mothers found the experience painful, whether they enjoyed it, and whether they felt looked after by hospital staff.

Scenario 2:

A researcher wants to investigate the impact of age on cortisol (a stress hormone) levels. The researcher is interested in whether there is a relationship between these two variables, hypothesising that an increase in age will lead to an increase in stress.

Quantitative or qualitative?	Subjective or objective?
Scenario 1	
☐ Qualitative	☐ Subjective
☐ Quantitative	☐ Objective
Scenario 2	
☐ Qualitative	☐ Subjective
☐ Quantitative	☐ Objective

Researchers may collect a range of different data types in order to answer their research question in an investigation. For example, in a study on people's exercise habits, they may collect the following types of data:

- a researcher may ask participants to fill in a questionnaire asking participants to report the number of times they have exercised in the last week (subjective quantitative data).
- a researcher may also ask them to describe how they feel about their exercise routine (subjective qualitative data).
- they may also collect sign-in data from the gym that they attend (objective quantitative data) in order to compare the participant's self-reported number of exercises and the number of times they actually attended.

Often, having a range of different data types helps researchers to gain a more holistic understanding of their topic of research.

Theory summary

In this lesson, you have learnt about different data types that researchers can collect through primary data collection methods, as well as the strengths and limitations of each in supporting researchers to answer their research question. You have learnt that:

- *Qualitative data* concerns written or oral descriptions. This type of data can give more context and depth of information, but can be difficult to analyse.
- *Quantitative data* concerns numerical values. This type of data allows easier data manipulation and comparison, but does not give a detailed understanding of the phenomena.
- *Subjective data* is dependent on the experience of the individual. This type of data allows for an in-depth and contextualised understanding of participants' perspectives, but the data can be unreliable.
- *Objective data* is collected through direct observation. This type of data is more valid, but does not provide an insight into participants' perspectives.

1F QUESTIONS

Theory-review questions

Question 1

Primary data collection involves

A the researcher directly collecting the data.

B the researcher using the data from other researchers' studies.

Question 2

Fill in the blanks with the following key terms.

- Qualitative
- Quantitative

_____ data is measurable and is expressed numerically, whereas _____ data is expressed using descriptions.

Question 3

Subjective data

A relies on the experience of individuals.

B is collected and measured directly by the researcher.

Question 4

Objective data

A relies on the experience of individuals.

B is collected and measured directly by the researcher.

Skills

Understanding research

Use the following information to answer Questions 5 and 6.

Read the following extract from the method section of this article. This article researched the ways in which the context of media content impacts the ability of people to process news and form opinions in debates. The article involves the use of a pilot study, which involves trialling a research procedure with a small group of participants before conducting a larger study.

Impression-motivated news consumption: Are user comments in social media more influential than on news sites?

In a pilot study, 32 participants (19 female, age: M=25.63, SD=4.80) rated 19 comments on the topic with regard to the stance of the comment (pro vs. con), levels of competence and argument quality, as well as whether the comment was easy to understand (on 7-point scales)... After reading the article, participants indicated their attitude toward the topic with three items (e.g.,"Media coverage on suicide should be reduced"), rated on 7-point scales between "strongly disagree" and "strongly agree".

(Winter, 2019)

Question 5

Was the data collected in this study objective or subjective?

A   Subjective data because the data was collected using a self-report method.

B   Objective data because the data was collected on a 7-point scale.

Question 6

Was the data collected in the study quantitative or qualitative?

A   Qualitative data because it reflected the individual's perspective.

B   Quantitative data because it was collected on a 7-point scale.

Exam-style questions

Multiple-choice questions

Question 7   (1 MARK)

A limitation of using qualitative data is that

A   it is difficult to manipulate and compare across data points.

B   it does not provide insight into the perspectives of the participants.

C   it will provide a less holistic understanding of the phenomenon.

D   the data collected will be less detailed.

Question 8   (1 MARK)

The type of data that is collected through open-ended interviews is

A   objective and quantitative.

B   objective and qualitative.

C   subjective and quantitative.

D   subjective and qualitative.

Question 9 (1 MARK)

Rahul conducted an experiment in which he tracked the number of steps participants walked each day in order to see if there was a correlation with their health.

The number of steps participants walked each day is an example of

A quantitative data, because it is expressed numerically.

B qualitative data, because it provides an indication of participants' health.

C subjective data, because it varied depending on the individual participant.

D objective data, because it is expressed using numbers.

Short-answer questions

Question 10 (1 MARK)

Describe one strength of objective data.

Question 11 (4 MARKS)

Arthur wanted to analyse popular YouTube videos to see if there were any commonalities in the most viewed videos. In the first stage of his study, he collected video popularity data including the number of views, number of likes and dislikes, the length of the video, and the number of subscribers the YouTuber had.

After using this data to analyse the popularity of the video, taking into account the number of subscribers and proportion of likes and dislikes on the video, he then further analysed the top 50 most popular videos in the second stage of his experiment. He watched each video three times and took notes on the following features:

- The topic of the video
- How charismatic the YouTuber was
- How the YouTuber engaged with the audiences

a Explain what type of data Arthur collected in the first stage of his experiment. (2 MARKS)

b Explain what type of data Arthur collected in the second stage of his experiment. (2 MARKS)

1G DATA ORGANISATION AND INTERPRETATION

Once you have conducted a study, you will find yourself staring at a lot of data and information that you have collected. How do you begin sorting through this data? What trends or patterns might emerge? How do you then communicate your findings to others? These are the questions that we will address in this lesson. Specifically, you will learn about how researchers organise and interpret the data they have collected in order to draw a meaningful conclusion about their study.

Image: Anna_leni/Shutterstock.com

1A Aims, hypotheses and variables	1B Scientific research methodologies	1C Population, sample and sampling	1D Sources of error and prevention	1E Ethical considerations	1F Collection of data	1G Data organisation and interpretation	1H Evaluation of research

Key science skills

- Analyse and evaluate data, methods and scientific models

    - process quantitative data using appropriate mathematical relationships and units

    - organise, present and interpret data using tables, bar charts, line graphs, percentages, calculations of mean as a measure of central tendency and understanding of standard deviation as a measure of variation around the mean

    - recognise the difference between statistics that describe a specific sample and the use of statistics to make inferences about the population from which the data were drawn

Key knowledge units

Organising and interpreting data	SS 5.2.1
Presenting data	SS 5.2.2

Data organisation and interpretation

- Organising and interpreting data SS 5.2.1
  - Mean
  - Standard deviation
  - Outliers
- Presenting data SS 5.2.2

Organising and interpreting data SS 5.2.1

OVERVIEW

Once a researcher has collected the raw data during an investigation, they must organise and present the data in order to construct meaningful interpretations.

THEORY DETAILS

It can be overwhelming to look at a raw set of data from a study. Often, researchers collect lots of data points from multiple participants, sometimes over long periods of time. When looking at the data in this format, it is difficult to draw out any meaningful conclusions and to decide whether their original hypothesis was supported or not. Instead, researchers must take this raw data and manipulate and organise it in order to identify meaningful trends or relationships within the data set. This is part of the process of *interpreting* data.

The researcher would begin by analysing the data collected in the study to derive **descriptive statistics,** which are statistics that *describe* the raw data. These statistics show, summarise and organise data in a meaningful way so that the researcher can more easily see and interpret patterns and trends; they are presented in forms such as graphs and summary tables. For example, a table summarising the average results of participants is more easily interpreted than a long list of data that shows each individual participant's results.

This differs from **inferential statistics,** which assist researchers in making judgments regarding the extent to which the results of the experiment are meaningful and might apply to the population of research interest.

Descriptive statistics statistics that are used to organise and summarise data

Inferential statistics statistics that provide information on the statistical significance of the results and suggest how they might apply to a wider population

> ⚠️ **Useful tip**
>
> - One way to remember descriptive statistics is by looking at the root word: *describe*. Descriptive statistics describe the raw data in a meaningful way.
> - Inferential statistics are used to *infer* how the data from the study could be applied to the wider population.

Mean

A common descriptive statistic that can give researchers information about the sample are measures of central tendency, which give information about what the 'centre' of the data set looks like. The centre is of interest to researchers because it demonstrates the trend of a data set and therefore represents a typical response. One measure of central tendency with which you should be familiar with is the mean.

The **mean** of a data set is the numerical average of the data points, calculated by adding up all of the data points and dividing it by the number of total data points. The mean is useful when the data points are clustered around a central score, so that this measure of central tendency can help researchers understand what the 'average' result is. If the data points are too widely or unevenly distributed, the mean could be a poor indicator of central tendency as it doesn't accurately reflect the 'central' score of the data set.

Mean a measure of central tendency, expressed numerically, that represents the average of a data set
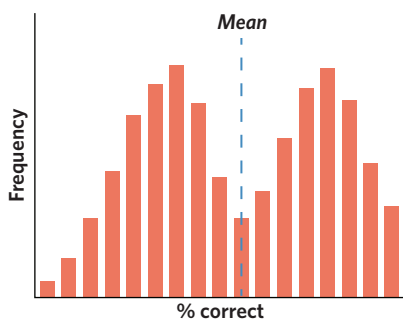
Figure 1 When the data is unevenly distributed or clustered around extreme values, the mean is not an accurate measure of central tendency
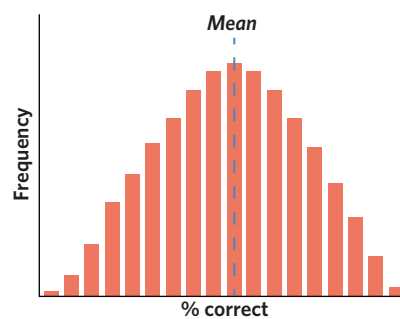
Figure 2 When the data points are clustered around a central score, the mean provides a more accurate measure of central tendency

> ➕ **Want to know more?**
>
> Two other common measures of central tendency are the *mode* and the *median*:
>
> - The *mode* is a numerical value that appears most frequently within a data set.
> - The *median* is the middle data point of a data set when data points are ordered from lowest to highest.

Standard deviation

Another descriptive statistic that researchers can use to interpret data is **standard deviation.** The standard deviation of a data set is a measure of variation around the mean that shows the spread of data values around the average. The standard deviation uses a number to show how much the data 'deviates' (differs from) the mean.

Standard deviation a measure of central tendency, expressed numerically, that represents the spread of data around the mean
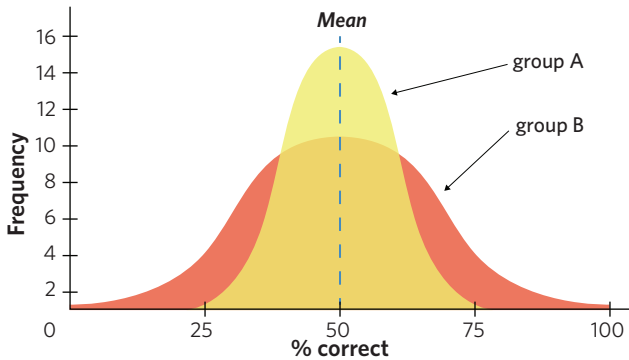
Figure 3 Two data sets with the same mean and differing standard deviations

Standard deviation can give researchers more information about the data set than the mean alone, as it shows the spread of results and how much variation there is in a data set. For example, figure 3 shows two data sets which have the same mean. If researchers were only to look at the mean, they might say that the results of the two groups are comparable. However, when researchers also look at the standard deviation, it can be seen that the data sets vary:

- In group A, the standard deviation is relatively small. That is, the results don't deviate much from the mean. You can see this because the yellow graph is much more narrow and only spreads from 25% to 75% correct.
- The standard deviation of group B is larger. That is, the results deviate much more from the mean, so the results obtained in group B have greater variance. You can see this because the red graph is wider and spreads from 0% to 100% correct.

In this way, using the standard deviation can allow researchers to more meaningfully compare two or more sets of data.

Standard deviations can also be represented numerically. The larger the standard deviation number, the more that the data in the set 'deviates' or differs from the mean, that is, the data set has more variance. Conversely, the lower the standard deviation number, the closer the spread of data is to the mean.

> (!) **Useful tip**
>
> It is important for you to understand standard deviations as you may be asked to interpret a standard deviation in a SAC or exam. However, you will not be asked to calculate one.

Outliers

An important component that researchers must take into consideration when organising and interpreting data is the presence of outliers. **Outliers** are data points that differ or lie far away from the other results. Outliers may arise for a number of reasons. Often, the presence of outliers may affect how accurately a mean summarises data. If an outlier is included in the calculation of the mean, the mean may not be an accurate reflection of the average result. When looking at data sets, researchers must decide whether or not to include outliers in their statistical analysis. This may require a deeper analysis of why the outlier occurred, what it represents and how it may affect the validity of the results.

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

Figure 4 Example of an outlier
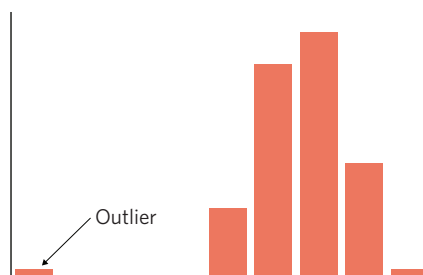
Figure 5 Example of an outlier

Presenting data SS 5.2.2

OVERVIEW

Visually presenting data can help researchers to interpret and share the data collected in an investigation. Common methods of data presentation include the use of a table, bar chart or line graph.

THEORY DETAILS

In analysing, organising, and interpreting data, researchers may choose different ways of representing it visually. Representing data visually makes it easier to see the relationship between the variables being investigated by making patterns or trends in the data set more evident.

The two main ways of representing data are in tables or graphs:

- A **table** displays information using columns and rows.
- A graph shows the relationship between variables using a vertical and horizontal axis.

Table a method of presenting data using columns and rows

Table 1 Example of a table used to display data (Australia Bureau of Statistics, 2018)

Student enrolments by school affiliation, Australia, 2014-2018

	2018	2017	2016	2015	2014
Government	2,558,169	2,524,865	2,483,802	2,445,130	2,406,495
Catholic	785,735	766,870	767,050	765,539	757,749
Independent	569,930	557,490	547,374	540,304	529,857
TOTAL	**3,893,834**	**3,849,225**	**3,798,226**	**3,750,973**	**3,694,101**

There are two main types of graphs with which you need to be familiar: line graphs and bar charts. Both types of graphs represent data along a vertical and horizontal axis to show the relationship between variables.

- A **bar chart** uses bars/columns that either sit horizontally or vertically and is used when the data represents categories.
- A **line graph** uses a line to connect the points of data along a graph, displaying the relationship between the variables.

Bar chart a graph that depicts the relationship between two variables using rectangular bars

Line graph a graph that depicts the relationship between two variables using a line that connects each data point

Proportion of Australian population who accessed subsidised mental health-related MBS services and PBS medication-2011, by age
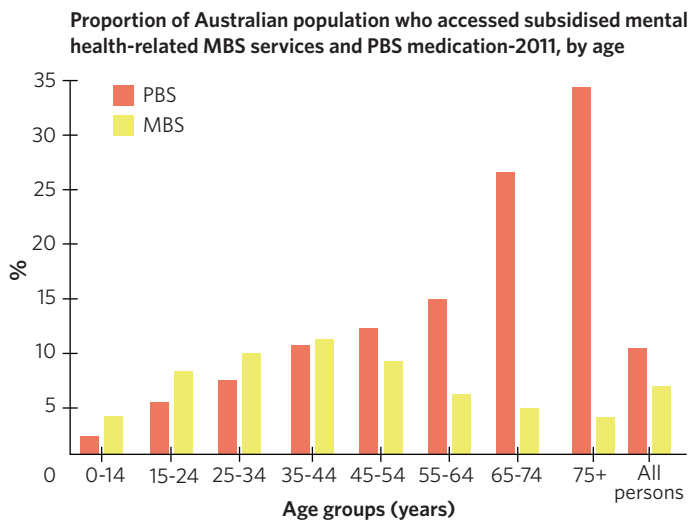
Figure 6 Example of a vertical bar chart (Australian Bureau of Statistics, 2011)

Children aged between 0 to 11 years who attended formal and/or informal care last week; 1996 to 2017

www.abs.gov.au/childcare
Australian Bureau of Statistics
©Commonwealth of Australia
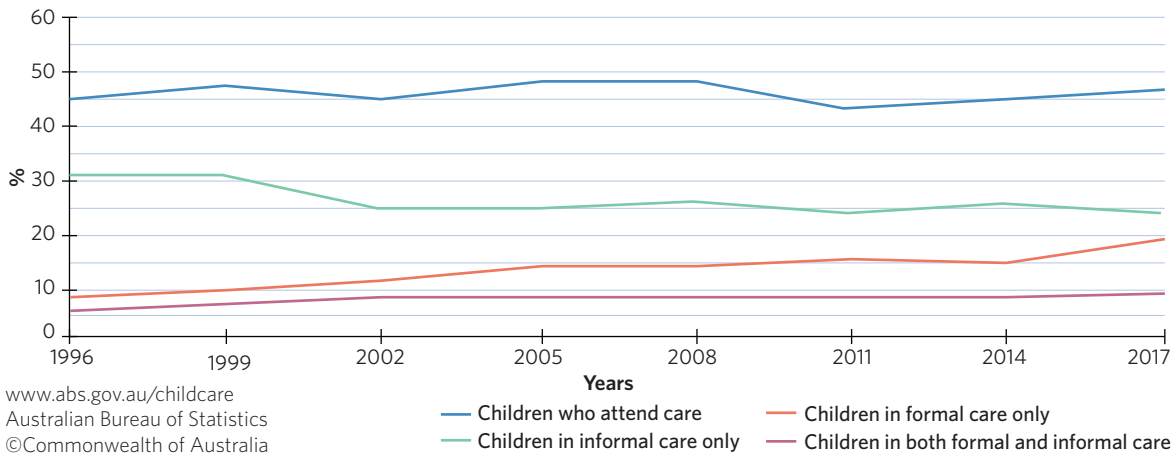
Figure 7 Example of a line graph (Australian Bureau of Statistics, 2018)

Want to know more?

You may have come across other methods of representing data.

- A pie chart displays the proportion of each key characteristic within the data.
- A scatterplot plots data points on a graph to represent the relationship between two variables.

Australia's goods trade with the EU by major EU country
Imports (A$m)
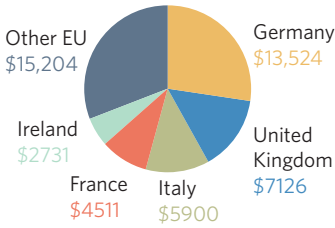
Figure 8 Example of a pie chart (Department of Foreign Affairs and Trade, 2017)
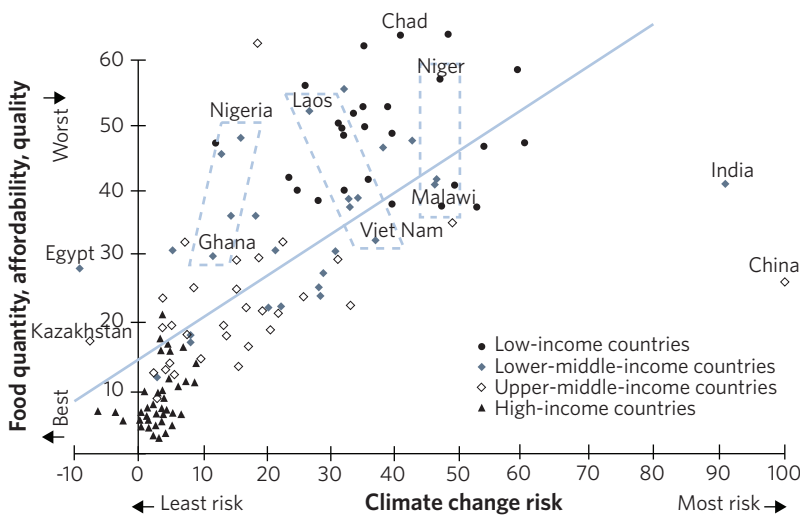
Figure 9 Example of a scatterplot (Oxfam, 2014)

> ⊕ **Useful tip**
>
> When drawing graphs, you should note that:
>
> - The *independent variable* is represented on the horizontal (x) axis while the *dependent variable* is represented on the vertical (y) axis.
>
> When interpreting graphs, you should note that:
>
> - The presence of a correlation (an observed relationship between variables, usually between the independent and dependent variables) does not necessarily establish that there is a causal relationship between two variables. Remember, *correlation does not equal causation!*
> - Not all experiments will show a correlation between variables.

> ⊕ **Useful tip**
>
> When drawing a graph, it is important to make sure you have all of the following components:
>
> - A title
> - A label for your horizontal (x) axis
> - A label for your vertical (y) axis
> - Units of measurements for both axes
>
> **Graph title**
>
> Y axis (dependent variable) with units of measurement
>
> X axis (independent variable) with units of measurement
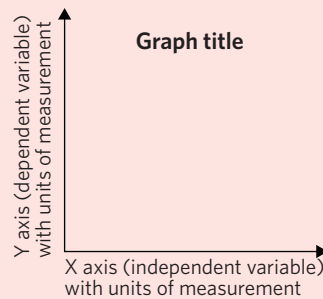
Theory summary

In this lesson, you have learnt about how you can organise, present, and interpret data collected from an investigation.

You have learnt that:

- The *mean* is a measure of central tendency that depicts the average result of a data set.
- The *standard deviation* is a descriptive statistic that indicates how much the data points in a set are spread out.
- *Outliers* are data points that differ from the other results, and should be analysed when they appear in data sets.

You should be able to present data in the following formats:

- A *table*, depicting data in rows and columns.
- A *bar chart*, depicting rectangular columns.
- A *line graph*, depicting data as connected points.

1G QUESTIONS

Theory-review questions

Question 1

Which of the following statements about descriptive statistics is correct? *(Select all that apply)*

I   Descriptive statistics describe trends in the data.

II   Descriptive statistics can be used to decide whether the results of a study can be generalised to the research population.

III Examples of descriptive statistics include mean and standard deviation.

Question 2

The mean gives a reliable indicator of the 'average' of a data set when *(Select one)*

A   the data is evenly distributed.

B   the data is unevenly distributed and is clustered around extreme values.

Question 3

Standard deviation is a measure of *(Select one)*

A   how accurate the data collected in a study is.

B   how spread out the data points within a data set are.

Question 4

Tables, bar charts and line graphs are tools used to *(Select one)*

A   make interpretation of data easier.

B   decide whether generalisations can be made to the wider population.

Skills

Understanding research

Use the following information to answer Questions 5 and 6.

Dr. Dagg is a researcher who wanted to study whether people who were clinically diagnosed as depressed preferred sad music. To study this, she recruited participants and allocated them to two groups:

- Group one consisted of participants who had been diagnosed with clinical depression
- Group two consisted of participants who had not been diagnosed with clinical depression, and self-reported as being 'generally happy'

She presented all participants with a list of thirty songs, of which she had categorised as either happy, sad or neutral music.

The raw data she collected is shown below:

Participant number	Group	Music choice
1	Depressed	Sad
2	Not depressed	Neutral
3	Depressed	Sad
4	Depressed	Happy
5	Depressed	Neutral
6	Not depressed	Happy
7	Not depressed	Happy
8	Not depressed	Neutral

Participant number	Group	Music choice
9	Depressed	Sad
10	Not depressed	Sad
11	Depressed	Happy
12	Not depressed	Neutral
13	Not depressed	Happy
14	Depressed	Neutral
15	Depressed	Sad
16	Not depressed	Sad

Question 5

Present the results Dr. Dagg collected in the table provided.

	Number of participants who chose happy music	Number of participants who chose neutral music	Number of participants who chose sad music
Group 1: Depressed			
Group 2: Not depressed			

Question 6

Present the data in a bar graph on the axes provided.

Music choices of clinically depressed compared to those of mentally healthy individuals
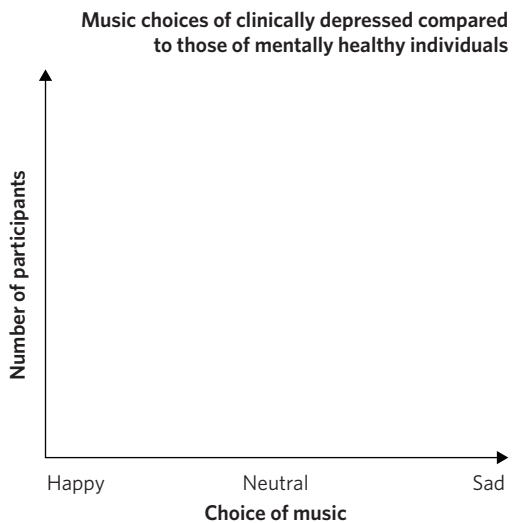
Exam-style questions

Multiple-choice questions

Question 7 (1 MARK)

A mean is

A a descriptive statistic.

B a measure of central tendency.

C both A and B.

D neither A nor B.

Question 8 (1 MARK)

Inferential statistics differ to descriptive statistics because

A they do not describe the raw data.

B they are used to infer about the wider population.

C they use different techniques of calculation.

D all of the above.

Question 9   (1 MARK)

For his school assessment, Raymond conducted an experiment exploring the influence weather has on appetite. He found that when the weather was colder, people were more likely to overeat.

Which of the following graphs is most likely to represent his results?
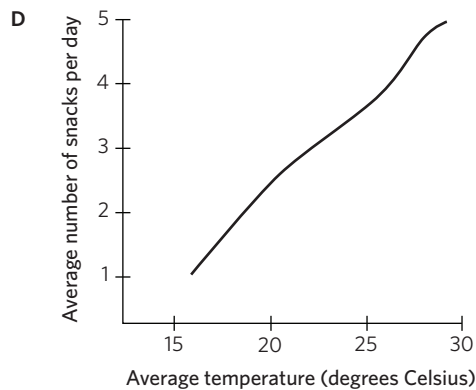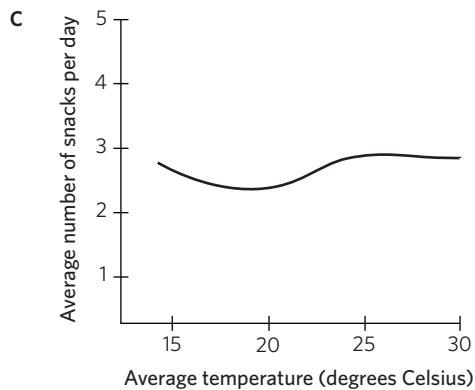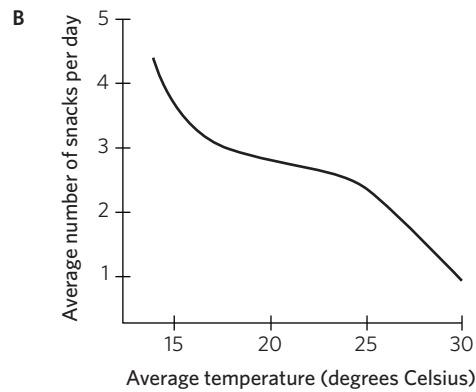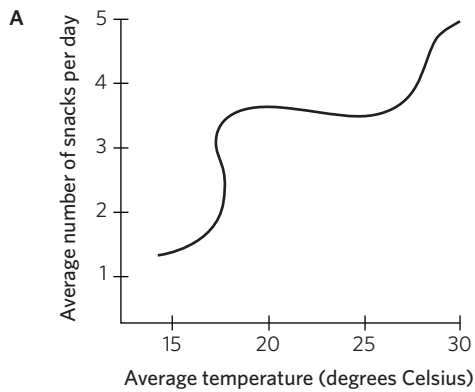
Short-answer questions

Question 10   (1 MARK)

Describe standard deviation as a measure of central tendency.

Question 11   (1 MARK)

Explain how outliers may affect measures of central tendency scores if they are not removed from a data set.

1H EVALUATION OF RESEARCH

How do researchers know if the results of a study accurately support their hypothesis? How do they know whether they can apply their findings to the entire population of interest?

In order to draw conclusions about their findings, researchers must evaluate their investigation, both in terms of the research procedures involved and the data collected. To do this, they need to consider multiple factors when evaluating investigations, and evaluate these factors according to the concepts of reliability and validity. Each of these must be considered in order for researchers to come to a conclusion and to generalise the results of the study to the research population. In this lesson, you will learn about these factors that researchers need to consider in order to draw accurate conclusions.

Image: ivector/Shutterstock.com

1A Aims, hypotheses and variables	1B Scientific research methodologies	1C Population, sample and sampling	1D Sources of error and prevention	1E Ethical considerations	1F Collection of data	1G Data organisation and interpretation	1H Evaluation of research

Key science skills

- Analyse and evaluate data, methods and scientific models
  - use basic principles of reliability and validity in evaluating research investigations undertaken
  - explain the merit of replicating procedures and the effects of sample sizes in obtaining reliable data
- Draw evidence-based conclusions
  - determine to what extent evidence from an investigation supports the purpose of the investigation, and make recommendations, as appropriate, for modifying or extending the investigation
  - draw conclusions consistent with evidence and relevant to the question under investigation
  - identify, describe and explain the limitations of conclusions, including identification of further evidence required

Key knowledge units

Drawing conclusions	SS 6.2.1
Evaluating research investigations	SS 5.4.1

Evaluation of research

- Drawing conclusions SS 6.2.1
  - Generalisability
  - Reproducibility and repeatability
- Evaluating research investigations SS 5.4.1
  - Reliability
  - Validity

Drawing conclusions SS 6.2.1

OVERVIEW

Once a researcher has conducted their investigation and analysed the results obtained, they will attempt to draw conclusions in order to either support or refute their initial hypothesis. They will also consider whether they are able to generalise the results of the study back to the wider research population.

THEORY DETAILS

At the end of an investigation, the researcher will come to a **conclusion**, which is a statement regarding the results of the investigation. Specifically, it will relate back to the hypothesis and state whether it has been supported or not, referring to the data or evidence that demonstrates this.

Conclusion a statement regarding the results of an investigation as to whether the hypothesis was supported or not

> **⊙ Useful tip**
>
> Remember, the data collected from one experiment cannot conclusively *prove* or *disprove* hypotheses. Therefore, it is important to not use this terminology in your conclusion. Instead, you can state whether the data collected *supports* or *rejects* the hypothesis.

Generalisability

Another key part of the conclusion is the extent to which the results of the investigation can be applied back to the research population, referred to as the **generalisability** of an investigation. As you learnt in lesson 1C: Population, sample and sampling, investigations are often conducted using a subset of the population called the sample. The purpose of using the sample is to be able to test a hypothesis in a practical manner. The results of the investigation should be able to be applied back to the wider population, that is, they should be able to be generalised. Factors that affect the generalisability of results are outlined in table 1.

Generalisability the extent to which the results of an investigation can be applied to the wider research population

Table 1 Factors affecting generalisability

Factor affecting generalisability	Explanation
If the sample is representative of the population	The more representative the sample, the more likely researchers will be able to generalise their results to the population. This is because the results that apply to the sample are then more likely to also apply to the population.
The size of the sample	A larger sample size increases the likelihood that it is representative of the population, and therefore increases the generalisability of the results.
If the results are valid and reliable	Valid and reliable results mean that the investigation has measured what it set out to measure, and that the results can be replicated. You will learn more about this in the next part of this lesson.

Often, it is difficult to generalise the results from an experiment to the wider population. The constraints of time and cost often mean that one or more of these factors are not met. Often, more research is required to build upon the data collected from one experiment, in order for scientists to have a more holistic understanding of the research area of interest.

Reproducibility and repeatability

In their conclusion, researchers may also make recommendations for future research, including extending or modifying their investigation in some way. With this in mind, it is important that investigations are replicable (that is, can be conducted again, either by the researcher themselves, or by another researcher) to ensure the data collected isn't a 'one-off' and in order to be able to draw reasonable conclusions. Two ways an investigation can be replicated include repeating or reproducing an investigation:

- *Repeatability* refers to the closeness of agreement between independent results obtained with the same method on identical test material, under the same conditions (same operator, same apparatus (materials and methods) and/or same laboratory) (VCAA, n.d.).
  - In other words, if the same tests are conducted again without any changes, the results will be the same or very similar.
- *Reproducibility* refers to the closeness of agreement between independent results obtained with the same method on identical test material but under different conditions (different operators, different apparatus and/or different laboratories). The purposes of reproducing experiments include checking of claimed precision and uncovering any systematic errors that may affect accuracy from one or other experiments/groups. Reproducibility is often used as a test of the reliability of an experiment (VCAA, n.d.).
  - In other words, if the same tests are conducted but with a change to the participants, researcher or some slight testing condition, the results will still be the same or very similar.

Want to know more?

The *replication crisis* refers to a growing concern that the results of scientific studies, particularly those in the fields of social science and psychology, have not been able to be reproduced. Without being able to reproduce results of investigations it is difficult to assess the accuracy of findings. In a study conducted on 100, well-respected, published psychological articles, only 36% of the studies' results could be replicated (Open Science Collaboration, 2015).

Can you think of some reasons why this replication crisis is more relevant in social science fields like psychology? What might be some of the factors that make it hard to reproduce the results of psychological investigations?

Evaluating research investigations SS 5.4.1

OVERVIEW

Validity and reliability are two important factors researchers must consider when evaluating the soundness of their conclusions and investigation.

THEORY DETAILS

In order to reach a conclusion and assess the generalisability of the results of an investigation, a researcher must evaluate how the study was conducted and how the data was collected. Concepts that researchers must consider include the reliability and validity of the data collected and whether the investigation is replicable and accurate.

Reliability

Experimental **reliability** refers to the consistency of results of an experiment. This involves the likelihood that another experimenter will perform exactly the same experiment under the same conditions and generate the same results (within a very narrow range of values) (VCAA, n.d.).

Reliability how likely it is that the results are consistent and that the same results could be obtained by another researcher

Studies may not produce results that are reliable when:

- experiments are subjective due to the use of human judgments, as different experimenters may judge and interpret data differently.
- small sample sizes are used.
- the study has insufficient trials.

(VCAA, n.d.)

Results must be reliable for researchers to be able to generalise them to the wider research population. Unreliable results can indicate that there were errors in the investigation, whether through the design, through conducting the investigation or through the analysis of results.

Validity

A measurement is **valid** if it measures what it claims to be measuring; for example, a test of memory should measure memory and not something else (such as intelligence or emotional state). Both the experimental design and the implementation should be considered when evaluating validity.

Validity the extent to which the investigation measures what it intends to measure

A distinction can be made between internal and external validity; both types are relevant to evaluating the validity of a research investigation or procedure:

- **Internal validity** refers to whether there is a causal relationship between the independent and dependent variables or whether any observed effects of the investigation or procedure are due to some other factor. Internal validity can be improved by controlling for extraneous variables (VCAA, n.d.). This can be achieved through measures such as using a particular type of experimental research design, using standardised instructions and procedures, counterbalancing and eliminating experimenter effects.

Internal validity the extent to which the changes in the dependent variable are caused by the independent variable, and not other variables

- **External validity** refers to the extent to which the results of an investigation can be generalised to other settings, other people and over time (VCAA, n.d.). In this way, external validity is a measure of generalisability. External validity can be improved through a number of methods including conducting experiments in settings natural to the research question of interest, increasing the size of the sample and using random

External validity the extent to which the results of an investigation can be applied to other settings, people and time

sampling to select participants. Experimental data conclusions are said to be valid if the measurements that have been made are affected by a single independent variable only. They are not valid if the investigation is flawed and control variables have been allowed to change or there is experimenter bias (VCAA, n.d.).

Similar to reliability, an investigation must be internally valid in order for researchers to confidently generalise the results to the wider researcher population. That is, an investigation must first be internally valid in order for it to be externally valid (generalisable). If a measure is not valid, this means that the conclusion reached may be inaccurate and the effects seen in the dependent variable may actually be due to causes other than the independent variable.

Analogy

Target 1	Target 2	Target 3
Reliable Not valid	Not reliable Not valid	Both reliable and Valid

One way to think about reliability and validity is looking at the analogy of archery. Let's say that validity in this case is being able to hit where the archer aims to hit, which is the centre point of a target.

- The first target shows that the archer has consistently hit the top right corner of the target. As they consistently do so, they are *reliable*. But as they haven't been able to hit the centre (which is what they aim to do), it is *not valid*.
- The second target shows that the archer has hit the target in a few different spots spread out around the target. This is *neither valid* (as it hasn't hit the centre) *nor reliable* (as the results aren't consistent across separate trials).
- The third target shows that the archer has consistently hit the centre of the target. This is both *reliable* (as they are consistent) and *valid* (as they have been able to hit where they aimed to hit).

As you can see here, an investigation can be reliable without being valid. Conversely, it is possible for an investigation to also be valid but not reliable. It is important that researchers evaluate investigations looking for both validity and reliability in order to draw a conclusion.

Theory summary

In this lesson, you have learnt about the factors in an investigation which researchers must consider to form a conclusion.

You have learnt that:

- For the results of an investigation to be generalised to the wider population, the sample size must be large and the sample must be unbiased and representative of the population
- The results also need to be both valid and reliable, in that the investigation measured what it aimed to measure and that the results can be replicated or reproduced

Key questions to help you remember the concepts covered in this lesson are summarised in table 2.

Table 2   Key question for each concept

	Key question
Generalisability	To what extent can the results of an investigation be applied to the research population?
Reliability	How likely is it that another experimenter can replicate the results?
Validity (internal)	Is the experiment actually measuring what it aims to measure?
Repeatability	Can the same results be obtained under the same conditions?
Reproducibility	Can the same results be obtained under different conditions?

1H QUESTIONS

Theory-review questions

Question 1

Which of the following affect generalisability? *(Select all that apply)*

I   The number of participants in the sample

II   If the sample is biased or not

III If the sample is representative of the population

IV   If the results are valid and reliable

Question 2

Reliability refers to *(Select one)*

A   the extent to which the results can be replicated.

B   the extent to which the investigation measures what it aims to measure.

Question 3

Validity refers to *(Select one)*

A   the extent to which the results can be replicated.

B   the extent to which the investigation measures what it aims to measure.

Question 4

Fill in the blanks with the following terms.

•   External validity

•   Internal validity

There are two types of validity that a researcher must evaluate. _____ refers to the extent that the independent variable has caused the change in the dependent variable. _____ refers to the extent that the results of an experiment can be generalised to other settings, people and over time.

Skills

Perfect your phrasing

Question 5

Which of the following sentences is most correct?

A   The hypothesis was disproved.

B   The hypothesis was not supported.

Question 6

Which of the following sentences is most correct?

A   The hypothesis was supported.

B   The hypothesis was proven correct.

Exam-style questions

Multiple-choice questions

Question 7   (1 MARK)

Generalisability refers to

A   the extent to which the results of an investigation can be applied to the research population.

B   the extent to which the results of an investigation can be applied to the sample of participants.

C   the extent to which the investigation measures what it aims to measure.

D   the extent to which another researcher could replicate the results of an investigation.

Use the following information to answer Questions 8 and 9.

Dr Raveer conducted an investigation looking into the effects of marijuana use on cognitive functioning. He found that participants who regularly used marijuana displayed decreased cognitive functioning in the areas of short-term memory and attention. However, when his colleague, Dr Jensen, conducted the same experiment, she found that participants who regularly used marijuana actually displayed higher cognitive functioning.

Question 8   (1 MARK)

Dr Jensen getting different results indicates that Dr Raveer's initial experiment was likely

A   reliable.

B   not reliable.

C   valid.

D   not valid.

Question 9   (1 MARK)

Dr Jensen also found that the test Dr Raveer used to measure short-term memory and attention was not a good tool, as it required a high level of literacy to be performed accurately. She found that half of the participants were from culturally and linguistically diverse backgrounds where English was not their first language so this may have confounded the results. This indicates that Dr Raveer's initial experiment was likely

A   reliable.

B   not reliable.

C   valid.

D   not valid.

Short-answer questions

Question 10   (1 MARKS)

Amir used a case study methodology to study synaesthesia, which is a neurological condition where people's perception of different senses are merged. Specifically, she worked with one person who self-reported as having synaesthesia, reporting that they could 'taste' music. They described that classical music tasted sweet whereas rock music tasted bitter. Through Amir's research, she concluded that people with synaesthesia have higher neurological activity than normal, resulting in this merging of sensation and perception.

Explain why Amir is unable to generalise their results to the wider population of people who have synaesthesia.

CHAPTER 1 REVIEW

CHAPTER SUMMARY

In the first half of this chapter, in lessons **1A-1E**, we learnt how to set up a scientific investigation. Specifically, we learnt

- about the scientific method, and how this is based on collecting empirical evidence to test hypotheses.
- how to construct testable hypotheses that include the independent and dependent variables.
- about different ways in which researchers can conduct psychological investigations, including the benefits and limitations of each of these methods.
- why researchers need to use a sample of participants, and how we can select these samples.
- about the different extraneous and confounding variables that could affect the results of an investigation, and different ways to control and account for them.
- about the ethical considerations that all researchers must adhere to, particularly regarding participants rights.

In lessons **1F-1H**, we learnt how to conduct experiments, analyse and communicate the findings. This involved learning

- about the different types of data that researchers could collect, and the benefits and limitations that they need to weigh up when deciding what type of data to collect.
- how to analyse, organise and interpret raw data, in order to then communicate findings to others.
- how to evaluate an investigation in regards to reliability and validity.

In this chapter, we learnt all about research methods and started developing the scientific skills you will need for Psychology units 1-4. These scientific skills can be linked to multiple other concepts, as seen in the following mind maps.

This mind map refers to planning your research and includes the concepts from lessons *1A: Aims, hypotheses and variables, 1B: Scientific research methodologies* and *1C: Population, sample and sampling*.
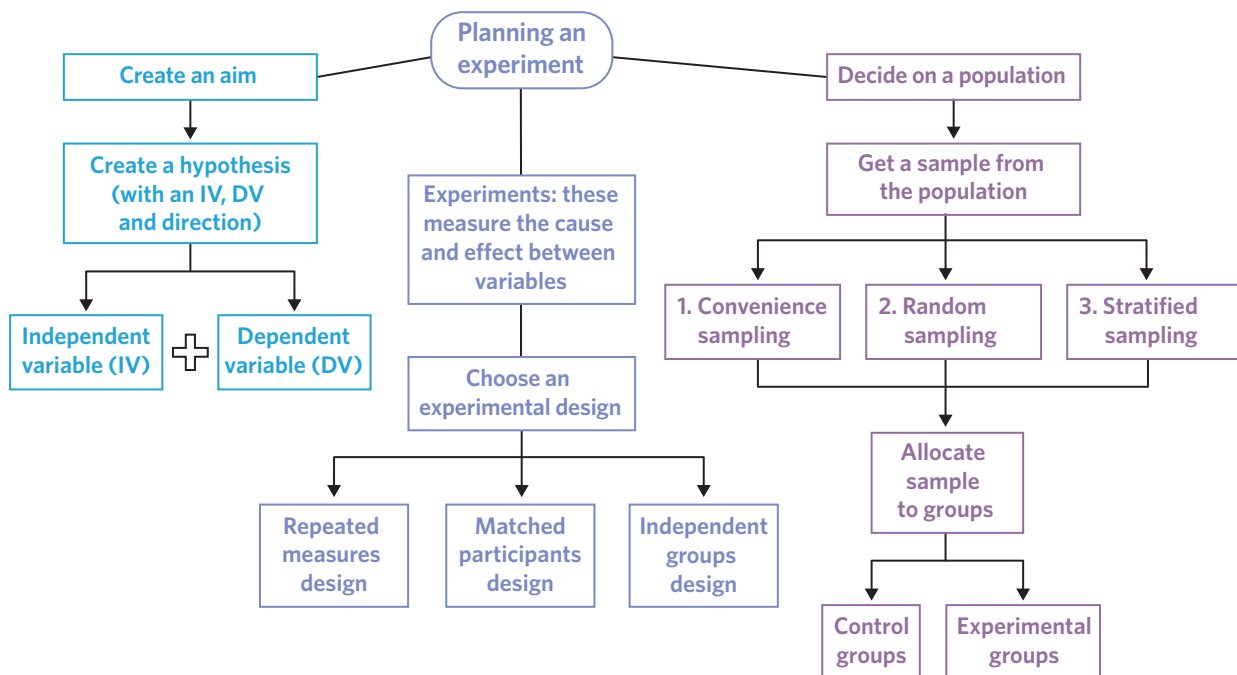
This mind map refers to conducting your research and includes the concepts from lessons **1D: Sources of error and prevention, 1E: Ethical considerations** and **1F: Collection of data**.

Conducting your research

Research must follow ethical guidelines

An ethics committee approves research

The researcher must follow the no-harm principle

Participant rights include:
- voluntary participation,
- informed consent,
- withdrawal rights,
- confidentiality, and
- debriefing (particularly when deception is involved in the study)

Research errors can occur. These include:

These errors can be prevented by:

1. Participant-related variables → 1. Sampling procedures

2. Order effects → 2. Choosing an experimental research design
2. Order effects → 2. Counterbalancing

3. Placebo effect → 3. Placebo
3. Placebo effect → 3. Single-blind procedures

4. Experimenter effects → 4. Double-blind procedures

5. Non-standardised testing procedures → 5. Standardised instructions and procedures

If not prevented, the errors can become extraneous or confounding variables

Researchers must decide what type of data to use

Qualitative OR quantitative ╬ Objective OR subjective

This mind map refers to evaluating your research and includes the concepts from lessons **1G: Data organisation and interpretation** and **1H: Evaluation of data.**

Evaluating your research

A study can be evaluated through data, which is organised and interpreted by calculating the:

1. Mean

2. Standard deviation

Data can be visually presented as a:

1. Table

2. Bar chart

3. Line graph

Research investigations must be evaluated at the conclusion of a study, which involves determining if the results can be generalised to the population.

Reliability and validity must occur for a conclusion to be drawn.

Over this course, and in units 3 and 4, we will revisit and continue to develop these scientific skills and be able to demonstrate them in the context of different psychological concepts.

CHAPTER REVIEW ACTIVITIES

Review activity 1: Design your own experiment

Now that you have learnt all about different research methods, it's time to start putting your scientific skills into practice. In this activity, you can start to practice designing an experiment by responding to the prompts below.

You may want to complete this activity individually, in pairs or even in a small group. You can either respond to the prompts in your workbook, or in another format such as a powerpoint presentation.
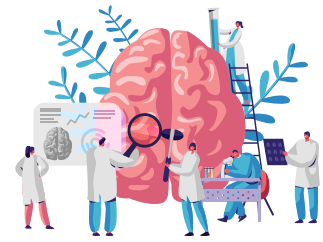
Image: ivector/Shutterstock.com

- Think of a research question you'd like to explore, or choose one from this list:
  - Why do people experience stress differently?
  - How do people cope with change?
  - Does having siblings make you more social?
  - Are there gender differences in intelligence?
  - What are the most effective mental health interventions?
  - How do social interactions affect self-esteem?
  - What influences attraction?
- Turn this research question into an **aim**, and then a **testable hypothesis** (remember, in your hypothesis you need to include the IV, DV and state a predicted direction of their relationship).
- **Operationalise your IV and DV**, describing in detail how you would manipulate the IV and how you would measure the DV.
- Choose an **experimental design** that you could use to test your hypothesis and remember to weigh up the benefits and limitations of each.
- Who is your research **population**?
- Decide on a **sampling method** that you could use, remembering to weigh up the benefits and limitations of each.
- What **ethical considerations** are relevant for your study?
- What **extraneous variables** do you need to control for?
- What **type of data** will you be collecting in your study?
- How will you analyse, organise, and present your **data**?
- Comment on whether you think the results from your study would be **generalisable, reliable and valid**. Why or why not?

Review activity 2: Unpacking an experiment

Read through the following abstract of an experiment and respond to the questions below.

> **Can learning to lucid dream promote personal growth?**
>
> A lucid dream occurs when a dreamer knows that he or she is dreaming while continuing to dream. Many people practice lucid dreaming to promote personal growth, including enhanced creativity and self-esteem… Our study asked whether successfully inducing lucid dreams leads to personal growth… using an experimental design. In a sample of undergraduates (N = 32), we assessed psychological well-being and personal growth longitudinally and compared participants assigned to lucid dream training to a group that only learned journaling and mindfulness practices and a third group that did not learn any techniques. We found no significant differences between the groups on indicators of personal growth on average. However, successful lucid dreamers had higher life satisfaction and self-esteem, as well as lower stress the day after lucid dreaming, compared with unsuccessful lucid dreamers.
>
> (Konkoly & Burke, 2019).

a What research methodologies has the experimenter used here?
   (Hint: they use more than one research method in this study).

b Why do you think the experimenter chose to use these research methodologies?
   Discuss the benefits and limitations.

c What type of data did the researchers collect?

d Can you think of any confounding variables that may have affected the results?
   Could the experimenter have accounted for these before conducting the experiment?
   If so, what measures could they put into place to minimise or eliminate these variables?

Image: Inspiring/Shutterstock.com

CHAPTER 1 TEST

Multiple-choice questions

Question 1   (1 MARK)

The placebo effect occurs when

A   the experimenter's expectations affect their mental processes and behaviours resulting in them behaving differently.

B   the participants' expectations affect their mental processes and behaviours resulting in them behaving differently.

C   experimenters are given an inactive treatment to serve as a control.

D   participants are given an inactive treatment to serve as a control.

Question 2   (1 MARK)

Nikita is completing her honours year in her psychology degree. For her thesis, she is studying the effect of staff motivation on performance. What are the independent and dependent variables for her study?

	Independent variable	Dependent variable
A	The motivation levels of staff	Staff performance
B	The motivation levels of staff	Staff enjoyment
C	Staff performance	The motivation levels of staff
D	Staff performance	Staff enjoyment

Question 3   (1 MARK)

Random allocation involves

A   each member of the population having an equal chance of being in the sample of participants.

B   each member of the sample having an equal chance of being in the control or experimental group.

C   the process of allocating participants to experimental conditions.

D   the process of assigning participants their task in an investigation.

Question 4   (1 MARK)

Deception can be used in a study when

A   participants have given informed consent and voluntarily participate.

B   no harm is done to participants, whether it be psychological or physical.

C   it is deemed ethical and necessary, and participants are debriefed afterwards.

D   confederates (actors pretending to be participants) are used to ensure the safety of participants.

Question 5   (1 MARK)

Professor Eugene conducted a study that found that people who have greater feelings of gratitude are more likely to perform random acts of kindness. His study has been replicated multiple times with consistent findings from other researchers. What does this indicate about Professor Eugene's experiment?

A   It has high reliability.

B   It has low reliability.

C   It has high validity.

D   It has low validity.

Question 6   (1 MARK)

Astrid wanted to study people's facial expressions when they are scared to see if there were any age-dependent differences in these expressions. To study this, she set up a secret camera in the hallway of her house and when family members walked in the door she jumped out and screamed at them, recording their reactions on tape.

Which of the following ethical considerations may have been breached in Astrid's investigation?

A   voluntary participation

B   informed consent

C   no-harm principle

D   all of the above

Question 7   (1 MARK)

Double-blind procedures control for

A   only participant expectations.

B   only experimenter expectations.

C   both participant and experimenter expectations.

D   neither participant nor experimenter expectations.

Use the following information to answer Questions 8 and 9.

For her university psychology assessment task, Eve wanted to see if there was a relationship between how much time people spend on Tik Tok and their mood. Her results are displayed in the graph provided.

Self-reported mood and Tik Tok usage
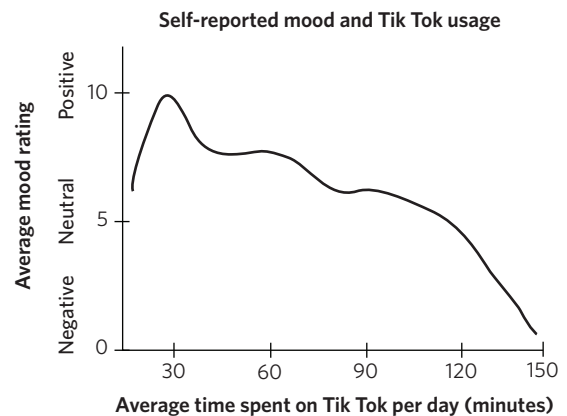
Question 8   (1 MARK)

Which of the following statements best describe her results?

A   The more time participants spend on Tik Tok, the better they feel.

B   The more time participants spend on Tik Tok, the worse they feel.

C   There is a slight increase in mood with small usage of Tik Tok, but then a decline in mood after 30 minutes of use per day.

D   There is a slight decrease in mood with small usage of Tik Tok, but then an increase in mood after 30 minutes of use per day.

Question 9   (1 MARK)

What type of data was collected in this study?

A   Subjective data, because the data is expressed numerically.

B   Subjective data, because measures were based on self-report.

C   Objective data, because the data is expressed numerically.

D   Objective data, because the measures were based on self-report.

Question 10   (1 MARK)

In analysing data, the mean score represents

A   the middle score of the results.

B   the range of the results.

C   the spread of the results from a central point of data.

D   the average score of the results.

Short-answer questions

Question 11   (2 MARKS)

Describe one benefit and one limitation of using convenience sampling to select participants for a study.

Question 12   (2 MARKS)

Explain what order effects are and how they can be controlled for.

Question 13   (1 MARK)

Outline one limitation of using a case study research methodology.

Question 14   (5 MARKS)

Angel is a researcher who is interested in the relationship between gender and emotional intelligence. She tested participants using an emotional intelligence test and found that there was no significant difference between genders, with the mean score for females being 20 out of 25, and the mean score for males being 19 out of 25.

Using the axes provided, construct a graph to depict Angel's results.
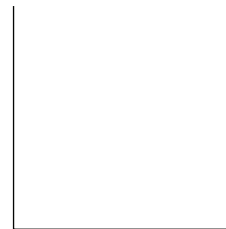
Question 15   (2 MARKS)

Janet tested people's tolerance of pain by asking them to self-report their pain score on a scale of 1 to 10 after being pricked with a needle.

Identify the types of data Janet is collecting in her study.

Question 16   (2 MARKS)

Explain why debriefing needs to occur when a placebo is used in a study.

Question 17   (4 MARKS)

Oanh is interested in researching emotional intelligence and how parents can teach their children emotional intelligence skills through modelling emotion regulation. She decides to use a longitudinal design for her study. This involves working with families with young children and collecting data from them every year from birth until the children are 10 years old.

a   Explain a strength and limitation of using a longitudinal research study design for Oanh's research. (2 MARKS)

b   Suggest and describe another research method Oanh could use to conduct this research. (2 MARKS)

Question 18   (1 MARK)

Outline one reason why researchers may choose to use animals in a study, rather than human participants.

Question 19   (3 MARKS)

Using an example, explain how experimenter's expectations could affect the results of a study and describe one way to control for this.

Question 20   (7 MARKS)

During the COVID-19 pandemic, many of Dr Olive's clients reported having distressing and highly vivid dreams. Dr Olive wanted to study how stress affects the nature of dreams, specifically investigating whether people who experienced higher levels of stress reported having more distressing dreams. In order to study this, she asked participants to self-report their levels of stress, and keep a dream journal to recount their dreams every morning.

a   Identify the independent and dependent variables of Dr Olive's study. (2 MARKS)

b   Write a possible hypothesis for Dr Olive's study. (3 MARKS)

c   Explain one limitation of Dr Olive's research methodology and describe how this may have impacted the results of Dr Olive's study. (2 MARKS)

UNIT

1

How are behaviour and mental processes shaped?

Human development involves changes in thoughts, feelings and behaviours. In this unit students investigate the structure and functioning of the human brain and the role it plays in the overall functioning of the human nervous system. Students explore brain plasticity and the influence that brain damage may have on a person's psychological functioning. They consider the complex nature of psychological development, including situations where psychological development may not occur as expected. Students examine the contribution that classical and contemporary studies have made to an understanding of the human brain and its functions, and to the development of different psychological models and theories used to predict and explain the development of thoughts, feelings and behaviours.

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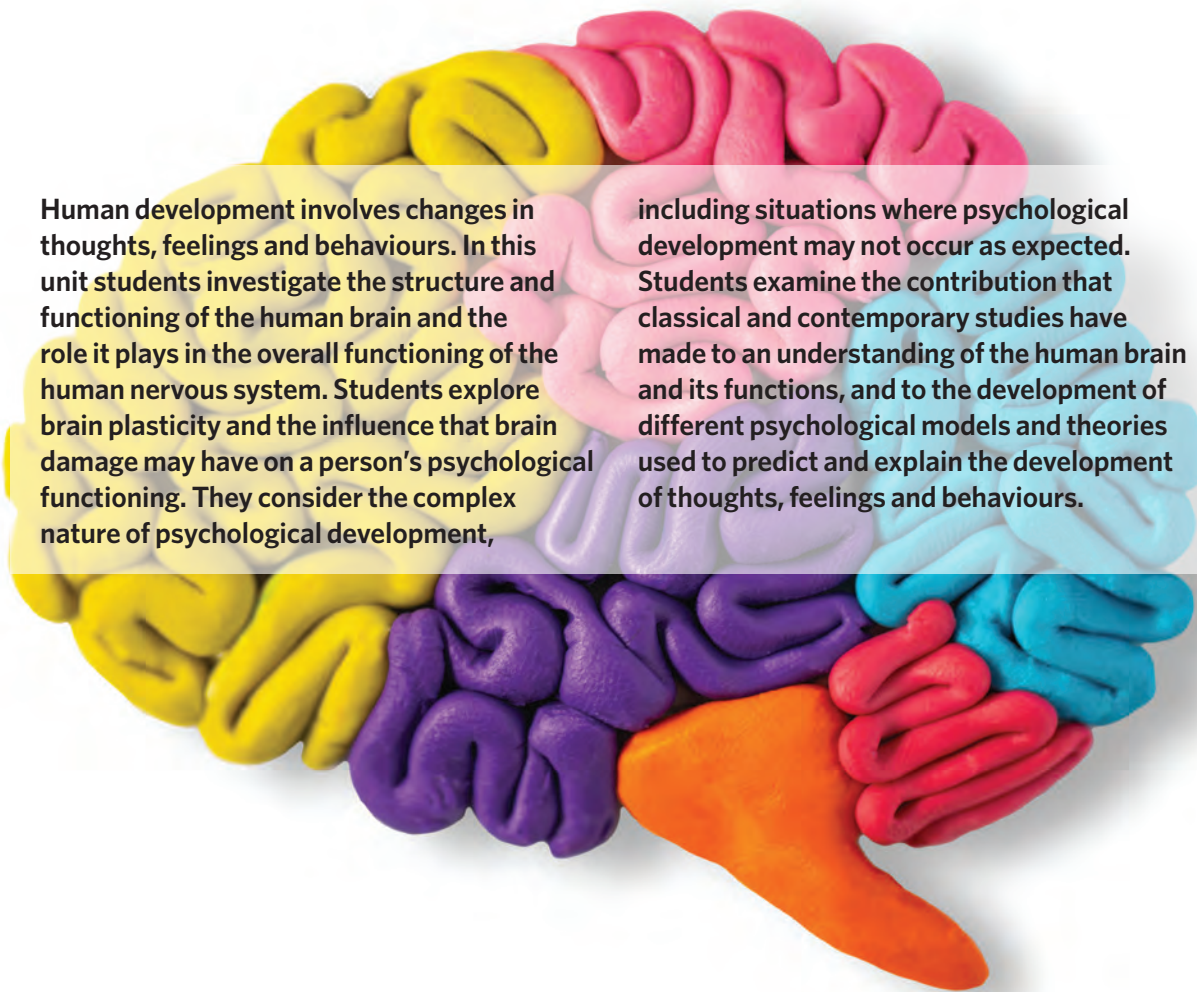
UNIT 1

AOS1
How does the brain function?

Advances in brain research methods have led to new ways of understanding the relationship between the mind, brain and behaviour. In this area of study students examine how our understanding of brain structure and function has changed over time and how the brain enables us to interact with the external world around us. They analyse the roles of specific areas of the brain and the interactions between different areas of the brain that enable complex cognitive tasks to be performed. Students explore how brain plasticity and brain damage can affect a person's functioning.

Outcome 1

On completion of this unit the student should be able to describe how understanding of brain structure and function has changed over time, explain how different areas of the brain coordinate different functions, and explain how brain plasticity and brain damage can change psychological functioning.

UNIT 1 AOS 1, CHAPTER 2

The role of the brain in mental processes and behaviour

02

2A   Historical approaches to understanding the brain

2B   The nervous system

2C   The neuron

2D   Structure and function of the brain

2E   The cerebral cortex

Key knowledge

- the influence of different approaches over time to understanding the role of the brain, including the brain vs heart debate, mind-body problem, phrenology, first brain experiments and neuroimaging techniques

- the basic structure and function of the central and peripheral nervous systems as communication systems between the body's internal cells and organs and the external world

- the role of the neuron (dendrites, axon, myelin and axon terminals) as the primary functional unit of the nervous system, including the role of glial cells in supporting neuronal function

- the basic structure and function of the hindbrain (cerebellum, medulla), midbrain (reticular formation) and forebrain (hypothalamus, thalamus, cerebrum)

- the role of the cerebral cortex in the processing of complex sensory information, the initiation of voluntary movements, language, symbolic thinking and the regulation of emotion, including localisation of function

2A HISTORICAL APPROACHES TO UNDERSTANDING THE BRAIN

How do we know that the brain is central to almost everything we think, feel, and do? How would you begin to investigate how the brain works? The brain has been central to the study of psychology for millennia and the approaches used to study it have significantly evolved. In this lesson, we will explore just how psychology has studied the brain over time.

Image: Nsit/Shutterstock.com

2A Historical approaches to understanding the brain	2B The nervous system	2C The neuron	2D Structure and function of the brain	2E The cerebral cortex

Study design dot point

- the influence of different approaches over time to understanding the role of the brain, including the brain vs heart debate, mind-body problem, phrenology, first brain experiments and neuroimaging techniques

Key knowledge units

Introduction to psychology	1.1.1.1
The brain versus heart debate	1.1.1.2
The mind-body problem	1.1.1.3
Phrenology	1.1.1.4
First brain experiments	1.1.1.5
Neuroimaging techniques	1.1.1.6

Historical approaches to understanding the brain

- Introduction to psychology 1.1.1.1
- The brain versus heart debate 1.1.1.2
- The mind-body problem 1.1.1.3
  - Monism
  - Dualism
  - The mind-body problem
- Phrenology 1.1.1.4
- First brain experiments 1.1.1.5
  - Autopsy
  - Ablation
  - Electrical brain stimulation (EBS)
  - Split-brain studies
- Neuroimaging techniques 1.1.1.6
  - Structural techniques
  - Functional techniques
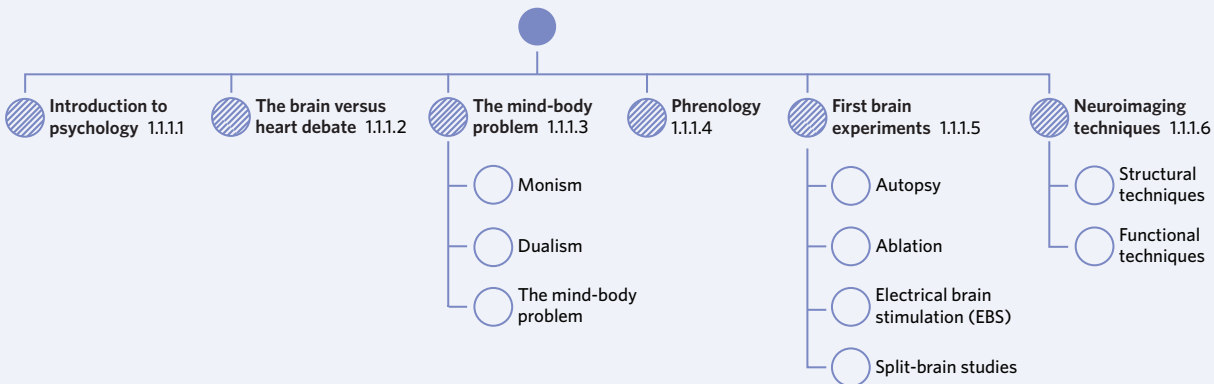
Introduction to psychology 1.1.1.1

OVERVIEW

Psychology is the scientific study of human mental states and behaviour.

THEORY DETAILS

In chapter 1, you learnt about the scientific method of collecting evidence to support or refute hypotheses. Modern **psychology** is a scientific discipline that uses this method to study human mental states (thoughts and feelings) and behaviour. Elements of what we now understand to be psychology have been investigated since ancient times, in civilisations such as those in ancient Egypt, Greece, China, and India. Psychology has significantly evolved since then, transitioning from being a branch of philosophy that investigated concepts including the nature of the 'soul', to being its own independent

Psychology the scientific study of human mental states and behaviour

modern scientific study. 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 dominated the field of psychology depending on the scientific evidence available at the time.

ACTIVITY 1

Historical timeline of modern psychology

Since the beginning of modern psychology, various schools of thought have reigned as the dominant theory; from Freudian psychoanalysis to behaviourism, various ideas have influenced the way psychologists understand and study the human mind and behaviour. Nowadays, the holistic 'biopsychosocial' approach is the preferred framework; this considers how the biological, psychological (thoughts and feelings), and social and cultural aspects of our lives interact and subsequently influence our functioning and development. You will learn much more about this approach in lesson 5B.

| Structuralism | Functionalism | | Gestalt | | Humanism | Cognitivism | Biological | | Socio-cultural |

Early **1900**s — Early **1900**s-**1960**s — **1970**s

Late **1800**s — Early **1900**s-**1950**s — **1950**s **1960**s

| Psychoanalysis | | Behaviourism | | Biopsychosocial approach |
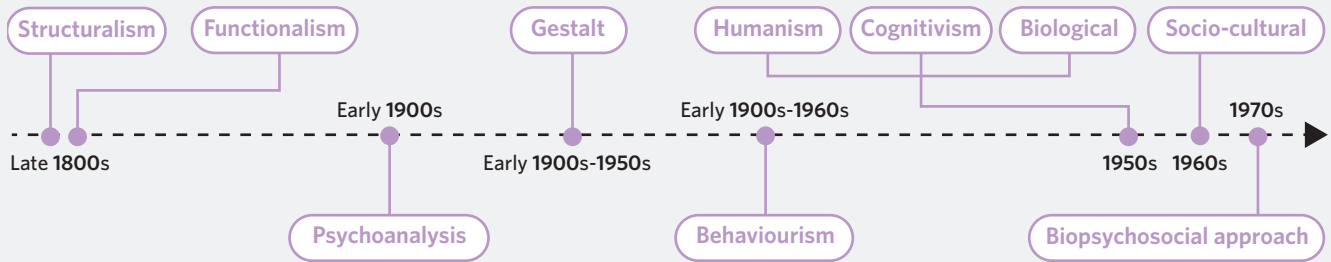
Research each of the schools of thought outlined in this timeline and write a few dot points on the central ideas of each school.

⊕ *Want to know more?*

Science or pseudoscience?

There are many non-scientific methods which investigate and make predictions about the mind or behaviour. Some of these include:

- Astrology: a framework which explains human behaviours and thoughts based on the position of planets and stars. You have likely seen horoscopes from astrology in the media, making predictions about your future based on your star sign.
- Numerology: a framework which examines the relationship between numbers and coinciding events. For example, some forms of numerology propose that the numbers of your birthday date determine your path in life.

However, even though these fields make claims about human behaviour and thought, they cannot be considered a part of psychology as they are non-scientific, therefore being a 'pseudoscience' (fake science). An important hallmark of psychological science is that claims made are never completely 'proved', but rather are able to be reproduced and investigated further with more supporting or refuting evidence through hypothesis testing. This means that they are *falsifiable* (i.e., if certain evidence is found to the contrary, claims are able to be refuted).

On the other hand, pseudoscience is not falsifiable; i.e., it makes claims that cannot be refuted with counterevidence, or, it is science that has been falsified by significant evidence. Astrology, for example, has been shown to be a pseudoscience because significant research has not supported its claims. Further, many of its claims are non-falsifiable; it makes generalised predictions that you can't refute, such as 'An important lesson is to follow your heart'. Can this claim be refuted with the scientific hypothesis testing? Not really.

In general, it's important to remember that science is complicated, and not all scientific progress, especially outside psychology, proceeds from this method of hypothesis-testing and falsification. It is, however, a good starting point when considering what can distinguish science from pseudoscience!

Historically, one major part of psychology has always been an attempt to understand the human mind and mental states. This has led to an investigation of the **brain**. How does the brain work? What is it responsible for? And how does it influence our mental states and behaviour? We now know that the brain is the primary organ for cognition (thought and mental processes) and the coordination of functioning and behaviour.

For the rest of this lesson, we will explore some of the approaches to understanding the brain throughout history.

Brain an organ contained in the skull that coordinates thought, behaviour and nervous system activity

The brain versus heart debate 1.1.1.2

OVERVIEW

Historically, ancient civilisations debated whether it was the heart or the brain that was responsible for our thoughts, feelings, and behaviour.

THEORY DETAILS

Should you follow your heart or your brain when making decisions? Which is more important to mental processes? Metaphorically, we still contemplate this ancient dichotomy: we may consider our heart as the source of emotion and our brain the source of logic and reasoning; the two organs are constantly amidst a battle for truth and right action. Although we now know that our heart contributes no such thought or feeling, with our brain being the source of mental functioning, this was not always the case in ancient forms of philosophical psychology. In fact, ancient debates argued whether it was the heart or brain which was responsible for all mental processes and functioning. This debate may be referred to as the **brain versus heart debate**.

In ancient Egypt, the heart was considered the sole source of psychology and wisdom. It was believed to hold the soul and the mind, and be responsible for all aspects of personality, emotion, logic, and so on. As such, ancient Egyptians held the *'heart hypothesis'* (also known as the *cardiocentric hypothesis*) side of the debate. The heart was also believed to be an important key to the afterlife. The brain on the other hand, was regarded as a useless organ. In mummification processes, the heart was stored in a vessel for preservation, while brains were discarded and removed through the nose.

Historians have records to show that contemplations of the brain versus heart debate occurred at least as early as ancient Greece. Greek philosophers debated whether the brain or the heart was the location of the mind and/or soul and responsible for our mental functioning. Those philosophers who believed that the brain was responsible contended the *'brain hypothesis'*. On the other hand, as in Egypt, there were still philosophers who believed firmly in the heart hypothesis.

Brain versus heart debate

a historical debate surrounding whether the heart or the brain was responsible for central functions including thought, emotion, and behaviour
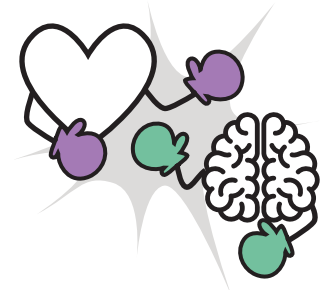
Image: Nsit/Shutterstock.com

Figure 1 The brain versus heart debate was an ancient debate, primarily in ancient Greece, which asked whether it was the brain or the heart that was the source of rationality, cognition, and behaviour

Table 1 Ancient Greek philosophers' views on the heart versus brain debate

| Brain hypothesis contenders
 Image: Nsit/Shutterstock.com | Alcmaeon of Croton (early 5th century B.C.E) is regarded as the first major contender of this view, believing that the brain was responsible for mental functioning based on a range of experiments, observations, and dissections that he conducted. He was the first to dissect animals for research (Oleksowicz, 2018). Pythagoras and Plato were also early supporters of the brain hypothesis (Crivellato et al., 2007). Hippocrates, often regarded as the father of medicine, believed the brain and nervous system was responsible for functioning, emotions, and thought (Breitenfeld et al., 2014). The brain hypothesis extended beyond ancient Greece: in the first century AD, as a Greek physician and doctor to Roman gladiators, Galen also posited the brain hypothesis. Through observation and experimentation (most famously with pigs), he noted how changes to the brain (such as injury) could cause changes in behaviour (The Stanford Encyclopedia of Philosophy, 2016). However, while he noted that the brain was responsible for rationality, he did have some inaccurate beliefs, such as the source of 'spiritedness' being in the heart. |
| Heart hypothesis contenders | Empedocles believed that blood was the place for human cognition and thought, especially the blood around the heart (Oleksowicz, 2018). Aristotle, Plato's student, rejected Plato's more brain-oriented hypotheses and instead posited that the heart was responsible for all mental functioning. Diocles, Praxagoras and the Stoics may also be regarded as contenders of the heart hypothesis (Crivellato et al., 2007). |

We now know, thanks to empirical scientific evidence, that the brain is responsible for our mental functioning, feelings, and behaviour. As such, the brain hypothesis can be regarded as the 'winner' of this debate. However, as with other organs, injuries, surgeries (including transplants) or problems with the heart can interact with the brain in such a way that mental functioning and behaviour is altered. Furthermore, ancient contenders of the heart hypothesis, such as Aristotle, significantly contributed to our understanding of the cardiovascular system.

The mind-body problem 1.1.1.3

OVERVIEW

Is the mind contained within (or a part of) the physical body or are the mind and the body separate entities? Historically, philosophers have asked this question in what is known as the mind-body problem.

THEORY DETAILS

The **mind-body problem** is a philosophical *conundrum* (complex and confusing problem) concerning the extent to which the mind and body are separate entities or whether they are one and the same thing. This problem raises questions such as:

- Are the mind and body the same thing? What distinguishes them or makes them the same?
- What is the nature of the mind compared to the body? What makes something 'mental' as opposed to 'physical'?
- Is the mind part of the body? Or is the body part of the mind?
- How do the mind and body interact with each other if they are separate? Is the body in charge, or is the mind? How do mental states affect physical states and vice versa?
- Are the 'mind' and the 'brain' one and the same thing, or are they different?

There are two overarching sides of the mind-body problem debate; these are known as dualism and monism. Essentially, while **dualism** proposes that the mind and body are two separate and distinguishable entities (dual – meaning 'consisting of two'), **monism** suggests that the mind and body are one and the same (mono – meaning 'consisting of one').

Mind-body problem a debate that questions whether our mind and body are separate and distinguishable things or whether they are the same thing

Dualism in the mind-body problem, the view that the mind and the body are separate and distinguishable things

Monism in the mind-body problem, the view that the mind and the body are one and the same thing
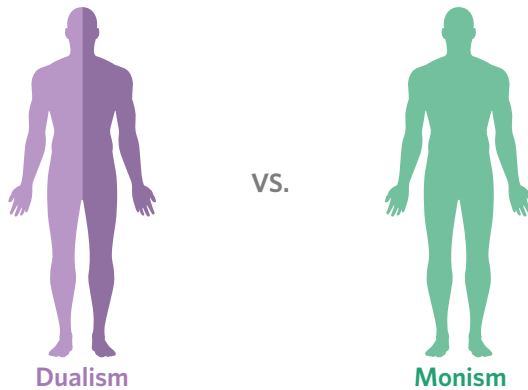
Image: AV-Art/Shutterstock.com

Figure 2 In the mind-body problem, dualism argues that we have a mind and a body and that they are distinguishable things. Monism argues that the mind and body are the same thing

Dualism

As mentioned, dualism posits that the mind and body are separate things. Although there are various forms of dualism, it ultimately suggests that the mind and body are separate entities because they are different and distinguishable by their very nature (e.g. the kinds of things that they do or the type of substances that they are). For example, a dualist might suggest that the mind is a nonphysical thing that allows us to reason and consciously experience things. In contrast, our body is a physical entity, which includes our brain as a separate thing from our 'mind', and can be explained purely in terms of physical processes.

The modern notion of dualism is often attributed to 17th century French philosopher and mathematician René Descartes. However, similar ideas and the mind-body problem were also raised in more ancient Greek and Asian traditions. Descartes' dualism, known as *Cartesian dualism*, specifically suggests that we are composed of two separate *substances*: the physical and the mental (which includes the mind and the soul).

Want to know more?

Descartes is famous for giving special privilege to the immaterial and mental substance due to it being the only thing he could be certain of existing. His famous phrase, 'cogito ergo sum' or 'I think, therefore I am', suggested that while we can doubt the true existence of our bodies, our minds *must* exist, for in order to be questioning, doubting, and thinking, there must be some *thinking thing* that underlies such processes.

Figure 3 René Descartes

Monism

In contrast to dualism, monism suggests that we are made of just one type of thing or substance.

'Materialism' or *'physicalism'* is one form of monism which simply posits that we are just made of matter and physical substance. In other words, mental states *are* physical states. For example, one physicalist explanation might be that just because we can't physically see and touch all that we think, doesn't mean that it isn't produced by, or are the result of, physical processes within our brain and body.

This physicalist notion of the mind is favoured by much of modern science, including neuroscience. Brain scanning technologies, as you will soon read about, have allowed us to trace what goes on in different areas of the brain when we perform certain tasks or have certain thoughts. Despite this, it can be argued that the mind-body problem still exists because we do not yet have complete and clear explanations for phenomena such as how consciousness works, and how it allows us to be aware of our own thoughts and intentions. Until modern neuroscience can account for all mental processes in terms of the physical, we cannot yet outright reject dualism.

The mind-brain problem

Stemming from the mind-body problem, the mind-brain problem in psychology specifically seeks to understand the nature of the conscious 'thinking thing' within us. Is our consciousness (awareness of internal and external states) reducible to physical brain processes, or is there an immaterial mind beyond these physiological events? In other words, is our mind the same thing as our brain, or is the mind something separate, aware of what our brain does?

As mentioned, although modern neuroscience has allowed us to empirically identify the brain as responsible for almost everything that we think, feel, and do, this task is not yet complete. Specifically, we cannot yet explain exactly how physiological processes underlie the awareness of our own existence and environments (consciousness). This has allowed some philosophers to question whether there is some thinking thing called the 'mind', that extends beyond or is independent of our brain, that might explain the more *elusive* (hard to capture) processes like consciousness.

Phrenology 1.1.1.4

OVERVIEW

Phrenology was an approach to understanding the brain used mostly in the 1800s. Although it was fairly progressive for its time and made some important contributions, it was largely discredited as a pseudoscience in the early 1900s.

THEORY DETAILS

Phrenology was a method used to assess an individual's personality traits, intelligence and mental functions by feeling the bumps, grooves and shape of the skull. Although phrenology initially set out to be scientific and made some important scientific contributions, it is now discredited as a pseudoscience.

Phrenology the study of the shape and size of the human skull to determine personality and mental functioning

Phrenology was developed in 1796 by German physician Franz Gall. Gall proposed that the brain was made up of 27 'mind organs' (areas of the brain) that each had their own distinct place in the brain and, importantly, its own mental function or 'faculty'. He was later joined by Johann Spurzheim, who added more 'mind organs' to the list and was responsible for naming the field 'phrenology'. Through observation and testing, Gall and Spurzheim created *phrenological charts*, which mapped the different mind organs and their functions. Figure 4 and table 2 show one version of a phrenological chart. There were different charts developed throughout the period. They believed that the more a certain faculty, such as 'continuity' (ability to concentrate), was used, the bigger its mind organ would grow. On the contrary, the less a faculty was used, the more it would deteriorate. Therefore, a physician would be able to feel for the bumps and grooves on a person's skull to assess which mind areas are used more or less.

Image: igor kisselev/Shutterstock.com

Figure 4 A phrenological chart labels parts of the brain and their corresponding 'faculty' or function (as listed in table 2)

Table 2 A list of 35 'mind organs' which correspond to figure 4

Emotional faculties	Intellectual faculties
1 Destructiveness	**22** Individuality
2 Attractiveness	**23** Form
3 Love for children	**24** Size
4 Adhesiveness	**25** Weight
5 Constancy	**26** Colour
6 Combativeness	**27** Space
7 Secretiveness	**28** Order
8 Susceptibility	**29** Number
9 Constructiveness	**30** Eventuality
10 Cautiousness	**31** Time
11 Comfort	**32** Tune
12 Self-esteem	**33** Language
13 Benevolence	**34** Comparison
14 Veneration	**35** Causality
15 Firmness	
16 Conscientiousness	
17 Hope	
18 Wonder	
19 Ideality	
20 Joy	
21 Imitation	

⊕ *Want to know more?*

When Gall was a student and his classmates performed better than he did on tests, he attempted to find out what it was that made these students different from him. Observing them, he noticed that they seemed to have protruding eyes, and so concluded that they must have a bigger brain than him at the point behind their eyes. From this, he concluded that the place for the faculty of memory must be located in the brain behind the eyes. This personal experience and curiosity led Gall to investigate further the brain and the areas of the brain responsible for different functions.

Empirical scientific evidence has since shown that phrenology's claims and methods were unfounded. However, the idea that the brain determined personality was an important achievement of phrenology and some of its ideas were quite advanced for its time. Most importantly, Gall's more general notion of the *'localisation of function'*, i.e. that different areas of the brain are responsible for different things, has merit still recognised today. For example, we now know that the front area of the brain (the frontal lobe) is responsible for executive functions such as decision making and planning. However, when performing any task, multiple areas of the brain are involved and cross-communicate. Despite this general accuracy, the extent to which Gall mapped highly specific functions to highly specific areas of the brain was exaggerated and false. Another important idea that Gall touched on was that the disuse of certain faculties may lead to their deterioration in the brain. While the way Gall described this was largely inaccurate, the general idea of 'use it or lose it' has been shown to apply to memory and the brain.

Furthermore, the methods Gall and Spurzheim used to make their claims have been criticised as unscientific: they had a limited sample sizes and many suggest their work suffered from *confirmation bias*; i.e. the tendency to pay attention to evidence that supports one's theories and hypotheses, while ignoring others. For example, if Gall believed that people with good memory had bulging eyes, he may have paid more attention to the people that confirmed this idea, while ignoring people with bad memory and bulging eyes. Due to this lack of clear evidence, phrenology was largely abandoned by the 1930s, however some practitioners continued to 'test' people's personality for money using a device called a 'psychograph' (figure 5), which was used to examine the bumps and shape of people's skulls.

🧩 *Lesson link*

You will learn more about memory and the brain in lesson *3A: Developmental plasticity*.

Figure 5 Psychographs were a popular way to measure someone's personality and mental abilities in the 1930s

First brain experiments 1.1.1.5

OVERVIEW

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

In the 19th and 20th century, pioneering studies were conducted into the brain and its functions. These first real brain experiments, excluding the more haphazard and inconclusive methods used in earlier periods, laid the foundations for the modern understanding of the brain and neuroscience. Three important methods were used to make these initial achievements: autopsies, ablation, and electrical brain stimulation. Sperry and Gazzaniga's Nobel prize winning studies on split-brain patients also made landmark achievements.

Autopsy

Autopsies involve the examination of a body after death to determine the cause of death or the cause of a disease or disorder that the person suffered. This method was particularly helpful for making initial discoveries of the brain: if a person suffered from a disorder, such as an inability to produce speech, then an examination of the person's brain after death might reveal something unique about the brain that could be responsible for that disorder. For example, if a part of the brain was destroyed or decaying due to disease, this might suggest that this damaged area of the brain was responsible for the missing ability or function.

Autopsy the examination of a body after death to determine the cause of death or the cause of a disease or disorder that a person suffered

Table 3 First brain studies: autopsy

Pierre Paul Broca and Carl Wernicke 1860s – 1870s **The brain and localisation of language functions**	French physician Pierre Paul Broca was able to make an important discovery about language and the brain by conducting an *autopsy* of his patient with language aphasia (i.e. a disorder in which someone is unable to produce or comprehend language). He found that his patient had significant damage to an area at the front left side of his brain, which he inferred to be responsible for grammatical speech production, including the movements involved in speech. This was confirmed by later studies and this area is now known as Broca's area. Around a decade later, German neurologist Carl Wernicke discovered another area of the brain important for language, though more so for speech comprehension than production. Also by examining patients' brains with a different type of aphasia, Wernicke found that this area was also located on the left side of the brain, but further back than Broca's area. This area is now known as Wernicke's area. Image: Pikovit/Shutterstock.com **Figure 6** Broca's and Wernicke's areas were discovered through autopsy in the 1860s-1870s

Ablation

Some of the most important early brain studies were conducted using a method called **ablation**. Ablation refers to the surgical removal or cutting of tissue; in these studies, this was specifically done to tissue of the brain. Inevitably, this type of research may only ethically be conducted on animals, unless a human requires surgery (such as brain tumour removal).

Ablation the surgical removal, destruction or cutting of tissue

Ablation helped researchers to determine how the brain responds to damage, and furthermore, allowed them to make inferences about localisations of function. For example, if a certain part of a bird's brain was severed or removed and the animal could no longer move their wing, this part of the brain may be inferred to be involved in or responsible for wing movement.

1. Intact animal brain **2.** Ablation process **3.** Observations **4.** Make inferences
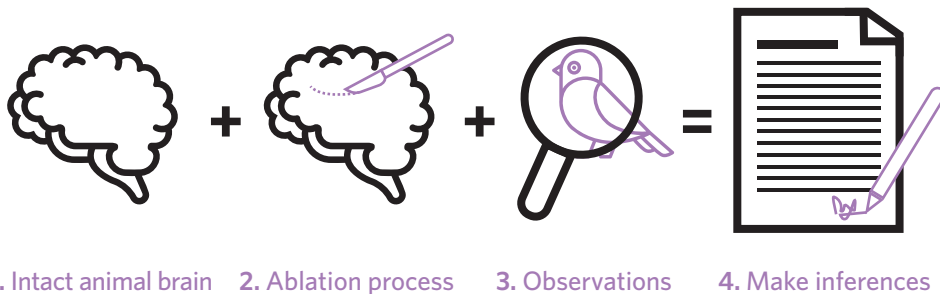
Image: Nsit, Good Ware/Shutterstock.com

Figure 7 Ablation allowed inferences to be made about different brain regions' functions and responses to damage

Table 4 First brain studies: ablation

Pierre Flourens 1820s **Discrediting highly-specific localisation of function and phrenology**	In the 1820s, French physiologist Pierre Flourens conducted ablations on animal brains, predominantly rabbits and pigeons. (Sabbatani, 1997). Flourens is most commonly recognised as the first person to study the brain in this direct way using ablations, and famous for conclusively 'discovering' that the 'mind' was in the organ of the brain and not the heart. He also conducted his studies on request of the French Academy in order to test Gall's phrenology claims; he demonstrated that much of phrenology was wrong. By performing ablations on animals, some of Flourens' conclusions included that: • the brain's hemispheres were responsible for higher-order cognitive functions • the cerebellum was involved in coordinating movement • the medulla was involved in respiration • when animals lost the ability to move after ablation, they could sometimes recover that ability at a later time Ultimately, Flourens was able to show that the localisation of function was more general than that proposed by phrenology, and the idea of localisation was then largely discredited in the scientific community (Carlson et al., 2009). Further, because functions could sometimes be recovered after ablation, the brain worked on tasks together as a 'whole' rather than different mind organs being independently responsible for certain functions. Despite these immense discoveries, Flourens was unable to make clear conclusions about the role or location of memory in the brain.
Karl Lashley 1920s **Memory and the brain**	Around 100 years later, American psychologist Karl Lashley also used ablation methods on animals to make important discoveries about the role of memory in the brain. Lashley's experiment involved teaching animals, such as rats and monkeys, certain memory tasks and then cutting some part of the brain tissue and observing the effects on such tasks. From this, Lashley was able to conclude that: • Memory and learning for complex functions were not stored in just one part of the brain, but relied on large parts of the brain working together (*'mass action'*). If some brain tissue was removed or damaged, functions could still be performed depending on how much tissue was destroyed. • If some part of the brain was damaged, another part of the brain could take on its role (*'equipotentiality'*).

> **Lesson link**
>
> Both Flourens' and Lashley's studies were the first to touch on notions of neuroplasticity (i.e. the ability of the brain to recover functioning after damage). You will learn about this concept more in lesson *3B: Brain injury and adaptive plasticity*.

Electrical brain stimulation (EBS)

Electrical brain stimulation (EBS) studies were also very important in early brain research. Our brain's activity constantly produces electrical signals. Electrical brain stimulation involves further stimulating or 'exciting' the brain with an electrical current.

Electrical stimulation may be done by placing electrodes (small circular conductors) on or inside a specific place of a person's head (see figure 8). These electrodes then send an electrical signal to that specific part of the brain, thereby stimulating the activity of the *neurons* (cells that communicate with each other in the brain) in that area. After this stimulation, observations of a person or animal's behaviour can be made. Did their arm move? Were they able to talk? As with ablation, inferences can be made about what different areas of the brain do based on how they respond to stimulation. These days, EBS is not commonly used for brain research studies as it is a fairly invasive and risky method. However, it may be used for specific therapeutic purposes.

Electrical brain stimulation (EBS) a research or therapeutic technique that involves electrically stimulating parts of the brain
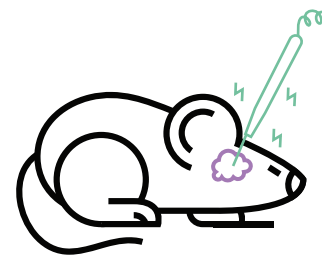
Image: VectorForever/Shutterstock.com

Figure 8 EBS involves sending an electrical signal to the brain
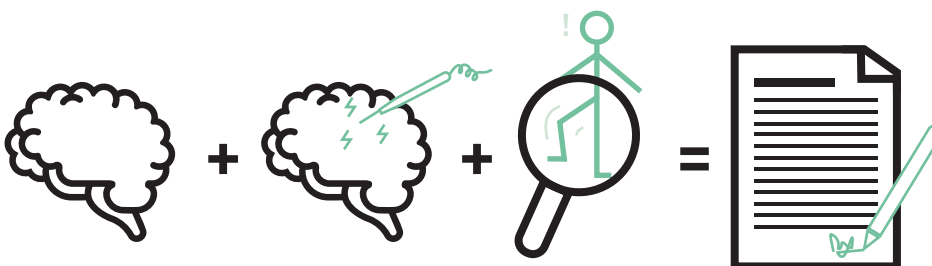
1. Animal or human brain **2.** Electrical stimulation **3.** Observations **4.** Make inferences

Image: Nsit/Shutterstock.com

Figure 9 EBS allowed inferences to be made about different brain regions' functions by recording organisms' responses to electrical stimulation

Table 5 First brain studies: electrical brain stimulation

Gustav Fritsch and Eduard Hitzig 1870s **The brain and localisation of motor functions**	In the 1870s, German physiologists Fritsch and Hitzig used EBS in their landmark studies with dogs (Carlson et al., 2009). By stimulating different areas of the dogs' brains, they were able to record a variety of motor (movement) responses. With certain stimulations, the dogs' limbs or other body parts moved. Fritsch and Hitzig also performed some ablations on these areas, resulting in motor paralysis of some body parts. Importantly, they discovered that: • The part of the brain that controls movement (which we now call the motor cortex) is at the front of the brain. Specific areas of the motor cortex triggered controlled movement in specific parts of the body. • Limb movement is *contralateral* to the part of the brain stimulated. This means that if the right side of the brain is stimulated, the left limb or part of the body will move and vice versa. Fritsch and Hidzig's work again provided evidence in favour of the localisation of function, which, after the work of Flourens, had been largely discounted. As you have probably noticed, throughout these two centuries of brain research, there were alternating claims about brain localisation.
Wilder Penfield 1950s **Mapping the anatomy of the brain**	In the 1950s, American-Canadian neurosurgeon Wilder Penfield used EBS to map almost all the areas of the brain responsible for a variety of functions, including sensorimotor functions (how we move and respond to stimuli), speech and memory (Isitan et al., 2020). Penfield worked as a surgeon to help patients with epilepsy, a disorder associated with abnormal brain activity, often resulting in convulsions and seizures. He operated on their brains to remove parts of the brain that caused seizures. During these operations, he worked closely with his colleague Herbert Jasper to electrically stimulate parts of the exposed brain and record the conscious patient's responses. Patients were under local pain anaesthesia. Penfield and Jasper operated on the brains of some 300 patients. With each electrical stimulation, they physically labelled the specific part of the brain stimulated with a numbered ticket and also wrote it down on a brain chart. They then recorded the patient's response, such as a movement or a feeling, in detail. Through this repeated procedure, and by excluding outliers or one-off results, Penfield was able to systematically map out the functions of different parts of the cerebral cortex (i.e. the outer layer of the brain). Most impressively, Penfield was able to map the motor cortices (the areas of the brain responsible for movement) and the sensory cortices (areas responsible for our senses, such as hearing and vision).

Stimulation on the **right** side of the brain
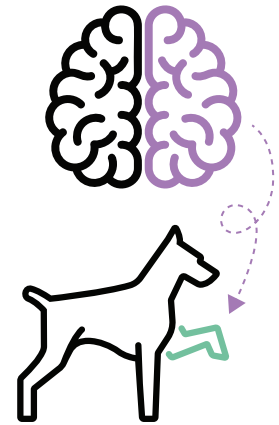
Movement of the **left** limb

Image: Nsit, Kapreski/Shutterstock.com

Figure 10 Fritsch and Hidzig's work with dogs found that stimulating one side of the brain could trigger movement in the opposite side of the body
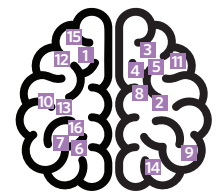
Image: Nsit/Shutterstock.com

Figure 11 Penfield and Jasper labelled the parts of the brain stimulated and the patients' corresponding response

Split-brain studies

Some of the most profound studies on the brain were conducted by Roger Sperry and his student Michael Gazzaniga in the 1960s. They were able to confirm that the left and right hemispheres (sides) of the brain *(cerebral hemispheres)* have different functions or 'specialisations', therefore demonstrating evidence for *hemispheric specialisation* or *brain lateralisation*. 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.

Sperry and Gazzaniga worked with patients who had undergone 'split-brain surgery'; that is, they had had their left and right brain hemispheres separated by cutting the nerve 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.

Image: Pikovit/Shutterstock.com

Figure 12 The corpus callosum is a C-shaped structure in the brain that connects the left and right hemispheres of the brain
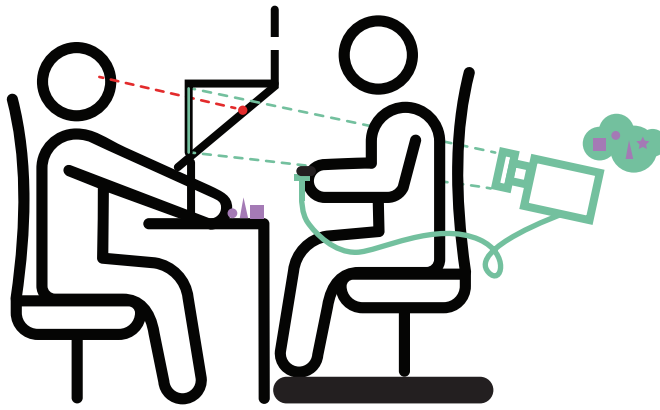
Image: Editable line icons/Shutterstock; Adapted from Gazzaniga, 1967

Figure 13 The set up of Sperry and Gazzaniga's 1967 experiment

To investigate the effects of such surgery, Sperry and Gazzaniga created experiments in which split-brain patients were situated behind a screen with a black dot in the centre on which they should focus their eyes (Gazzaniga et al., 1967). Words and objects were then projected on either the left or right side of the dot. Words and objects projected to the left were therefore in the patients' left visual field, and because vision is processed contralaterally (i.e. opposite to where visual stimuli appears), they were sent to the right hemisphere for processing. Likewise, if words and images were presented in the right visual field, they would be processed in the left hemisphere.

> ⓘ *Useful tip*
>
> It's important to note that an object or a word being in your 'left visual field' doesn't mean it is seen only by your left eye. Rather, it is in the left side of space that both eyes see.
>
>
>
> Image: VectorMine/Shutterstock.com
>
> **Figure 14** Objects in the left visual field are processed in the right side of the brain and vice versa
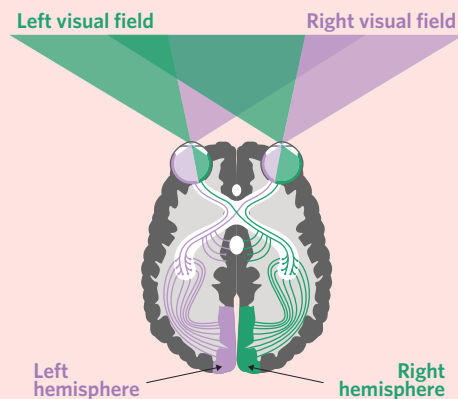
Sperry and Gazzaniga asked patients to describe what they saw. They found as follows:

- When images or words were presented on 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 on 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 indicate what they saw through non-verbal means, such as reaching out and grabbing from behind the screen an object that they had seen or a word they had heard with their left hand. This demonstrated that although patients could not verbally state what they had seen in this case, they did in fact see something.

So what did these findings indicate?

- The left hemisphere is responsible for the organisation of language expression and comprehension, and when images/words are not processed in this hemisphere, they cannot be verbally stated.

- This is because information processed in the right hemisphere (the image seen) could not be transferred as it would be in an intact brain, via the corpus callosum, to the left hemisphere for language processing.
- The right hemisphere is involved in language comprehension to some degree, but the left hemisphere is dominant in its expression.

ACTIVITY 2

Watch Sperry and Gazzaniga's experiments

You can watch one of Sperry and Gazzaniga's experiments on YouTube by searching *'Split-brain patient 'Joe' being tested with stimuli presented in different visual fields'* (Neuroslicer, 2007). Watch the entire four minutes and thirty five seconds and then answer the following questions:

1   Which functions did the video identify the right hemisphere as specialising in? Which functions did the video identify the left hemisphere as specialising in?
2   Why was Joe able to name objects flashed to his right visual field?
3   Why was Joe unable to name objects flashed to his left visual field, yet able to draw them only using only his left hand?

Many research studies using split-brain patients have been conducted since by Gazzaniga and his colleagues. These have continued to profoundly impact what we know about the role of the brain in various domains, such as consciousness, language, mental arithmetic and so on (Volz & Gazzaniga, 2017).

Neuroimaging techniques 1.1.1.6

OVERVIEW

Neuroimaging refers to a range of techniques that use various technologies to capture images of the brain in order to track its changes and functions. Neuroimaging is still used in brain research today.

THEORY DETAILS

In contemporary psychology (from the late 20th century onward), **neuroimaging** techniques are used to capture images of the brain. Neuroimaging may be used for both medical reasons (such as for disease detection) or for research. These methods are much less invasive and more exacting for brain research than previous methodologies. 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 the activities of the brain responsible for the task being performed.

Neuroimaging a range of techniques used to capture images of the brain's structure, function and activities

> 📖 *Psychology in practice*
>
> While all areas of psychology are concerned with the brain, *neuropsychologists* specifically study how the brain and its processes underlie our thoughts and behaviours. *Clinical neuropsychologists* may work with people to diagnose, treat and rehabilitate those with a disorder that affects the brain or its functioning.

There are various neuroimaging techniques, with each having their own benefits and limitations and therefore certain circumstances in which they can be most optimally used. Neuroimaging techniques may be divided into two broad categories: structural and functional neuroimaging.
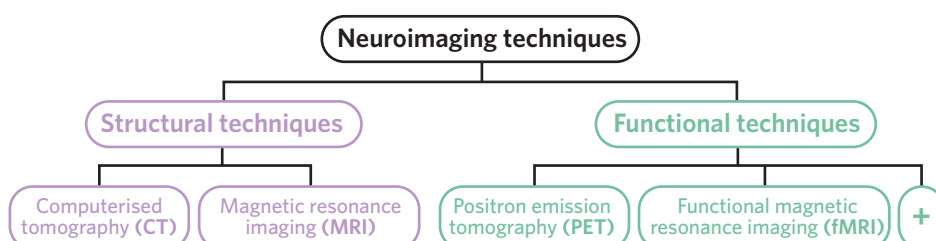
Figure 15 Types of neuroimaging techniques

Structural techniques

Structural techniques of neuroimaging are techniques which produce images of the brain's structure and composition.

Computerised tomography (CT)

Developed in the 1970s, **computerised tomography (CT)** is a neuroimaging technique that involves taking continuous two-dimensional x-ray images of a person's brain or body that are then processed using a computing device to develop three-dimensional images. The individual two-dimensional x-ray images provide cross-sectional 'slices' of a person's brain, which are then stacked together to develop more comprehensive and three-dimensional images.

Computerised tomography (CT) a neuroimaging technique that involves taking continuous two-dimensional x-ray images of a person's brain or body in order to provide both two and three-dimensional images

Image: GagliardiPhotography/Shutterstock.com

Figure 16 CT scans require the patient to slowly enter a gantry while the spiralling x-ray source captures multiple images that can be stacked using a computer and interpreted by a specialist
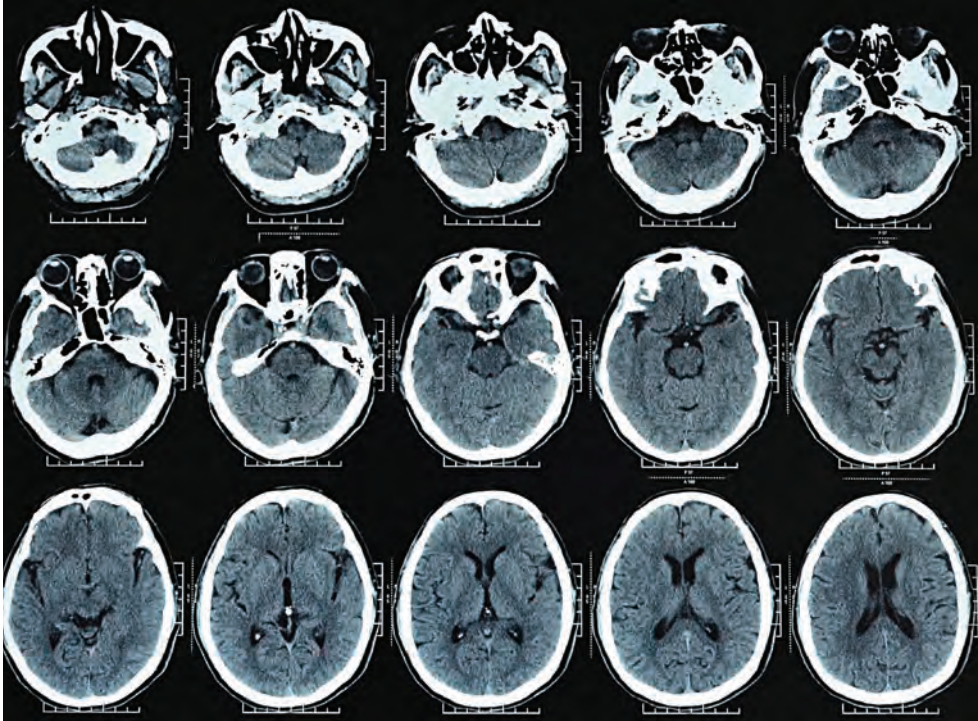
Image: sanyanwuji/Shutterstock.com

Figure 17 A CT scan show black and white, two-dimensional x-ray images which, when stacked, generate three-dimensional images

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 the x-ray source, while lying horizontally on a bed (as shown in figure 16). Successive x-ray images are taken in a spiralling motion as the individual in the bed moves slowly through the gantry.

While this can be a somewhat intrusive process for the patient, it enables the detection of hemorrhage, blood clots, cancer, and the loss of brain mass that can reflect disorders. However, these images are limited to black and white and aren't as detailed as images from other neuroimaging techniques. X-rays also use electromagnetic ionizing radiation which, when used excessively, has the potential to have biological effects like causing cancers. CT scans nonetheless do not need to be used as frequently as other kinds of neuroimaging techniques, given how comprehensive CT scans are insofar as they develop multiple images of the entire body or brain. CT scans are more commonly used for disease or disorder detection rather than for research.

Magnetic resonance imaging

Magnetic resonance imaging (MRI) is a neuroimaging technique that uses magnetic and radio fields to take detailed two-dimensional and three-dimensional pictures of the brain. To get an MRI image, a person enters a chamber device which 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.

Magnetic resonance imaging (MRI) a neuroimaging technique that uses magnetic and radio fields to take two and three-dimensional images of the brain
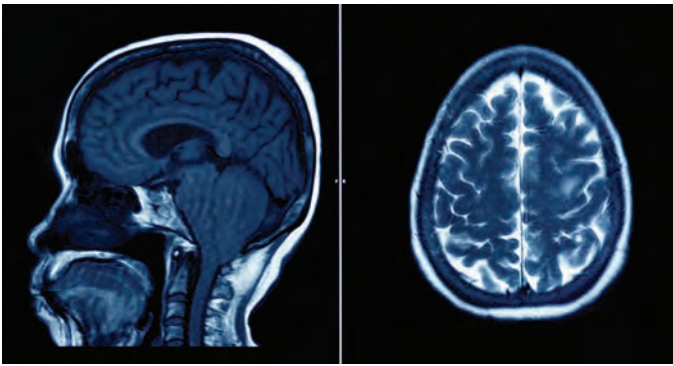
Image: NaNahara Sung/Shutterstock.com

Figure 18 An MRI scan of the brain can show more detail than a CT scan

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. Because of this, it is less harmful to the patient and can also produce more detailed, coloured images of the brain. However, due to it relying on magnetic fields, an MRI cannot be used on a person with internal screws, pacemakers or other similar devices. As with CT, MRI is predominantly used for disease or disorder detection.

Functional techniques

Functional neuroimaging are techniques which are able to show how the brain functions to perform specific tasks. As well as providing images on the brain's structure, functional techniques can also show brain activity.

Positron emission tomography (PET)

Positron emission tomography (PET), as well as showing the structure of the brain, provides images which show the brain's levels of activity when performing certain tasks or functions. As with MRI and CT, a person must enter a chamber in order to get PET scans. Before entering, a person is injected with a special radioactive glucose solution which, when reaching the brain via the bloodstream, 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 used. 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, meditating, etc.

Looking at figure 19, you will notice how a PET scan shows a range of colours and has a colour key on the side (in this case, the left side). Each colour represents a different level of activity, with red showing the most activity to purple showing the least. If, for example, 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 might light up red. In general, PET scans are very useful for tracking brain function, but are less detailed than structural techniques in showing brain structures.

Positron emission tomography (PET) a neuroimaging technique that uses a scanning device to take coloured images of the brain, showing its functional activity and structure by tracing the levels of a radioactive substance in the brain
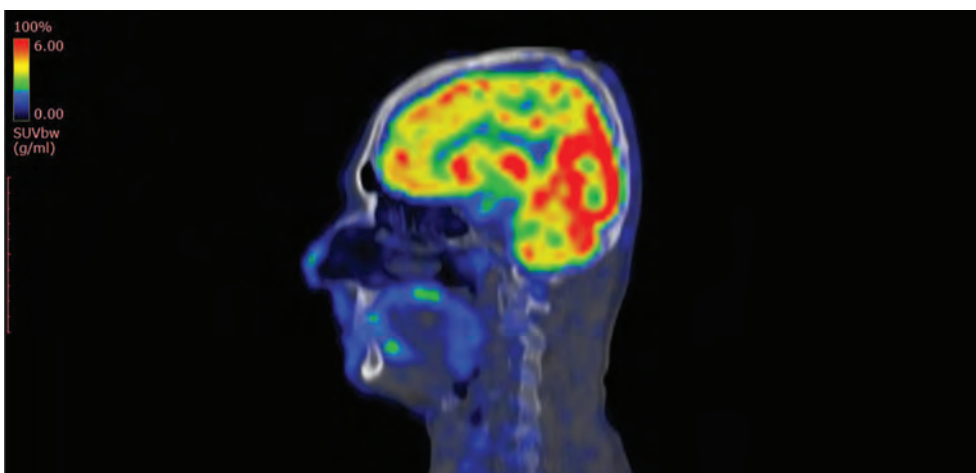
Image: springsky/Shutterstock.com

Figure 19 PET scans use a colour key to indicate levels of activity in different brain regions

Functional magnetic resonance imaging (fMRI)

Functional magnetic resonance imaging (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 part of the brain is, the more oxygenated the blood will be in that area. fMRI uses the same methods as MRIs to get detailed two 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 structure than PET scans and does not require the injection of a radioactive substance to trace brain activity.

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 its activity levels
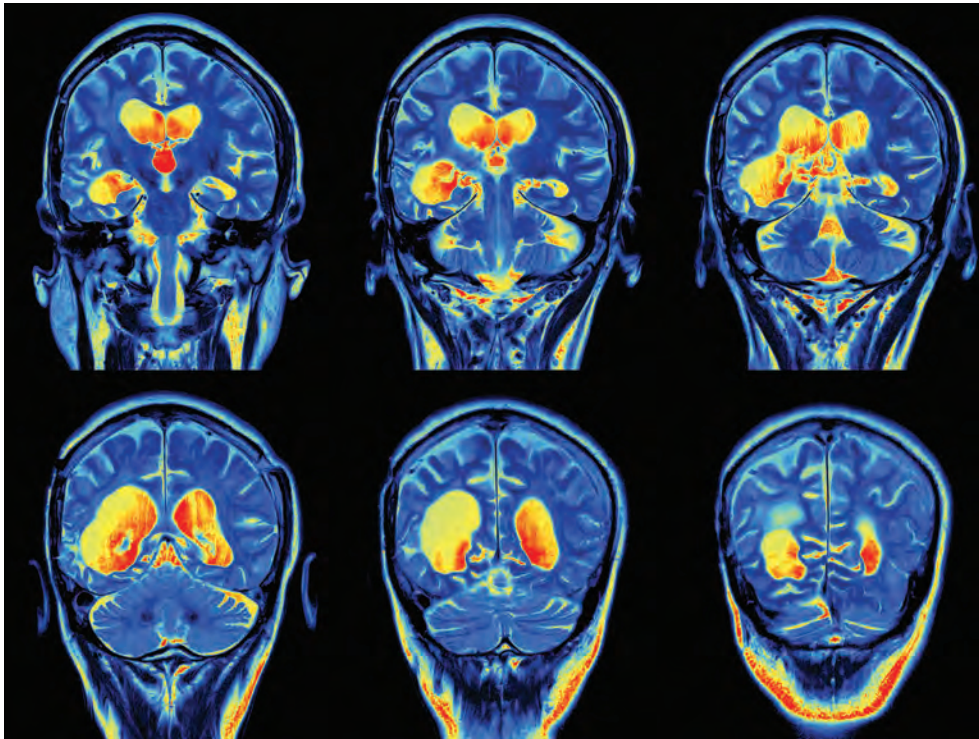
Image: MriMan/Shutterstock.com

Figure 20 An fMRI scan shows levels of blood oxygenation to reflect brain activity

Theory summary

In this lesson, you learnt about how important the study of the brain is to historical and modern psychology. We traced the study of the brain through its evolution from the ancient heart versus brain debate, all the way to the more precise neuroimaging techniques of our time.
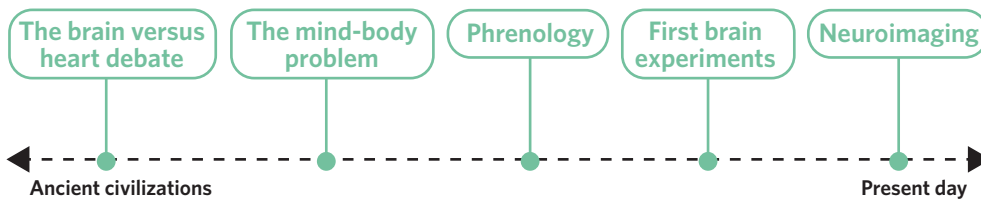
Figure 21 Some of the approaches to studying the brain from ancient civilisations to present day

2A QUESTIONS

Theory-review questions

Question 1

True or false? The brain has always been considered the centre for logic, reasoning, and emotion?

A   true

B   false

Question 2

True or false? All approaches to studying the brain can be considered scientific.

A   true

B   false

Question 3

True or false? The mind-body problem considered whether mental processes were in the brain or in the body.

A   true

B   false

Question 4

Which of the following ideas of phrenology can be considered important to the modern understanding of the brain? *(Select all that apply)*

I   The brain is made up of separate 'mind organs', each with their own distinct and separable function.

II   There is a 'localisation of function' in the brain.

III The more you use a certain mental ability, the stronger it becomes.

IV   You can interpret a person's personality by feeling the shape and size of their skull.

Question 5

Fill in the blanks with the following terms.

- Ablation
- Electrical brain stimulation
- Autopsies

Pioneering brain research of the 19th and 20th century used a range of methods to understand how different areas of the brain work to perform different functions.

_____ involved stimulating the brain with a current in order to observe the responses of an organism. This was similar in nature to _____, which involved cutting or destroying parts of the brain to observe how it would affect functioning. Other studies had to rely on _____, examining a patient's brain after death to see if any damage could explain their disorder.

Question 6

Fill in the blanks with the following terms.

- Structural
- Functional

Neuroimaging techniques allow images of the brain to be captured using various scanning technologies. _____ techniques capture images of the brain and its regions, whereas _____ techniques also capture which areas of the brain are active when performing certain tasks.

Skills

Understanding research

Use the following information to answer Questions 7-9.

Read the following extract adapted from one of Gazzaniga and his colleagues' split-brain experiments. This study investigated simple mathematical calculations and whether there were any hemispheric specialisations involved in this task.

Abstract

The purpose of the study was to investigate simple calculation in the two cerebral hemispheres of a split-brain patient. In a series of four experiments, the left hemisphere was superior to the right in simple calculation, confirming the previously reported left hemisphere specialization for calculation.... The error patterns in [one] experiment suggested that for subtraction and addition, the right hemisphere does have some capacity for approximating the solution even when it is unable to generate the exact solution. Furthermore, right hemisphere accuracy in addition and subtraction was higher for problems with small [numbers] than with large [numbers]. An additional experiment assessed approximate and exact addition in the two hemispheres for problems with small and large [numbers]. The left hemisphere was equally accurate in both tasks but the right hemisphere was more accurate in approximate addition than in exact addition. In exact addition, right hemisphere accuracy was higher for problems with small [numbers] than large, but the opposite pattern was found for approximate addition.

(Funnell et al., 2007).

Question 7

Who was the sample in this research? *(Select one)*

A   'two cerebral hemispheres'

B   'a split-brain patient'

C   'four experiments'

Question 8

The statement that 'The left hemisphere was equally accurate in both tasks but the right hemisphere was more accurate in approximate addition than in exact addition' may be regarded as a/an *(Select one)*

A   hypothesis.

B   conclusion.

C   evidence.

Question 9

What was the aim of this study? *(Select one)*

A   'The purpose of the study was to investigate simple calculation in the two cerebral hemispheres of a split-brain patient.'

B   'An additional experiment assessed approximate and exact addition in the two hemispheres for problems with small and large [numbers].'

Exam-style questions

Multiple-choice questions

Question 10   (1 MARK)

Which of the following is an example of a functional neuroimaging technique?

A   structural techniques

B   magnetic resonance imaging (MRI)

C   positron emission tomography (PET)

D   computerised tomography (CT)

Question 11   (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 12   (1 MARK)

The belief that a person's character and mental functions can be determined by the shape and size of their skull was a feature of which historical approach to understanding the brain?

A   monism

B   ablation

C   phrenology

D   the brain hypothesis

Question 13   (1 MARK)

Ablation involves

A   cutting or removing brain tissue to insert new functions into the brain.

B   cutting or removing brain tissue to observe its effects.

C   electrically stimulating the brain with a conductor.

D   examining a brain to determine the cause of death.

Short-answer questions

Question 14   (2 MARKS)

Outline the difference between what the heart and brain hypothesis argued in the brain versus heart debate.

Question 15   (3 MARKS)

Sperry and Gazzaniga's studies on patients who had a 'split-brain' demonstrated that words processed by the right hemisphere could not be verbalised. In terms of hemispheric specialisation, explain why this is the case.

Question 16   (3 MARKS)

Identify one structural neuroimaging technique and describe how it is conducted and used to understand the brain.

Question 17   (4 MARKS)

Historically, researchers used the method of electrical brain stimulation (EBS) on animals such as dogs and rats to investigate a range of phenomena including memory and localisation of function.

a   Outline what is meant by the phrase 'localisation of function'.   (1 MARK)

b   Explain how a researcher might have used electrical brain stimulation to determine where in the brain controlled a rat's leg movement.   (3 MARKS)

2B THE NERVOUS SYSTEM

Why do we keep breathing, even when we are not consciously thinking about it? How do we know what's going on around us? How does our body and brain respond to the things going on inside us and in our external environment? The answer to all of these questions lies within the various functions of the nervous system.

2A Historical approaches to understanding the brain	2B The nervous system	2C The neuron	2D Structure and function of the brain	2E The cerebral cortex

Study design dot point

- the basic structure and function of the central and peripheral nervous systems as communication systems between the body's internal cells and organs and the external world

Key knowledge units

The human nervous system	1.1.2.1
Central nervous system	1.1.2.2
Peripheral nervous system	1.1.2.3

The nervous system

- The human nervous system 1.1.2.1
- Central nervous system 1.1.2.2
- Peripheral nervous system 1.1.2.3
  - Somatic nervous system
  - Autonomic nervous system

The human nervous system 1.1.2.1

OVERVIEW

The nervous system is a highly organised structure in the body and is responsible for everything that we think, feel, and do.

THEORY DETAILS

In the last lesson, you learnt about historical approaches to understanding the brain and how we now know that the brain is the central organ for much of what we think, feel, and do. However, the brain doesn't just work in isolation and has to communicate with other parts of the body to get the job done. The **nervous system** is a very complex part of the body that allows us to communicate about and respond to what's happening inside of and around us. It is made up of the brain and networks of specialised cells. Within this structure, we are able to transmit information around the body and to and from the brain in order to formulate appropriate responses to stimuli.

Nervous system the complex network of specialised cells in the body that allows the communication of information around the body about the internal and external environment
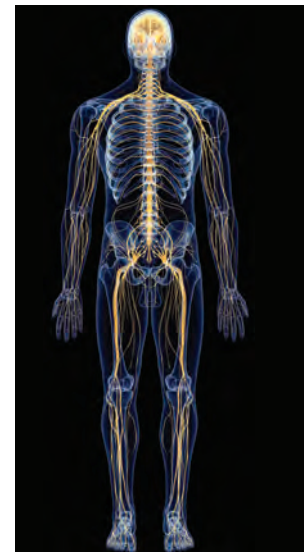
Image: SciePro/Shutterstock.com

Figure 1 The human nervous system is made up of the brain, spinal cord, and nerve cells around the body

Imagine that you are sitting on a big green hill. There is a light breeze and the smell of flowers. You close your eyes and breathe in deeply to get some fresh air. In order to do all of these things and be aware of our environment, our body and brain have to communicate about what they are doing and feeling, and how and if they should respond. Information about the sensations the skin is feeling (a breeze and possibly grass) and nose (the smell of flowers) is registered by the body and sent to the brain. In order to take a deep breath, the brain has to tell the lungs (an organ) to move and respond more than usual. In this sense, you can think of the nervous system as a 'communication system' between the body's internal cells and organs and the external world.

Image: Arina Streltsova/Shutterstock.com

Figure 2 The nervous system is responsible for everything we think, feel, and do

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ⓘ ***Useful tip***

Primarily, the nervous system is involved in:

- *receiving* information (about our internal or external environment from our body's cells)
- *transmitting* information to the right places (the brain or parts of the body)
- *processing* this information (often done by the brain) and
- *formulating* or *coordinating* responses to this processed information.

In the example with the grass:

- the nose and skin *receive* information from the environment and transmit it to the brain.
- the brain and body work together to *process* this information about the environment.
- the brain *formulates* a response, communicating to the lungs to take a deep breath.

The nervous system is made up of different *subsystems* or *divisions* that all work together, though each have their own important roles. These are outlined in figure 3 and in the next section, we learn about each division's role.
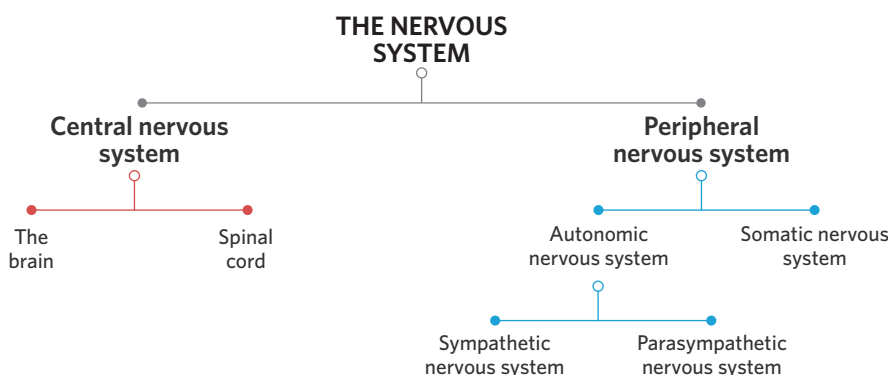
Figure 3 The divisions of the nervous system

Central nervous system 1.1.2.2

OVERVIEW

The central nervous system is made up of the brain and the spinal cord. It is via the brain and the spinal cord that information from the rest of the body and the environment is processed and that responses are formulated.

THEORY DETAILS

The **central nervous system (CNS)** is 'central' to the body in that:

- it consists of the **brain** and the **spinal cord.**
- the spinal cord runs down the middle of the body.
- it is from this 'centre' that all the body's activity is coordinated and integrated via communication with other areas.

Figure 4 outlines the components of the CNS.

The brain is the control centre for the body, allowing the body to respond to information both from within and outside the body. As mentioned, the brain *processes* information *received* by the body, and then *formulates* responses to these messages. You will learn more about the brain throughout this chapter. The spinal cord is the information route along which messages are transmitted to and from the brain, and to and from other parts of the body.

Central nervous system (CNS) the brain and the spinal cord

Brain an organ contained in the skull that coordinates thought, behaviour and nervous system activity

Spinal cord a long cable of nerve tissue connecting the brain to the peripheral nervous system, responsible for carrying motor information from the brain, and sensory information from the body

---

⊙ *Analogy*

Think of the brain as the 'post office' of the body, in which letters (neural messages) are received, sorted and then sent out. The spinal cord is the route via which the letters must travel to in order to get to and from the post office. This analogy is represented in figure 4.

POST OFFICE

Brain
(centre for cognition, processing and responding)

MESSAGE

Spinal cord
(route for messages to and from the brain)
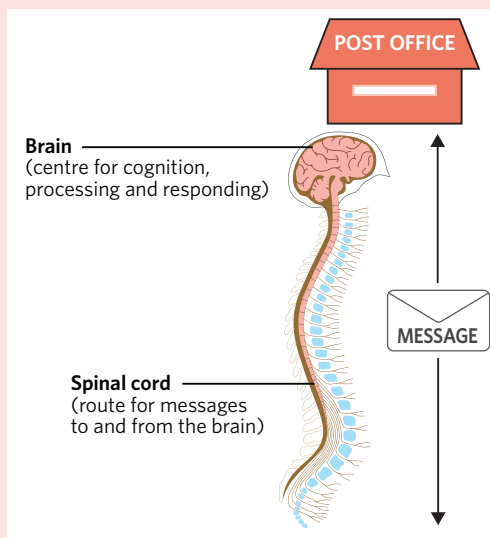
Image: takito/Shutterstock.com

Figure 4 A memory analogy where the brain is the post office and spinal cord is the route for letters

🧩 *Lesson link*

Have you ever jerked your hand back quickly after touching something hot? We are able to have this reflex reaction to certain, often dangerous stimuli thanks to spinal reflexes, which are another important function of the spinal cord. In *Units 3 & 4 Psychology*, you will learn about spinal reflex responses, which are initiated at the spinal cord and allow us to almost instantly respond to stimuli without relying on our brain.

Peripheral nervous system 1.1.2.3

OVERVIEW

The peripheral nervous system is made up of every nerve in the body outside of the CNS. It is further divided into two branches: the somatic and autonomic nervous systems.

THEORY DETAILS

The **peripheral nervous system (PNS)** is comprised of all nerves outside the CNS and functions primarily to transmit information from the rest of the body to the CNS, and to bring information about how to respond from the CNS to the rest of the body. Figure 5 depicts the CNS and PNS in the body. The PNS can be further subdivided into two different systems: the autonomic nervous system (ANS) and the somatic nervous system (SNS). Each of these subdivisions have a unique and important role.

Peripheral nervous system (PNS) all nerves outside the CNS, responsible for carrying information to and from the CNS

Somatic nervous system

The somatic branch of the PNS is responsible for all voluntary movements and actions performed by an organism. These are formulated by communication with the CNS. The **somatic nervous system (SNS)** controls these voluntary movements by transmitting information about the body's sensations to the brain, and then making the **skeletal muscles** (the muscles controlled by the brain and spinal cord and attached to the skeleton) respond. This occurs through the communication of two different kinds of messages:

- **Sensory messages** (also known as afferent messages) transmit information about the body's sensations (such as touch) to the brain (via the spinal cord) so that the brain can coordinate a response.
- **Motor messages** (also known as efferent messages) are transmitted from the brain (via the spinal cord) to the skeletal muscles, giving instructions on how to move.

When responding to activity in the body or external environment, the somatic and central nervous systems work together in a communication system. Together, they might communicate as follows:

1 The body registers something, such as its temperature or things in the external environment like rain.

2 The SNS sends sensory messages about these sensations to the CNS.

3 The CNS processes this information and coordinates a response if necessary.

4 The CNS sends a motor message to the skeletal muscles, telling them to respond e.g. by walking to get out of the rain.
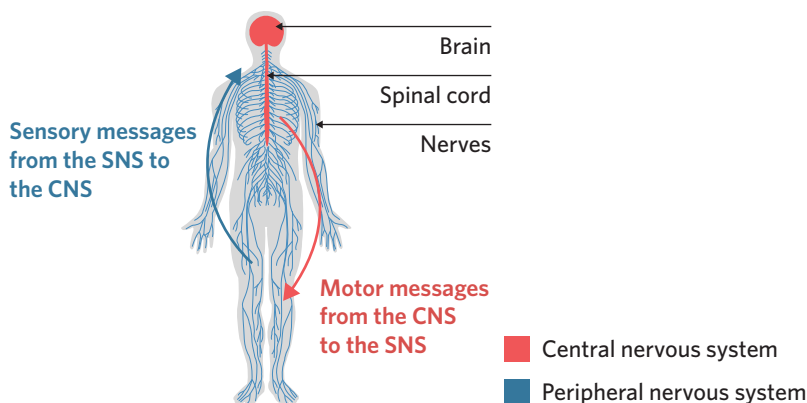
Image: Systemoff/Shutterstock.com

Figure 5 The relationship between the somatic division (SNS) of the PNS (blue) and CNS (red) in coordinating and integrating sensory and motor information

Somatic nervous system (SNS) the branch of the PNS responsible for sending motor information from the CNS to the body's skeletal muscles, and bringing sensory information from the body to the CNS in order to formulate voluntary responses

Skeletal muscles muscles connected to the skeleton that are involved in conscious, voluntary movement

Sensory messages (also known as afferent messages) information about the body's sensations transmitted from the PNS to the CNS

Motor messages (also known as efferent messages) information about voluntary movement transmitted from the CNS to the skeletal muscles

Lesson link

How are these motor and sensory messages sent? Specialised nerve cells, known as 'neurons', are responsible for sending these messages and transmitting information around the body. There are specialised motor neurons and specialised sensory neurons. You will learn more about the structure and function of the neuron in the next lesson *2C: The neuron*.

Analogy

Thinking back to the post office and letters analogy, the SNS includes:

- addresses which send letters containing sensory information to the post office and also receive letters containing motor information from the post office.

The letters are sent to and from the CNS and the SNS. Letters sent to the CNS are sensory messages, while letters sent from the CNS are motor messages.

For example, figure 6 shows how an address, in this case the hand, might have the sensation of feeling the stickiness of honey. It then sends a sensory letter (sensory message) about the stickiness to the post office (brain) via the mail route (spinal cord). The post office then sends a motor letter (motor message) back, telling the skeletal muscles in the hand to respond to the stickiness by moving away.
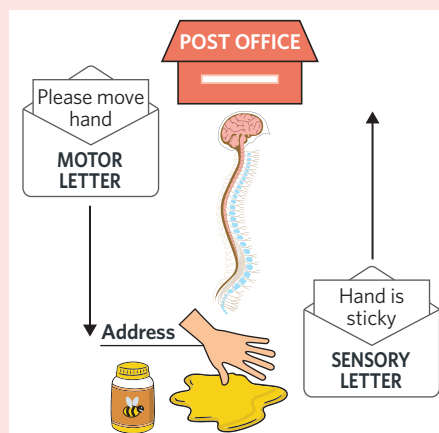
Imgae: takito/Shutterstock.com

Figure 6 The post office memory analogy detailing the role of the SNS, which sends letters about sensory information and receives letters about motor information

Autonomic nervous system

The **autonomic nervous system (ANS)** is responsible for initiating the responses of the body's **visceral muscles, organs, and glands**, such as the heart, stomach, and liver. It also sends feedback to the brain about their activity.

The organs, muscles, and glands involved in the ANS are mostly self-regulating in that they don't require conscious mental control to operate. However, we can gain conscious control over some of the actions of our ANS. For example, we are able to regulate our breathing, making it faster or slower, or take deeper or more shallow breaths. The organs, muscles and glands regulated by the ANS are seen in figure 7.

> **Autonomic nervous system (ANS)** the branch of the PNS responsible for connecting the CNS and the body's visceral (non-skeletal) organs, muscles and glands
>
> **Visceral muscles/organs/glands** the body's non-skeletal muscles, organs and glands
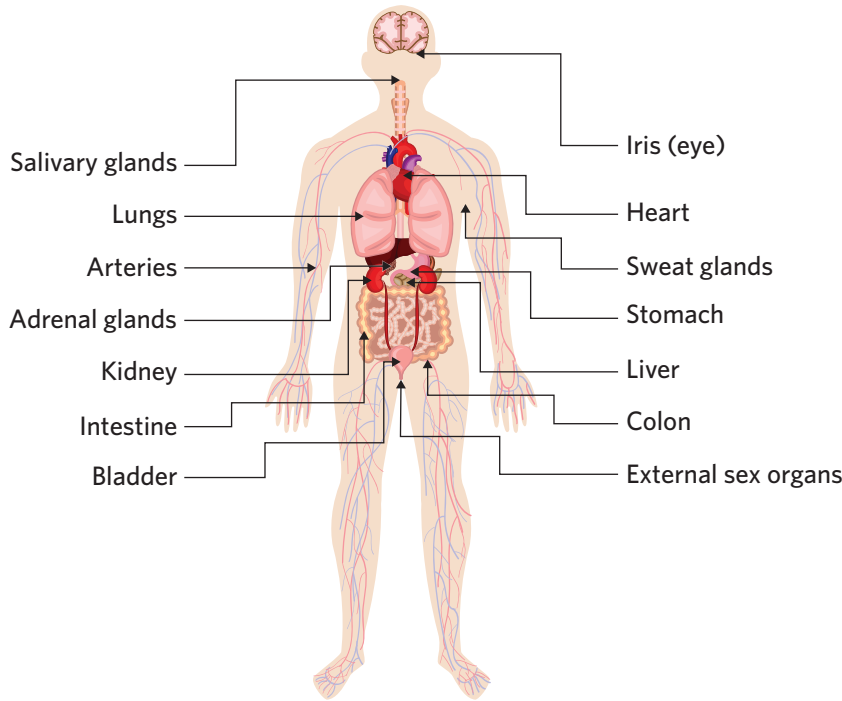
Image: stockshoppe/Shutterstock.com

Figure 7 Some of the visceral muscles, organs and glands controlled by the ANS

The ANS is further divided into two branches: the sympathetic nervous system and parasympathetic nervous system.

Sympathetic nervous system

The **sympathetic nervous system** is responsible for activating the body's visceral organs, muscles and glands in order to prepare the body for dealing with high levels of activity, such as exercise or escaping a threat. The organs and glands need to be activated in particular ways so that they can help energise the body and be better able to deal with a threat; this may involve either increasing or decreasing their regular activity depending on what best optimises the body's resources. These changes are called 'sympathetic responses' and some of these are outlined in table 1. Importantly, the sympathetic nervous system is responsible for an adaptive response called the *fight-flight response*, which allows us to either fight or fly from a threat or stressful stimulus.

> **Sympathetic nervous system** a branch of the ANS responsible for activating the body's visceral organs, muscles, and glands for increased activity or when under threat

Parasympathetic nervous system

The **parasympathetic nervous system** is responsible for maintaining optimal levels of functioning of the visceral organs, muscles and glands. This optimal state is known as *homeostasis* (an equilibrium in the body where all systems are at a stable level of functioning). It also returns the body to balanced and ideal levels of functioning (homeostasis) after the heightened arousal of a sympathetic response. If organs, muscles and glands are kept functioning at sympathetic levels when there is no threat, the body's energy becomes depleted.

> **Parasympathetic nervous system** a branch of the ANS responsible for returning and maintaining the body's visceral organs, muscles and glands at optimal and balanced functioning

Given their distinct roles, the two ANS systems cause different physiological responses in each of the body's muscles, organs and glands. Some of these are listed in table 1.

Table 1 How different body parts are controlled by parasympathetic and sympathetic responses

Sympathetic responses During high levels of activity/under threat	Parasympathetic responses During rest and inactivity
• Dilates pupils of the eyes to allow for more light to enter the eyes and subsequently improve sight when needed e.g. under threat • Heart rate increases to energise the body for activity by increasing blood flow • Lung airways relax and expand to allow for increased oxygenation required for more intense activity • Digestion is inhibited to allow for more essential bodily functions needed during activity • Blood flow increases to allow for efficient movement of skeletal muscles • Bladder relaxes to allow for more essential bodily functions needed during activity • Adrenal glands secrete stress hormones to energise the body • Body increases release of glucose to energise the body	• Constricts pupils of the eye according to the light levels required to see optimally • Heart beats at a rate best for optimal functioning during inactivity • Lung airways constrict for ideal breathing rate at rest • Digestion operates to allow for regular eating • Blood flow is directed evenly around the body as skeletal muscles do not need increased blood flow at rest • Bladder constricts and is controlled • Adrenal glands do not secrete stress hormones to allow the body to rest • Body reduces release of glucose so it does not deplete the body of energy

---

ⓘ **Useful tip**

Be careful when abbreviating divisions of the nervous system as some divisions start with the same letter (peripheral and parasympathetic, and somatic and sympathetic). In SAC/test/exam answers, always write the full name of the division you are talking about first before putting it in brackets. Do this in each individual question of the exam you are using an acronym in, and avoid abbreviating divisions that start with the same letter in one answer.

Theory summary

In this lesson, you learnt about what the human nervous system is and how it works. You should now be familiar with the different divisions of the nervous system and their functions, including:

- The central nervous system
- The peripheral nervous system
  - The somatic nervous system
  - The autonomic nervous system
    - The sympathetic and parasympathetic nervous systems

You can think of the nervous system as a communication system between the body's internal cells and organs and the external world.

2B QUESTIONS

Theory-review questions

Question 1

The nervous system is responsible for *(Select all that apply)*

I   highly specific functions.

II   everything we think, feel, and do.

Question 2

Fill in the blanks of the diagram with the following terms.

- Central nervous system
- Peripheral nervous system

Image: Systemoff/Shutterstock.com
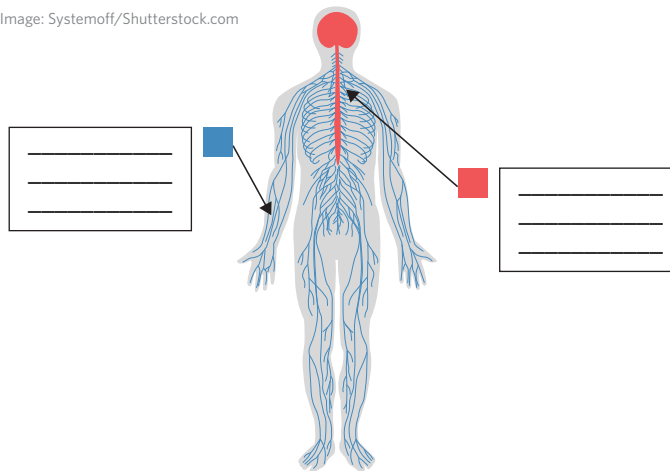
Question 3

True or false? The central nervous system controls our central functions such as movement and decision making.

A   true

B   false

Question 4

True or false? The peripheral nervous system communicates information about the external world and the central nervous system communicates about information from inside the body.

A   true

B   false

Question 5

Fill in the blanks with the following terms.

- Somatic
- Autonomic

The peripheral nervous system is divided into the somatic and autonomic nervous system. The _____ nervous system controls the skeletal muscles and voluntary movement, whereas the _____ nervous system controls visceral muscles, organs and glands which are largely self-regulating.

Question 6

Fill in the blanks of the diagram with the following terms.

- Central nervous system
- Peripheral nervous system
- Somatic nervous system
- Sympathetic nervous system
- Parasympathetic nervous system

THE NERVOUS SYSTEM
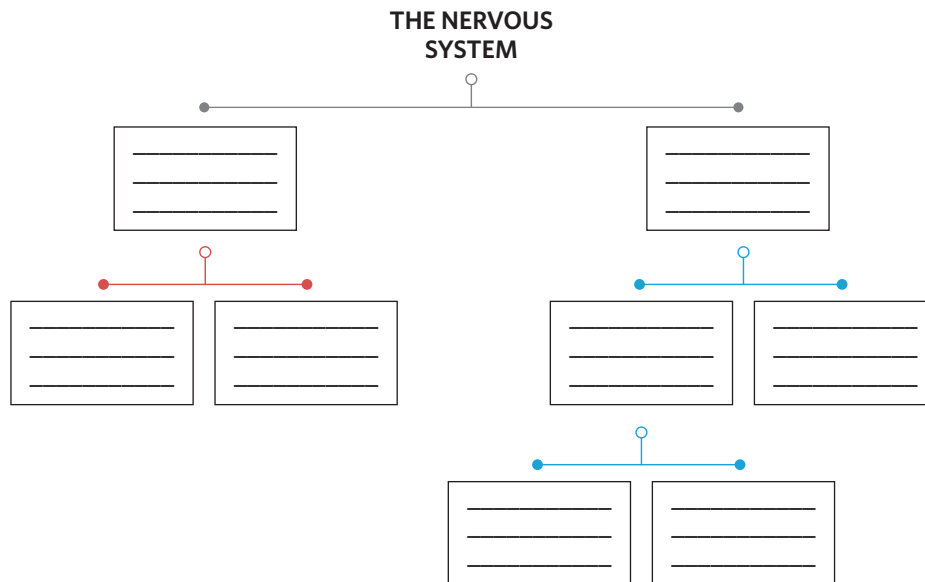
Skills

Unpacking the scenario

Question 7

Alyssa was at the beach and wanted to go for a swim. She walked into the water slowly, bracing herself because of the cold waves on her legs. As she walked forward, she started involuntarily shivering and could feel her heart racing. After a few more steps, Alyssa decided to get the hard part over and dived directly beneath the water.

Fill in the blanks in the following paragraph based on the scenario provided, using the following key terms.

- Sympathetic
- Somatic
- Central

Alyssa's actions at the beach involved the communication between various divisions of her nervous system. The division of Alyssa's nervous system that detected the cold on her legs would have been the _____ nervous system which sent a message to her brain about the external world. The _____ nervous system would be responsible for sending a message to Alyssa's somatic nervous system, telling her to move her legs, dive and any other intentional actions she took. On the other hand, Alyssa's involuntary shivering and heart heart racing would be caused by the activation of her _____ division of the autonomic nervous system.

Exam-style questions

Multiple-choice questions

Question 8   (1 MARK)

Which of the following processes is the sympathetic division of the autonomic nervous system responsible for?

A   the fight-flight response

B   maintaining the homeostasis

C   mood

D   voluntary movement

Question 9   (1 MARK)

Which of the following options best describes the location and primary function of the peripheral nervous system?

	Location	Primary function
A	The brain and spinal cord	Coordinating responses of the body to internal and external stimuli
B	All nerves outside the central nervous system	Transmitting information about the body to the central nervous system, and messages about how to respond from the central nervous system to the body
C	The visceral muscles, organs, and glands	Sleep and digestion
D	The skeletal muscles	Movement

Question 10   (1 MARK)

Gin was having a shower and could feel that the water was too cold. She turned the hot tap on further to adjust the temperature. Which two divisions of the nervous system were involved in coordinating Gin's response?

A   the central and autonomic

B   the somatic and peripheral

C   the central and the somatic

D   the sympathetic and somatic

Question 11   (1 MARK)

The central nervous system consists of

A   all nerves in the body.

B   the brain and skeletal muscles.

C   the brain and spinal cord.

D   all nerves outside the brain and spinal cord.

Short-answer questions

Question 12   (2 MARKS)

Outline one difference and one similarity between the sympathetic and parasympathetic nervous systems.

Question 13   (2 MARKS)

Describe two functions of the somatic nervous system.

Question 14   (5 MARKS)

Erfan was walking at the park when an aggressive dog came and bit him. He jumped in fright before walking away.

a   Identify two sympathetic nervous system responses that Erfan might be experiencing. (2 MARKS)

b   Explain how the central and the somatic nervous systems would act as a communication system to tell Erfan to walk away. (3 MARKS)

Questions from multiple lessons

Use the following information to answer Questions 15 and 16.

Ablation was a method used in early brain research. By cutting or removing certain parts of animals' brains and observing their responses, inferences could be made about what that part of the brain controlled.

Question 15 (1 MARK)

Which division of the nervous system is directly operated on through the process of ablation for brain research?

A the central

B the peripheral

C the somatic

D the autonomic

Question 16 (1 MARK)

If an animal could no longer move their leg after brain ablation, but could still move all other skeletal muscles, it could most clearly be assumed that

A sensory messages could no longer be sent from the skeletal leg muscles of the somatic nervous system.

B the entire central nervous system was cut off from the peripheral nervous system.

C motor messages could no longer be sent from the brain to the skeletal leg muscles of the somatic nervous system.

D the autonomic and somatic nervous systems could no longer communicate.

2C THE NEURON

We now know that our nervous systems are responsible for all the very complicated things we think, feel and do. But zooming in, how does the communication within the nervous system occur? There are billions of microscopic nerve cells in the nervous system known as neurons that function to communicate information around the body. By the end of this lesson, you will understand how neurons communicate the messages that allow us to perform everything we do.

Image: Systemoff/Shutterstock.com

2A Historical approaches to understanding the brain	2B The nervous system	2C The neuron	2D Structure and function of the brain	2E The cerebral cortex

Study design dot point

- the role of the neuron (dendrites, axon, myelin and axon terminals) as the primary functional unit of the nervous system, including the role of glial cells in supporting neuronal function

Key knowledge units

Role of the neuron	1.1.3.1
Structure of the neuron	1.1.3.2
Glial cells	1.1.3.3

The neuron

- Role of the neuron 1.1.3.1
  - Types of neurons
- Structure of the neuron 1.1.3.2
- Glial cells 1.1.3.3

Role of the neuron 1.1.3.1

OVERVIEW

Neurons are specialised cells that serve as the foundational unit for the communication of information within the nervous system.

THEORY DETAILS

As you've learnt, the nervous system is made up of billions of different cells. **Neurons** are the specialised nerve cells in the nervous system that enable the communication of information around the body. They do this by receiving, transmitting, and processing information in the form of *neuronal messages* (messages which can be sent via neurons). Similar to dominos falling, neuronal communication occurs in one direction. Further, neuronal messages are carried by one neuron at a time and are conveyed from one neuron to the next in rapid, smooth succession. As with dominos, there are of course things that can prevent or 'inhibit' this communication.

Neuron a nerve cell responsible for transmitting, receiving, and processing information
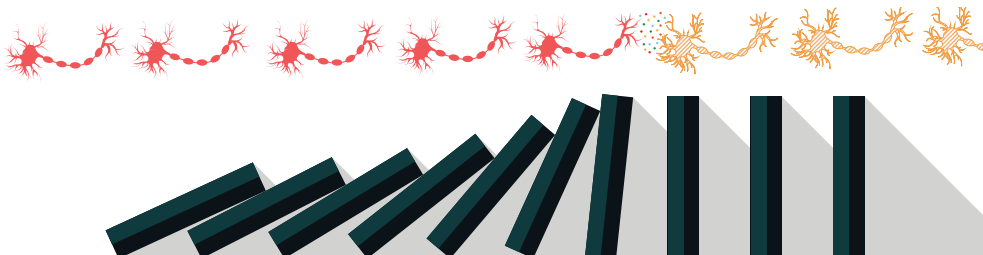
Image: Eloku/Shutterstock.com

Figure 1 Communication between neurons occurs in one direction and is imperceptibly fast

Importantly, neuronal messages are sent *electrochemically*; i.e., chemicals containing the neuronal message are sent *between* neurons and this is powered by an electrical current generated *within* the neuron. When this electrical current reaches the sending end of the neuron, the chemicals are released and sent onto the next adjacent neuron. **Neurotransmission** occurs when a neuron sends one of these neuronal messages to another neuron, muscle, or gland. Importantly, neurons never touch and so messages have to be sent over a gap between them. When a neuron receives a neuronal message, it is known as **neuronal reception**. After this message is received, the neuron processes the message before sending it to the next neuron or cell.

Neurotransmission
the process in which a neuron sends a message

Neuronal reception the process in which a neuron accepts (receives) a message

> **⊕ Want to know more?**
>
> The electrical impulse generated within the neuron is known as the *action potential*. In other words, an action potential is a neuronal message in its electrical form. An action potential occurs when a certain voltage threshold within the neuron is met. Only when an action potential occurs can chemicals subsequently be sent from the ends of one neuron to the next.

Electrical signal (action potential)

Message contained in chemicals released
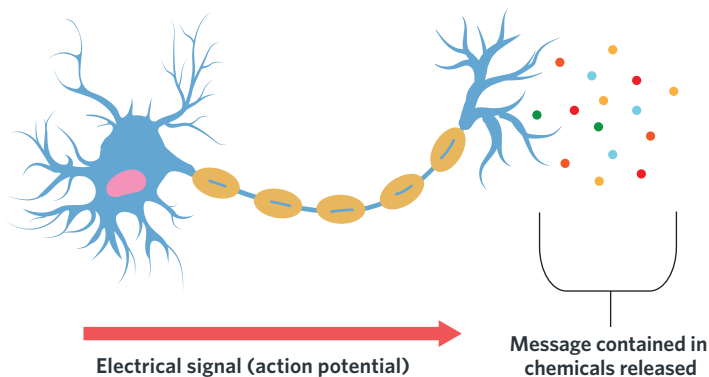
Figure 2 Neurons communicate via electrochemical neuronal messages. Once an electrical current reaches the end of a neuron, it is able to send a chemical message onto the next neuron or cell

Neurons are organised into various neuronal 'networks' or 'pathways' within the nervous system. Within a network, there are many interconnected neurons that communicate together to perform specific functions. These neuronal structures are the basis for all that we think, feel, and do. For example, when we kick a ball, various neuronal networks that allow us to perform this motor action are activated as neuronal messages run through them. When we learn something, neuronal networks are formed and/or strengthened.

Types of neurons

There are various types of neurons, each with their own unique function. The three most common neuron types are:

- *Motor neurons (also known as efferent neurons)*, which specialise in communicating information about our movement. As you learnt in the previous lesson, motor messages are sent from the central nervous system (CNS) to the skeletal muscles in the peripheral nervous system (PNS).

- *Sensory neurons (also known as afferent neurons)*, that specialise in communicating information about the body's sensations (both from within the body and the outside environment) from the PNS to the CNS. Our sensory organs (such as our skin, eyes, ears etc.) have special cells called sensory receptors, which convert sensory information into neuronal messages which can then be communicated via sensory neurons to the CNS for processing. There are many different types of sensory neurons that specialise in different sensory functions.

- *Interneurons*, which are a special type of neuron that function primarily to relay neuronal messages between motor and sensory neurons, as motor and sensory neurons do not usually communicate directly with each other. Interneurons also communicate with each other. Interneurons are particularly important for cognition and reflex actions.
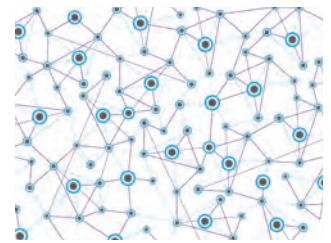
Image: foto 2.0/Shutterstock.com

Figure 3 Neurons in the nervous system form many different circuits, each serving their own unique functions. Each circle represents a different neuron, which may form many different connections with other neurons and be part of various neuronal networks

> **✍ Memory device**
>
> Sometimes, you might see sensory neuronal messages referred to as 'afferent neuronal messages', and 'motor neuronal messages' as 'efferent neuronal messages'
>
> To remember which is which, think of the acronym '**SAME**':
>
> **S**ensory messages are also called
>
> **A**fferent
>
> **M**otor messages are also called
>
> **E**fferent

Different types of neurons vary in their structure, though they consist of essentially the same components that we will now explore.
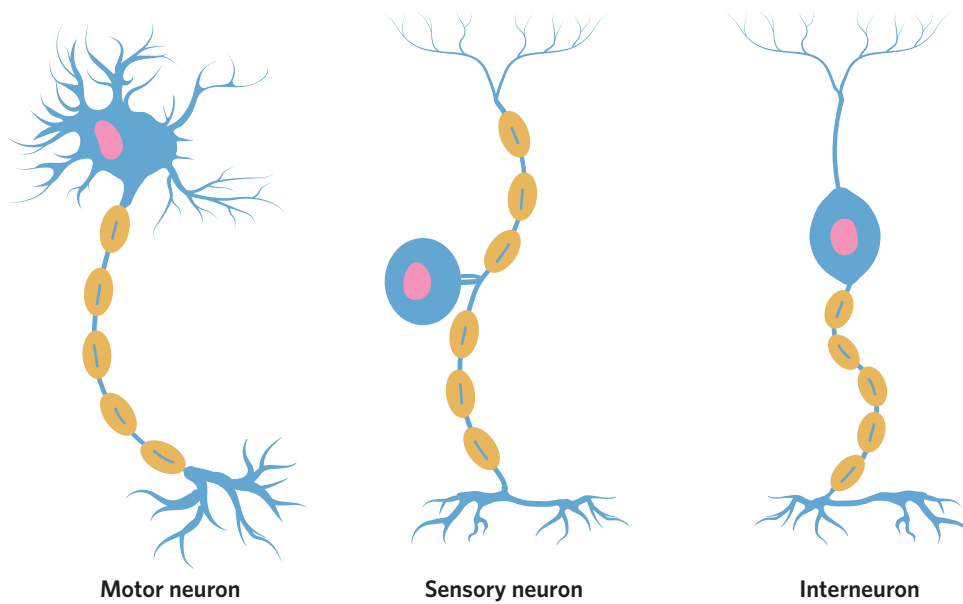
Image: Designua/Shutterstock.com

Figure 4 Motor (left), sensory (middle), and interneurons (right) all have their own unique function and appearance, although are made of essentially the same parts

Structure of the neuron 1.1.3.2

OVERVIEW

There are several essential components of a neuron that allow for neurotransmission and function.

THEORY DETAILS

During neurotransmission from one neuron to another, the neuronal message is sent across the space between the neurons, known as the **synaptic gap**. The neuron that fires the message into the synapse is known as the **presynaptic neuron**, (that is, the neuron that comes before the synapse). The neuron that receives this message from the synapse is known as the **postsynaptic neuron**, (the neuron that comes after the synapse).
The area where this transmission process occurs, including the very end of the presynaptic neuron, the synapse, and the very beginning of the postsynaptic neuron, is referred to as the **synapse**.

Synaptic gap the space between two neurons into which a neuronal message is transmitted

Presynaptic neuron the neuron that releases a message into the synapse

Postsynaptic neuron the neuron that receives a message from the synapse

Synapse the area in which neurotransmission occurs between two neurons, including the sending end of the presynaptic neuron, the gap between two neurons, and the receiving end of the postsynaptic neuron

Figure 5 A presynaptic and postsynaptic neuron. In a neuronal pathway, neurons transmit information to each other across the synaptic gap

There are several components of the neuron that work together to allow this transmission and reception of information across the synapse.

cell body (soma)

direction of impulse
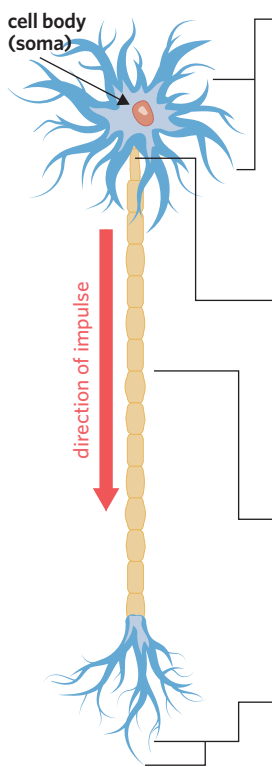
Dendrites are the bushy branches at the receiving end of a neuron. During neuronal communication, the end of dendrites, known as receptor sites, receive the neuronal message before it is sent to the *cell body (soma)* for processing. The neuronal messages received by dendrites are in the form of chemicals known as *neurotransmitters*, of which there are various kinds each with their own functions. When they are sent to the soma and processed, electrical energy is generated.

The **axon** is the long stick-like part of the neuron. It is along the axon that neuronal messages (now in the form of electrical signals) are *transmitted* from the cell body of the neuron to the sending end. This is enabled by conducting electrical energy away from the cell body and sending it towards the axon-terminals.

The **myelin** of a neuron is a substance made of fat and protein that looks like small fatty bubbles along the axon. It functions to *insulate* the axon, which helps to protect it and neuronal messages from interference. This also importantly helps to increase the speed of the electrical impulse.

The **axon terminals** are at the sending end of the neuron, meaning that they are responsible for the *release* of the neuronal message (neurotransmitters) into the synapse. The very end of axon terminals, known as *terminal buttons* or *synaptic buttons* are where neurotransmitters are contained and then released from when the electrical impulse reaches this end of the neuron.

Figure 6 A motor neuron. All neurons have these labelled components, though their exact location may look a little different (as shown in figure 4)

Dendrites the bushy spines of a neuron that receive a message

Axon the long strand-like part of a neuron that conducts electrical impulses away from the cell body to the sending end of a neuron

Myelin the fat and protein substance that surrounds and insulates the axon of a neuron

Axon terminals the ends of a neuron that release a message into the synapse

---

🧠 *Want to know more?*

Neurons can vary greatly in size. Some of the shortest neurons are in the brain, being too small to see with the naked eye. On the other hand, our longest neuron, which extends from the bottom of our spine to our toe, can be up to a metre in length.

Glial cells 1.1.3.3

OVERVIEW

Glial cells are extremely important cells in the nervous system that function to support and protect neurons.

THEORY DETAILS

Besides neurons, there are other specialised cells in the human nervous system. **Glial cells (also known as glia)** are another very important cell that function primarily to support neurons. Unlike neurons, they do not send electrochemical signals but rather support neurons to do so. There are billions of these specialised cells located in both the central and peripheral nervous systems, where they surround neurons with an estimated ratio of around one glial cell to one neuron (von Bartheld et al., 2016).

The primary roles of glial cells are to:

- hold neurons in place,
- provide neurons with nutrients and oxygen,
- repair neurons and eliminate diseased or damaged neurons,
- insulate neurons from one another,
- produce myelin, and
- aid neurons in neurotransmission.

Glial cell (also known as glia) a specialised cell that protects and supports neurons and their functioning

🗣️ *Memory device*

The term *glial* comes from the Greek word for 'glue'. When glial cells were first discovered, it was believed that they really did help cells in the nervous system stick together.

However, you can remember the role of glial cells as being primarily supportive and keeping neurons in place, which is similar in function to glue, though not as literal as was once believed.

Image: olllikeballoon /Shutterstock.com

Figure 7 Like glue, glial cells are supportive and hold things in place
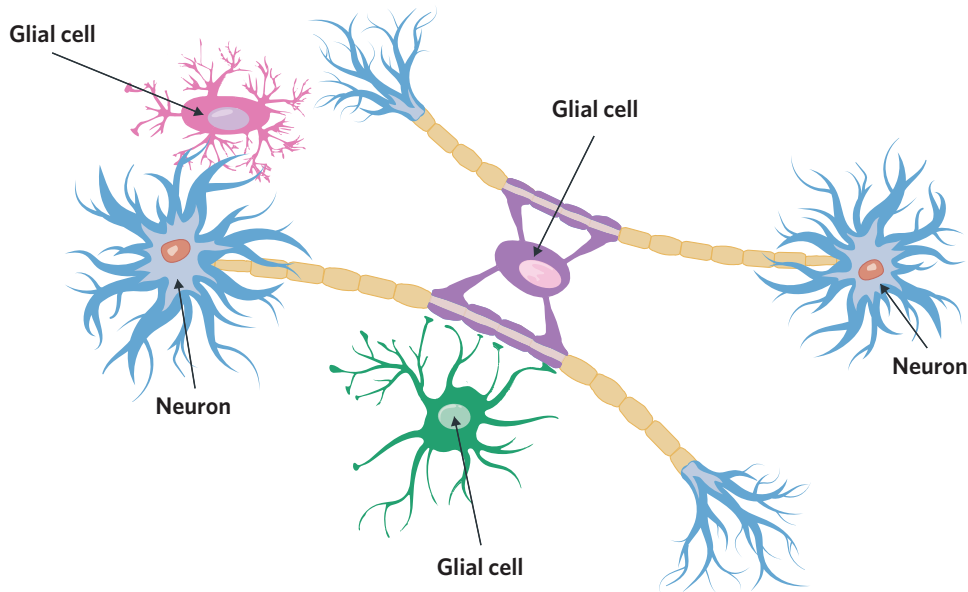
Image: Designua/Shutterstock.com

Figure 8 As you can see, there are different types of glial cells that surround, protect, and support neurons

As shown in figure 8, there are different kinds of glial cells that vary in their function and usual location. Essentially, they all share the same role of supporting neurons, but may vary in their specialisation and how they do so.

Want to know more?

Different types of glial cells

There are different types of glial cells in the nervous system. Some of the specific glia and their functions include:

Table 1 Four glial cells and their function

CNS glial cells	PNS glial cells
• *Astrocytes* are the most common glial cell and function to connect neurons to the blood supply, provide helpful chemicals, remove waste, and provide structural support. • *Oligodendrocytes* form myelin to insulate neurons and help with transmission. • *Microglia* are tiny glial cells that remove waste and protect neurons from harmful substances.	• *Schwann cells* form myelin for neurons in the PNS.

Theory summary

In this lesson, you learnt that neurons are specialised nerve cells which function to receive, process and transmit information around the nervous system. To perform this function, neurons communicate with each other in networks via electrochemical messaging.

The different components of a neuron with which you should be familiar include:

Table 2 Summary of the components of a neuron

Dendrites	The bushy ends of a neuron which receive neurotransmitters.
Axon	The long stick-like part of the neuron along which neuronal messages are transmitted.
Myelin	The fatty outer coating of axons which insulate neurons and speed up transmission.
Axon terminals	The ends of a neuron which release neurotransmitters into the synapse.

You should also be familiar with the general role of glial cells, which is to support and protect neurons throughout the nervous system.

2C QUESTIONS

Theory-review questions

Question 1

Fill in the blanks with the following terms.

- Neurons
- Glial cells

Specialised nerve cells that communicate information via electrochemical messages around the nervous system are _____, whereas _____ help to protect and support them to perform their function.

Question 2

Which of the following processes regarding neuronal messages are neurons responsible for? *(Select all that apply)*

I   Transmitting

II   Receiving

III   Processing

Question 3

Fill in the blanks with the following terms.

- Presynaptic
- Postsynaptic

The synaptic gap is the space between two adjacent neurons. A neuron that sends a message into the synaptic gap is called the _____ neuron, and a neuron that receives a message is called the _____ neuron.

Question 4

Label the diagram with the following terms.

- Axon
- Axon terminals

Dendrites _____ **Myelin** _____

direction of impulse
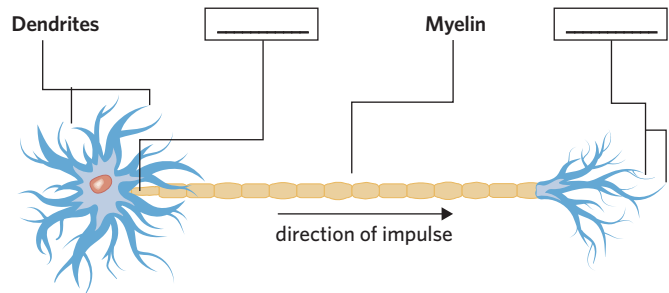
Question 5

Fill in the blanks with the following terms.

- Transmits
- Receive
- Release

When a neuronal message first reaches a neuron, the dendrites _____ the message. After being processed by the cell body, the axon _____ electrical energy away from the cell body down the neuron. When this electrical impulse reaches the axon terminal, the synaptic buttons on their ends _____ chemicals called neurotransmitters into the synaptic gap.

Skills

Perfect your phrasing

Question 6

Which of the following sentences is most correct?

A   Neuronal messages are electrochemical, which means that they are transmitted via chemicals between neurons which are sent when an electrical impulse reaches the end of a neuron.

B   Neuronal messages are electrochemical, which means that chemicals travel within neurons from one end of the neuron to the other, before an electrical signal is sent between neurons.

Exam-style questions

Multiple-choice questions

Question 7   (1 MARK)

The part of the neuron that releases neuronal messages into the synapse is the

A   dendrite.

B   axon.

C   axon terminal.

D   synaptic gap.

Question 8   (1 MARK)

When neuronal messages are first received by a postsynaptic neuron, what is their first point of contact?

A   The receptor sites on the axon terminals.

B   The axon.

C   The receptor sites on the dendrites.

D   The synaptic gap.

Question 9   (1 MARK)

Which of the following is **not** a function of the glial cells?

A   To remove neuronal waste.

B   To produce electrical impulses.

C   To aid neurotransmission.

D   To hold neurons in place.

Question 10   (1 MARK)

If a neuron's axon was damaged, what could be the impact on the transmission of neuronal messages?

A   Electrical messages may not be transmitted because the axon conducts electrical energy away from the cell body and transmits it down the neuron.

B   The neuron could not function properly because the axon provides nutrients and oxygen to the cell.

C   Less neurotransmitters would be received by the neuron because the axon contains the receptor sites which receive chemicals.

D   Fewer neurotransmitters would be sent into the synaptic gap because the axon contains buttons that store neurotransmitters.

Adapted from VCAA 2019 Exam MCQ3

Short-answer questions

Question 11 (2 MARKS)

Outline two roles of myelin.

Question 12 (2 MARKS)

Compare the primary function of neurons to the primary function of glial cells.

Questions from multiple lessons

Question 13 (1 MARK)

Glial cells are found within the

A central nervous system only.

B peripheral nervous system only.

C central and peripheral nervous systems.

D somatic nervous system only.

Question 14 (1 MARK)

Name the parts of the central nervous system in which glial cells are present.

2D STRUCTURE AND FUNCTION OF THE BRAIN

Is one area of the brain responsible for movement? What about problem-solving? Which part of the brain is active when you laugh? In this lesson, you will be introduced to the basic structure and function of the brain. You will learn about three basic areas called the hindbrain, midbrain and forebrain, and their respective functions and structures.

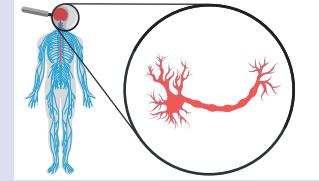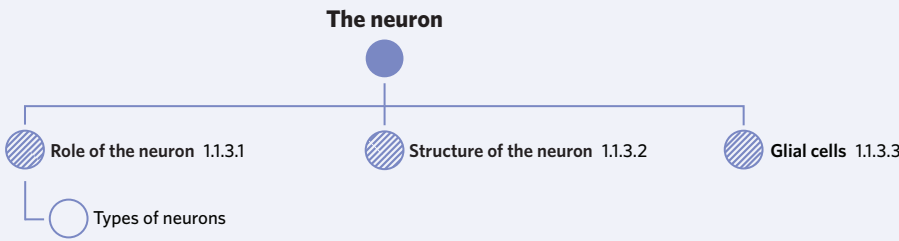Image: Pikovit/Shutterstock.com

2A Historical approaches to understanding the brain	2B The nervous system	2C The neuron	2D Structure and function of the brain	2E The cerebral cortex

Study design dot point

- the basic structure and function of the hindbrain (cerebellum, medulla), midbrain (reticular formation) and forebrain (hypothalamus, thalamus, cerebrum)

Key knowledge units

Hindbrain	1.1.4.1
Midbrain	1.1.4.2
Forebrain	1.1.4.3

Structure and function of the brain

- **Hindbrain** 1.1.4.1
  - Cerebellum
  - Medulla
  - Pons
- **Midbrain** 1.1.4.2
  - Reticular formation
- **Forebrain** 1.1.4.3
  - Thalamus
  - Hypothalamus
  - Cerebrum
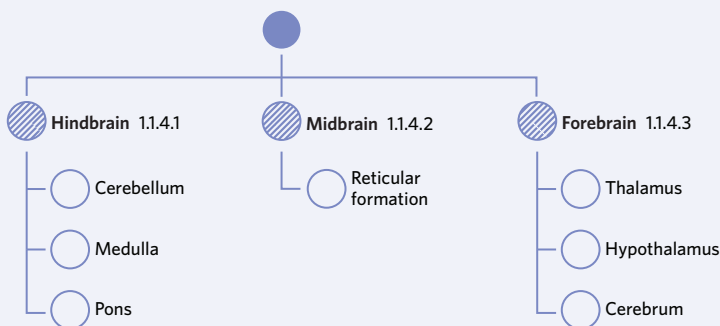
As you now know, the brain may be thought of as the body's 'control centre', coordinating much of our activities with the rest of the nervous system. Although the brain is a single organ, it has different components with different functions. As you've learnt, this idea that different brain regions have different functions or specialisations is called 'localisation of function'.

Lesson link

Each area of the brain is made up of different types of matter and cells. You have already learnt about two types of cells in the brain: neurons and glial cells in lesson **2C: The neuron**. Depending on the area or structure of the brain, neurons vary in number, size and density. While one area of the brain may have billions of small and dense neurons, other areas of the brain may have much fewer, larger neurons. The types and numbers of cells in each brain area depend on that area's structure and function.
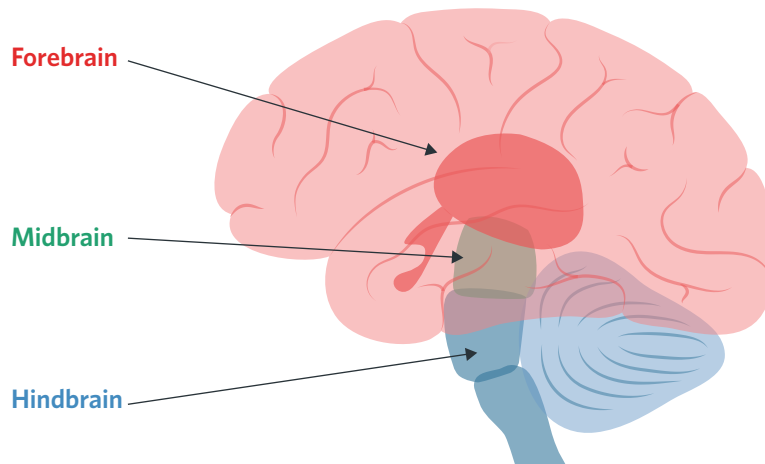
Image: Pikovit/Shutterstock.com

Figure 1 The hindbrain, midbrain, and forebrain

The brain may be divided into three major sections: the hindbrain, the midbrain, and the forebrain. During development in utero (before birth), these regions emerge as bulges early in gestation and continue to develop. Each of these divisions have their own distinct structures and functions which we will examine in this lesson.

While the hindbrain and midbrain are responsible for more basic, lower-level functions, such as survival and movement, the forebrain is responsible for complex cognitive processes (such as perception and evaluation). In terms of evolution, the more basic survival areas, such as those in the hindbrain, were the first to develop. Our more complex and highly developed forebrain is what now distinguishes our human brains from the brains of other animals. If we were to extract the brain and look at it, the most visible part of the brain would be the thin, greyish, and wrinkly outer layer; this is known as the cerebral cortex which is part of and covers our forebrain. The cerebral cortex will be explored in depth in the next lesson.

> ⓘ **Useful tip**
>
> When studying the various parts of the brain, it is important to remember that no area works in isolation. One seemingly simple task may involve the integration and coordination of information from multiple parts of the brain.

Hindbrain 1.1.4.1

OVERVIEW

The hindbrain is a region at the lower part of the brain responsible for some of our most basic functions.

THEORY DETAILS

The **hindbrain** is located towards the bottom and back of the brain, around and including some of the **brain stem**. It is responsible for some of our most fundamental functions, such as autonomic regulation of breathing and basic movement. The hindbrain consists of the cerebellum, medulla, and pons.

Hindbrain an area at the base of the brain, including the medulla and pons (in the brain stem) and the cerebellum

Brain stem a part of the brain which is an extension of the spinal cord, including the midbrain, medulla, and pons
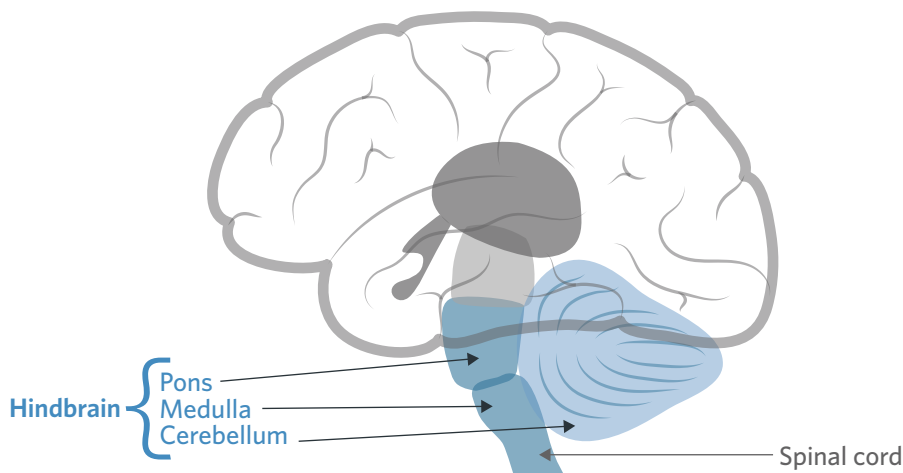
Image: Pikovit/Shutterstock.com

Figure 2 The hindbrain and its components

Cerebellum

As shown in figure 2, the **cerebellum** is a ball-of-wool-like structure located at the back and base of the brain. The primary function of the cerebellum is to calculate and help coordinate muscle movement. It also helps us to control our balance and maintain posture. By receiving information from the rest of the nervous system about the position of the body in space, and after receiving motor commands from the cerebral cortex on what movements to make, the cerebellum is then able to calculate how to move and then communicate this information to the skeletal muscles. Importantly, the cerebellum is also involved in the voluntary movement involved in 'procedures' or 'sequences', such as tying your shoelace, riding a skateboard, playing guitar, or doing the dishes; often these sequences are so natural to us that they are hard to describe in words step-by-step. The cerebellum is also an important memory formation site for these kinds of activities.

Medulla

The **medulla** is a mass of neurons located at the very bottom of the brain stem, connecting the brain to the spinal cord. In this sense, it is the point at which the spinal cord meets the brain, creating one seamless messaging system in which neural messages can be transported. The medulla functions to regulate our autonomic functions, such as breathing, heart rate, digestion, blood pressure, sneezing, and so on.

Pons

The **pons** is located directly above the medulla in the brain stem. The pons:

- relays information between the the cerebral cortex and the cerebellum, as well as between the medulla and the midbrain,
- regulates the respiratory system,
- is involved in sleep and some research suggests dreaming and waking from sleep,
- is involved in some involuntary movements.

Cerebellum the ball-like structure at the lower back of the brain behind the brain stem, primarily involved in skeletal muscle movement and coordination

Memory device

The word 'cerebellum' is Latin for 'little brain'. You can remember the cerebellum as looking like a miniature brain at the back and bottom of our brain.

Medulla (also known as medulla oblongata) a mass of neurons located at the bottom of the brain stem, just above the spinal cord, primarily involved in regulating autonomic functions

Pons a small structure located directly above the medulla in the brain stem, primarily involved in relaying information between different brain areas and regulating the respiratory system

Memory device

'Pons' is Latin for 'bridge'. One way to remember its structure is that it acts as a bridge between the hindbrain (medulla) and the midbrain.

Midbrain 1.1.4.2

OVERVIEW

The midbrain is located in the centre of the brain and is part of the brain stem.

THEORY DETAILS
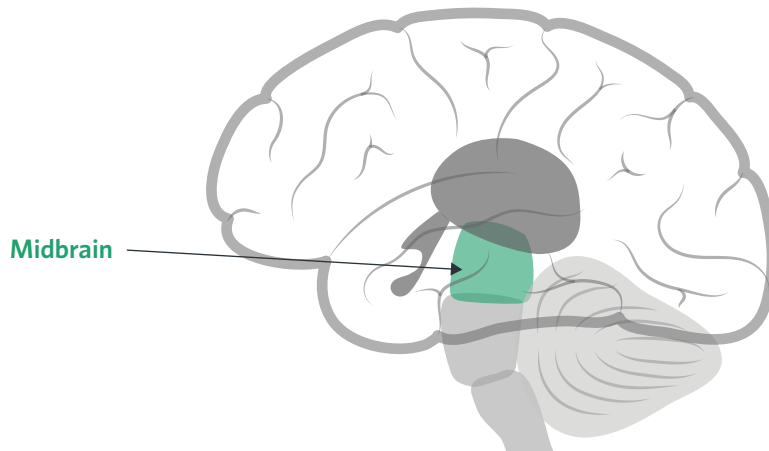
Image: Pikovit/Shutterstock.com

Figure 3 The midbrain

The **midbrain** is located in the middle of the brain between the hindbrain and the forebrain. The midbrain is involved in:

- processing sensory information, such as auditory, visual, and *tactile* (touch) information,
- regulating sleep and physiological arousal,
- motor movement, such as those involved in responding to sensory stimuli, and also more general voluntary movement. Motor messages also travel through the midbrain to and from the spinal cord and forebrain.

Reticular formation

The **reticular formation** is a net-like cluster of neurons located largely in the midbrain, though it extends to other areas. As shown in figure 4, this structure runs through the midbrain and extends along the brain stem, connecting the spinal cord to other parts of the brain. The reticular formation has pathways which project into various parts of the brain, including the forebrain and hindbrain, and functions primarily to:

- filter inputs of information to the brain, passing on important information to its different areas,
- adjusting muscle tension,
- regulating the sleep-wake cycle and consciousness,
- regulating physiological arousal and alertness through the *reticular activation system (RAS)*. This network of neurons has pathways which extend to allow information to be sent up toward the cerebral cortex, and down toward the spinal cord, telling the body to either increase or decrease arousal/alertness in response to information about the body's state and environmental stimuli.
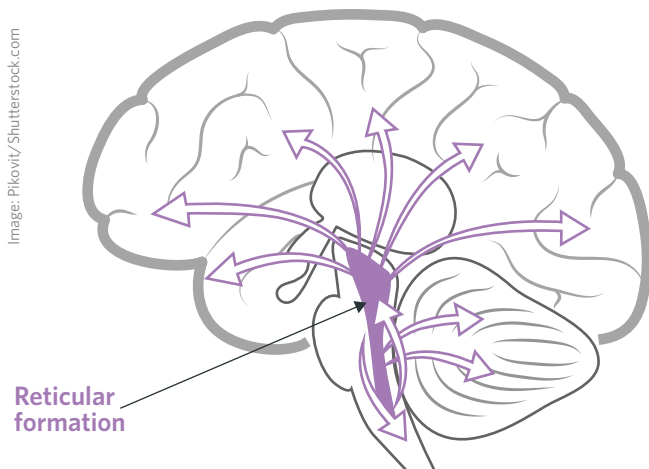
Image: Pikovit/Shutterstock.com

Figure 4 As you can see, the reticular formation is not confined to the midbrain. It has pathways both ascending to other areas of the brain and descending toward the spinal cord

Lesson link

In the next chapter in lesson *3C: Neurological disorders and Parkinson's disease*, you will learn about an area of the midbrain called the substantia nigra. This small area is involved in coordinating voluntary movements, and when there is damage to or loss of neurons in this area (such as the result of Parkinson's disease), voluntary movement can be impacted.

Midbrain a part of the brain stem in the centre of the brain

Reticular formation a net-like structure of neurons extending along the brain stem, connecting various parts of the brain and spinal cord via pathways and projections

Forebrain 1.1.4.3

OVERVIEW

The forebrain is the largest area of the brain and is responsible for the integration and coordination of information that allows us to perform our most complex functions.

THEORY DETAILS

The **forebrain** is the largest of the three areas of the brain, located at the top and front of the brain. It contains our most complex neuronal networks and pathways, being involved in our more sophisticated functions like cognition, perception, learning, and memory. The forebrain includes the hypothalamus, thalamus and cerebrum.

Forebrain the largest area of the brain, located at the top and front of the brain
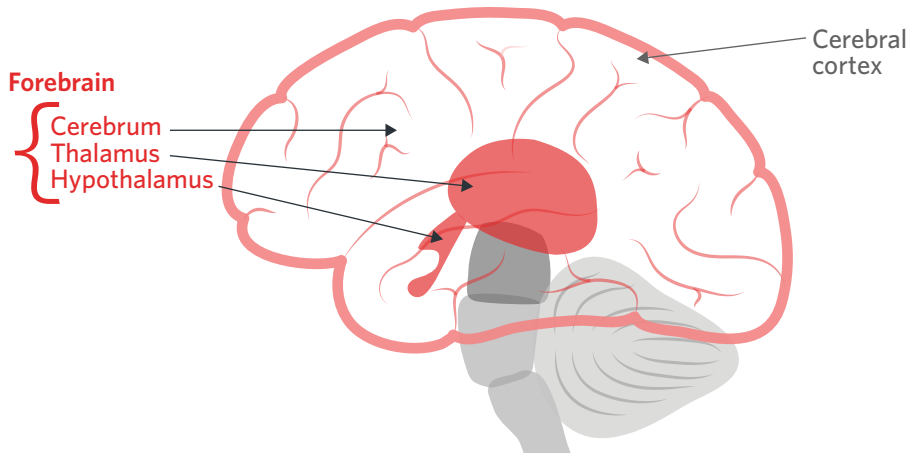
Image: Pikovit/Shutterstock.com

Figure 5 The forebrain and its components

Thalamus

The **thalamus** consists of two oval structures located deep beneath the cerebrum and above the midbrain, with one lobe in each of the cerebral hemispheres. The thalamus may be thought of as a 'relay centre' and filtering system in the brain. It also functions to regulate arousal, attention, and activity.

- Information from all of the senses, such as vision and taste (but excluding smell), pass through the thalamus, which filters out the most important information from sensory stimuli and then directs it to other parts of the brain (e.g. the cerebral cortex) for further processing. In this way, the thalamus is involved in attention and regulating activity, providing the most important and relevant sensory information to different brain regions for processing.

- Importantly, the thalamus also acts as a relay centre for information from higher brain areas, helping different areas to exchange information.

- Through connections with the reticular formation, the thalamus also contributes to arousal.

- The thalamus also plays a role in motor control by relaying motor signals between higher and lower motor centres in the brain (such as the cerebral cortex and the cerebellum).
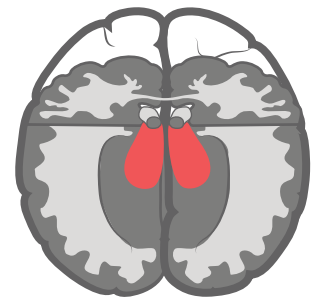
Image: Pikovit/Shutterstock.com

Figure 6 The thalamus is deep within the brain above the midbrain

Thalamus a structure comprising two egg-shaped globes within the forebrain, primarily involved as a relay centre and filtering system for sensory and motor signals, as well as regulating arousal, attention and activity

---

📑 *Lesson link*

In *chapter 6*, you will learn about the processing of sensory information (specifically vision and taste) in much more depth. The thalamus is important here: as shown in figure 7, when sensory information e.g. visual information enters the brain, it first is filtered by the thalamus before being directed to visual areas of the brain.

In lesson *2B: The nervous system*, you learnt that our brain acts as a post office to which sensory letters are sent. You can think of the thalamus as the 'mail sorter', making sure the right departments of the post office receive the right messages.
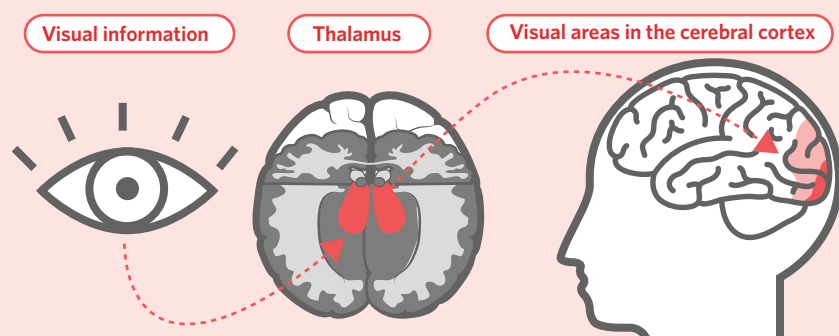
Image: igor kisselev, Pikovit/Shutterstock.com

Figure 7 The thalamus is a filter for incoming sensory information. It does this for all sensory information except smell

ACTIVITY 1

Research on the thalamus and age-related cognitive decline

As you now know, the thalamus is involved in both attention and arousal. It is also involved in the cognitive processing of information with speed.

A 2001 study conducted by Dutch researchers (Van Der Werf et al., 2001) found evidence for a correlation between the volume of the thalamus and performance on cognitive tests of speed: as thalamic volume decreased, so did performance on tests of cognitive speed.

57 healthy participants were gathered through advertisements in the newspaper. Data collection involved giving participants tests which measured their speed of information processing (how fast participants responded to and worked through cognitive tasks), as well as measuring their thalamic volume through structural magnetic resonance imaging (MRI). The findings are important to age-related cognitive decline because the study found that as we age, our thalamus decreases in volume. It is possible, then, that the diminishing thalamus may be related to age-related cognitive decline.

Answer the following questions on brain research and research methods.

1   Why was structural, rather than functional, neuroimaging used for this study? What is another type of structural neuroimaging technique that could have been used?
2   What type of data (subjective or objective) was collected? How do you know?
3   How big was the sample size? What does this mean for the generalisability of the study?
4   What was the sampling method used?

Hypothalamus

Have you ever been in a situation where it was inappropriate to laugh, but you couldn't stop? Your hypothalamus might have been involved. The **hypothalamus** is a small almond-sized structure located below the thalamus in your forebrain. It is responsible for a range of functions relating to emotional and motivated behaviour, as well as maintaining biological functioning.

- The hypothalamus is involved in maintaining *homeostasis*, which you learnt about in lesson 2B. This is the balanced state our body is in at rest that allows us to function optimally. The hypothalamus helps to maintain this state, for example, by regulating our hormone and body temperature levels.
- The hypothalamus is also involved in other biological processes, such as our sleep cycles, hunger, and sex drive.
- The hypothalamus is part of the *limbic system*. The limbic system also includes the amygdala and hippocampus, and together these three areas are involved in emotional and motivated behaviour and memories. In this way, the hypothalamus is involved when we perform pleasure-seeking or pain-averting behaviours, and is active when experiencing emotions such as fear, anger, and joy (such as when you can't stop laughing) in response to environmental stimuli.

Cerebrum

The **cerebrum** is the largest and uppermost area of the brain, extending from the front of the brain, all the way back to the cerebellum. It includes the cerebral cortex (the outermost layer which covers the brain), as well as the tissue and neurons beneath it. The cerebrum and the cerebral cortex are divided into the left and right hemispheres (sides of the brain) connected by the *corpus callosum*. The cerebrum also has four lobes, with half of each lobe in either hemisphere.

As mentioned, the areas of the cerebrum are responsible for our most sophisticated, higher-order functions like language, perception, evaluation and so on. You will continue to explore the functions of the cerebral cortex in the next lesson.

Hypothalamus an almond-sized structure in the forebrain, primarily involved in homeostatic functioning as well as motivated and emotional behaviours

Memory device

You can remember the roles of the hypothalamus (and the limbic system more generally) as being involved in the 'four Fs': feeding, fighting, fleeing, and fornification.

You can also remember that the hypothalamus is *below* the thalamus, as 'hypo' means beneath or below.

Lesson link

In **Units 3 & 4 Psychology**, you will learn more about how the amygdala and hippocampus, two areas of the limbic system, are involved in the formation and storage of emotional memories and our fear response.

Cerebrum the largest expanse of brain matter, including the outer cerebral cortex and inner tissue of the forebrain, responsible for a range of sophisticated functions

⊕ **Want to know more?**

Although the cerebral cortex is one of the largest brain regions and is responsible for our most complex functions, it has one quarter of the number of neurons as the cerebellum! The human brain consists of 86 billion neurons, and the cerebellum has around 80% of these. In contrast, the cerebral cortex has only about 20%, despite it being much bigger in terms of brain area and mass. The rest of the brain has less than 1% of the brain's neurons. How could this be the case? Think about the following factors:

- The number of connections neurons have and their density
- The comparative size of different neurons
- Other types of matter and cells in the brain

Essentially, this difference is due to the above factors. The neurons in the cerebellum are much smaller and more dense, whereas the neurons in the cerebral cortex are larger and have more connections that allow for our more complex functioning. Importantly, not all brain structures are made up primarily of neurons.

(Van Essen et. al., 2018)

Theory summary

In this lesson, you have learnt about the structure and function of the hindbrain, midbrain, and forebrain. These three areas each consist of important structures, each with unique and often interrelated functions.
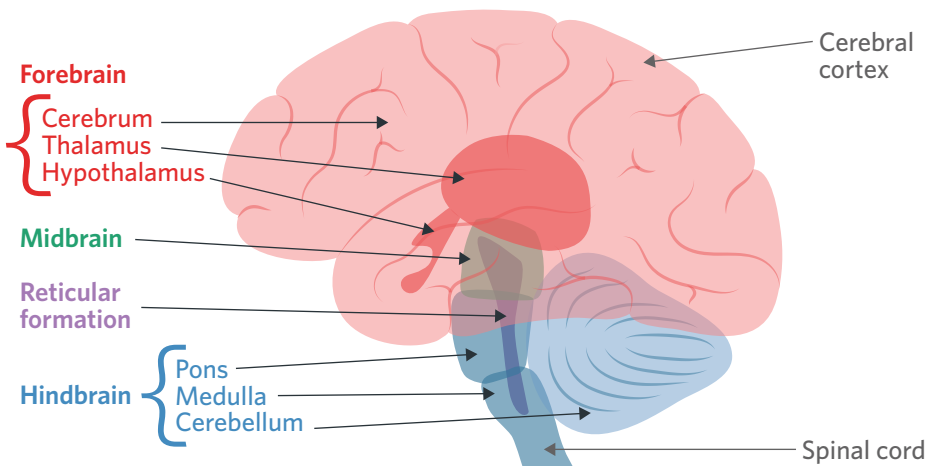
Image: Pikovit/Shutterstock.com

Figure 8 The hindbrain, midbrain, and forebrain and their components

ACTIVITY 2

Summarise the structures and functions of the three brain regions

Copy out and fill in this table to summarise the key information from this lesson.

Region	Structure/s	Functions
Hindbrain Overall, the hindbrain functions to…	Cerebellum	
	Medulla	
	Pons	
Midbrain Overall, the midbrain functions to…	Reticular formation	
Forebrain Overall, the forebrain functions to…	Thalamus	
	Hypothalamus	
	Cerebrum	

2D QUESTIONS

Theory-review questions

Question 1

Label the diagram using the following key terms.

- Hindbrain
- Midbrain
- Forebrain
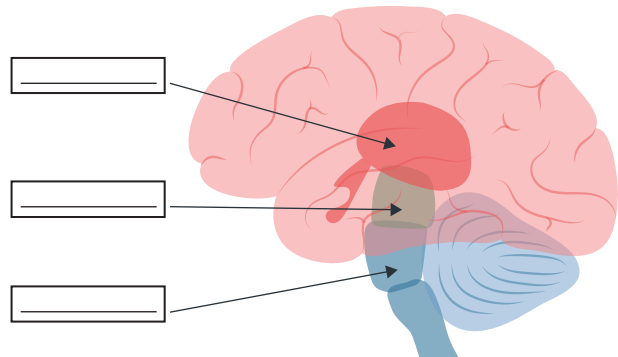
Image: Pikovit/Shutterstock.com

Question 2

True or false? Each of the three regions of the brain (the hindbrain, midbrain and forebrain) each have their own unique and distinct responsibilities, functioning in isolation.

A true

B false

Question 3

Which of the following brain regions is responsible for our most complex and sophisticated functions? *(Select one)*

A hindbrain

B midbrain

C forebrain

Question 4

Which of the following structures are part of the hindbrain? *(Select all that apply)*

I medulla

II cerebrum

III cerebellum

IV thalamus

V pons

VI spinal cord

Question 5

True or false? The reticular formation is solely located in the midbrain.

A true

B false

Question 6

True or false? The hindbrain, midbrain, and forebrain are all involved in motor movement.

A true

B false

Skills

Perfect your phrasing

Question 7

Which of the following sentences is most correct?

A   The brain stem is part of the spinal cord and includes only the midbrain.

B   The brain stem is a continuation of the spinal cord and includes the midbrain and parts of the hindbrain.

Exam-style questions

Multiple-choice questions

Question 8   (1 MARK)

Which area of the brain is covered by and includes the outer layer of the cerebral cortex?

A   hindbrain

B   midbrain

C   forebrain

D   brain stem

Question 9   (1 MARK)

Which of the following structures is **not** part of the forebrain?

A   cerebrum

B   thalamus

C   hypothalamus

D   cerebellum

Question 10   (1 MARK)

The hindbrain is primarily responsible for

A   complex cognitive processes like perception and language processing.

B   autonomic functioning and basic motor function.

C   mental health.

D   muscle tone.

Question 11   (1 MARK)

Phoenix kicked a soccer ball.

Which of the following options best describes two areas of the hindbrain and how they would be involved in this activity?

A   The cerebellum would help to communicate to Phoenix's skeletal muscles how they should move (after receiving instructions from the cerebral cortex), while the pons helps to relay information about this movement between the cerebral cortex and the cerebellum.

B   The cerebellum would decide what to move and the pons would then communicate this information to Phoenix's skeletal muscles.

C   The medulla would decide which muscles to move, and then Phoenix's cerebellum would tell them to move.

D   The pons would receive information about what to move from the cerebral cortex, and the cerebellum would relay this information between the cerebral cortex and the pons.

Short-answer questions

Question 12 (2 MARKS)

Identify two functions of the reticular formation.

Question 13 (4 MARKS)

Dasha was walking in a field of her favourite flowers, sunflowers. She could hear birds singing and could see many sunflowers. Overjoyed, Dasha bent down and picked one of the flowers and held it close to her, smiling.

Identify two structures of the forebrain and explain how they may have been involved in two of Dasha's actions.

Questions from multiple lessons

Question 14 (1 MARK)

Areas of the brain, such as the cerebral cortex and cerebellum, are involved in communicating information about how to move. When instructions on how and what to move are sent to the peripheral nervous system, these messages would be communicated via

A sensory neurons.

B motor neurons.

C interneurons.

D glial cells.

Question 15 (1 MARK)

Different areas of the brain have different numbers of neurons. For example, the cerebellum has many more neurons than the cerebral cortex. This would also likely mean that

A they also have different numbers of glial cells.

B some areas of the brain function better than others.

C some areas of the brain function quicker than others.

D the areas with more neurons are larger than areas with less neurons.

2E THE CEREBRAL CORTEX

Do different areas of the brain have specific functions? Or is the brain interrelated for all of our mental processes and behaviours? In this lesson, you will explore these questions further by learning about the cerebral cortex, including its four lobes, as well as the psychological concepts of hemispheric specialisation and localisation of function.

2A Historical approaches to understanding the brain	2B The nervous system	2C The neuron	2D Structure and function of the brain	2E The cerebral cortex

Study design dot point

- the role of the cerebral cortex in the processing of complex sensory information, the initiation of voluntary movements, language, symbolic thinking and the regulation of emotion, including localisation of function.

Key knowledge units

The cerebral cortex	1.1.5.1
Lobes of the cerebral cortex	1.1.5.2

The cerebral cortex 1.1.5.1

OVERVIEW

The cerebral cortex is the outermost layer of the brain's surface which is responsible for a number of different thoughts, feelings, and behaviours.

THEORY DETAILS

The **cerebral cortex** is the thin outer layer of the cerebrum. It has important functions in the processing of complex sensory information, the initiation of voluntary movements, language, symbolic thinking, and the regulation of emotion. Different areas of the cerebral cortex have different roles in all of these tasks, as illustrated by **hemispheric specialisation** (the unique functions of each of the cerebral hemispheres) and the specific roles of each of the four lobes of the cerebral cortex that you will examine in this lesson.

Cerebral cortex the thin outer layer of the cerebrum

Hemispheric specialisation the idea that each of the brain's cerebral hemispheres has its own specialisations

> (!) **Useful tip**
>
> The functions of the cerebral cortex are often divided into three different categories:
>
> - Sensory
> - Motor
> - Associative (integrating the information from different areas to perform higher-order mental processes)
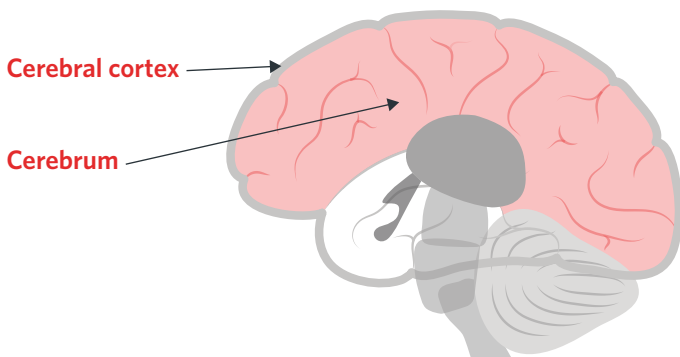
Image: Pikovit/Shutterstock.com

Figure 1 The cerebral cortex is the outermost area of the brain's surface that includes part of the cerebrum

Hemispheric specialisation

The cerebral hemispheres are the two almost-symmetrical areas of the brain running from its front to its back that are connected by the corpus callosum (see figure 2). These hemispheres are called the left and right hemispheres respectively. They share many of the same functions, but perform these functions on different sides of the body. These are **contralateral functions**, meaning that each hemisphere controls the opposite side of the body:

- The *right* hemisphere therefore receives sensory information from, and controls the movements of, the *left* side of the body.
- The *left* hemisphere of the brain receives sensory information from, and controls the motor movements of, the *right* side of the body.

Each hemisphere nonetheless also has its own specialised functions. Hemispheric specialisation is the term that is used to describe the unique functions of one hemisphere that is not shared with the other. This is an example of the psychological principle of **localisation of function**, which suggests that different areas of the brain are dominant for different behaviours and mental processes. The localised functions of the left and right hemispheres are shown in table 1.

Table 1 The localised functions of the left and right hemispheres

Hemisphere	Functional dominance	Example
Left hemisphere	Verbal and analytical functions including being active in: • Reading • Writing • Speaking (both production and interpretation of speech) • Aspects of *sequential* (step-by-step) processes of analysis.	The left hemisphere is most dominant when composing an argument that develops a logical sequence of points in order to posit a particular position. The left hemisphere is also most dominant when reading and interpreting a sentence.
Right hemisphere	Non-verbal functions including being active in: • Visual awareness, including recognition of places, objects and faces • Spatial awareness.	The right hemisphere is most dominant when appreciating visual stimuli, such as art.

Throughout the rest of this lesson, you will also learn about the role of hemispheric specialisation in controlling movement and processing sensations from the opposite side of the body.

Lobes of the cerebral cortex 1.1.5.2

OVERVIEW

The cerebral cortex can be divided into four lobes: the frontal lobe, parietal lobe, occipital lobe, and the temporal lobe.

THEORY DETAILS

Another common way of looking at the brain is its division into four distinct areas called lobes: the frontal lobe, parietal lobe, occipital lobes and temporal lobes. Each of these lobes are responsible for different and unique functions, such as the frontal lobe being involved in motor movements, the occipital lobe being involved in vision and the temporal lobes being involved in memory. This further supports the idea of localisation of function to specific areas of the brain.

Contralateral functions the role of each cerebral hemisphere to receive sensory information from, and control the movement of, the opposite side of the body

Left hemisphere   Right hemisphere
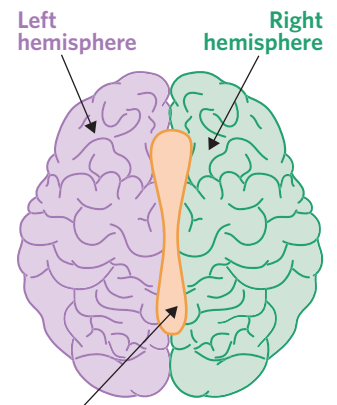
Position of the corpus callosum

Image: Veronika By/Shutterstock.com

Figure 2 The cerebral hemispheres of the brain

Localisation of function the psychological principle that suggests that different areas of the brain are responsible for different behaviours and mental processes

Memory device

You can remember that the left hemisphere is responsible for processes of language and logic, as all of these start with 'L'.

Memory device

You can remember all of the lobes of the cerebral cortex using the acronym **FPOT**:

Frontal lobe

Parietal lobe

Occipital lobe

Temporal lobe

Frontal lobe

The **frontal lobe** is the largest lobe of the cerebral cortex and is its frontmost area. It has multiple functions crucial for our functioning, including higher-order mental processes such as logic and reasoning, the expression of emotions, personality, voluntary movement, and the production of speech. The frontal lobe comprises specific brain regions that each have distinct functions. These include the:

- Prefrontal cortex
- Premotor cortex
- Primary motor cortex
- Broca's area

Frontal lobe the largest lobe of the cerebral cortex at the front of the cerebral hemispheres with the functions of high-order mental processes, regulation and expression of emotions, voluntary movement, and the production speech
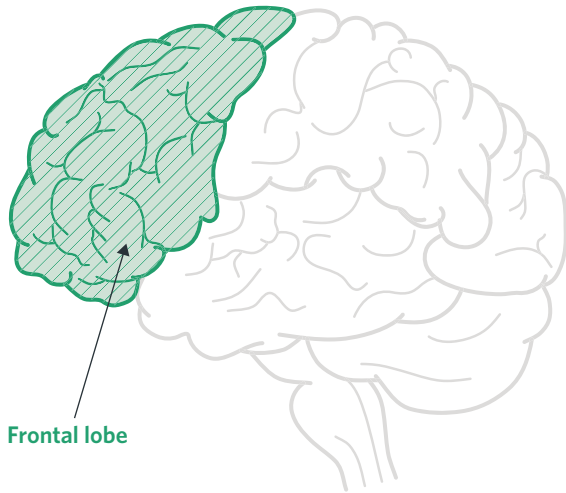
Frontal lobe

Image: Veronika By/Shutterstock.com

Figure 3 The frontal lobe

The **prefrontal cortex** of the frontal lobe has an important role in *executive functions*, which relate to thoughts, feelings, and behaviours that demonstrate higher-order cognitive capabilities. This includes symbolic thinking, reasoning, decision making, planning, and the regulation and expression of emotions that influence our personality. This is the last area of our brains to fully develop, reaching maturity at about 25 years old for most people.

Prefrontal cortex an area of the frontal lobe responsible for higher-order cognitive processes

The prefrontal cortex also has other important functions, including initiating voluntary movement, which it does alongside the **premotor cortex**, and the **primary motor cortex**, which are other important regions in the frontal lobe.There are a sequence of mental processes involved when we consciously move different regions of our body. Such sequences begin with the prefrontal cortex, which first plans a particular motor sequence. The premotor cortex then receives the planned movements and processes them into the organised sequence of movements that are required for the fluent execution of movement by our skeletal muscles. This sequence is then sent to the primary motor cortex, which initiates these voluntary movements by signalling the other parts of the brain, such as the cerebellum, to send afferent motor neural messages to our skeletal muscles.

Premotor cortex an area of the frontal lobe responsible for planning necessary sequences for motor movements

Primary motor cortex an area of the frontal lobe that initiates voluntary movements by sending motor neural messages to our skeletal muscles

The interrelationship between the prefrontal, premotor, and primary motor cortices can be demonstrated through the example of picking up our drink bottle and drinking from it. The prefrontal cortex would first register that the drink bottle needs to be picked up and would send this information to the premotor cortex. The premotor cortex would then plan the coherent sequence of movements needed for this action (picking up the bottle, raising it to the lips, squeezing the bottle so that water comes out, etc.) and send this information to the primary motor cortex. The primary motor cortex would lastly initiate these sequences of movements by signalling the cerebellum to send afferent motor neural messages to the skeletal muscles in the hands and arms to carry out this movement of picking up the drink bottle and drinking from it.

> **Lesson link**
>
> In lesson **2D: Structure and function of the brain**, you also learnt about the interrelationship between the frontal lobe and cerebellum in initiating voluntary movement. Specifically, you learnt that the cerebellum receives motor commands from the cerebral cortex on what movements to make and then communicates this information to the skeletal muscles.

In this way, although the different areas of the frontal lobe have specific functions, they all work together in order to execute a behaviour such as movement.

Prefrontal cortex → Premotor cortex → Primary motor cortex
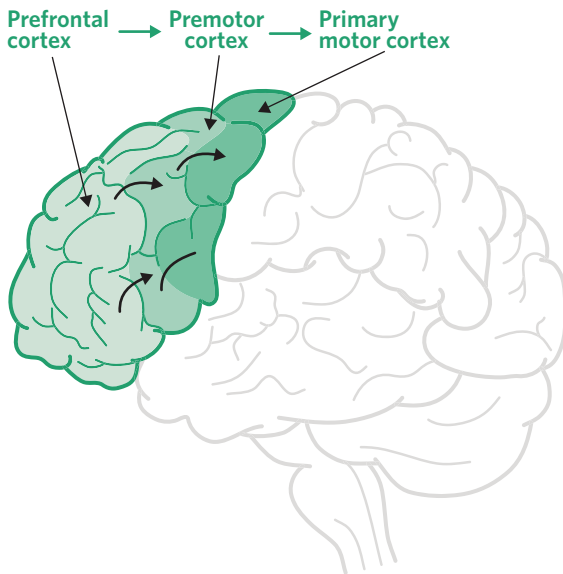
Image: Veronika By/Shutterstock.com

Figure 4 The process of initiating voluntary movement begins in the prefrontal cortex, then the premotor cortex, and finishes with the primary motor cortex that sends efferent neural messages to skeletal muscles

The role of hemispheric specialisation in voluntary movement detailed earlier in the lesson applies to the role of the primary motor cortex in initiating voluntary movement. The primary motor cortex on the left side of the frontal lobe is responsible for initiating motor movement on the right side of the body and, by extension, the primary motor cortex of the right side of the frontal lobe is responsible for initiating motor movement on the left side of the body.

Another important region of the left frontal lobe in particular is the **Broca's area**, which is responsible for the *production* of speech. This means that the Broca's area is involved in coordinating the appropriate movements (i.e. movement of the tongue, lips, jaw, and vocal cords) required to produce speech clearly and fluently. There is also evidence that Broca's area is involved in some aspects of speech comprehension. When the Broca's area is damaged, such as can occur through injury or stroke, this can result in *Broca's aphasia*, which is characterised by the difficulty to produce speech. You learnt about this in lesson 2A.

Broca's area the area of the frontal lobe responsible for the production of speech and some aspect of speech interpretation

Frontal lobe
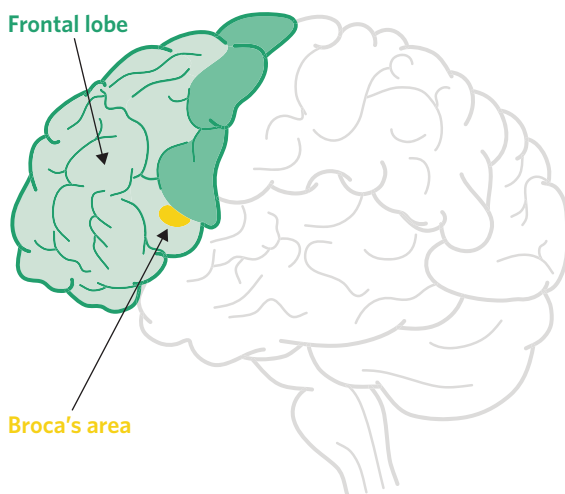
Broca's area

Image: Veronika By/Shutterstock.com

Figure 5 Broca's area within the frontal lobe

The frontal lobe also includes neurons that connect to other parts of the brain, such as the gustatory cortex, which plays an important role in taste perception. The gustatory cortex extends to the parietal lobe, therefore demonstrating that while different lobes of the brain have specialised functions, they also communicate with each other.

Want to know more?

Another primary sensory cortex that is located in the frontal lobe (and parts of the temporal lobe) is the primary olfactory cortex. The primary olfactory cortex is largely responsible for processing the sensation of smell.

Parietal lobe

The **parietal lobe** is the area behind the frontal lobe with the function of receiving and processing sensory stimuli.

Parietal lobe the lobe of the cerebral cortex behind the frontal lobe with the functions of receiving and processing sensory stimuli and spatial awareness
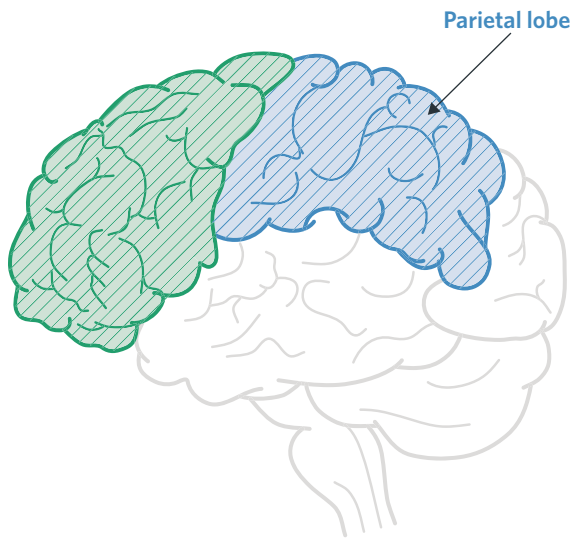
Image: Veronika By/Shutterstock.com

Figure 6 The parietal lobe

Similarly to the frontal lobe, there are specific areas within the parietal lobe with unique functions. The **primary somatosensory cortex** is an important region of the parietal lobe that receives and processes sensory information and is important for *spatial awareness* (an awareness of the position of our body in relation to our external environment). This means that sensory sensations of touch, temperature, and pain are all processed by the primary somatosensory cortex. Here again, hemispheric specialisation plays a role in how the primary somatosensory cortex receives and processes sensory afferent neural messages. The primary somatosensory cortex on the left side of the parietal lobe receives and processes the sensory neural information of the right side of the body and, by extension, the primary somatosensory cortex on the right side of the parietal lobe receives and processes the sensory neural information of the left side of the body.

Primary somatosensory cortex the area of the parietal lobe responsible for receiving and processing sensory information
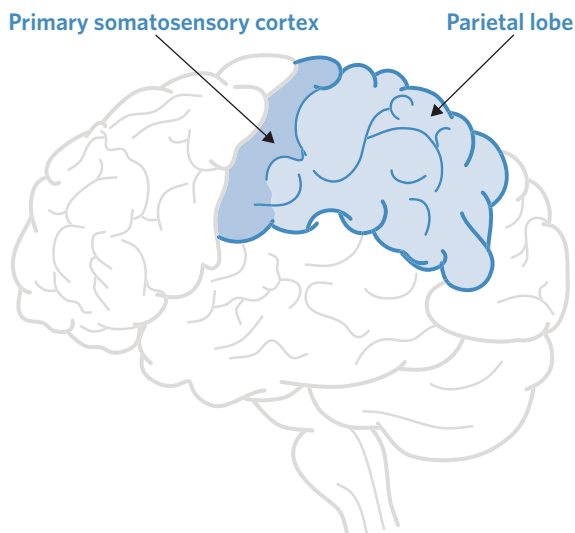
Image: Veronika By/Shutterstock.com

Figure 7 The primary somatosensory cortex

The primary gustatory cortex also extends into the parietal lobe, meaning that it communicates with the frontal lobe in order to achieve taste perception.

Want to know more?

The amount of brain mass of the primary somatosensory cortex that is dedicated to a particular part of the body demonstrates the sensory sensitivity of that area of the body. The greater the cortical area of the parietal lobe that is dedicated to a body part, the more sensitive it is to the sensation of touch. A *homunculus* is a figure that represents each part of the body in relation to the cerebral size that is responsible for receiving and processing its sensory information. It is a good thing that we don't actually look like this!

There is also an equivalent diagram that shows how much of and what areas of the primary motor cortex are devoted to different parts of the body. This demonstrates which parts of the body we have the finest motor control over.
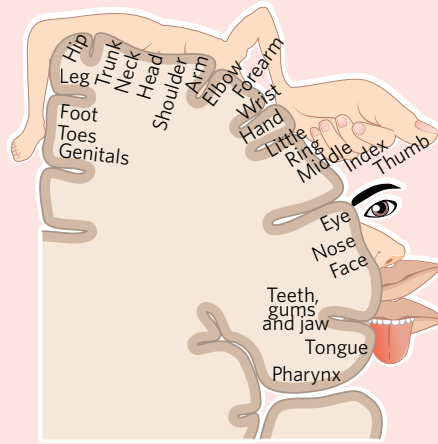
Figure 9 A diagram showing the primary motor cortex and its corresponding area of the body that it is responsible for controlling

Figure 8 The homunculus

Occipital lobe

The **occipital lobe** is the rearmost lobe of the cerebral cortex behind the parietal lobe that has a key function in processing visual stimuli.
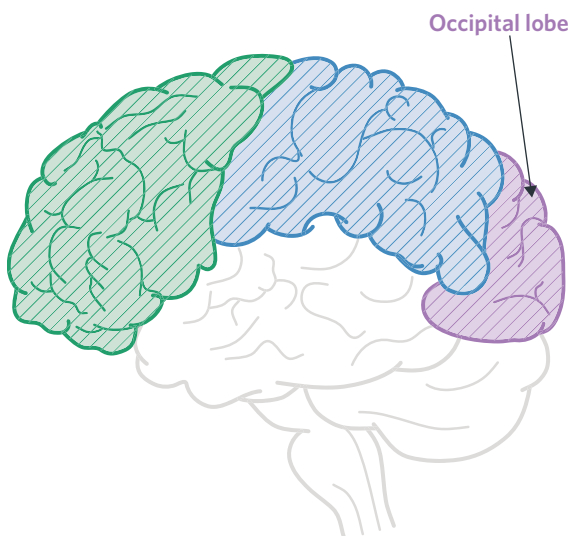
Figure 10 The occipital lobe

Image: Veronika By/Shutterstock.com

Occipital lobe the rearmost lobe of the cerebral cortex behind the parietal lobe, with the primary function of processing visual stimuli

The **primary visual cortex** is an important region of the occipital lobe in the sense of vision, receiving visual information from the sensory receptors located on the retina of our eyes. The role of primary visual cortex within each hemisphere of the occipital lobe is slightly more complex than with the primary somatosensory cortex and primary motor cortex detailed so far in this lesson, but still supports the concept of hemispheric specialisation insofar as each hemisphere processes different visual information. Each hemisphere receives and processes half the visual information from each individual eye (as opposed to each hemisphere processing the visual information for each eye respectively):

Primary visual cortex the area of the occipital lobe involved in receiving visual information from the sensory receptors located on the retina of our eyes

- The left primary visual cortex receives and processes the visual information from the left part of each eye, which receives visual information from our right visual field.
- The right primary visual cortex receives and processes the visual information from the right part of each eye, which receives visual information from our left visual field.

In this way, the functioning of the primary visual cortex demonstrates both hemispheric specialisation and the contralateral nature of brain functioning.
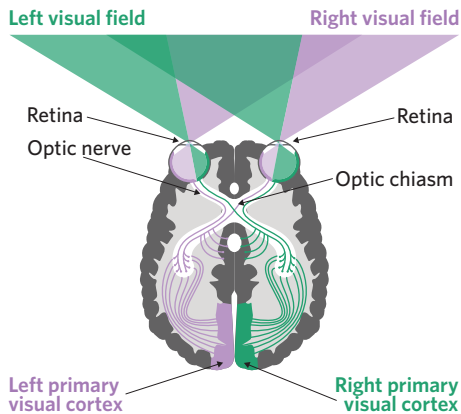
Image: VectorMine/Shutterstock.com

Figure 11   The primary visual cortex of each hemisphere receives and processes half the visual information from each individual eye

Temporal lobe

The **temporal lobe** is the lower central lobe of the cerebral cortex, responsible for auditory perception, as well as being involved in memory, visual perception, and emotional responses.
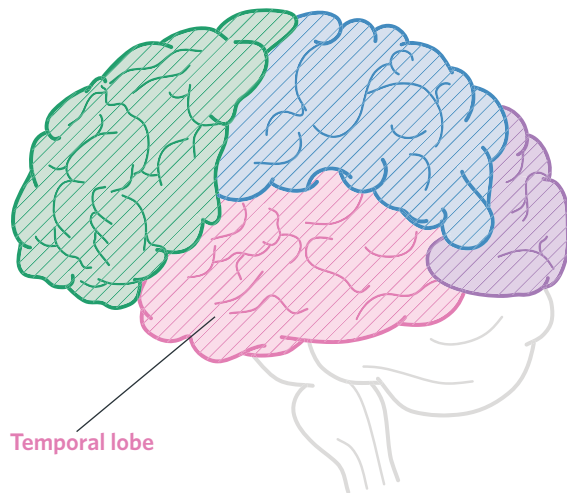
Image: Veronika By/Shutterstock.com

Figure 12   The temporal lobe

The **primary auditory cortex** is located in both the temporal lobes of each cerebral hemisphere. It receives the sensory auditory information from the ears and processes it in order to give these sounds meaning. Different regions of the primary auditory cortex are responsible for processing different kinds of sounds and are able to identify these sounds as distinct from one another.

Surrounding the primary auditory cortex is the **Wernicke's area**, which is usually located in the left hemisphere (at the point in which the temporal and parietal lobes meet) and is responsible especially for the comprehension of speech. This likewise demonstrates the localisation of function, where the primary auditory cortex of the left temporal lobe has its distinct role of *processing* this sensory information, whereas the Wernicke's area *interprets* this sound in order to give it meaning. When the Wernicke's area of the brain is damaged, this can result in a condition called *Wernicke's aphasia*, which is characterised by the inability to understand spoken words and sentences. Wernicke's aphasia can also involve difficulties with producing meaningful speech, as while sentences are usually spoken with correct structure, non-sensical words or phrases may also be included.

Lesson link

You will learn more about how we process visual information, including the role of the primary visual cortex, in lesson *6B: Vision*.

Temporal lobe the lower central lobe of the cerebral cortex, responsible for auditory perception, as well as being involved in memory, visual perception, and emotional responses

Primary auditory cortex the area of the temporal lobe that is responsible for the perception of sound

Wernicke's area the area of the temporal lobe responsible for the comprehension of speech
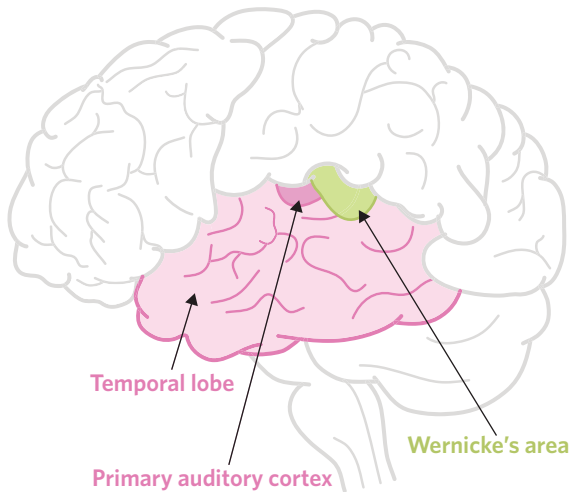
Image: Veronika By/Shutterstock.com

Figure 13   The primary auditory cortex and Wernicke's area

The temporal lobe is also involved in memory, visual perception, and emotional responses. For example, it is also responsible for object and facial recognition through working with memory and visual information from other areas of the brain.

Theory summary

In this lesson, you have learnt about the role of the cerebral cortex in processing different kinds of information. This involves learning firstly about the hemispheres of the cerebral cortex, which receive, process, and interpret information from the opposite side of the body. You also learnt about the different lobes of the cerebral cortex, which have distinct functions in the processing of different kinds of information, demonstrating the psychological concept of localisation of function. The roles of each lobe of the cerebral cortex, and the important brain regions within each lobe, are summarised in table 2. The brain nonetheless functions in a holistic way. Different mental processes require interrelationships between different areas of the brain.

Table 2   Summary of the roles of the lobes of the cerebral cortex in processing different types of information

Lobe of the cerebral cortex	Role
Frontal lobe (comprising of the prefrontal cortex, premotor cortex, primary motor cortex, and Broca's area)	• Initiating voluntary movements (including the production of speech) • Higher order executive functions (e.g. symbolic thinking) • Regulating and expressing emotions • Personality • Taste perception
Parietal lobe (comprising of the primary somatosensory cortex)	• Processing sensory information (e.g. the sensation of touch) • Spatial awareness • Taste perception
Occipital lobe (comprising of the primary visual cortex)	• Processing visual information
Temporal lobe (comprising of the primary auditory cortex and Wernicke's area)	• Processing auditory information (including the interpretation of speech) • Memory • Visual perception • Emotional responses

2E QUESTIONS

Theory-review questions

Question 1

Fill in the blanks with the following terms.

- Frontal lobe
- Hemispheric specialisation
- Cerebral cortex

The _____ is the thin outer layer of the cerebrum. It can be divided into two hemispheres, which demonstrates the concept of _____ with each hemisphere having unique functions for different thoughts, feelings, and behaviors. It can also be divided into four lobes, including the _____, parietal lobe, occipital lobe, and temporal lobe.

Question 2

True or false? The left hemisphere is responsible largely for verbal and analytical functions.

A true

B false

Question 3

Which of the following structures are part of the frontal lobe? *(Select all that apply)*

I primary somatosensory cortex

II premotor cortex

III Broca's area

IV Wernicke's area

V primary visual cortex

Question 4

Which of the following brain structures is most significantly involved in spatial awareness? *(Select one)*

A prefrontal cortex

B primary somatosensory cortex

C Broca's area

Question 5

Which structure of the occipital lobe is responsible for receiving visual information? *(Select one)*

A Wernicke's area

B prefrontal cortex

C primary visual cortex

Question 6

True or false? The temporal lobe contains the Wernicke's area, which is involved in interpreting speech.

A true

B false

Skills

Perfect your phrasing

Question 7

Which of the following sentences is most correct?

A The Broca's area functions to assist the *production* of speech, whereas the Wernicke's area functions to *interpret* speech.

B The Broca's area functions to *interpret* speech, whereas the Wernicke's area functions to assist the *production* of speech.

Exam-style questions

Multiple-choice questions

Question 8   (1 MARK)

The motor functions of the cerebral hemispheres are contralateral, meaning that they

A control the opposite side of the body.

B control the same side of the body.

C control both sides of the body.

D control neither side of the body.

Question 9   (1 MARK)

The specialised function of processing visual information is enabled largely due to the

A left cerebral hemisphere.

B occipital lobe

C temporal lobe.

D premotor cortex.

Use the following information to answer Question 10-12.

Millie is walking her dog Jasper on the beach. It is a warm sunny day and after having walked for an hour Millie starts to feel the surface of her arms burning. Worried that she may get sunburnt, she applies some sunscreen to her arms. Satisfied that she won't get sunburnt, Millie enjoys the rest of her walk on the beach and is happy to see Jasper smiling and walking along happily.

Question 10   (1 MARK)

Which brain structure would have processed Millie's sensation of the temperature of her skin?

A premotor cortex

B primary motor cortex

C Broca's area

D primary somatosensory cortex

Question 11   (1 MARK)

Millie registering that she needs to put on sunscreen, planning the sequences of movements required, and then initiating these movements by sending motor messages to skeletal muscles would have been completed by which brain structures respectively?

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 12   (1 MARK)

Millie seeing Jasper's happy face while walking on the beach would have been processed by which brain structure?

A   Broca's area

B   Wernicke's area

C   primary auditory cortex

D   primary visual cortex

Short-answer questions

Question 13   (2 MARKS)

Explain the difference between the primary functions of the Broca's and Wernicke's areas in language.

Question 14   (3 MARKS)

Identify an area of the occipital lobe and describe how it demonstrates the principle of localisation of function.

Questions from multiple lessons

Question 15   (1 MARK)

The frontal lobe maintains an important role in the initiation of voluntary movement. Which division of the nervous system is responsible for executing the sequences of voluntary movements that have been planned in the frontal lobe?

A   the autonomic nervous system

B   the spinal cord

C   the somatic nervous system

D   the sympathetic nervous system

Question 16   (2 MARKS)

Describe a difference between the function of the pons and the frontal lobe.

CHAPTER 2 REVIEW

CHAPTER SUMMARY

This chapter was all about understanding the brain and how it allows us to function, including its role in mental processes and behaviour.

In **2A**, we learnt about approaches to studying and understanding the brain and how these have changed over time. Within the study of psychology, these methodologies to studying the brain have become more rigorous and technologically advanced. Specifically, you learnt about the following approaches:

- the heart versus brain debate
- the mind-body problem
- phrenology
- the first brain experiments
- neuroimaging techniques

After understanding a bit about the history of the psychological study of the brain, in **2B**, we learnt about the current understanding of the nervous system and its divisions, including the:

- central nervous system
- peripheral nervous system, which is divided into the:
  - somatic nervous system
  - autonomic nervous system, which is divided into the:
    - the sympathetic nervous system
    - parasympathetic nervous system

In **2C**, we extended this knowledge of the nervous system to the neuron: an extremely important cell responsible for communication within the nervous system. We learnt about the function of the neuron and its different components including the:

- dendrites
- axon
- myelin
- axon terminals

We also learnt about the importance of glial cells in helping neurons and the nervous system to function.

In **2D**, we started to learn about the brain in a bit more depth. We covered three areas of the brain, including:

- the hindbrain (including the cerebellum, medulla, and pons)
- the midbrain (including the reticular formation)
- the forebrain (including the thalamus, hypothalamus, and cerebrum)

Finally, in **2E**, we learnt more about the covering of the cerebrum known as the cerebral cortex. Specifically, we learnt about its role in the processing of complex sensory information, the initiation of voluntary movements, language, symbolic thinking, and the regulation of emotion. This included the concept of localisation of function, as demonstrated through hemispheric specialisation and the specific functions of the frontal, parietal, occipital, and temporal lobes.

2A
Historically, the brain was understood through approaches including:
- the brain versus heart debate
- the mind-body problem
- phrenology
- early experiments
- neuroimaging

2B
The human nervous consists of:
- the central nervous system (brain and spinal cord)
- the peripheral nervous system (including the somatic and autonomic, and sympathetic and parasympathetic nervous systems)

2C
The nervous system communicates via neurons which are supported by glial cells.

2D
The brain can be divided into the:
- Hindbrain (cerebellum, medulla, pons)
- Midbrain (including part of the reticular formation)
- Forebrain (thalamus, hypothalamus and the cerebrum which is covered by the cerebral cortex)

2E
The cerebral cortex can be divided into two hemispheres and four lobes, each with important localised and complex functions.

Image: Systemoff /Shutterstock.com

CHAPTER REVIEW ACTIVITIES

Review activity 1: Historical timeline
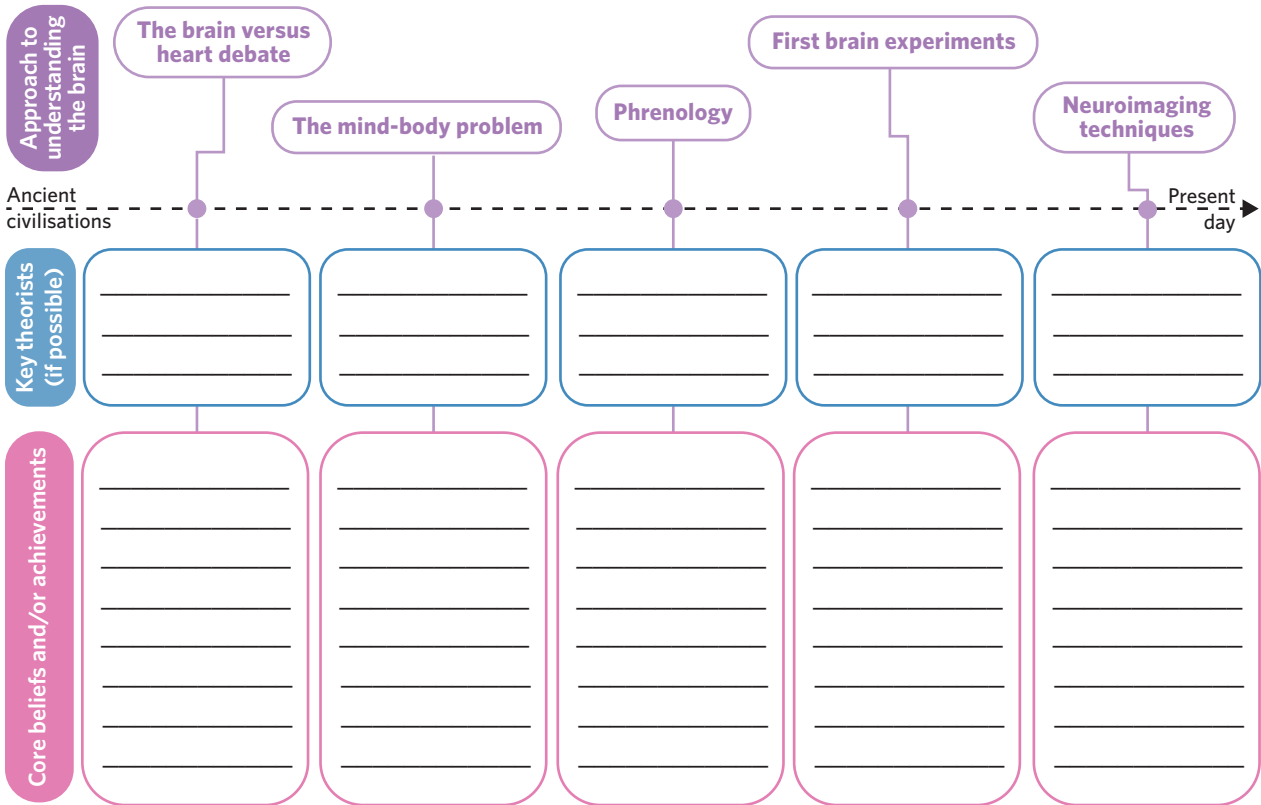
Review activity 2: Match the key terms

Match the key of the components of the neuron on the left with words that describe their function on the right.

Key term	Function
Dendrites	Receive
Axon	Insulate
Myelin	Support
Axon terminals	Transmit
Glial cells	Release

Review activity 3: Making inferences

Although our brain regions or structures don't operate in isolation, a localisation of function does exist. When someone suffers a brain trauma, medical professionals are often able to infer which area of the brain has been impacted based on the things that their patient is no longer able to do. You will learn more about the different effects of brain damage to the cerebral cortex and how we can recover in the next chapter. For the following accident scenarios, identify the likely brain region/s that may have been impacted based on the symptoms described and what you have learnt so far.

1   Thomas fell out of a tree and hit his head. His friends and family have noticed that he is way more irritable than he used to be, and his personality seems a bit 'off'.

2   Akhmad had a stroke and his language is now impaired. Although he produces lengthy and grammatically correct utterances, their content is nonsensical.

3   Tahnee was in a skiing accident from which she suffered a serious blow to the head. She now finds it difficult to concentrate when working, and often feels drowsy. Interestingly, she has also noticed that she has decreased sensitivity to touch and taste.

4   Thu has been drinking excessively for years and is now trying to quit drinking. Thu is surprised to find that even though she is now sober, she has trouble balancing and coordinating her movement.

5   George has a brain tumor in his forebrain. He is finding that his sex drive is far lower than usual, and that he is suffering from changes in body temperature throughout the day.

CHAPTER 2 TEST

Multiple-choice questions

Question 1 (1 MARK)

Dilating the pupils, increasing blood flow, and increasing oxygenation are all functions of the

A   central nervous system.

B   somatic nervous system.

C   sympathetic nervous system.

D   parasympathetic nervous system.

Question 2 (1 MARK)

Which of the following correctly identifies the location of the cerebral cortex?

A   The thin outer layer of the cerebellum.

B   The net of neurons that extends along the brain stem.

C   The thin outer layer of the cerebrum.

D   The deepest layer of the cerebrum.

Question 3 (1 MARK)

Hemispheric specialisation was most strongly supported by evidence from which of the following historical brain studies?

A   Descartes' conception of Cartesian dualism.

B   Sperry and Gazzaniga's studies on split-brain patients.

C   The discovery of phrenology.

D   Broca's studies of people with language aphasia.

Question 4 (1 MARK)

Scientists have found that the cerebellum contains far more neurons than the cerebral cortex. As a result of this finding, which of the following statements is true?

A   The cerebellum is responsible for our most sophisticated functions.

B   The cerebellum operates most efficiently.

C   The cerebellum is larger than the cerebral cortex.

D   The cerebellum contains more axons than the cerebral cortex.

Question 5 (1 MARK)

Which of the following options best identifies the part of the neuron labelled at point 'X' and a function of this part?

	Part of neuron	Function
A	Axon terminal	Releases neural messages into the synapse.
B	Myelin	Insulates the neuron.
C	Dendrites	Receive neural messages from the synapse.
D	Axon	Transmits neural information.
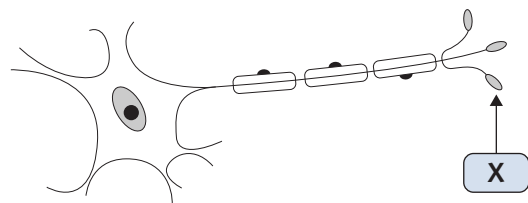
Question 6   (1 MARK)

Glial cells are located

A   only in the brain.

B   only in the central nervous system.

C   in both the peripheral and central nervous systems.

D   in only the cerebellum.

Question 7   (1 MARK)

When we process auditory information, several components of the brain are involved. Primarily,

A   the hypothalamus first filters the information, then sends it to the primary auditory cortex in the frontal lobe.

B   the thalamus first filters the information, then sends it to the primary auditory cortex in the temporal lobe.

C   the ears listen to the information and then send it to the cerebral cortex.

D   the cerebellum first filters the information, then sends it to the temporal lobe.

Question 8   (1 MARK)

A researcher is investigating language processing in the brain and wants to measure levels of activity. She should

A   use brain ablation to cut the Broca's and Wernicke's areas.

B   use a structural neuroimaging technique to collect images of the brain.

C   use electrical brain stimulation (EBS) to stimulate the left hemisphere.

D   use a functional neuroimaging technique.

Short-answer questions

Question 9   (2 MARKS)

Name a brain structure involved in regulating hormone levels and describe its location in the brain.

Question 10   (2 MARKS)

José woke up to a freezing cold room. Annoyed, he slid out of bed and went straight to the shower.

a   Identify a division of José's nervous system active when his body first sent information about the cold temperature to his brain from his sensory organs. (1 MARK)

b   Identify the division of José's nervous system active when he registered the cold temperature. (1 MARK)

Question 11   (3 MARKS)

This diagram shows a brain in which the three areas of the hindbrain have been numbered. Name which part of the diagram are labelled by numbers 1, 2, and 3.
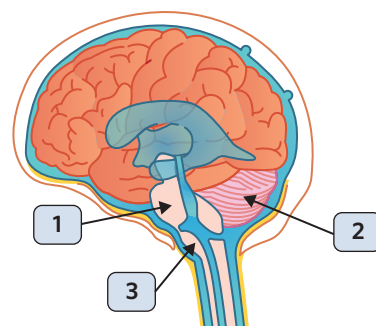
Image: VectorMine/Shutterstock.com

Question 12   (3 MARKS)

Perri was in a car accident and suffered a blow to the head. Although she recovered quickly, at first she experienced difficulty seeing. She had no other impairments to her other senses.

a   Name the lobe of the brain most likely affected by the accident. (1 MARK)

b   Describe how Perri's impairments to this lobe might demonstrate the concept of localisation of function. (2 MARKS)

Question 13   (2 MARKS)

Identify two functions of glial cells.

Question 14   (4 MARKS)

Outline the difference between structural and functional neuroimaging techniques, providing an example of each.

Question 15   (5 MARKS)

Wilder Penfield used electrical brain stimulation (EBS) to investigate the brain and was able to make landmark discoveries about the localisation of brain functions, particularly sensorimotor functions.

a   If a researcher were to use electrical brain stimulation to stimulate areas of the frontal lobe, identify two responses they might observe in a patient. (2 MARKS)

b   Explain how a researcher would be able to infer a function of the frontal lobe using electrical brian stimulation. (3 MARKS)

Question 16   (2 MARKS)

Describe the structure and function of the reticular activating system.

Key science skills questions

Question 17   (1 MARK)

As a brain research technique, ablation would most likely be deemed unethical because it

A   prevents voluntary participation.

B   breaches the no-harm principle.

C   prevents accurate debriefing.

D   breaches informed consent.

Question 18   (1 MARK)

After electrically stimulating a patient's brain, a researcher writes down a brief written description of the patient's response. What type of data is collected?

A   objective, quantitative data

B   subjective, quantitative data

C   objective, qualitative data

D   subjective, qualitative data

Question 19   (5 MARKS)

Sperry and Gazzaniga conducted many important in-depth studies on patients who had undergone split-brain surgery by having their corpus callosum severed.

a   With reference to Sperry and Gazzaniga's studies, explain the most 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. (3 MARKS)

Adapted from VCAA 2016 exam SAQ8a

b   Identify the type of investigation that Sperry and Gazzaniga's split-brain studies used and outline one limitation of this type of investigation. (2 MARKS)

Question 20   (6 MARKS)

Doctor Rosen wants to investigate the influence of arousal on attention processes in the brain. To do this, she gathers 50 participants and splits them into two groups at random. In the first group (condition 1), participants are to consume two cups of coffee and run 600 metres to increase arousal. After this, they then complete pen-and-paper concentration tasks while a neuroimaging machine tracks their brain activity. The second group (condition 2) completes the same concentration tasks but after spending half an hour watching television. Dr Rosen asked trained PhD students to administer the concentration tasks and clinicians to perform the neuroimaging, without telling either group the purpose of the study.

a   Identify one type of neuroimaging technique that would be appropriate for Doctor Rosen's study. Justify your response. (2 MARKS)

b   Identify the experimental design used and outline an appropriate procedure for allocating participants to condition 1 and 2. (2 MARKS)

c   Explain why Doctor Rosen asked trained PhD students to administer the concentration tasks without telling them the purpose of the study. (2 MARKS)

UNIT 1 AOS 1, CHAPTER 3

Brain plasticity and brain damage

03

3A Developmental plasticity

3B Brain injury and adaptive plasticity

3C Neurological disorders and Parkinson's disease

Key knowledge

- infancy and adolescence as periods of rapid development and changes in brain structure and function, including development of myelin, synaptic pruning and frontal lobe development

- the impact of injury to the cerebral cortex on a person's biological, psychological and social functioning and the ability of the brain to undergo adaptive plasticity, illustrated by rehabilitation of people with brain injuries

- the use of animal studies and neuroimaging techniques to develop understanding of human neurological disorders including Parkinson's disease

3A DEVELOPMENTAL PLASTICITY

How is it that an adult's brain is double the size of an infant's, but has less than half the amount of the neuronal connections? In this lesson, you will learn about the brain changes we experience as we grow into adulthood, as well as the answer to this question.

3A Developmental plasticity	3B Brain injury and adaptive plasticity	3C Neurological disorders and Parkinson's disease

Study design dot point

- infancy and adolescence as periods of rapid development and changes in brain structure and function, including development of myelin, synaptic pruning and frontal lobe development

Key knowledge units

Developmental plasticity   1.1.6.1

Developmental plasticity

Developmental plasticity 1.1.6.1

Infancy and adolescence   Myelination   Synaptic pruning   Frontal lobe development
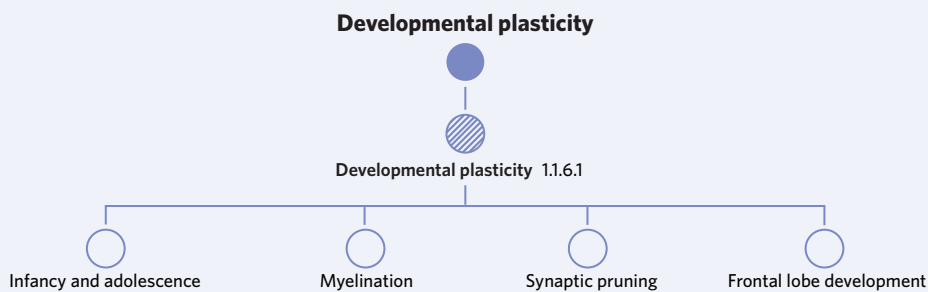
Developmental plasticity 1.1.6.1

OVERVIEW

Our brains have an amazing ability to change and develop in response to our experiences. This malleability is referred to as plasticity.

THEORY DETAILS

Plasticity refers to our brain's ability to physically change in response to experience and learning. When we interact with our environment, our brain and the connections within our brain mature and change in response.

Plasticity the ability of the brain to physically change in response to experience and learning

1. Brain   **2. Environmental interaction**   **3. Brain changes**
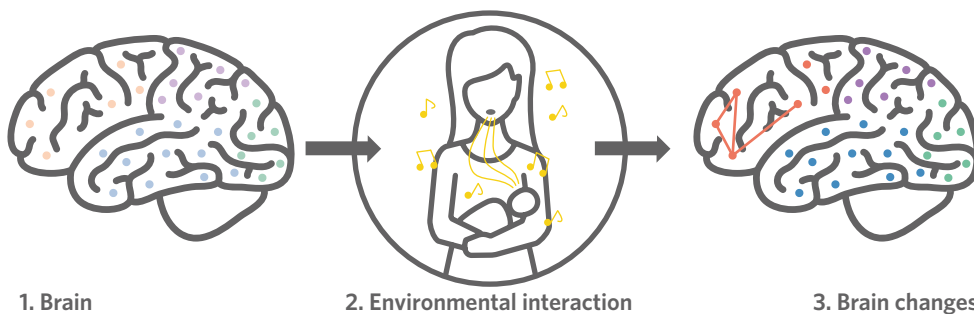
Image: Pikovit, VoodooDot/Shutterstock.com

Figure 1 Plasticity involves the brain physically changing in response to experience. For example, as a baby is exposed to their parents' language, their brain changes to incorporate this linguistic information

Plasticity occurs in response to two kinds of experience:

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*.

This lesson focuses on developmental plasticity. As we've said, developmental plasticity involves the changes our brain makes in response to ageing and maturation ('development'). Essentially, the brain physically changes to form the learnings and memories that we need as we grow up. As such, developmental plasticity occurs mostly from when we are a fetus until we are about 25 years of age, when the brain reaches maturity. After this stage, adaptive plasticity accounts for most changes in our brain's structure.

A number of processes occur as part of developmental plasticity. These changes primarily involve neurons and how they function, including the formation or adaptation of connections in neuronal circuits. As you learnt in lesson 2C, neuronal circuits form the physical foundations of everything we think, feel and do. Our brain also grows in size as part of developmental plasticity.

Developmental plasticity changes in the brain that occur in response to ageing and maturation

🧩 *Lesson link*

In the next lesson, lesson *3B: Brain injury and adaptive plasticity*, you will learn about the role of adaptive plasticity and how it can help the brain to recover from injury.

⊕ *Want to know more?*

The components of developmental plasticity which involve changes to neurons and their connections are listed here. Although you only need to know synaptic pruning and myelination in depth, it can help your understanding to be aware of what comes before them.

Proliferation ↓	When we are a fetus, our neurons form. This is called '**proliferation**'.
Migration ↓	**Migration** involves our neurons moving or 'migrating' from where they are first formed in the brain to where they will stay in the nervous system. This occurs largely during the fetal period.
Synaptogenesis ↓	The axons of neurons grow and form connections to nearby neurons creating **synapses**. This can occur throughout the lifespan but is most intense in infancy.
Synaptic pruning ↓	Underused synapses are cut off or 'pruned'. This occurs throughout the lifespan, but the periods which occur after infancy (age two to three) and during adolescence are the most intense periods of **synaptic pruning**.
Myelination 	**Myelination** occurs throughout the developmental period, involving the insulation of neurons to ensure efficient neuronal transmission. • Keep in mind that the final three stages occur throughout maturation, and don't have to occur in this precise order.

Infancy and adolescence

Neuroscientists have identified infancy and adolescence as two periods of significant change due to developmental plasticity. Essentially, the general trend of developmental plasticity in these periods is as follows:

- In **infancy**, the number of neuronal connections (synapses) greatly increases through the process of '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.

Infancy the developmental period from birth until one years old

Adolescence the developmental period beginning after the onset of puberty from approximately 10 to 19 years old

1. Start of infancy ➡ **2. End of infancy** ➡ **3. End of adolescence**
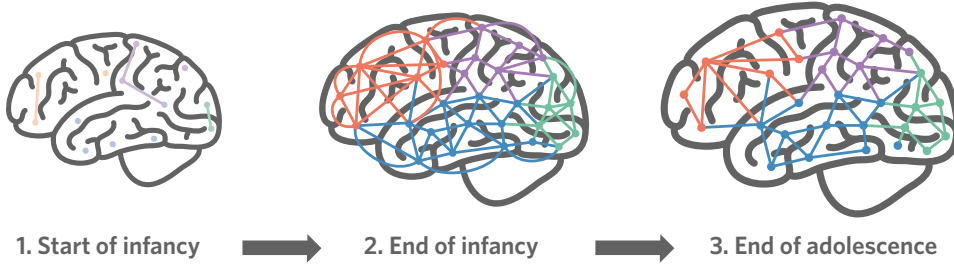
Image: Pikovit/Shutterstock.com

Figure 3 A representation of an infant and adolescent brain. Although our brain continues to grow after infancy, the number of connections between neurons decreases

If you think about it, this trend makes a lot of sense. As an infant, there is so much new information to learn and incorporate into our brain; we need lots of synapses as the foundation for these new memories and skills. As we get older, we still learn but do so at a slower pace as our learning becomes more specific and goal-directed. As such, learning later in life is more about refining the connections within our brain as opposed to just forming lots of connections.

Myelination

One important process of developmental plasticity is myelination. As you've learnt, myelin is the protein and fatty outer coating around the axon of a neuron. This ensures neuronal messages are transmitted quickly and efficiently.

When neurons are first formed, they do not have a myelin covering. **Myelination** refers to the process of neurons forming this protective coating. This is essential to developmental plasticity, as myelin facilitates the communication of messages between neurons and across neuronal networks. This means that as we develop and learn new skills, communication in the brain can happen quickly. Myelination mostly occurs from infancy through to early adulthood, but does continue across the lifespan.

Myelination the formation of myelin around the axons of neurons

Table 1 Myelination in infancy and adolescence

Myelination in infancy	Myelination in adolescence
Myelination of neurons begins before a baby is born. However, during infancy, myelination is rapid (Holmes et. al, 2012). This allows a baby to consolidate information from incoming stimuli and helps to form the neuronal basis for many life skills including emotion, language and movement.	Myelination also occurs in adolescence and into adulthood. 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.

Figure 4 An unmyelinated neuron (left) and myelinated neuron (right)

⊙ *Analogy*

Myelin can be compared to the rubber coating that insulates electrical wires, such as on your phone or laptop charger. Without this rubber, the inside wires (comparable to a neuron's axon) will not be protected and could be damaged and unable to send electrical currents.

Image: M.Style/Shutterstock.com

Figure 5 Just like electrical wires, neurons benefit from the safety of an outer coating

Synaptic pruning

Synaptic pruning refers to the process of eliminating or trimming away synaptic connections between neurons. When certain connections are not activated or used, they are eliminated. This is necessary to make way for more essential connections in our brain, thereby fine-tuning our brain's functioning and making it more efficient.
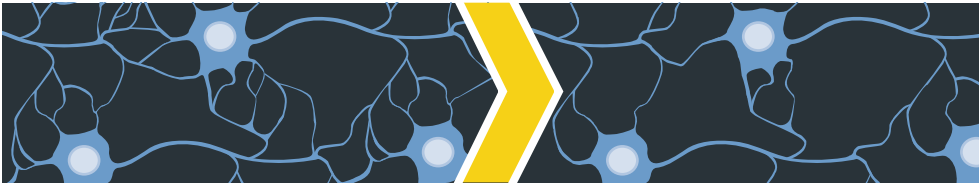
Figure 6 Neuronal circuits before pruning (left) and after pruning (right)

> **⚠ 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.

Synaptic pruning occurs over many years. 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.

> **⚠ Useful tip**
>
> There are some tricky areas of developmental plasticity. Some students incorrectly think that changes in the brain are always due to more neurons developing, or that neurons simply 'die off'. While this does partially occur, keep in mind that:
>
> - As we reach maturity, more so than just losing neurons, we lose the connections between neurons (synapses)
> - The growth in brain size from birth to adulthood is not just due to more neurons growing, but instead due to other processes of developmental plasticity outlined in this lesson (specifically myelination and synaptogenesis)

Frontal lobe development

As we age, all the regions of our brain mature and undergo the processes of developmental plasticity. Research suggests that our brain continues to develop until about 25 years of age. The last area of our brain to mature and undergo myelination and synaptic pruning is the frontal lobe. **Frontal lobe development** refers specifically to this long-term maturation of the frontal lobe, including its growth in size and the development of its neuronal pathways.

Importantly, an area called the prefrontal cortex is the last to develop in the frontal lobe. This area is responsible for higher-order decision making and reasoning. Some suggest that the late maturation of this area is responsible for the impulsive behaviours that characterise teenagehood.

Table 2 Frontal lobe development in infancy and adolescence

Frontal lobe development in infancy	Frontal lobe development in adolescence
From infancy onward, the synaptic density of the frontal lobe increases until its peak around age 10 (Jacobs et. al, 2001). In infancy, the size of the frontal lobe also increases and some myelination occurs. The number of neurons in the lobe also increases until about age six (Shankle et. al, 1999).	Synaptic pruning and myelination in the prefrontal cortex occurs mostly in adolescence and continues into early adulthood. This development contributes to emotional maturity and rationality.

Synaptic pruning the elimination of underused synapses

> **◎ Analogy**
>
> Like it is important to trim your hair to keep it healthy and allow it to flourish, neurons in the brain also need to be trimmed to allow for healthy and optimal brain functioning.
>
>
>
> **Figure 7** We need to prune our neurons just like we need to trim our hair
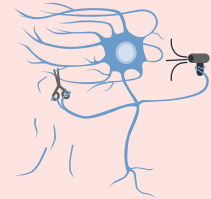
> **🧩 Lesson link**
>
> For a refresher on the roles of the frontal lobe, head to lesson **2E: The cerebral cortex**.

Frontal lobe development the growth and neural maturation of the frontal lobe

Frontal lobe
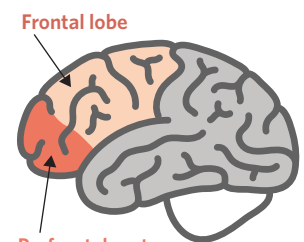
Prefrontal cortex

Image: Pikovit/Shutterstock.com

Figure 8 The frontal lobe and the prefrontal cortex are the last areas of the brain to complete the processes of developmental plasticity

Theory summary

- Developmental plasticity involves changes in the brain as it physically accommodates for our learnings and memories as we mature.
- Developmental plasticity begins when we are a fetus and ends when we are in our mid-twenties.
- Infancy and adolescence are two periods when changes due to developmental plasticity are most intense.

The processes of developmental plasticity with which you need to be most familiar are summarised in figure 9.

	Myelination	Synaptic pruning	Frontal lobe development
What?	The process of coating neurons' axons with a fatty protein layer.	The elimination of underused synapses.	The development of the frontal lobe, including its growth in size and the maturation of its neuronal connections.
Why?	To ensure neuronal communication is fast and efficient, laying the foundations for learning in infancy, and for more complex thought in adolescence.	To ensure the brain can function efficiently as only necessary connections are kept.	To allow for the functioning of any task the frontal lobe is responsible for, such as movement, language and decision making.
When?	Myelination occurs largely in infancy as neurons are first myelinated, and then further myelination occurs in adolescence.	Some pruning occurs after infancy but it occurs most intensely during adolescence.	The frontal lobe develops from when we are a fetus until about the age of 25 through changes to our neuronal connections.

Figure 9 Summary of the components of developmental plasticity

3A QUESTIONS

Theory-review questions

Question 1

Developmental plasticity involves the brain changing which represents *(Select one)*

A   the brain accommodating for learnings and experience as we age.

B   the brain altering its structure when it has been injured.

Question 2

Fill in the blanks with the following phrases.

- refine and build on the understanding of the world
- build the foundations for understanding the world

In infancy, developmental plasticity functions mostly to _____, whereas in adolescence, it functions more to _____.

Question 3

Fill in the blanks with the following phrases.

- Developmental plasticity
- Myelination
- Synaptic pruning

_____ can involve changes to the neurons and their connections. _____ ensures communication between neurons is successful and efficient by protecting neurons. _____ removes connections that are underused.

Question 4

True or false? The formation of synaptic connections in response to learning piano at age 45 is an example of developmental plasticity.

A   true

B   false

Question 5

Frontal lobe development involves *(Select all that apply)*

I   the formation of synapses

II   the lobe decreasing in size

III   the elimination of synapses

IV   myelination

V   the maturation of the frontal lobe

Question 6

Because they must learn to walk, talk and understand their environment, infants must have greater or lesser synapses than adolescents? *(Select one)*

A   greater

B   lesser

Skills

Perfect your phrasing

Question 7

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 8

Which of the following sentences is most correct?

A   Infants have many more synapses than adolescents because they need many more connections between neurons to lay the foundations for understanding their environment.

B   Adolescents have many more synapses than infants because they need them to learn complex tasks and form the connections necessary for higher-order thinking.

Exam-style questions

Multiple-choice questions

Question 9   (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 10   (1 MARK)

In developmental plasticity, myelination involves

A   the growth of myelin between neurons.

B   the formation of a protective coating around axons.

C   the formation of synapses.

D   the elimination of myelin.

Question 11   (1 MARK)

Which area of the brain is the last to complete the processes of developmental plasticity?

A   midbrain

B   parietal lobe

C   frontal lobe

D   occipital lobe

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 2013 exam MCQ26

Short-answer questions

Question 13   (2 MARKS)

Describe the roles of myelination in developmental plasticity.

Question 14   (2 MARKS)

Identify two changes that occur in the brain as part of developmental plasticity.

Question 15   (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 16   (3 MARKS)

In terms of the roles of the frontal lobe and developmental plasticity, suggest why teenagers may perform more irrational and impulsive behaviours than adults.

3B BRAIN INJURY AND ADAPTIVE PLASTICITY

Why is it that people who sustain injury to the brain are often able to recover over time? What would happen if you were hit in the head and survived? Would your personality be the same? Would you still be able to carry out all the activities that you enjoy? In this lesson, you will be learning about the biological, psychological and social impacts that occur when the cerebral cortex is injured. You will also learn about the answer to the above questions in regards to the concept of adaptive plasticity as it relates to the process of recovering from these kinds of brain injuries.

| 3A Developmental plasticity	3B Brain injury and adaptive plasticity	3C Neurological disorders and Parkinson's disease

Study design dot point

- the impact of injury to the cerebral cortex on a person's biological, psychological and social functioning and the ability of the brain to undergo adaptive plasticity, illustrated by rehabilitation of people with brain injuries

Key knowledge units

Impact of injury to the cerebral cortex on functioning	1.1.7.1
Adaptive plasticity	1.1.7.2

Adaptive plasticity

- Impact of injury to the cerebral cortex on functioning 1.1.7.1
  - Impact of injury to the cerebral cortex on biological functioning
  - Impact of injury to the cerebral cortex on psychological functioning
  - Impact of injury to the cerebral cortex on social functioning
- Adaptive plasticity 1.1.7.2
  - Sprouting
  - Rerouting
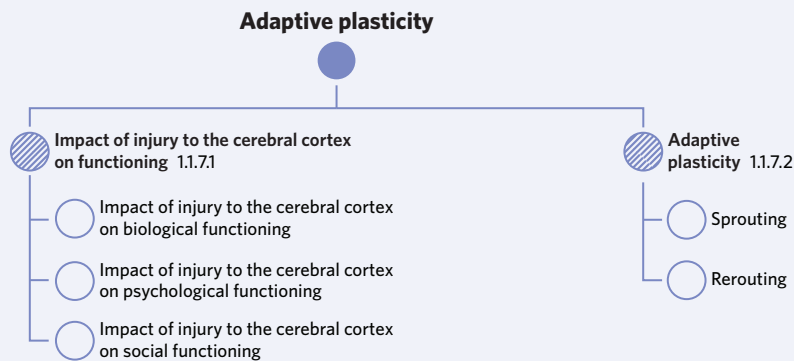
Impact of injury to the cerebral cortex on functioning 1.1.7.1

OVERVIEW

The cerebral cortex has a key role in biological, psychological and social functioning. The impact of injury to the cerebral cortex, then, can be examined within these categories.

THEORY DETAILS

There are many different kinds of brain injuries that can occur throughout the lifespan. Brain injuries can occur externally, such as through a collision while playing sport, or internally, such as through a medical condition like a stroke. All types of brain injuries can have impacts on biological, psychological or social functioning.

This was demonstrated in 1848 for Phineas Gage during what would become a historical case study of brain injury for psychology (Harlow, 1999). Gage was a railway worker who had a metal rod go through the top of his skull in an accident. He survived despite the rod going through his left eye socket and left cheekbone, piercing his brain and coming out the other side of his head. There were some aspects of his functioning that we were not affected despite such an intense injury being sustained. For example, his motor skills and speech were unaffected, in fact, it was reported that Gage maintained consciousness during the accident. Other aspects of his functioning were nonetheless impaired.

> **Lesson link**
>
> To remind yourself about the role of the cerebral cortex head to lesson *2E: The Cerebral cortex*. Here, the cerebral cortex was discussed in relation to its involvement in processing complex sensory information, initiating voluntary movements, language, symbolic thinking and regulating emotions.

Damage was sustained to the prefrontal cortex of the brain, resulting in significant changes to Gage's personality and temperament. Initially an even-tempered measured man, he started demonstrating sudden changes in mood and spontaneous behaviours. The case study of Phineas Gage demonstrates how injury to the cerebral cortex can have distinct effects on biological, psychological and social functioning depending on the area of the brain that was injured.

Impact of injury to the cerebral cortex on biological functioning

Impacts of injury to the cerebral cortex on biological functioning largely relate to our movement. Given the frontal lobe's role in motor function, injury to this region of the cerebral cortex 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.
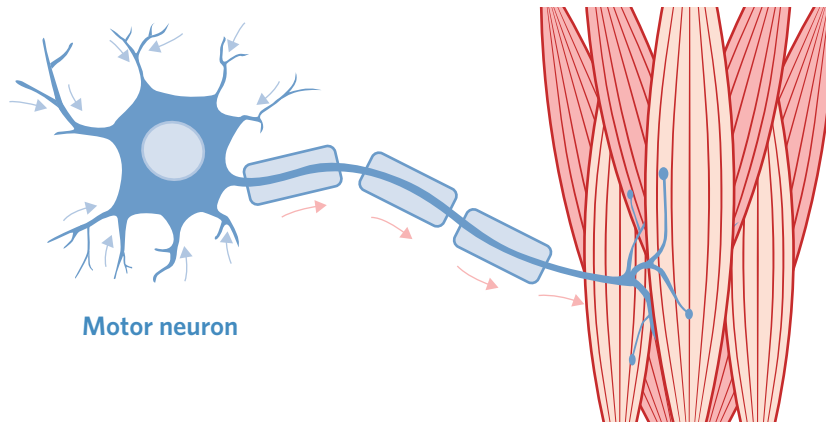
Motor neuron

Figure 1 Paralysis can occur after brain injury due to brain no longer being able to send adequate motor neural messages for motor neurons to carry to skeletal muscles to initiate movement

Impact of injury to the cerebral cortex on psychological functioning

The cerebral cortex of our brain plays an important role in many aspects of our psychological functioning, including our ability to form and retrieve memories, executive functioning such as decision making, and our expression of personality, mood, and emotions.

Within the process of memory, the cerebral cortex is primarily involved in storing long-term memories. Long-term memories refer to information that has been learned in the past and is stored neurologically in the brain for later use. Damage to different regions of the cerebral cortex can therefore disrupt these neural connections and the capacity to remember past information. Long-term memories are stored in various locations within the cerebral cortex, so neural connections are able to be formed between different memories. These links between memories attach meaning to memories and enhance your understanding of how different concepts are interrelated. Brain injury to the cerebral cortex can therefore disrupt these links and consequently the ability to retrieve and make sense of information learnt in the past.

Effects to more general cognition can also occur given the executive function of the frontal lobe, such as difficulty in decision making or planning. Damage to the frontal lobe can also have an impact on mood levels given its role in processing and regulating emotions. This can result in a difficulty regulating emotions which can be demonstrated by spontaneous behaviour when interacting with others, for example, suddenly becoming agitated or, alternatively, excitable. These rapid and intense changes in mood are referred to as *emotional lability* and can also reflect that a change in personality has occurred.

Impact of injury to the cerebral cortex on social functioning

The psychological effects of a brain injury can have far-reaching impacts on social relationships. Given the frontal lobe's influence on personality, injury to this part of the cerebral cortex can impact relationships with friends and family. Personality dictates how people are perceived by others, so when an injury is sustained to the frontal lobe social relationships can be disrupted. By extension, due to the frontal lobe's role in processing and regulating emotions, its damage can result in a lack of spontaneity when interacting with others.

These changes in social relationships 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.

⊙ Analogy

Think about brain injury 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 injury 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.

Image: Puwadol Jaturawutthichai/ Shutterstock.com

Figure 2 Brain injury can be understood through the analogy of a soccer team, comprising of different team members, but nonetheless working together

ACTIVITY 1 – CLASS DISCUSSION

What role does personality have in your relationships with friends and family?

How would you describe your personality? How does it influence your relationships with others? Discuss with a partner what would happen if aspects of your personality suddenly changed.

⊕ Want to know more?

Spatial neglect is an example of a disorder which results from brain injury to the cerebral cortex with significant impacts on functioning. It usually will occur after a stroke or an accident damages a person's parietal lobe. Given the parietal lobe's necessity for spatial awareness, spatial neglect makes stimuli in certain locations less detectable for the patient.
Generally, the side of the world opposite to the hemisphere which is damaged becomes unnoticeable. For example, if a stroke victim sustained damage to the parietal lobe of the right hemisphere of the brain, they would neglect stimuli to their left. Common behaviours for spatial neglect patients include shaving only one side of their face or eating food on only one side of their plate.

Image: Roskoshniy/Shutterstock.com

Figure 3 Spatial neglect patients demonstrate behaviours like eating the food on one side of the plate because the other side is outside of their spatial awareness

Adaptive plasticity 1.1.7.2

OVERVIEW

So far in this lesson, we have discussed how significant brain injury to the cerebral cortex can affect biological, psychological and social functioning. Luckily, the brain usually has the ability to recover from injury. This is due to adaptive plasticity.

THEORY DETAILS

Adaptive plasticity refers to the brain's ability to change and recover in response to different experiences of brain injury or learning which occur outside normal maturation. Such experiences can include, but are not limited to, brain injury. Adaptive plasticity enables the brain to recover after injury and restore adequate neural functioning over time. Adaptive plasticity involves the processes of sprouting and rerouting.

Adaptive plasticity the brain's ability to restore and enhance neural functioning over time due to experience

Sprouting

Sprouting is the ability for 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 injury, enabling new neural connections to be formed in areas of the cerebral cortex where the neural activity has been prevented or depleted.

Sprouting a neuron's ability to develop new branches on the dendrites or axons

Damaged neuron   **Sprouted neuron**
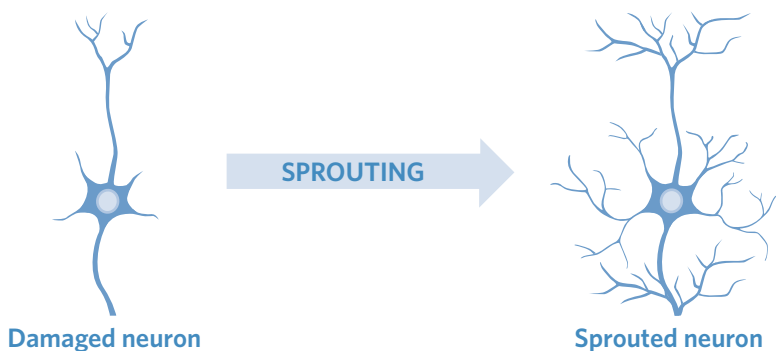
Figure 4 Sprouting can involve a damaged neuron growing branches on the axon and dendrite to enhance its ability to reach areas of the cerebral cortex that have been damaged

Rerouting

In contrast to sprouting, **rerouting** involves an undamaged neuron forming a new connection with another undamaged neuron. The neuron that is rerouting abandons its connection with a damaged neuron, enabling new neural connections to be formed after injury and, by extension, cognitive functioning to be re-developed.

Rerouting a neuron's ability to form a new connection with another undamaged neuron

> ⊙ *Analogy*
>
> You can think about neural rerouting as being like rerouting in other contexts otherwise. For example, think about your route to school that you travel every day. One day on your way, there are roadworks and you have to follow a detour sign instead. This detour sign is forcing you to create a new route (like a new 'rerouted' neural connection) and still achieve the outcome of going to school.
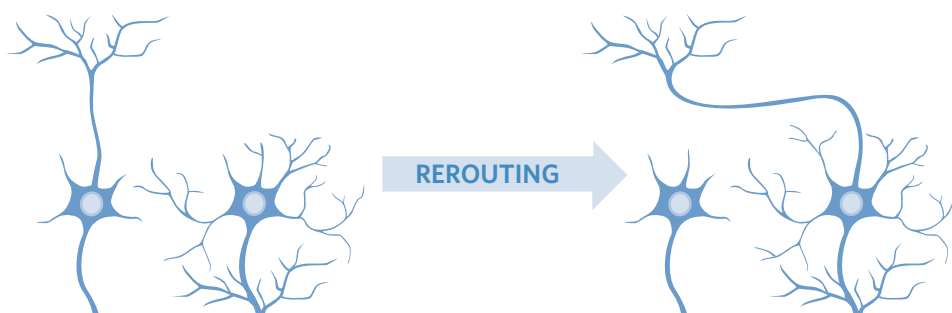
Figure 5 Rerouting involves an undamaged neuron seeking a new connection with another undamaged neuron to promote the formation of strong neural connections

ACTIVITY 2

How does adaptive plasticity relate to our everyday experiences?

Adaptive plasticity has an important role in our psychological development beyond helping to recover from brain injuries. To learn more about the role of adaptive plasticity in learning and memory more broadly, watch Lara Boyd's ted talk *'After watching this, your brain will not be the same'*.
(Tedx Talks, 2015)

Discuss how adaptive plasticity helps us beyond recovering from brain injury.

The theory behind the processes of adaptive plasticity is often incorporated into the rehabilitation techniques of patients who suffered brain injury. For example, physiotherapists often work with patients who have recently suffered from a brain injury, 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 injury, 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).

Theory summary

In this lesson, you have learnt about the impact of injury to the cerebral cortex on a person's biological, psychological and social functioning. In summary:

- Impact on biological functioning includes loss of motor movement including paralysis.
- Impact on psychological functioning includes difficulty retrieving information from long-term memory, and changes to general cognition and mood/emotions.
- Impact on social functioning includes the impact of the psychological changes to mood/emotions and the effects this has on relationships with family and friends.

You have also learnt about the ability of the brain to undergo adaptive plasticity following an injury. In summary:

- People are able to rehabilitate after brain injury due to adaptive plasticity.
- Adaptive plasticity restores losses to neural functioning.
- Sprouting enables adaptive plasticity when a neuron develops new branches on the dendrites or axons.
- Rerouting enables adaptive plasticity when a neuron forms a new connection with another undamaged neuron.

3B QUESTIONS

Theory-review questions

Question 1

An impact of injury to the cerebral cortex on biological functioning includes *(Select one)*

A   changes to personality.

B   mood changes.

C   loss of motor movement.

Question 2

An impact of injury to the cerebral cortex on psychological functioning includes *(Select one)*

A   difficulty retrieving long-term memories.

B   difficulty maintaining relationships.

C   loss of motor movement.

Question 3

Fill in the gaps with the following terms.

- Social functioning
- Mood

Due to the frontal lobe's role in determining aspects of our personality, an impact of injury to the cerebral cortex on _____ includes difficulty maintaining positive relationships with family and friends due to changes in _____ .

Question 4

True or false? Adaptive plasticity enables the brain to restore adequate neural functioning after having experienced brain injury.

A true

B false

Question 5

Adaptive plasticity involves *(Select all that apply)*

I Sprouting

II Recovery after brain injury only

III Rerouting

IV Help from a psychologist

Question 6

Fill in the gaps with the following terms.

- Sprouting
- Rerouting

_____ involves a neuron seeking a new connection with another undamaged neuron to ensure the formation of strong neural pathways, whereas _____ involves a neuron growing branches on the axon and dendrite to enhance the neuron's ability to communicate and connect with other neurons effectively.

Skills

Perfect your phrasing

Question 7

Which of the following sentences is most correct?

A The impact of injury to the cerebral cortex depends on the region that sustained injury.

B The impact of injury to the cerebral cortex is always the same regardless of the region that sustained injury.

Question 8

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.

Exam-style questions

Multiple-choice questions

Question 9 (1 MARK)

An impact of injury to the cerebral cortex on a person's biological functioning is

A   difficulties accessing long-term memories.

B   fluctuations in mood.

C   paralysis, involving the brain no longer being able to send adequate sensory neural messages to skeletal muscles to initiate movement.

D   paralysis, involving the brain no longer being able to send adequate motor neural messages to skeletal muscles to initiate movement.

Question 10 (1 MARK)

What is an example of the impact of injury to the cerebral cortex on a person's psychological functioning?

A   difficulty maintaining relationships with friends and family

B   paralysis

C   difficulty in decision making

D   difficulty performing fine motor skills

Question 11 (1 MARK)

The brain's ability to change as a result of non-developmental experiences, such as brain injury, demonstrates the concept of

A   an impact of injury to the cerebral cortex in a person's psychological functioning.

B   an impact of injury to the cerebral cortex on a person's biological functioning.

C   adaptive plasticity.

D   developmental plasticity.

Short-answer questions

Question 12 (2 MARKS)

Explain what adaptive plasticity is and describe its role in restoring functioning after brain injury to the cerebral cortex.

Question 13 (4 MARKS)

Identify and describe two processes of adaptive plasticity.

Questions from multiple lessons

Question 14 (1 MARK)

Which of the following options correctly identifies an impact of injury to the cerebral cortex on a person's social functioning and the lobe of the cerebral cortex 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 15 (2 MARKS)

Identify the lobe of the cerebral cortex responsible for moderating personality and explain how it can impact social functioning when injured.

3C NEUROLOGICAL DISORDERS AND PARKINSON'S DISEASE

Understanding neurological disorders has been a complex and invasive project of modern psychology. If someone has a disorder of other parts of the body, say for example the arm, it can be examined fairly easily and without many repercussions for other parts of the body. Yet when examining regions of the brain that have been impacted by neurological disorders, any resulting impact could disrupt the interconnectedness of different parts of the brain, and have many consequences on our mental and physical functioning. In this lesson, you will learn about how animal studies and neuroimaging techniques have been used to limit such consequences and develop an understanding of neurological disorders, such as Parkinson's disease.

Image: studiostoks/Shutterstock.com

3A Developmental plasticity	3B Brain injury and adaptive plasticity	3C Neurological disorders and Parkinson's disease

Study design dot point

- the use of animal studies and neuroimaging techniques to develop understanding of human neurological disorders including Parkinson's disease

Key knowledge units

Neurological disorders and Parkinson's disease	1.1.8.1
Animal studies	1.1.8.2
Neuroimaging techniques	1.1.8.3

Neurological disorders and Parkinson's disease

- Neurological disorders and Parkinson's disease 1.1.8.1
- Animal studies 1.1.8.2
  - Levodopa
  - Deep brain stimulation
- Neuroimaging techniques 1.1.8.3
  - Structural neuroimaging techniques
  - Functional neuroimaging techniques
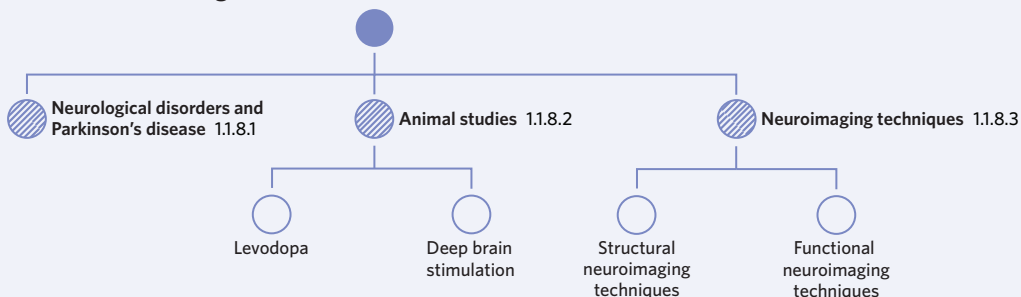
Neurological disorders and Parkinson's disease 1.1.8.1

OVERVIEW

Our neural functioning undergoes many changes throughout the lifespan. Such changes can enhance neural functioning, as exemplified by the increased plasticity of the brain as an infant, but can also impair our neural functioning, as exemplified by neurological disorders. A neurological disorder is marked by changes that impair neural functioning, which can occur externally, such as through a brain injury, or as a result of disease or a natural loss of neurons throughout the lifespan.

THEORY DETAILS

Broadly speaking, a **neurological disorder** is a condition that represents any change to neural functioning that impairs the ability for 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. However, when this negative change to neural functioning occurs as a result of a degeneration of neurons throughout the lifespan, it constitutes a **neurodegenerative disorder**. **Parkinson's disease** is one such neurodegenerative disorder that involves the progressive loss of neurons, and subsequently, a reduced production of the neurotransmitter dopamine. **Dopamine** is a neurotransmitter that is involved in the coordination of voluntary movement and the experiences of pleasure and pain.

Neurological disorder
a disease characterised by any damage or malfunctioning of the nervous system

Neurodegenerative disorder
a disease characterised by the progressive loss of neurons in the brain

Parkinson's disease a progressive disease of the nervous system characterised by both motor and non-motor symptoms

Dopamine a neurotransmitter responsible for the coordination of voluntary movement and experiences of pleasure and pain

The neuronal loss and damage characteristic of Parkinson's disease occurs in a region of the brain called the *substantia nigra*. As illustrated in figure 1, the substantia nigra is located in the basal ganglia of the midbrain. It is this region of the brain that plays a significant role in coordinating voluntary movement and regulating the experiences of reward and pleasure. The neurons in this area of the brain are responsible for producing dopamine, and when the loss of these neurons occurs, sufficient levels of dopamine are unable to be produced. This results in slowed or insufficient neural messages that are required to coordinate voluntary movements. Parkinson's disease is characterised by a series of motor and non-motor symptoms that are summarised in table 1.

Table 1 Some motor and non-motor symptoms of Parkinson's disease

Motor symptoms	Non-motor symptoms
• Muscle rigidity (stiffness or tightness of muscles) • Reduced motor control and precision of movement • Tremors (uncontrollable and involuntary shaking) • Slowed voluntary movements • Difficulty balancing • Stooped posture	• Fatigue • Mental health problems (such as depression due to the detrimental impacts on lifestyle and the effects of reduced dopamine) • Increased sensitivity to temperature • Decreased sense of smell • Problems with cognition such as decision-making and memory • REM sleep behaviour disorder • Constipation
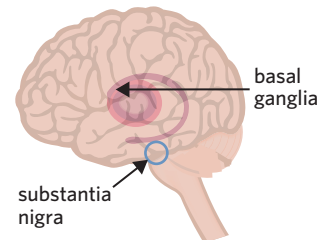
Image: joshya/Shutterstock.com

Figure 1 The symptoms of Parkinson's disease are caused by a decrease in dopamine, due to the degeneration of neurons in the substantia nigra within the basal ganglia of the midbrain

Animal studies 1.1.8.2

OVERVIEW

Animal studies are a useful tool of psychological research which enable researchers to understand the brain processes behind the development of Parkinson's disease. Animal studies have also been conducted for trial medication that improves the production and functioning of the neurotransmitter and region of the brain most impacted by Parkinson's disease.

> **Lesson link**
>
> As you learnt in lesson **1E: Ethical considerations**, the use of animals in psychological research needs to be conducted ethically. Similarly to studies with people, the value of *beneficence* needs to be considered. This involves researchers needing to evaluate the potential benefit and harm the experiment could cause the animal in order to decide whether the study is justified. Likewise, harm to animals must be minimised and research should be conducted with research merit and integrity. Using animal studies is often considered as justified on the basis of beneficence because the findings achieved testing on the often similar mental processes of animals acts as a starting point that can help to develop a medication or procedure that will save or improve the quality of life of millions of humans now and into the future. This is illustrated by the examples of animals testing provided in this lesson.

Levodopa

The use of animal studies to develop understanding of human neurological disorders can be illustrated through Parkinson's disease research. Arvid Carlsson (1957) conducted experiments on rabbits in order to develop an effective medical treatment for Parkinson's disease. His tests involved injecting the drug *Reserpine* into rabbits, in order to replicate the loss of dopamine that naturally occurs for people with Parkinson's disease. This significantly impaired the rabbits' voluntary movement to the point that they demonstrated similar motor symptoms to human Parkinson's disease patients. Carlsson then injected the treatment **levodopa**, which is converted to dopamine by neurons in the brain. This helped to restore the motor function of the rabbits and then was consequently produced as the first human treatment for the symptoms of Parkinson's disease.

Levodopa a Parkinson's disease medication that is converted to dopamine by neurons in the brain upon consumption to improve motor functioning outcomes

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⊕ Want to know more?

There is no *cure* as such for Parkinson's disease, but rather medication and therapy that *alleviates* its symptoms or slows its progression.

Deep brain stimulation

Another treatment that can be used to alleviate the symptoms of Parkinson's disease is **deep brain stimulation**. Deep brain stimulation treatment involves electrodes being implanted into the substantia nigra where, due to impaired dopamine levels, there is a lack of neuronal activity. The electrodes create an electrical current through a pulse generator, producing enhanced neuronal functioning in the basal ganglia and overcoming the inadequate neural activity caused by degenerating levels of dopamine.

The use of deep brain stimulation in this way often improves motor functioning by enhancing the otherwise inadequate levels of neural activity that would cause motor symptoms such as postural instability and muscle rigidity. It is nonetheless a very invasive procedure, and given the interrelationships between different regions of the brain, can affect other processes and cause strokes or permanent depression and anxiety. Historically, treatments such as deep brain stimulation have been first tested and further refined on animals before being available for human trials and treatment, given this potential consequence of causing serious mental damage.

Deep brain stimulation
a treatment for neurological disorders that involves creating an electrical current through a pulse generator to stimulate a particular region of the brain with depleted neural activity due to degenerated and damaged levels of neurons

Image: Krysja/Shutterstock.com

Figure 2 Deep brain stimulation involves the use of the apparatus shown for the precise placement of electrodes to direct electrical stimulation to the substantia nigra

In lesson 2A: Historical approaches to understanding the brain, you learnt about electrical brain stimulation, of which deep brain stimulation is a form of. Deep brain stimulation has been developed through testing on animals. Early studies include research from the 1870s, including when Gustav Fritsch and Eduard Hitzig recorded a variety of motor (movement) responses by stimulating different areas of dogs' brains.

There is no perfect 'cure' for Parkinson's disease that stops the natural degeneration of neurons and dopamine, but rather different treatments like deep brain stimulation can slow its progression and target its motor symptoms. Contemporary research is still conducted through animal studies to refine these treatments to make them as effective as possible and to limit the disabling side effects that they could cause.

Neuroimaging techniques 1.1.8.3

OVERVIEW

Neuroimaging enables the detection of neurological disorders by documenting the current state of neural activity in the brain. In the case of neuronal loss or damage, such as in Parkinson's disease, neuroimaging can identify the region of the brain most impacted and therefore inform the most appropriate treatment.

⧉ Lesson link

You first learned about neuroimaging techniques in lesson **2A: Historical approaches to understanding the brain**. This lesson examines their role in detecting Parkinson's disease and understanding its development.

THEORY DETAILS

Structural neuroimaging techniques

Neurological disorders often are visible through examination of the structure of the brain. For example, the death of neurons associated with neurodegenerative disorder causes changes in brain mass in the regions where neuronal degeneration occurs. With Parkinson's disease, the degeneration of dopamine-producing neurons causes brain mass to decrease in the basal ganglia of the midbrain. Through structural neuroimaging techniques, this loss of brain mass can be detected. Then, with information about the motor- and non-motor symptoms that the patient is experiencing, this can be used to make an informed judgement about the presence of a neurological disorder, such as Parkinson's disease. **Computerised tomography (CT)** and **magnetic resonance imaging (MRI)** are useful structural neuroimaging techniques to examine if there has been physical degeneration in the basal ganglia that would suggest the inadequate dopamine activity and therefore provide information about the impact of Parkinson's disease.

Functional neuroimaging techniques

Functional neuroimaging techniques can specifically examine the level of activity in the basal ganglia to determine if the motor functions of the brain are impaired. **Positron emission tomography (PET)** and **functional magnetic resonance imaging (fMRI)** scans go beyond determining if physical degeneration in the brain has occurred and can determine the level of activity of different regions of the brain. In the case of neurodegenerative disorders such as Parkison's disease, lower levels of activity in the basal ganglia due to the inadequate levels of dopamine can be recorded visually, and shown on a colour scale from low to high.

Functional neuroimaging techniques can monitor levels of functioning regardless of the level of physical degeneration that has occurred and can more conclusively associate this lack of activity with a neurological disorder that matches these effects. This is especially important for being able to ensure an early detection of decreased neuronal activity, so that it can be targeted as soon as possible and degeneration can be slowed through treatment. Observing the levels of neuronal activity of other areas of the brain associated with non-motor symptoms of Parkinson's disease, such as depression, is also useful for making an informed decision about other treatment options.

Computerised tomography (CT) a neuroimaging technique that involves taking continuous two-dimensional x-ray images of a person's brain or body in order to provide both two and three-dimensional images

Magnetic resonance imaging (MRI) a neuroimaging technique that uses magnetic and radio fields to take two 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 and structure 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 its activity levels

Normal   **Moderate**   **Severe**
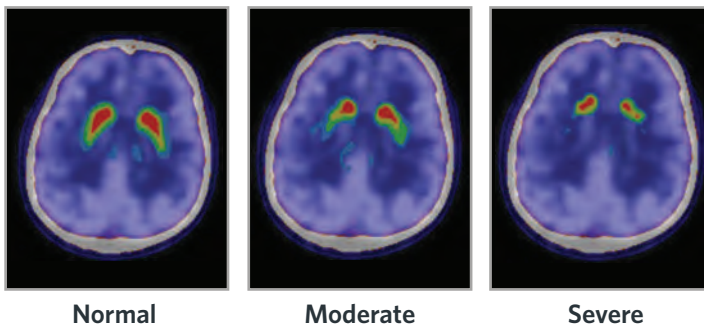
Image: springsky/Shutterstock.com

Figure 3 A representation of a PET scan for a Parkison's disease patient demonstrating impaired neural activity in the substantia nigra due to depleted levels of dopamine

Theory summary

In this lesson, you learnt about the concept of neurological disorders, including neurodegenerative disorders such as Parkinson's disease. Parkinson's disease involves:

- inadequate levels of the neurotransmitter dopamine caused by the degeneration of neurons in the substantia nigra in the basal ganglia of the midbrain.
- motor symptoms such as muscle rigidity, reduced motor control and precision of movement, tremors, slowed voluntary movement, difficulty balancing, and stooped posture.
- non-motor symptoms such as fatigue, mental health problems, increased sensitivity to temperature, decreased sense of smell, problems with cognition such as decision-making and memory, REM sleep behaviour disorder, and constipation.

You also learnt about the use of animal studies to develop an understanding of Parkison's disease and its treatment.

- Rabbits were used in Arvid Carlsson's experiments to determine the efficacy of Levodopa, a medical treatment for the symptoms of Parkinson's disease.
- Animals have likewise been used in the development of techniques such as deep brain stimulation.

Finally, you learnt about the use of neuroimaging techniques to develop an understanding of Parkison's disease.

- *Structural* neuroimaging techniques (CT and MRI) demonstrate the loss of brain mass associated with the degeneration or impairment of neurons in the brain.
- *Functional* neuroimaging techniques (PET and fMRI) demonstrate the impaired neural activity associated with the degeneration or impairment of neurons in the brain.

3C QUESTIONS

Theory-review questions

Question 1

Fill in the blanks with the following terms.

- Parkinson's disease
- Neurological disorder
- Neurodegenerative disorder

Broadly speaking, a _____ refers to any damage or malfunctioning of the nervous system. A _____ specifically refers to the progressive breaking down of neurons in the brain over time, which includes _____.

Question 2

Motor symptoms of Parkinson's disease include *(Select all that apply)*

I   muscle rigidity.

II   tremors.

III   fatigue.

IV   constipation.

Question 3

True or false? The development of medication for Parkison's disease through animal testing can be ethical.

A   true

B   false

Question 4

Deep brain stimulation involves *(Select one)*

A   stimulating electrical activity in an area of the brain where neural functioning has been impaired.

B   cutting out brain regions that have depleted levels of dopamine.

C   electrically inserting dopamine-producing neurons into the substantia nigra.

Skills

Perfect your phrasing

Question 5

Which of the following sentences is most correct?

A   *Functional* neuroimaging techniques allow the size of brain regions to be observed and the presence of a possible neurodegenerative disorder to be inferred in the case of decreased brain mass.

B   *Structural* neuroimaging techniques allow the size of brain regions to be observed and the presence of a possible neurodegenerative disorder to be inferred in the case of decreased brain mass.

Question 6

Which of the following sentences is most correct?

A *Structural* neuroimaging techniques establish if there is impaired neural activity in the brain that could suggest the presence of a neurological disorder.

B *Functional* neuroimaging techniques establish if there is impaired neural activity in the brain that could suggest the presence of a neurological disorder.

Exam-style questions

Multiple-choice questions

Question 7   (1 MARK)

Parkinson's disease involves

A motor symptoms only.

B non-motor symptoms only.

C motor and non-motor symptoms.

D interference to the neurotransmitter GABA only.

Question 8   (1 MARK)

For someone with Parkinson's disease, neuronal death in the brain occurs largely in the

A frontal lobe.

B wernicke's region.

C broca's region.

D substantia nigra.

Question 9   (1 MARK)

How does deep-brain stimulation improve motor function for people with Parkison's disease?

A By stimulating electrical activity in the substantia nigra where there would otherwise be a lack of dopamine production due to neural degeneration.

B By stimulating hormonal activity in the substantia nigra where there would otherwise be a lack of dopamine production due to neural degeneration.

C By inserting dopamine into the substantia nigra.

D By enlarging the mass of the substantia nigra.

Question 10   (1 MARK)

An MRI of the brain of someone with Parkison's disease would likely show

A decreased neural activity in substantia nigra given the degeneration of dopamine-producing neurons.

B inadequate levels of dopamine in the substantia nigra.

C decreased brain mass of the substantia nigra given the degeneration of dopamine-producing neurons.

D increased brain mass of the substantia nigra given the degeneration of dopamine-producing neurons.

Question 11   (1 MARK)

Which of the following options demonstrates how functional neuroimaging techniques allow researchers to develop an understanding of Parkison's disease?

A Determining where there is a lack of neural activity in the brain demonstrates the impact of Parkinson's disease on brain function.

B Determining where brain mass has decreased in the brain demonstrates the impact of Parkinson's disease on brain function.

C It specifically identifies the neurotransmitter involved.

D It offers a treatment that stimulates neural activity where neuronal death has mostly occurred.

Short-answer questions

Question 12   (2 MARKS)

Define neurodegenerative disorders and identify one example.

Question 13   (2 MARKS)

Identify the difference between the use of Levodopa and deep brain stimulation as potential treatments for Parkinson's disease.

Question 14   (4 MARKS)

Describe the role of dopamine in Parkison's disease and identify two motor symptoms that occur as a result of its dysfunction.

Questions from multiple lessons

Question 15   (1 MARK)

Parkison's disease causes a degeneration and impairment of dopamine-producing neurons in the substantia nigra. The area of the neuron responsible for releasing the neurotransmitter dopamine is the

A   axon terminals.

B   dendrites.

C   synaptic gap.

D   myelin.

Question 16   (2 MARKS)

Describe how the motor symptoms of Parkison's disease demonstrate impaired functioning of the somatic nervous system.

CHAPTER 3 REVIEW

CHAPTER SUMMARY

In this chapter, we learnt more about the brain. Specifically, we learnt about how the brain changes and develops as we grow, and also its amazing ability to recover after damage.

In **3A**, we learnt about the concept of developmental plasticity and specifically, how this occurs in infancy and adolescence. Myelination, synaptic pruning, and frontal lobe development are all important components of developmental plasticity, and have predictable patterns throughout development.

In **3B**, we learnt what can happen when someone injures part of their cerebral cortex, including the biological, psychological, and social consequences. We also learnt that our brain can recover and rehabilitate from some brain injuries through the processes of adaptive plasticity, including sprouting and rerouting.

In **3C**, we learnt about neurological disorders. More specifically, we learnt about the neurodegenerative disorder Parkinson's disease and how animal studies have allowed us to understand the disease and assist with treating its symptoms.
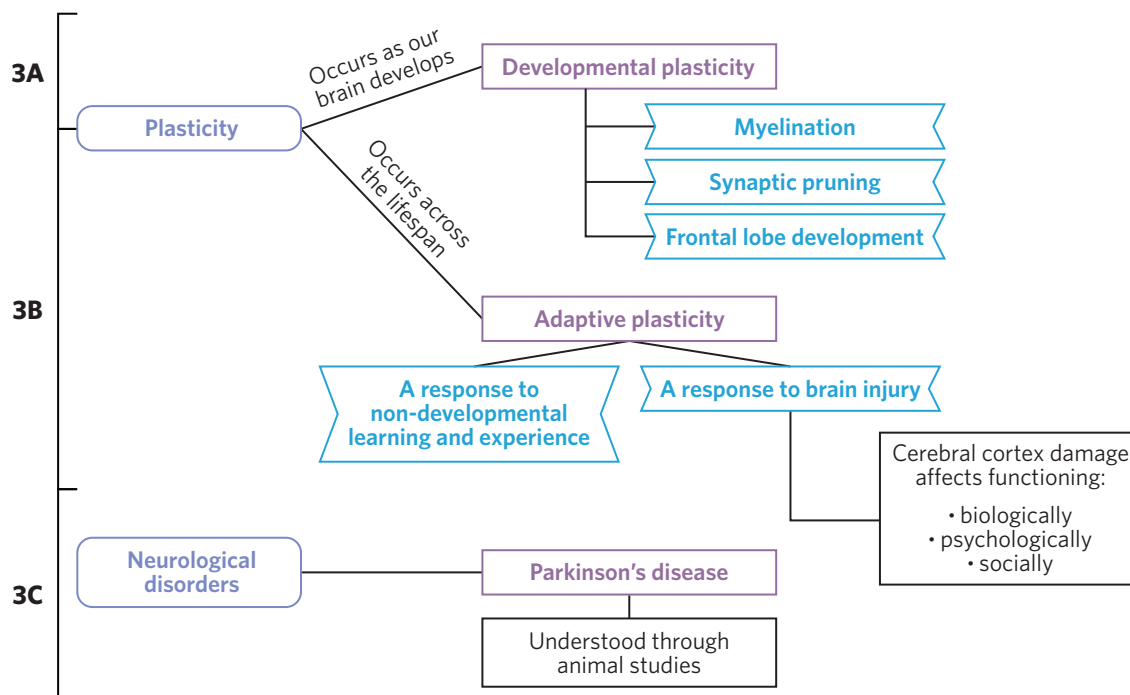
CHAPTER REVIEW ACTIVITIES

Review activity 1: Venn diagram

Developmental and adaptive plasticity are two important processes that occur in the brain. Copy out and use the venn diagram below to list as many similarities and differences between these two processes. It can help to think about:

- The purpose of them
- The timing of them
- The sub-processes within them
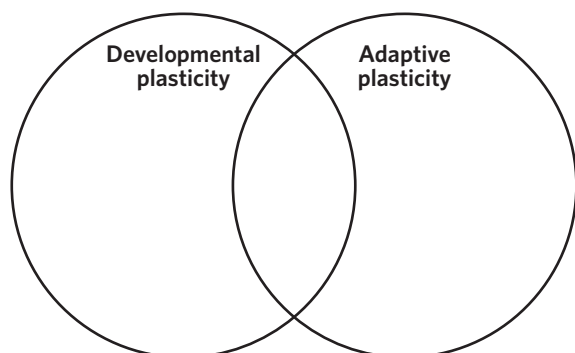
Review activity 2: Summary table

There is a lot to remember in this chapter about different areas of the brain and what happens to them when they undergo certain experiences or in response to injury. Copy out and use this table to revise and summarise the concepts of the chapter, including the brain areas involved and how they can be affected. The first example has been done for you.

What?	Brain area/s involved	How?
Developmental plasticity	All neurons in the brain, and also specifically maturation of the frontal lobe.	All neurons in the brain undergo the processes of myelination and synaptic pruning. The frontal lobe is the last area of the brain to reach developmental maturity.
Adaptive plasticity		
Cerebral cortex damage		
Parkinson's disease		

Review activity 3: Theory application notes

On YouTube, search *'Phantom Limbs'* (ABC Science, 2014). Watch the whole video up until three minutes and nine seconds.

Answer the following questions using your understanding of concepts from chapter 3:

- How can 'phantom limb syndrome' be explained by the processes of adaptive plasticity?
  - Does sprouting and/or rerouting occur?
  - How does sprouting and/or rerouting account for the strange phenomenon of phantom limb syndrome?

CHAPTER 3 TEST

Multiple-choice questions

Question 1   (1 MARK)

Synaptic pruning is most rapid

A in infancy.

B in adolescence.

C in adulthood.

D in infancy and adolescence.

Question 2   (1 MARK)

A social impact of injury to the cerebral cortex could be

A loss of motor control.

B memory retrieval difficulties.

C changes to executive functions.

D strain on relationships due to psychological changes.

Question 3   (1 MARK)

An under-production of which neurotransmitter is responsible for some of the symptoms of Parkinson's disease?

A serotonin

B glutamate

C dopamine

D gamma-aminobutyric acid

Question 4 (1 MARK)

Which of the following is a non-motor symptom of Parkinson's disease?

A muscle rigidity

B tremors

C fatigue

D difficulty balancing

Question 5 (1 MARK)

After brain trauma damages neurons, the ability of neurons to form a new connection with another undamaged neuron is referred to as

A sprouting, and occurs due to adaptive plasticity.

B rerouting, and occurs due to adaptive plasticity.

C sprouting, and occurs due to developmental plasticity.

D rerouting, and occurs due to developmental plasticity.

Question 6 (1 MARK)

Animal studies were used to develop a treatment for Parkinson's disease called Levodopa. Levodopa is a medication that works by

A mimicking the role of dopamine in the brain.

B replacing damaged and lost dopamine-producing neurons.

C being converted into dopamine for use in the brain.

D electrically stimulating damaged areas of the brain to help with motor symptoms.

Question 7 (1 MARK)

Brain plasticity

A occurs only after serious brain injury.

B happens only as the brain matures and develops.

C occurs only in childhood.

D may occur in different areas of the brain at different times.

Adapted from VCAA 2013 exam MCQ27

Question 8 (1 MARK)

Which area of the brain takes the longest to reach maturity?

A frontal lobe

B parietal lobe

C cerebellum

D temporal lobe

Short-answer questions

Question 9 (1 MARKS)

Identify one biological impact of injury to the frontal lobe.

Question 10 (4 MARKS)

Explain the difference between developmental and adaptive plasticity, including when they occur.

Question 11   (3 MARKS)

Fernando has recently been diagnosed with Parkinson's disease at 68 years of age. Identify the area of Fernando's brain impacted by Parkinson's disease and explain how deep brain stimulation might provide Fernando with the therapeutic relief of his symptoms.

Question 12   (4 MARKS)

Explain how one structural and one functional neuroimaging technique may be used to track the progression of Parkinson's disease in the brain.

Question 13   (2 MARKS)

Describe one change that occurs as part of developmental plasticity and its function.

Question 14   (2 MARKS)

Using an example, outline what a neurodegenerative disorder is.

Question 15   (4 MARKS)

Nikole is 27 years old and sustained an injury to her cerebral cortex while playing local football. Pulled aside to rest, Nikole was unable to concentrate and found it difficult to decide whether she should keep playing or go to a doctor. She also found it difficult to balance and coordinate her movement.

a   Describe how Nikole's injury to her cerebral cortex has impacted her psychological functioning. (1 MARK)

b   If Nikole's neurons are damaged, identify and describe one process of adaptive plasticity that could aid her recovery. (3 MARKS)

Question 16   (2 MARKS)

In terms of developmental plasticity, identify two changes that occur in the adolescent brain.

Key science skills questions

Question 17   (1 MARK)

Doctor Groove is researching myelination in the brains of 100 infants of various ages. On day 1 of his study, Doctor Groove compares CT scans of all 100 infants' brains. He knows that 'white matter' on CT scans corresponds to myelinated axons of neurons.

In terms of developmental plasticity, which of the following options best identifies what Doctor Groove should expect to see and the kind of research investigation he is conducting.

	Expected results	Methodology
A	More white matter at the beginning of infancy compared to the end.	Case study
B	More white matter at the beginning of infancy compared to the end.	Longitudinal study
C	More white matter at the end of infancy compared to the beginning.	Cross-sectional study
D	More white matter at the end of infancy compared to the beginning.	Experiment

Question 18   (3 MARKS)

A team of researchers are conducting an investigation to examine the effect of exercise on the brains of rats with Parkinson's disease. They hypothesise that increased regular exercise may increase the neuroplasticity in the brains of rats with Parkinson's disease, and that these rats would, as a result, show less severe symptoms of Parkinson's disease.

a   What type of plasticity are the researchers investigating? Justify your response. (2 MARKS)

b   In terms of generalisability, outline a limitation of this study. (1 MARK)

Questions from multiple chapters

Question 19   (1 MARK)

Dendrites are a structure on one end of a neuron and are responsible for receiving neurotransmitters from the synapse during neurotransmission. Which of the following identifies two changes that occur at the dendrites during plasticity and the type of plasticity that allows for these changes to occur.

	Developmental plasticity	Adaptive plasticity
A	rerouting	sprouting
B	myelination	pruning
C	sprouting	pruning
D	pruning	sprouting

Question 20   (2 MARKS)

Oligodendrocytes are a type of glial cell with the primary function of producing myelin. Myelination occurs as our brain develops, but it can also occur when the myelin of neurons are damaged.

Name the types of plasticity oligodendrocytes are involved in.

UNIT 1

AOS2

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. They consider the interactive nature of hereditary and environmental factors and investigate specific factors that may lead to development of typical or atypical psychological development in individuals, including a person's emotional, cognitive and social development and the development of psychological disorders.

Outcome 2

On completion of this unit the student should be able to identify the varying influences of nature and nurture on a person's psychological development, and explain different factors that may lead to typical or atypical psychological development.

UNIT 1 AOS 2, CHAPTER 4

The complexity of psychological development

04

Development involves gradual changes that occur across the lifespan, with growth occurring in physical, social, emotional and cognitive areas. Researchers have debated the nature of development, questioning whether development is continuous and whether it follows a sequence, as well as how changes across the lifespan are best measured. In this chapter, you will learn about the processes involved in psychological development.

Key knowledge

- the interactive nature of hereditary and environmental factors on a person's psychological development, illustrated through twin and adoption studies
- the role of critical and sensitive periods in a person's psychological development
- the importance of attachment on an individual's emotional development: genetics; temperament and early life experiences (with reference to the work of Harlow & Ainsworth)
- the development of cognitive abilities from concrete to symbolic thinking (with reference to the work of Piaget)
- psychosocial development across the lifespan as an influence on the development of an individual's personality (with reference to the work of Erikson).

Image: Yuganov Konstantin/Shutterstock.com

4A   NATURE VERSUS NURTURE

Which influences have contributed to your personality? When you lose your temper, is this because something bad happened, or is it deep within your own personality? These questions, as well as many others, are commonly discussed as part of the nurture versus nature debate. In this lesson, you will learn about this debate and how it is linked to psychological development. You will also learn about twin and adoption studies and how these illustrate the impact of hereditary and environmental factors on development.

Image: VoodooDot/Shutterstock.com

4A Nature versus nurture	4B Periods of psychological development	4C Attachment and emotional development	4D Studies of attachment	4E Cognitive development	4F Piaget's theory of cognitive development	4G Erikson's theory of psychosocial development

Study design dot point

- the interactive nature of hereditary and environmental factors on a person's psychological development, illustrated through twin and adoption studies

Key knowledge units

Psychological development	1.2.1.1
The nature versus nurture debate	1.2.1.2
The interaction of hereditary and environmental factors in psychological development	1.2.1.3
Twin and adoption studies	1.2.1.4

Nature versus nurture

- Psychological development 1.2.1.1
- The nature versus nurture debate 1.2.1.2
  - Nature
  - Nurture
- The interaction of hereditary and environmental factors in psychological development 1.2.1.3
- Twin and adoption studies 1.2.1.4

Psychological development 1.2.1.1

OVERVIEW

Development refers to the growth and change within an individual's lifespan. The process of development has many facets, including physical and psychological change. Psychological development encompasses changes across multiple domains, including emotional, social and cognitive growth.

THEORY DETAILS

Can you remember when you were 10 years old? What were you like? How have you changed since then? It is likely that you have changed physically; you likely have grown taller, become stronger, and perhaps your hair colour has changed. You will have also developed psychologically; for example, the way you process information, interact with your friends, and the way that you experience and show emotions would have changed and become increasingly sophisticated. These changes over time are referred to as development.

Development, in general, refers to changes that occur across the lifespan, and occurs in many different areas, such as physical, social, emotional, and cognitive development. Physical development involves processes such as getting taller and experiencing puberty. Although physical development is overt and observable, psychological development is a bit

4A THEORY

more complex as it is unable to be directly observed. In this chapter, we will be focusing on **psychological development**, which broadly refers to growth across multiple domains, including changes in your emotions, cognition and social interactions as you age. Some of the main aspects of psychological development include cognitive, emotional and social development.

Table 1 Aspects of psychological development

Aspect	Definition	Examples
Cognitive development	The changes in thought processes that occur as we age. This includes an increasing sophistication in producing thoughts 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
Emotional development	The continuous, life-long changes in skills which allow individuals to control, express, and recognise emotions in an appropriate way	• Learning how to appropriately express anger as an adult • Recognising your own emotions • Understanding how others around you feel
Social development	The changes in skills as we age to effectively and appropriately interact with others	• Learning how to have conversations with others • Learning how to appropriately communicate with your work colleagues

As can be seen in table 1, the aspects of psychological development are interlinked and rely on each other. For example, to be able to learn how to work effectively in a team (social development), you need to recognise how your team members feel (emotional development), and understand their reasoning and logic if they communicate why they are upset (cognitive development). In this chapter, you will learn about the different aspects of psychological development and how they interact to understand the complexity of psychological development.

The nature versus nurture debate 1.2.1.2

OVERVIEW

How does psychological development occur? Do our genes predict the traits that we will or will not develop? Or does our environment? These questions have contributed to one of psychology's most disputed debates: the nature versus nurture debate.

THEORY DETAILS

Each person's psychological development is due to a combination of factors including their genetic makeup, the experiences they had as a child, their friendship groups, and the activities they participate in, just to name a few. Can you think of some of the factors that have influenced your development?

For centuries, philosophers and psychologists have wanted to know what influences the characteristics developed by each individual. 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 biological, *genetic* basis. Even before we had all of this modern knowledge about genes and DNA, some philosophers believed that our development was predetermined by the genes that we were born with.

2 The second school of thought suggested that each individual was unique due to their experiences and how these experiences shaped them. They believed that we are a product of our environment, the people around us, and the experiences that we have.

The two schools of thought had opposing ideas and for centuries psychologists debated which school of thought was right. This debate is more commonly known as the **'nature versus nurture' debate**.

Psychological development an individual's changes across multiple domains, including the life-long growth across emotional, cognitive and social domains

Psychological development
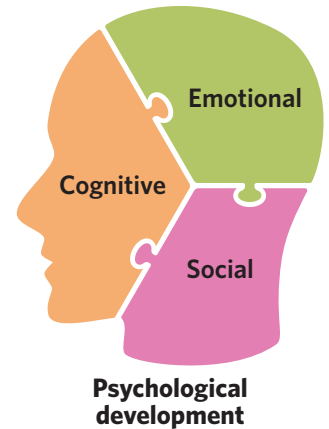
Image: seamuss/Shutterstock.com

Figure 1 Psychological development is a complex process with many aspects, including social, emotional and cognitive development

Nature versus nurture debate a debate which questions whether development is dependent on hereditary (nature) or environmental (nurture) factors

Nature

Those who emphasised the impact of genetics, which were believed to predetermine how an individual develops, were in the *nature* school of thought. This school of thought believed that the development of each individual was solely impacted by the genetic makeup which determines who they will become and the characteristics they will hold from birth.

Hereditary factors refer to the of unique, genetic material passed on from biological parents to their offspring. Heritable traits you may be familiar with include physical traits such as hair colour and eye colour, which involve the expression of certain genes which biological parents hold. In this sense, it is clear how certain characteristics are already predetermined, with some traits being set before birth.

Although it is easier to see how hereditary factors can influence physical development, how much do these factors impact an individual's psychological development? Individuals can inherit a *genetic predisposition* to develop certain traits. Genetic predisposition is an 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 which make them more likely to develop that 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). Certain personality traits and levels of intelligence have also been linked to genetics, with individuals having a predisposition to inherit certain traits.

> ### ⊕ *Want to know more?*
>
> If someone has a genetic predisposition to a certain condition will they definitely experience it at some point in their life? It is important to understand that individuals with a genetic predisposition will not have a 100% likelihood of expressing that trait or occurrence. This is due to multiple conditions needing to be met and interact in a certain way to produce the trait or occurrence. If, for example, you have a genetic predisposition for a mental health disorder, it does not mean that you will definitely experience it. It only means that your threshold for withstanding that condition is lowered compared to someone who does not have a genetic predisposition. For example, those with a genetic predisposition may experience a mental health disorder if exposed to three extremely stressful events in their life, while it may take five similarly stressful events for the condition to arise in someone who does not have a genetic predisposition for the condition.

> ### 🌐 *Psychology applied*
>
> Do you look completely different to your biological parents, or even your siblings? Maybe you are the only one in the family with blue eyes, or have a different hair colour. When you hold physical traits which differ from your biological parents, this difference is often due to recessive genes. *Recessive genes* are carried by your parents, yet are not physically *expressed* (the characteristics are not observable by others). The understanding of genes and how they are mapped was discovered during The Human Genome Project, which was completed in 2003. If you want to learn more about this project, watch the Youtube video titled *'The race to sequence the human genome - Tien Nguyen'* (TED-Ed, 2015).

Nurture

Those who were in the opposing school of thought emphasised the role of *nurture*; that is, the influence of our surroundings, environment, and experiences over the lifespan to shape us into who we are.

John Locke, a philosopher, famously coined the term *'tabula rasa'*, which meant '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, adults, and more specifically parents or caregivers, may shape the development of their kids by teaching them what is right and wrong and important skills and functions.

This notion was supported by the *behaviourism* school of thought. This perspective was proposed by psychologist John Watson, who observed the relationships between stimuli in the environment, and subsequent behaviours in response to the stimuli.

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

Image: grmarc/Shutterstock.com

Figure 2 Have you ever been told that you look like a mini-me of one of your parents? Hereditary factors can sometimes lead to children having physical traits which are extremely similar to their biological parents

> ### 🧩 *Lesson link*
>
> You will learn about different types of mental health disorders in *chapter 5: Atypical psychological development*. In lesson **5C: Major categories of psychological disorder**, you will learn about biological factors, particularly genetic predisposition, and how these can influence mental health disorders. In lesson **5D: Schizophrenia and the 'two-hit' hypothesis**, you will learn how hereditary factors can lead individuals to be more vulnerable to developing schizophrenia, which is a type of mental health disorder.

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

Behaviourism emphasises the role of learning, in which individuals modify their behaviours in response to the stimuli they are exposed to and the consequences of behaviours made in response to those stimuli. Watson proposed that individuals can learn by experiencing the rewards and punishments that follow a behaviour they may have carried out, and can also learn from observing other people's behaviours and subsequent consequences.

Like behaviourism, historically, there have been a range of philosophies which investigate the effect of environmental factors on development. Contemporary psychology now 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.

For example, an individual who has experienced multiple stressful or traumatic experiences, is more likely to develop mental health disorders such as anxiety (Fernandes & Oŝorio, 2015).

> **⚠ Useful tip**
>
> It is important not to confuse 'nature' and 'environment'. In the context of development, nature refers to hereditary factors, and nurture refers to the environmental factors in which an individual grows over the lifespan, particularly focusing on an individual's social and cultural environment.

📎 Lesson link

In **Units 3 & 4 Psychology**, you will learn about classical and operant conditioning. Both of these forms of conditioning arose from the perspective of behaviourism, in which behaviours become associated with stimuli. Key researchers in this field included John Watson, Ivan Pavlov and B. F. Skinner, who did much of their research on animals.

ACTIVITY 1

Nature or nurture?

Copy out the following venn diagram into your book. Classify each of the following characteristics as either nature or nurture, or a mixture of both.

- Eye colour
- Intelligence
- Life expectancy
- Favourite movies
- The shape of your nose

After completing the venn diagram, answer the questions below.

a Which characteristics were easy to classify?

b Were there characteristics that were difficult to classify as either nature or nurture?

c Were there any characteristics that you put as both nature and nurture? If so, why?

Nature   Nurture
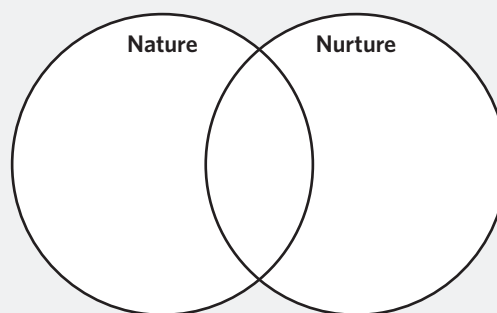
You most likely found some of these characteristics hard to classify. This is due to the difficulty in isolating hereditary factors from environmental factors, with most traits having an interaction of both factors. You will learn more about this interaction throughout the lesson.

The interaction of hereditary and environmental factors in psychological development 1.2.1.3

OVERVIEW

Is nature or nurture more important for development? Which school of thought ended up being right? Researchers now agree that the complexity of human development relies on an interaction of both nature and nurture due to the influence of both hereditary and environmental factors on development, rather than just solely nature or nurture alone.

THEORY DETAILS

Modern psychologists no longer question whether our development is due to nature *or* nurture, but rather, suggest that it is an interaction of both.

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.
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. This environment may potentially impact someone's personality by shaping the traits they inherited to be louder as they have to stand out to be heard in their environment.

Within this interaction, both nature and nurture provide different influences on development.

- Nature, or the hereditary factors each individual holds, provide the *potential* or *foundation* (predisposition) for certain traits or characteristics to be developed, given the right environmental conditions (nurture).

- Nurture, or an individual's social, cultural and physical environment, have the ability to fulfil an individual's potential to develop certain traits (provided by nature) by providing them with the certain situations or conditions that are needed for that trait to develop. Nurture also has the ability to influence an individual's development independent of their genetic predispositions, leading to the creation of certain traits or characteristics from the influence of nurture alone.

⊕ *Want to know more?*

The concept of *epigenetics* relates to alterations in *gene activity* which arise in response to environmental impact, rather than from the DNA sequence. In such a way, the expression of genes (the characteristics which are physically observable) are altered by environmental factors. Through studying epigenetics, the complex bidirectional relationship between nature and nurture is highlighted. If you want to further understand this process, search and watch the video *'What is epigenetics? - Carlos Guerrero-Bosagna'* (TED-Ed, 2016).

◉ *Analogy*

The tomato seeds shown in figure 3 can only grow into a tomato plant, due to their genetic material only 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 got 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.

Seed 1   Seed 2   Seed 1   Seed 2
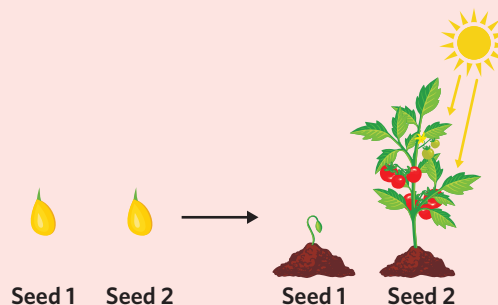
Image: VikiVector/Shutterstock.com

Figure 3 The interaction of nature and nurture is illustrated through the example of two tomato seeds

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Why do children act like their parents? Is this because they have inherited their genes? Or because children who grow up with their biological parents are influenced by the environments their parents create for them? How can you tell if hereditary or environmental factors have a bigger impact on the child?

The impact of nature and nurture have a relatively equal influence on development. It is often difficult to distinguish between the impact of nature and nurture because these two influences are so interlinked. This is particularly difficult when looking at the impact of nature and nurture on the development of kids who live with their *biological parents*
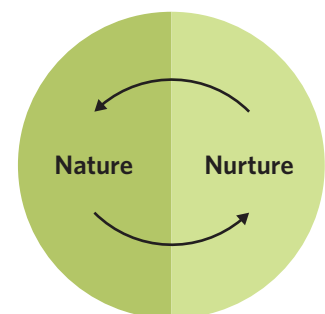
Figure 4 You can think of nature and nurture as two separate components which form the complete circle of development

(parents who provided them with their genes), as the parents not only provide the genes (nature), they also make choices which create the social and cultural environment the child lives in (nurture).

When children hold traits that are similar to those of their biological parents, these are often attributed to their genetics or hereditary factors (nature). However, it is important not to overlook the environmental (nurture) impacts that may encourage these traits to develop, such as creating a social and cultural environment which promotes or encourages the development of a certain trait.
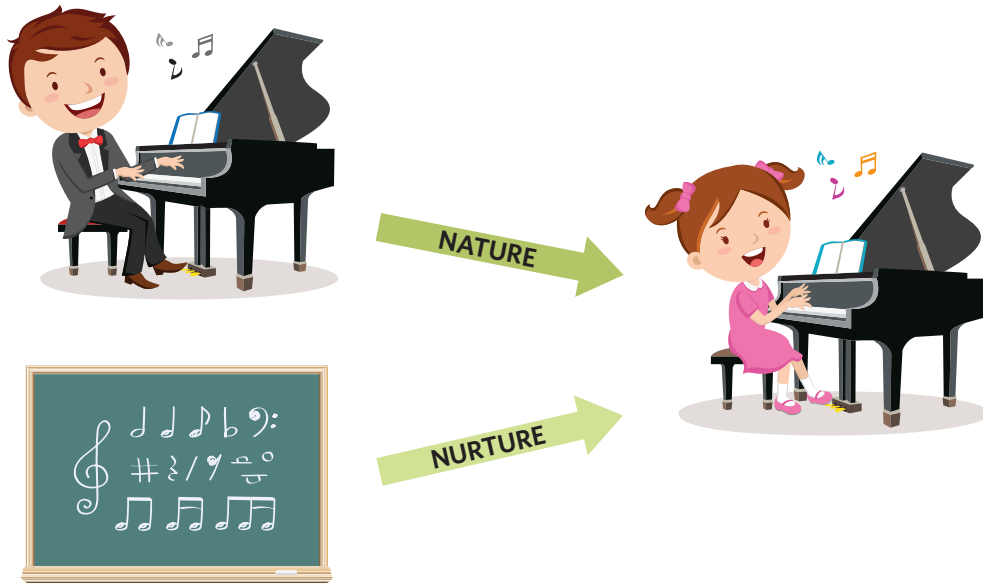
Image: graphic-line, romvo/Shutterstock.com

Figure 5 A child piano prodigy may be told that being able to play piano is 'in their blood' if their father is also a really great piano player. However, this skill may also be due to the biological father taking them to piano class from a young age and playing classical music in the house

The interaction of hereditary and environmental factors can be illustrated through certain developments, such as the development of intelligence and the development of personality. These two aspects of psychological development are both extremely complex, therefore relying on both nature and nurture to develop to an optimal level. All three components of psychological development (social, cognitive and emotional development) influence each other and contribute to intelligence and personality.

Table 2 The interaction of hereditary and environmental factors in the development of intelligence and personality

Intelligence	Personality
Have you ever felt like being around someone smart made you feel smarter? This may not be too far from the truth, with research demonstrating that an individual's social interactions can shape their own IQ (intelligence quotient) (Dickens & Flynn, 2001). This highlights the potential impact of the environment on an individual's intelligence. Historically, hereditary factors were believed to be completely responsible for an individual's intelligence, with an individual's genes pre-determining their intelligence. This notion was later challenged, with environmental influences, such as education programs, having the ability to increase IQ levels of children. This was even shown for children who were adopted with biological parents that had lower IQs, developing greater IQs when given extra educational resources and experiences (Dickens & Flynn, 2001). However these environmental influences can only go so far, with an individual's genetics still impacting how intelligent a person can become. This demonstrates the interaction between the environment (nurture) and genes (nurture) for intelligence.	Personality traits are most commonly used to measure personality differences among individuals. Previous research has identified that the influence of hereditary factors on the existence of personality traits ranges from 40-60% (Bleidorn et al., 2010), with the remaining proportion of personality being influenced by environmental influences. Nature and nurture have a reciprocal relationship in the development of personality, with individuals usually gravitating towards certain situations or events which match the traits they inherited. The environment then strengthens and reinforces these existing traits (Bleidorn et al., 2010). Similarly, if you inherit a strong, muscular build, you may be more inclined to seek out sporting opportunities. But does this mean that our personality constantly changes in line with our experiences? Although the environment does influence our personality, the traits we hold tend to become more stable over time and more resistant to being shaped by our experiences (Bleidorn et al., 2010). At the age of 50, our experiences have little to no influence on the traits that we hold (Bleidorn et al., 2010).

Twin and adoption studies 1.2.1.4

OVERVIEW

Twin and adoption studies provide a unique circumstance in which the impact of nature and nurture can be studied. In twin studies, researchers focus on either identical (monozygotic) twins, or fraternal (dizygotic) twins who are not identical.

THEORY DETAILS

One way to research the influences of nature and nurture on development is through twin and adoption studies. Twins provide a unique opportunity to study people who either have approximately half of the same DNA, as for **dizygotic** (non-identical) twins, or 100% of the same DNA, as for **monozygotic** (identical) twins. They serve as a great case study for the effects of the hereditary factors that influence development.

Dizygotic twins twins who are not identical due to variations in the genes they inherited

Monozygotic twins twins who are identical due to inheriting the exact same genes

> **Want to know more?**
>
> **How do identical and non-identical twins occur?**
>
> Identical twins share the exact same DNA. This is due to one of their biological mother's egg, also known as an *ovum*, being fertilised by one *sperm* from their biological father. After this process, the fertilised egg, called the *zygote*, splits into two *embryos*. These embryos then develop into identical, or monozygotic twins.
>
> In contrast, fraternal twins (non-identical) twins occur through two of the biological father's sperms fertilising two separate ova (eggs). These ova then go on to form zygotes and then embryos. These embryos do not split, but each develop into one of the two dizygotic twins.
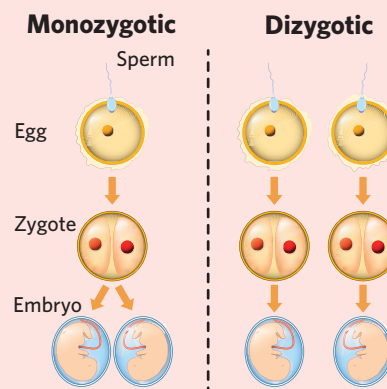
Image: Designua/Shutterstock.com

Figure 6 The biological processes involved in the *prenatal* (before birth) development of monozygotic and dizygotic twins

> **Memory device**
>
> The best way to remember the difference between monozygotic and dizygotic twins is to remember that *mono* refers to one, as the twins are identical and come from the same egg. Whereas *di* refers to two, in which the twins are not identical but are fraternal as they come from two separate eggs.

Twin studies involve exploring developmental similarities and differences among identical and non-identical twins. In twin studies, the number of shared traits and characteristics between identical, monozygotic twins are compared to those shared by non-identical, dizygotic twins. The similarities found between the identical, monozygotic twins are said to be more likely due to hereditary factors, as they share more of the same DNA when compared to non-identical twins. If this is the case, this provides evidence for the impact of nature on development. The only issue here is that twins are often brought up together in the same family, therefore having similar environmental influences. To navigate this issue, adoption studies provide some answers.

ACTIVITY 2

Can you spot the lies?

Which of the following statements about twins are true and which are false?

1   It is impossible for twins to be born on different days.
2   Older women are more likely to have twins than younger women.
3   The amount of twins born has significantly increased over recent decades.
4   Identical twins have the same fingerprint.
5   Some twins have different dads.

(Segal, 2017; Rosenstein, 2019)

So what can adoption studies tell us? *Adoption studies* compare the biological and adoptive families. Due to adopted children having not genetically inherited any genes from their adoptive parents, researchers are able to explore the impact of nature and nurture on development. If adopted children bear more resemblance to their biological parents, the impact of nature is highlighted. By contrast, if these adopted children are more similar to their adoptive family, the impact of nurture is shown.

In cases where twins have been separated and adopted into different families, psychologists can learn about the effects of environmental factors and maybe once and for all determine whether nature or nurture has a greater effect on development.
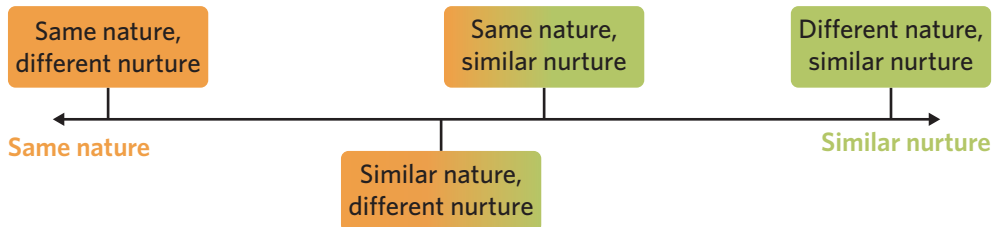
Figure 7 Psychologists can research twins at four points on the continuum of nature versus nurture, with each providing an opportunity to explore the impact of nature and nurture on development

As can be seen in figure 7, there are multiple variations of twin and adoption studies. Each of these variations provide researchers with an alternate angle in which the impacts of nature and nurture can be analysed. The following variations analyse identical and non-identical twins which have or have not experienced adoption, however, there are other research scenarios which just look at adoption. These variations include:

- **Same nature, different nurture:** identical (monozygotic) twins who share the same DNA and are separated at birth, potentially through adoption. Similarities between these twins indicate the impact of nature on development. Any developmental differences between these twins indicate the impact of the environment, and provide evidence for the impact of nurture on development.

- **Same nature, similar nurture:** identical (monozygotic) twins brought up in the same environment with the same family. Due to having the same environment and genetic basis, in theory, these twins should hold extremely similar characteristics.

- **Similar nature, different nurture:** non-identical (dizygotic) twins separated at birth, potentially through adoption. These twins have experienced different nurture, but still share similar nature due to having the same biological parents. Due to this, these twins should hold less similar characteristics than identical twins and twins growing up in the same environment but they are still likely to share some characteristics.

- **Different nature, similar nurture:** non-identical (dizygotic) twins brought up in the same family. Due to not being identical twins, if these twins share similar developmental characteristics, the impact of the environment is clear.

Psychology in practice

One field of scientific research is behavioural genetics. *Behavioural genetics* involves observing the influence of both inherited genes and the environment on development. This research involves estimating the influence of both genes and the environment for certain traits and exploring differences within certain populations. This field of research involves the cooperation of researchers in the fields of psychology and biology.

Image: MicroOne/Shutterstock.com

Figure 8 Behavioural genetics involves closely analysing the differences in DNA among individuals

ACTIVITY 3 – CLASS DISCUSSION

Three identical strangers

Three identical strangers is a documentary about a controversial study where triplets were separated at birth and adopted by different families (Wardle, 2018). The three identical (monozygotic) triplets, who had the same nature (same genetics) grew up in three different environments: a working-class family, a middle-class family and an affluent family. Their adopted parents were unaware that they had brothers, with the triplets discovering this at 19 years of age.

The parents later discovered that a researcher had purposefully separated these three triplets, among other sets of twins and triplets, as part of a study. When this was discovered, it was assumed that the researcher wanted to investigate whether environmental or hereditary factors more significantly impact development. However, there is still uncertainty as to whether this was the aim of the study, with the study's results locked up until the year of 2066.

As part of the study, the three triplets received regular visits from researcher assistants, who videotaped them, interviewed them and conducted psychometric testing throughout their childhood. Their parents were misinformed about the purpose of these visits, being told when they adopted their children that they were randomly selected to be part of a childhood developmental study.

- a The three brothers discovered many similarities between them, despite having grown up in different families, including that they smoked the same brand of cigarettes as well as more significant similarities. Which side of the nature versus nurture debate does this particular finding of the study align with?
- b The documentary is criticised for overlooking environmental effects on development, and therefore failing to show the interaction of both nature and nurture. This was seen to be particularly true for the development of personality. Can you think of how an individual's environment can influence their personality?
- c Do you think this was an ethical study? Why or why not?
  - - Is there any way that this study could have been conducted ethically?
  - - Which principles did the researcher and research assistants violate during this study?

Theory summary

In this lesson, you learnt about the process of psychological development, involving the changes in an individual's emotional, cognitive and social growth across the lifespan. You also learnt about the impact of environmental and hereditary factors on psychological development. This involved learning that

- Environmental factors represent the nurture perspective of the nature versus nurture debate
- Hereditary factors represent the nature perspective

You learnt that modern psychology emphasises the interaction of hereditary and environmental factors (or nature and nurture) on psychological development. Finally, you also learnt about twin and adoption studies, and how research in these areas illustrate the interaction between nature and nurture.

4A QUESTIONS

Theory-review questions

Question 1

Fill in the blanks with two of the following terms.

- Emotional
- Physical
- Cognitive

Psychological development refers to continual changes and growth in domains including _____, social and _____ development.

Question 2

The nature versus nurture debate questions whether development is influenced by hereditary or environmental factors. Individuals who believe that development is only predetermined by genetic factors align with the *(Select one)*

A nature perspective of the debate.

B nurture perspective of the debate.

Question 3

The nurture perspective of the debate believes that *(Select all that apply)*

I   Experiences shape individuals.

II   Traits are inherited from parents.

III The environment an individual grows up in impacts development.

IV   Culture impacts development.

Question 4

Most researchers agree that there is an interaction between hereditary and environmental factors in development. In this interaction, hereditary and environmental factors have different roles. Which of the following statements correctly outlines these roles?

A   Inherited genes provide an individual with the potential to develop certain traits, with the environmental circumstances influencing whether these traits develop.

B   Inherited genes predict all of the characteristics an individual will develop, with the environment having minimal contributions on an individual's development.

Question 5

The impacts of nature and nurture on development are researched through twin and adoption studies. In these studies, researchers investigate both identical, and non-identical twins. Identical twins *(Select one)*

A   are also known as dizygotic twins, and have some variations in the genes they inherited.

B   are also known as monozygotic twins, and share the same inherited genes.

Skills

Understanding research

Use the following to answer Questions 6-8.

Read the following excerpts from a journal article. This article on 'The Twin Relationship Questionnaire' examined the validity and reliability of the five-factor scale used in the questionnaire to measure similarities and differences between twins.
The study involved the parents of twins filling out this questionnaire multiple times from when the twins were aged three to seven years old. The twins also filled in a questionnaire about their own perceived closeness at 11. The validity and reliability of this questionnaire was also examined.

Method - Measures

The relationships between twins were assessed using the parent-reported 'Twin Relationship Questionnaire' (Fortunaet al., 2010). Parents rated the degree to which each one of 22 statements characterized each of the twins, using a scale ranging from 1 = not characteristic at all to 5 = very characteristic. Items were selected to represent the five relationship dimensions of conflict (six items), closeness (five items), dependence (five items), dominance (three items), and rivalry (three items).

At the age of 11, the twins themselves (461 pairs) evaluated their own closeness with a 4-item scale taken from the 'Multidimensional Scale of Perceived Social Support' (Zimet, Dahlem, Zimet, & Farley,1988). Items concerning family relationships were adapted to relate to the co-twin (e.g.,"My twin really tries to help me").

Discussion

The external validity of the questionnaire, as measured with regard to the twins' reports on their closeness at age 11, is substantial. Mothers' reports on the twins' closeness at all measurement points and fathers' reports at age 6.5 and 8–9 predicted the twins' self-reports at late childhood. This finding demonstrates the predictive validity of the questionnaire.

The strength of our research stems from the consistent psychometric findings about the 'Twin Relationship Questionnaire' at different ages and according to fathers' and mothers' reports. The replication of the findings reinforces the reliability and validity of the questionnaire.

(Segal & Knafo-Noam, 2020).

Question 6

The twins and their parents both used rating scales throughout the study. What type of research methodology was involved through the use of ratings scales? *(Select one)*

A   repeated measures study

B   self-report

C   interviews

D   case study

Question 7

What type of data would have been collected from these scales? *(Select one)*

A   objective, quantitative data

B   objective, qualitative data

C   subjective, qualitative data

D   subjective, quantitative data

Question 8

The excerpt states that 'The replication of the findings reinforces the reliability and validity of the questionnaire.' What does replicability of research mean for this study? *(Select one)*

A   Replicable studies indicate that the results aren't a 'one-off', meaning that conclusions on the questionnaire's validity can be accurately drawn as other studies gain similar results.

B   Replicable studies indicate that the 'Twin Relationship Questionnaire' is valid, with future studies being unlikely to get the same results.

Exam-style questions

Multiple-choice questions

Question 9   (1 MARK)

Which of the following statements is **not** an assumption of the nurture perspective of the nature versus nurture debate?

A   Babies are born as a 'blank slate'.

B   The environment shapes development.

C   What parents and caregivers teach their children influences their development.

D   Development is influenced by the characteristics children inherit from their parents.

Question 10   (1 MARK)

In which way is the table incorrect?

Things influenced by hereditary factors	Things influenced by environmental factors
• Eye colour	• Religious beliefs
• Dimples	• Fingerprint
• Height	• Favourite sport

A   'Favourite sport' should have been listed as a hereditary factor as an individual's biological parents' favourite sport influences their choice of favourite sport.

B   'Dimples' should have been listed as an environmental factor as this is predetermined by the genes an individual inherits.

C   'Fingerprint' should have been listed as a hereditary factor as each individual's unique fingerprint is the same throughout the lifespan due to being genetically based.

D   'Eye colour' should have been listed as a hereditary factor as this is predetermined by the genes passed on to an individual from their biological parents.

Question 11 (1 MARK)

Psychological development includes

A physical, sociocultural and cognitive development.

B social, emotional and cognitive development.

C emotional, spiritual and political development.

D intellectual, cognitive and physical development.

Question 12 (1 MARK)

Lorena's parents were both English high school teachers after finding it easy to learn and succeed at English at school. From a young age, they read to her each night, and paid for English tutoring as soon as she started school. After going to university, she decided to also teach English. Lorena's English skills were likely to be due to

A the impact of nature, with Lorena inheriting great English skills from her parents.

B the impact of nurture, with Lorena learning great English skills due to her educational opportunities from a young age.

C hereditary factors, with the genes for great English skills being passed on to Lorena at birth.

D the interaction of nature and nurture, with Lorena inheriting intelligence from her parents and her English skills being nurtured from a young age.

Use the following to answer Questions 13 and 14.

Mulan had learnt at school that height is genetically inherited. She told this to her twin brother, Mushu, who disagreed, arguing that even though they are twins, he is taller than her.

Question 13 (1 MARK)

If Mulan is correct and height is inherited, this would align with the nature perspective of development. The nature perspective outlines that

A development is predetermined as an individual's genetic makeup determines the traits they will hold, such as their height.

B development is influenced by the environment, with aspects of nature such as exposure to clean air and safe drinking water impacting development.

C development is due to the learnings an individual acquires from their environment, such as learning what is accepted by society.

D development is due to both nature and nurture.

Question 14 (1 MARK)

The difference in height between Mulan and Mushu may be due to them being

A identical twins, as they share the exact same genes.

B dizygotic twins, as their genes have some variation, leading to them having different heights.

C monozygotic twins, as their genes have some variation, leading to them having different heights.

D twins, therefore failing to explain why they have different heights.

Short-answer questions

Question 15 (1 MARK)

Explain the difference between monozygotic and dizygotic twins.

Question 16 (2 MARK)

Define one of the aspects of psychological development and provide an example of this aspect.

Question 17 (2 MARKS)

Using an example, describe the role of both nature and nurture in their interaction during development.

Question 18   (2 MARKS)

Khaled and Steven are identical twins separated at birth and were adopted into separate families. At the age of 23, they found each other on social media and decided to meet. They discovered that they were both really organised people who always planned their days out to the hour. However, Khaled was an overly loud and friendly person, while Steven was more quiet.

Outline how the influence of nature and nurture is clear in the scenario and explain why this may be the case.

Questions from multiple lessons

Question 19   (1 MARK)

Marcus is undergoing physiotherapy sessions after enduring a brain injury. In these sessions, Marcus' physiotherapist urges him to consciously think about gripping a pencil while they do exercises which will hopefully allow him to complete this action. In doing so, the physiotherapist is encouraging adaptive plasticity to occur so that Marcus's neural connections involved in being able to grip objects are developed again. The process of adaptive plasticity highlights the role of

A   nurture, as Marcus can relearn how to grip through physiotherapy due to his brain having the ability to change due to experience.

B   nature, as Marcus must have inherited an extra malleable brain from his parents, allowing him to produce new neural connections involved in gripping objects.

C   nurture, as Marcus must have a really great physiotherapist who will allow him to relearn how to grip objects.

D   physical development, as Marcus's ability to think about gripping objects will be solely responsible for him learning how to grip again.

Adapted from VCAA 2014 exam SAQ13

4B PERIODS OF PSYCHOLOGICAL DEVELOPMENT

*Can our psychological skills develop at any time? Is there a set age at which certain skills need to have been developed? This actually depends on the skill or function: while some psychological skills have set time periods in which it is best that they develop, others have periods in which they **must** develop. In this lesson, you will learn about these different types of periods. You will also learn about the story of Genie.*

Image: vasabii, igor kisselev/Shutterstock.com

4A Nature versus nurture	4B Periods of psychological development	4C Attachment and emotional development	4D Studies of attachment	4E Cognitive development	4F Piaget's theory of cognitive development	4G Erikson's theory of psychosocial development

Study design dot point

- the role of critical and sensitive periods in a person's psychological development

Key knowledge units

Critical and sensitive periods   1.2.2.1

Periods of psychological development

Critical and sensitive periods 1.2.2.1

Critical periods   Sensitive periods   The story of Genie
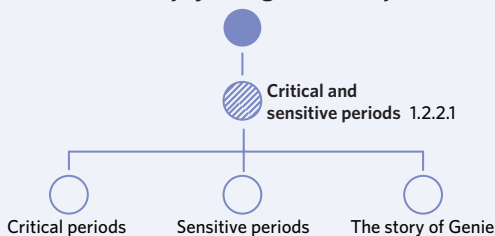
Critical and sensitive periods 1.2.2.1

OVERVIEW

There are certain periods during development in which it is vital for certain skills or functions to be developed, whilst for other skills there is a more flexible amount of time for development. These periods occur within all dimensions of development, including physical growth. However, in this lesson, we will be applying these ideas specifically to psychological development.

THEORY DETAILS

Some functions have set time periods in which they *must* develop to develop at all throughout the lifespan (critical periods), and others have an optimal, but more flexible period (sensitive periods). These time periods are different for specific skills or functions, with the period for each skill being set out by the process of maturation.

Maturation is a biologically programmed process of growth, which has a fixed sequence and facilitates all aspects of our development as we grow from conception into adulthood. It involves laying down predetermined neural structures from conception. Experiences throughout childhood and adulthood then shape and add to these structures, allowing skills to be acquired as they have been set out to (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.

Maturation the biologically programmed changes which facilitate development from conception through to adulthood

⊙ **Analogy**

Maturation has two distinct processes which we can think of through using the following analogy:

1   The laid out neural structures which are mapped out in your brain. These neural structures can be thought of as a blueprint which is already set, with experiences then building in line with the blueprint.

2   Experiences contributing to or modifying the already set structures in the blueprint. You can think of these experiences as blocks which fill the gaps in the mapped neural structures or add to them.
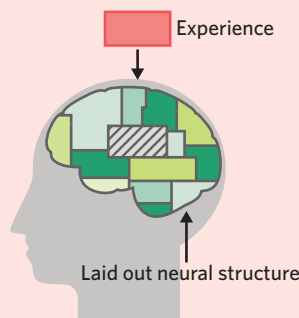
Image: Pikovit, igor kisselev/Shutterstock.com

Figure 1 When you have a formative experience, this experience may represent a shape of a square which perfectly fits within the mapped-out neural structure in your brain

🧩 **Lesson link**

Maturation is an innate process which 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 the foundational structure of maturation to come to life, certain experiences need to occur, acting as a source of *nurture*. To revisit these concepts, return to lesson **4A: Nature versus nurture**.

🧩 **Lesson link**

Neurological processes such as myelination and synaptic pruning lay the foundations of maturation, and are outlined in lesson **3A: Developmental plasticity**. Return to this lesson if you need a refresher on these concepts.

Due to infants and children having more malleable brains, they have an enhanced ability to learn from and be responsive to their environment. This malleability allows developmental plasticity to occur, with processes such as *myelination*, *synaptogenesis* and *synaptic pruning* making certain periods in infancy and childhood more suited to acquire certain psychological functions.

But why do different functions have different time periods in which they have to be, or are most optimally, learnt? The difference in periods is due to different brain regions being more malleable, or having more plasticity, at different times. Due to this, some brain regions will be more responsive to environmental stimuli at certain times in development. For example, at two months of age one brain region might be particularly responsive to certain stimuli, while another region might be more responsive at five months of age. This is all due to the foundations laid out by the process of maturation which began from conception.

The periods in which certain skills can be or need to be developed are called sensitive and critical periods respectively. These periods are described to provide different 'windows of opportunity' in which skills and functions can develop. The different sizes of these windows of opportunity can be visualised in figure 2.
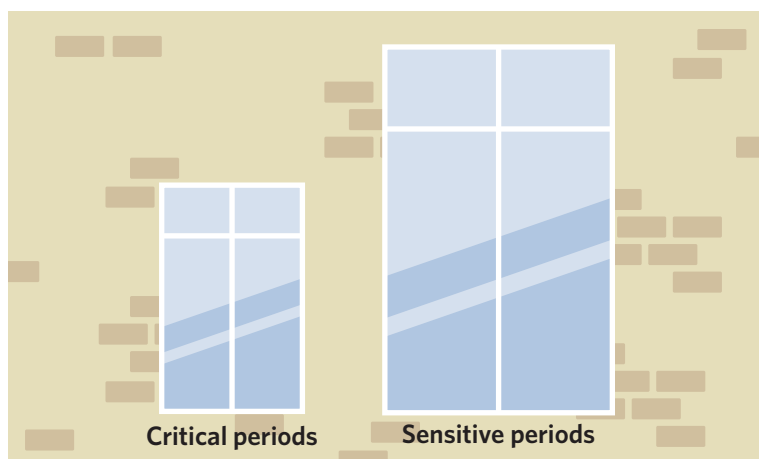
Figure 2 Critical periods are less flexible due to having smaller windows of opportunity in which skills and functions can be developed when compared to sensitive periods

As highlighted in figure 2, the main difference between sensitive and critical periods is the flexibility of each period, as represented by the size of the window of opportunity. In general, critical periods are less flexible, while sensitive periods have greater flexibility in which a skill or function can be developed. The differences in flexibility between critical and sensitive periods is a general difference characteristic of most sensitive and critical periods, although there are exceptions for some skills and functions. In general, critical periods usually have a smaller time period when compared to sensitive periods, but this varies for different skills and is a less important distinction between the two types of periods.

Critical periods

Critical periods are narrow, rigid periods in which a specific skill or function must be learnt. If these functions are not acquired during this time, they may never develop, or *maladaptive* development (development which is not typical and is inappropriate for the environment) may occur. From a psychological perspective, this refers to 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, mainly due to the neural processes and plasticity of the brain at this time. This hypothesis is particularly relevant for language acquisition.

Critical periods the narrow, rigid developmental period in which a specific skill or function must be learnt

Example of first-language acquisition

Language acquisition, or the ability to perceive and comprehend language and produce and communicate speech, is one of the most well-known critical periods for humans. Researchers, most notably Noam Chomsky, suggested that humans are born with a predisposition to acquire language (Chomsky, 1965). This predisposition allows babies to even be able to hear in their mothers' womb, as well as being equipped with the tools to acquire language from birth. 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 at all. This acquisition period varies but it is believed that first-language acquisition (acquisition of native language, also known as mother tongue) needs to occur in the first three to five years of life. For example, if a child is deprived of exposure to language in the first few years of life, they will never be able to acquire the language skills comparable to that of a native speaker.

🌐 *Psychology applied*

Critical periods can also be seen within animals. Specifically, *imprinting* is seen as a critical period for many animals such as ducks. Imprinting involves ducklings becoming attached to the first living thing they see after they hatch, which means that they form an emotional bond with the living thing they see. This enhances their survival as the ducklings usually see their mother first, which encourages their survival as they attach to them and are therefore protected by their mother. If ducklings hatch and do not see a living object, or become attached to other living things such as dogs, cats or even humans, their chance of survival will become limited. This very short period after birth demonstrates how critical periods begin and end extremely abruptly.
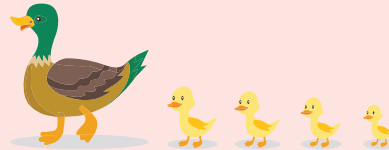
Image: Golden Vector/Shutterstock.com

Figure 3 If ducklings successfully experience imprinting by attaching to their mother or other family members, their chance of survival becomes heightened as they will be protected by their family. Imprinting is often seen by ducklings walking in a line behind their mother

Sensitive periods

Sensitive periods are optimal developmental time frames in which there is the opportunity to learn a skill or process in the fastest and easiest way. These periods occur when the brain is most sensitive to learning from environmental influences. Sensitive periods most commonly occur during infancy and early childhood due to the greater level of brain plasticity and neural growth at this time. This allows synaptic connections between neurons to form more efficiently and if stimulated, to develop to a greater strength.

Sensitive periods the optimal developmental period for a specific function or skill to be learnt

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 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 developmental 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).

Table 1 Comparing critical and sensitive periods and summarising relative examples of each period

	Critical periods	Sensitive periods
Definition	A narrow, rigid period in which a specific skill or function must be learnt	An optimal period for a specific function or skill to be learnt
Characteristics	• Skills or functions with a set critical period must be learnt during this predetermined period or they will not be learnt at all • Humans have very few critical periods, but other animals have more • The developmental period of time starts and finishes suddenly	• Particular skills and functions with sensitive periods will be easiest to learn during this developmental period • If skills are not learnt in this period, the skill or function has the potential to develop at a later time, however, it may take longer and be more difficult to learn, and may not be developed to the same strength as it would be if development had occurred in the sensitive period • Neurological processes during these periods facilitate the optimal timing of sensitive periods, such as skills being learnt more easily during infancy due to high levels of myelination and low levels of synaptic pruning • Period starts and finishes more gradually than critical periods
Examples	• Acquisition of one's own native, first language • There is a critical period in which children need to learn their native first language to learn it at all • If there are atypical circumstances that result in the child not acquiring language during this critical period, they will not be able to completely learn the language later in life	• Acquisition of a second language • Infants and young children have a sensitive period to learning a second language, which means that their brains are more able to learn a second language as compared to an adult • However, if an infant or child doesn't learn a second language during this sensitive period, they can still pick up the language later in life as an adult, but they will be slower at picking it up and it may require more effort

⊙ *Analogy*

One way in which you can remember the difference between sensitive and critical periods is to think of sensitive periods as a 'best before' date, with the date being less strict and more flexible than 'used by' dates. If you eat food after the best before date, it may be less tasty and enjoyable than if you ate it before the best before date, just as the function or skill can develop after the sensitive period, but may be harder to develop to the same strength.

In contrast, critical periods are more prescriptive just like 'used by' dates, with foods having little to no leeway after the 'used by' date to be eaten, just like functions or skills being unable to be learnt after the critical period.

⊕ *Want to know more?*

There are also critical and sensitive periods for physical development. Critical periods for growth and development are particularly important during *prenatal development* (which is the period from conception up until birth). During prenatal development, certain processes need to occur at specific periods, such as the development of the nervous system which has to occur within a period of a month and a half.

Substances called *teratogens* are harmful, toxic substances that may interfere with the critical periods of physical growth during prenatal development. These substances include alcohol, lead, and high levels of mercury. Mercury, which is found in food such as tuna and swordfish, must be limited for pregnant women or it may have detrimental impacts on the development of the baby.

Image: Walnut Bird/Shutterstock.com

Figure 4 Critical periods are particularly important during prenatal development (from conception up until birth)

The story of Genie

The devastating story of Genie was a case study which further developed understandings researchers had about critical and sensitive periods related to language acquisition. Genie was a girl who 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.

When discovered, she:

- was unable to walk
- was unable to talk
- did not make any noises (such as crying)
- was the size of a six or seven-year-old child

At this point, researchers and psychologists began working with Genie to see if she could acquire language. Researchers were impressed when she was able to learn and understand words at a rapid rate. Although researchers were surprised at the rate at which Genie could add words to her vocabulary, this process was far more difficult and lengthy compared to the rate at which infants and toddlers expand their vocabulary. The ability to understand words and acquire vocabulary was therefore thought of as a *sensitive period*, due to the optimal period occurring as a young child, yet Genie was still able to acquire this skill as a teenager, even though it took longer and was more difficult.

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). Genie was not able to develop certain skills required in language acquisition, including:

- fully understanding all aspects of grammar; she was unable to separate grammatically correct from grammatically incorrect sentences
- verbally producing sentences
- understanding *intonation* (the pattern involving rises and falls in pitch when speaking to convey meaning)

These processes which Genie could not fully develop were then thought to be skills which have a critical period. Interestingly, the research demonstrated that the aspects of language comprehension and verbal language production were distinctly different processes of language acquisition. This suggests that some aspects of language acquisition (e.g. verbal language production) have *sensitive periods*, while others (e.g. understanding intonation) have *critical periods*.

After a few years of developing Genie's language skills and studying her progress, the researchers were unable to work with her anymore due to conflicts with Genie's mother which led to a court case. Since this point, Genie has lived in an aged care facility.

The case study of Genie was extremely unique. Her story and circumstances provided researchers with an opportunity to learn about the processes of language development by working with her for an extended period of time. Through working with her, a lot of insight was gained. This insight could not be replicated in an experiment due to ethical principles, with the findings therefore significantly enhancing understandings of psychological development.

> **Want to know more?**
>
> The name Genie is a *pseudonym* (a fake name used to protect her identity). In protecting her identity, researchers were upholding the ethical guideline of confidentiality.

Image: Pikovit, igor kisselev/Shutterstock.com

Figure 5 Even though Genie was able to display that she understood sentences, she was unable to verbally produce sentences herself

> **Want to know more?**
>
> Verbal language production is a more complex and sophisticated process which relies on the process of language comprehension. The function of language production requires specific synapses being stimulated at a young age and strengthened over time, as well as the development of strength and control over muscles required to produce speech (Curtiss et al., 1974; Weston, 2002). This interaction of multiple physical and psychological processes may explain why certain aspects of language production are likely to have a critical period.

ACTIVITY 1 – CLASS DISCUSSION

Discuss the following questions about the story of Genie with a partner.

1   What type of research methodology was used when researchers investigated Genie and her ability to acquire language as a teenager? What evidence do you have to support this?

2   In terms of processes of developmental plasticity, why may Genie be unable to ever produce sentences or understand all aspects of grammar?

3   Before this study, the *critical period hypothesis* stated that language acquisition was a critical period. However, Genie was able to acquire some processes of language acquisition (e.g. expand her vocabulary, verbally produce one and two-word sentences) but not others (e.g. verbally produce complete sentences). What do these findings from the study into Genie suggest about this hypothesis? Do the results support the hypothesis completely? Why or why not?

Theory summary

In this lesson, you learnt about the differences between sensitive and critical periods, with sensitive periods having greater flexibility whereas critical periods are rigid periods in which a skill or function has to be developed. In learning about the characteristics of both of these periods, you also learnt about the contributing role of maturation and processes of developmental plasticity. You also learnt about the story of Genie, and the knowledge her case study provided about language acquisition.

4B QUESTIONS

Theory-review questions

Question 1

Fill in the blanks with the following phrases.

*   Are most optimally learnt

*   Have to be learnt

Critical periods refer to specific times in which skills _____, whereas sensitive periods refer to times in which specific skills _____.

Question 2

Critical and sensitive periods have different amounts of time in which skills and functions can be learnt. Which of the following options best describes critical and sensitive periods? *(Select one)*

	Critical periods	Sensitive periods
A	Rigid period in which a skill or function has to be developed to develop at all	More flexible period in which it is optimal for a skill or function to be developed
B	More flexible period in which it is optimal for a skill or function to be developed	Rigid period in which a skill or function has to be developed to develop at all

Question 3

The timing of both critical and sensitive periods relies upon the process of maturation. The process of maturation *(Select one)*

A   provides the structural foundation for the development of skills.

B   refers to the experiences from the environment that contributes to development.

Question 4

The story of Genie provided researchers with insights into the sensitive and critical periods of language acquisition. Genie surprised the researchers by being able to expand her vocabulary; however, this was at a slower rate than the speed at which toddlers and young children expand their vocabulary, suggesting that the function has a *(Select one)*

A   critical period.

B   sensitive period.

Skills

Perfect your phrasing

Question 5

Which of the following sentences is most correct?

A Critical periods are narrow periods in which a function is most optimally learnt.

B Critical periods are narrow periods in which a function has to be learnt.

Exam-style questions

Multiple-choice questions

Question 6   (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 7   (1 MARK)

Skills which 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 8   (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 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 9   (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.

Use the following information to answer Questions 10 and 11.

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 10   (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 11   (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.

Short-answer questions

Question 12   (1 MARK)

Identify one difference between sensitive and critical periods.

Question 13   (2 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.

Based on Genie's scenario, identify whether learning grammar has a sensitive or critical period. Justify your response.

Question 14   (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 to his brother by referring to the type of period the acquisition of a second language is. (2 MARKS)

Questions from multiple lessons

Question 15   (1 MARK)

The biological sequence of learning set out by the process of maturation contributes to the existence of critical and sensitive periods. In such a way, functions are unable to develop if they miss the short window of opportunity set by the critical period. From a developmental plasticity perspective, these functions are unable to be developed at a later time due to

A   the reduction of neuronal connections after infancy due to the process of synaptic pruning in which unused synaptic connections between neurons are eliminated.

B   synaptogenesis, as the unstimulated synaptic connections between neurons are eliminated, physically changing the shape of the brain.

C   the heightened level of synaptogenesis in adulthood, meaning that the brain is too overworked to learn new functions.

D   myelination during adolescence, which facilitates higher-order thinking and eliminates any neuronal changes occurring.

4C ATTACHMENT AND EMOTIONAL DEVELOPMENT

How do children learn to go to their parents when they are hurt or upset? What factors influence how strong a bond is between a child and their parent? How do these bonds influence a child's emotional development? Can they influence future relationships?

Attachment theory explains the type of bonds formed between an infant and their caregivers, and how this attachment style is likely to impact the emotional development of that child into adulthood. In this lesson, you will learn about attachment theory, as well as the factors which affect attachment.

Image: Viktoria Kurpas/Shutterstock.com

4A Nature versus nurture	4B Periods of psychological development	4C Attachment and emotional development	4D Studies of attachment	4E Cognitive development	4F Piaget's theory of cognitive development	4G Erikson's theory of psychosocial development

Study design dot point

- the importance of attachment on an individual's emotional development: genetics; temperament and early life experiences (with reference to the work of Harlow & Ainsworth)

Key knowledge units

Attachment and emotional development   1.2.3.1

Factors affecting attachment   1.2.3.2

Attachment and emotional development

- Attachment and emotional development 1.2.3.1
  - Attachment theory
  - Emotional development
- Factors affecting attachment 1.2.3.2
  - Genetics
  - Temperament
  - Early life experiences
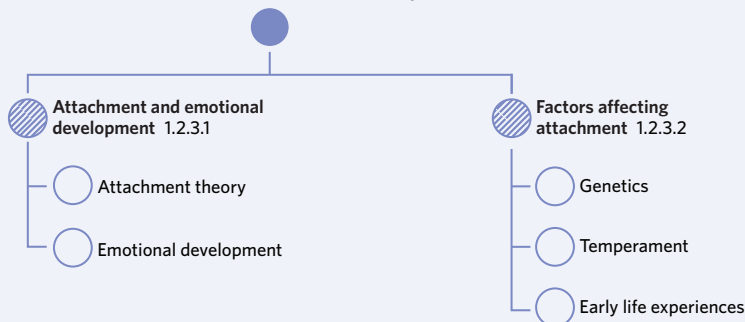
Attachment and emotional development 1.2.3.1

OVERVIEW

The attachment formed between an infant and their primary caregiver/s significantly impacts their 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. Attachment theory outlines different styles of attachment, which have been shown to contribute to emotional development.

THEORY DETAILS

Attachment theory

Attachment involves the formation of long-lasting emotional bonds between two individuals. In the context of **attachment theory**, this refers to the strength of an emotional bond between an infant and their primary caregiver. Attachment theory has been researched by many psychologists, with significant research being conducted by John Bowlby, Harry Harlow, and Mary Ainsworth.

Prior to the studies of Bowlby, Harlow, and Ainsworth, researchers believed that the bonds observed between an infant and their caregivers were solely due to the caregivers

Attachment a long-lasting emotional bond between two individuals

Attachment theory a theory that suggests that the bond formed between children and their primary caregivers determines the nature of the child's emotional development into adulthood

providing the infant with food. This perspective assumed that this bond was created for an evolutionary purpose, in which the infant would form an attachment with their caregivers to ensure that they continued to get fed and therefore survive. In the 1950s, Harlow began to conduct studies which questioned and opposed this notion, with Bowlby and Ainsworth also conducting their own research at this time. They found that attachment was much more complex than this, and wasn't just purely based on evolutionary needs. You will learn about the studies conducted by Harlow and Ainsworth in the next lesson.

Through his observations from 1944 to 1988, Bowlby described attachment as a necessary component to ensure that a child experienced *normative emotional development* (standard, or normal process of healthy, emotional growth), allowing the child to understand and cope with their own emotions.

In 1969, Bowlby identified that healthy attachment allowed the *primary caregivers* (adults who predominantly look after the child) to act as a *secure base,* with the infant being able to return to the caregiver for safety while exploring their environment. One way to think of a secure base is to think of a caregiver like a home. You may leave during the day for school, work, sports or social events, but you have a base to come back to, and know that it will be there.

Infants begin to form attachments with caregivers between six to seven months of age. Attachment continually changes and strengthens throughout childhood in line with experiences.

Image: ksuklein, Viktoria Kurpas/Shutterstock.com

Figure 1 An infant with healthy attachment will be able to leave their primary caregiver to explore their environment and then return to their caregiver who acts as a secure base

To form healthy attachment, Bowlby (1969) stated that:

1 The caregiver must consistently meet the needs of the infant, particularly responding when the infant is distressed and being able to anticipate their needs

2 The caregiver and child must interact in an enjoyable and playful manner

Bowlby's theory of attachment described the emotional bond formed between an infant and their primary caregiver as having significant impacts on the children's emotions, behaviours, and relationships as an adult. This 'healthy attachment' equips the individuals with the ability to form strong relationships due to a developed sense of trust and self-esteem as an adult. This aligns with Bowlby's later research (1973) which contended that a child's early experiences with their primary caregiver form a working model or prototype which children apply to their future relationships. Bowlby believed that these working models influenced the development of personality as well as emotional development.

There are multiple attachment styles or forms of attachment which have been identified through research on attachment. Different researchers refer to these differing attachment styles using slightly different terminology, however all forms generally fall under two categories: *secure* and *insecure* attachment. A description of these two styles of attachment, as well as what these attachment styles involve, are outlined in table 1.

Input : *positive early childhood attachment*

Output : *prototype applied to future relationships*
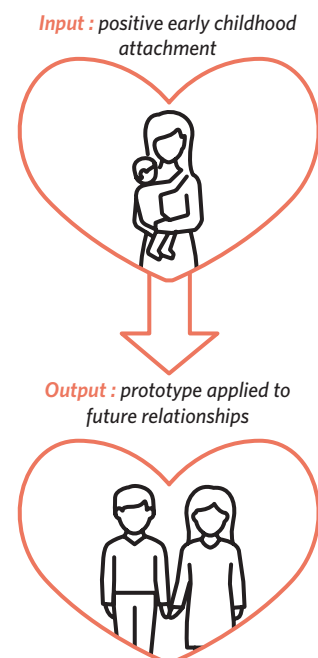
Image: VoodooDot/Shutterstock.com

Figure 2 If healthy attachment is formed between a child and their primary caregiver, they will be more likely to apply this internal working model to future relationships, such as being able to develop a trusting and loving romantic relationship as an adult

Table 1 Descriptions of the two overarching styles of attachment

Attachment style	Description	Characteristics
Secure attachment	As an infant, 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.	• Allows an emotional bond between the infant and the primary caregiver • Can be explained as 'healthy' attachment, allowing the infant to form strong relationships with others as an adult when they apply this prototype • The term *secure attachment* is often interchangeable with '*organised attachment*'
	Image: Margarita Fedorenko/Shutterstock.com **Figure 3** A caregiver consistently soothing an infant when they cry can contribute to the development of a secure attachment	
Insecure attachment	As an infant, insecure attachment may involve the primary caregiver/s inconsistently meeting the infants' 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.	• May have a less strong or even non-existent emotional bond between the infant and primary caregiver • Can be explained as 'unhealthy' attachment, potentially leading to the infant being unable to form strong relationships with others and being unable to trust others as an adult • There are multiple forms of insecure attachment, with most resources and studies identifying these as *insecure-avoidant, insecure-anxious* and *disorganised attachment*
	Image: Ria Yui/Shuttesrtock.com **Figure 4** If a child constantly feels ignored or neglected by their primary caregiver/s, insecure attachment may form	

There are multiple factors which impact the attachment style developed between an infant and their primary caregiver/s. The main factors we will focus on are genetics, temperament, and early life experiences, which we will explore later in this lesson.

Emotional development

Attachment theory has been closely linked to emotional development. **Emotional development** involves the continuous, life-long development of skills which 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 life, with us all having felt angry, sad, relieved, and excited at some point. Like all forms of development, the range of emotions and our knowledge of how and when to express these emotions become increasingly sophisticated as we age and develop.

Emotional development the continuous, life-long development of skills which allow individuals to control, express, and recognise emotions in an appropriate way
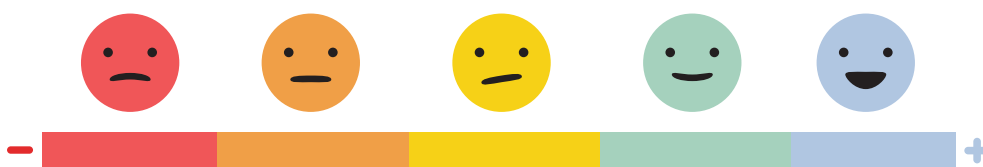
Figure 5 You can visualise your range of emotions on a scale, which constantly change each day in line with your experiences

Emotions can also differentiate based on the energy associated with them, and how pleasant or unpleasant they are. A psychologist called Marc Brackett developed a 'Mood metre' using these two scales which can be seen in figure 6.

How are you feeling?

enraged	panicked	stressed	jittery	shocked	surprised	upbeat	festive	exhilarated	ecstatic
livid	furious	frustrated	tense	stunned	hyper	cheerful	motivated	inspired	elated
fuming	frightened	angry	nervous	restless	energized	lively	enthusiastic	optimistic	excited
anxious	apprehensive	worried	irritated	annoyed	pleased	happy	focused	proud	thrilled
repulsed	troubled	concerned	uneasy	peeved	pleasant	joyful	hopeful	playful	blissful
disgusted	glum	disappointed	down	apathetic	at ease	easygoing	content	loving	fulfilled
pessimistic	morose	discouraged	sad	bored	calm	secure	satisfied	grateful	touched
alienated	miserable	lonely	disheartened	tired	relaxed	chill	restful	blessed	balanced
despondent	depressed	sullen	exhausted	fatigued	mellow	thoughtful	peaceful	comfy	carefree
despair	hopeless	desolate	spent	drained	sleepy	complacent	tranquil	cozy	serene

Energy (vertical axis) ←→ Pleasantness (horizontal axis)

Figure 6   A 'Mood metre' identifies emotions on two scales, energy level and pleasantness (Anderson, n.d.)

Want to know more?

Emotional wellbeing is one of the key characteristics of a mentally healthy person. It involves the ability to appropriately control and express emotions, as well as understand and recognise the emotions of others. Examples of strong emotional wellbeing include:

- Being aware of and being able to understand how other people feel
- Having a wide range of emotions
- Expressing emotions at appropriate times

Healthy emotional development facilitates emotional wellbeing, contributing to strong mental health.

Figure 7   Being able to experience and appropriately express a range of emotions is vital for healthy emotional development

But how does attachment influence our emotional development? Attachment theory states that the style of attachment we form at a young age impacts our ability to experience and display emotions at that stage of development, as well as impacting our emotional wellbeing during adulthood. Generally, it has been explained that:

- *secure attachment* usually leads to 'healthy' emotional development, and
- *insecure attachment* is more likely to lead to 'unhealthy' emotional development.

For example, if a primary caregiver consistently responds to an infant's cries, a secure attachment is likely to be created as the infant's needs are being met. This is likely to translate to 'healthy' emotional development as that infant is more likely to develop a sense of trust in others and feel valued, increasing their sense of self.

More specifically, healthy emotional development equips individuals with skills that they may need to navigate in future times of stress, excitement, and even heartbreak. These skills have a major impact on adult life, with healthy emotional development contributing to occurrences such as:

- High self-efficacy, referring to an individual's self-confidence in their ability to complete daily tasks important for functioning
- The ability to trust others
- Being able to show resilience in the face of adversity
- Being able to ask for help when needed

If emotional development is unhealthy or limited, occurrences in adulthood could include:

- Increased likelihood to be manipulative
- Craving or pushing away affection
- Increased feelings of anxiety
- Being a 'people-pleaser'

ACTIVITY 1

Are you emotionally intelligent?

A concept related to emotional development is emotional intelligence. *Emotional intelligence* involves the ability to accurately identify, perceive, and manage the emotions of others, as well as the ability to appropriately understand and regulate your own emotions. Having high emotional intelligence allows individuals to manage stress, be resilient, and read how other people are feeling, which helps to increase social connection and allow for positive social interactions.

There are many online tests to measure how emotionally intelligent you are. Type the URL *mindtools.com/pages/article/ ei-quiz.htm* into your browser to see how emotionally intelligent you are. Remember that these results are not always accurate.

(MindTools, n.d.)

Image: Griboedov/ Shutterstock.com

📖 *Psychology in practice*

Unhealthy emotional development can lead to many negative traits or behaviours arising during adulthood. The inability to control emotions may lead some individuals to be rude, demanding bosses, or even lead to an increased likelihood to engage in risk-taking behaviours such as violence. These behaviours are often investigated in a branch of psychology called, *community psychology*.

Community psychology is a form of psychology which investigates the relationships between individuals, groups and society. As a part of their practice, *community psychologists* often focus on social issues. Social issues such as domestic violence and forms of crime are therefore often researched by community psychologists, partially focusing on the emotional development these individuals may hold, among other personal aspects which may have been impacted by past societal experiences.

Factors affecting attachment 1.2.3.2

OVERVIEW

Throughout life, and particularly in childhood, there are multiple factors which can affect attachment. The main factors which collectively contribute to either secure or insecure attachment are genetics, temperament and early life experiences.

THEORY DETAILS

There are three main factors which affect the attachment style developed by an infant. These factors are genetics, temperament, and early life experiences.

Genetics

We have all inherited traits from our biological parents. These biological traits are derived from our **genetics,** which involve the unique, cellular makeup of each individual which is passed onto offspring. The genetics of each individual is determined by their DNA, which is the genetic material which influences the makeup of all organisms, including us humans.

Our genetics contribute to all the unique characteristics we hold. For this reason, our genetics impact how we form attachments with others, and the forms of these attachments. Due to each infant inheriting traits from their biological parents, the infant and primary caregiver will generally share similar characteristics which can further strengthen the bond between them.

Genetics the unique, cellular makeup of each individual which is inherited from biological parents

Figure 8 Our DNA determines our genetic makeup, influencing all of the characteristics we hold

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⊕ *Want to know more?*

Although shared characteristics between an infant and their biological parents can strengthen the development of attachment, this only occurs when the biological parents consistently respond to the infants' needs. Other factors can also impact the attachment style developed between an infant and its biological parents. For this reason, it is not guaranteed that secure attachment will be developed just because the parent and child share the same genetic makeup.

When an infant does not share the same genetics with their primary caregivers, it does not rule out the development of secure attachment due to genetics being only one factor affecting attachment. If an infant is adopted and their adoptive parents nurture and support them by consistently meeting their needs, secure attachment will be able to develop.

All infants are born with an innate set of traits and desires, with an inherent desire to bond with their caregivers. One of these innate desires is the desire to seek comfort from others. The infant develops a set of skills and behaviours linked to this desire, including:

- *Social recognition:* many researchers state that babies at the age of two months can recognise the faces of their primary caregivers.
- *Social engagement*: babies can display facial expressions which indicate to their primary caregivers when they are unhappy, fearful or scared, as well as when they are happy. This starts to occur at around four months of age, with increasingly complex facial expressions developing slightly later. The use of crying to indicate distress is developed from birth.
- *Social referencing:* infants are able to recognise facial expressions of those around them, and use those expressions to inform their own. For example, if an infant looks around and sees everyone in the room laughing, they may begin to laugh. Infants develop the ability to social reference at around nine months of age.

These innate skills and desires each infant holds helps to encourage attachment to develop between them and their primary caregiver/s. Due to facial expressions, primary caregivers can recognise how an infant feels and use that to inform how they should respond to their needs. Additionally, the ability of infants to recognise and respond to their primary caregivers' expressions through social referencing may strengthen the bond between the infants and caregiver due to shared experiences. If these innate skills are met with encouragement and responsiveness from primary caregivers, secure attachment is likely to occur.

Many primary caregivers also have an innate desire to protect their baby, therefore wanting to respond to their needs and diffuse any distress they may experience. This has a genetic basis, with most parents wanting to protect their children to ensure the survival of their genetics, biologically contributing to future generations.

⊕ *Want to know more?*

When early research was being conducted on attachment, researchers believed that mothers were naturally, genetically gifted with the skills and traits to become the primary caregiver for infants. However, recent research has shown that the close bond between a mother and child was influenced by social norms and gender roles, with it being expected that mothers would stay home and fathers would go to work. Now in contemporary society, we are seeing these gender roles being challenged, with more fathers playing an active role in their children's lives.

Temperament

Temperament refers to the relatively stable disposition each individual holds, which is expressed through an individual's behaviours and emotions. Do you have an easy-going, friendly, and outgoing temperament? Or does it take you longer to warm up to new people? These examples help to explain how temperament is relatively stable over time and across different circumstances.

Temperament the relatively stable disposition of an individual, including the typical behaviours and emotions they express

Temperament is easily observable in infancy, with babies usually being described as having an 'easy' or 'difficult' temperament.

- **Easy temperament**: infants are more likely to be happier, fall asleep easier and eat a wider array of foods.
- **Difficult temperament**: infants are more likely to display signs of distress, be unhappy, struggle to fall asleep and be a picky eater.

Easy temperament a relatively stable disposition in which infants are warm and friendly and have established sleeping and eating patterns

Difficult temperament a relatively stable disposition in which infants are unhappy and have irregular sleeping and eating patterns

These differences in temperament have a bi-directional relationship with attachment, which means that temperament can affect attachment but it can also occur the other way. Specifically, it can involve the temperament of an infant making an attachment style more likely to develop, or the developed attachment style contributing to the temperament the infant holds. This can be seen in table 2.

Table 2 Impact of temperament on attachment with primary caregiver

Temperament type	Behaviours infant displays	Impact on attachment with the primary caregiver
Easy temperament	• More likely to be warm and friendly • More stable emotions, usually happy • Have more established patterns such as stable sleeping and eating patterns	• More likely to develop *secure (or organised) attachment* • Due to primary caregiver being able to anticipate, understand, and respond to the needs of the infant due to established patterns and stable emotions
Difficult temperament	• More likely to be unhappy and unfriendly • More irregular patterns such as fluctuating sleeping patterns • Inconsistent responses and emotional reactions to the same stimuli and experiences • More likely to be moody	• More likely to develop an *insecure (or disorganised) attachment* style • The infant's moodiness and irregularity makes it more difficult for the primary caregiver to anticipate and meet the needs of the infant

It is important to remember that attachment applies to all relationships, impacting the bonds we hold with others throughout our life. For this reason, the temperament of each individual impacts the attachments they develop with friends, peers, colleagues, family members and romantic partners throughout their life.

Analogy

What is the difference between temperament and emotions? How can someone with a stable, happy temperament experience a range of emotions, including sadness and anger?

Due to *temperament* being the relatively stable disposition of each individual, you can think of it as the *climate*. A locations' climate refers to the general, enduring weather conditions of that place, for example, Queensland has a humid climate, whereas Tasmania has a colder climate.

In contrast, you can think of the *emotions* someone experiences and expresses as the *weather conditions* within the climate. Weather conditions are temporary and tend to fluctuate, just as emotions can fluctuate in line with different circumstances. Queensland's humid climate experiences different weather conditions, being extremely hot at times as well as experiencing heavy rain and tropical cyclones at other times.

Image: Happy Art/ Shutterstock.com

Figure 9 Temperament is similar to a location's climate, while emotions is similar to the weather conditions of that location

Early life experiences

Early life experiences generally refer to the relationships and events which occur pre-birth up until the age of around five. There are a range of experiences which fall under this category, such as a person's socioeconomic level, family conflict or trauma, maternal nutrition while *in utero* (as a foetus before birth), premature birth, attending childcare, extended family support, and much more.

As identified by Bowlby (1973), healthy attachment serves an evolutionary purpose in which the infant seeks comfort from the primary caregiver who is meant to support and protect them. When an infant experiences a collection of positive early life experiences, they are more likely to develop a secure attachment style. Some examples of positive early life experiences include:

• Being encouraged to socialise with young children of the same age
• The biological mother consuming a healthy diet full of nutrients while carrying the child
• Exposure to resources such as books
• Being encouraged to be creative and play
• Experiencing support from extended family, the community, and other social groups

Want to know more?

How do community and extended family impact attachment? Although attachment styles mainly develop from children's relationships with their primary caregivers, usually from their parents, the relationships they hold with other individuals, as well as the relationships they observe, can also contribute to the child's internal attachment model.

For example, if a child has developed a secure attachment with their primary caregivers, and also experiences support and care from external family members or family friends, their ability to trust others is enhanced as they are receiving additional care. On top of this, children who live in neighbourhoods or communities which are filled with young, caring families observe these models of family support which encourage secure attachment, therefore contributing to their internal prototype of attachment which they will apply to future relationships.

Image: VoodooDot/Shutterstock.com

Figure 10   The observation of other families interacting can contribute to a child's internal prototype of attachment

When these positive early life experiences do not occur, the likelihood of developing secure attachment decreases. Importantly, when a child is exposed to multiple negative early life experiences, the cumulative effect can greatly impact them and lead to 'unhealthy' or insecure attachment. Negative early life experiences include:

- Family conflict, particularly troubled divorces and separation
- Maternal use of drugs and alcohol while the child is in utero
- Any form of abuse
- Premature birth
- Loss of a parent

When these early life experiences negatively impact the ability of a child to form secure attachment with their caregivers, such as the loss of a parent, the child may be unable to trust others as an adult out of fear that they may leave. When a child may be exposed to a dysfunctional family with a lot of conflict, their internal working model of what relationships should look like may become flawed, causing them to experience unfulfilling relationships as an adult.

Although negative early life experiences can negatively impact emotional development, this impact is not permanent and can be changed. For example, other experiences in life, such as being surrounded by supportive family and friends as an adult, can contribute to the development of healthy emotional development, mitigating the impacts of negative early childhood experiences. In such a way, it is important to remember that attachment and emotional development is not set, and can be shifted in response to experience.

Theory summary

In this lesson, you have learnt about attachment theory and the impact of attachment on emotional development. You have learnt about the two overarching styles of attachment and how these impact emotional development as an adult. These are:

- Secure attachment, which involves the needs of the infant being consistently met and anticipated by the primary caregivers, enabling the infant to trust others and have higher self-efficacy as an adult.
- Insecure attachment, which involves the needs of the infant being inconsistently met or ignored, encouraging the infant to push away or excessively crave affection as an adult and have difficulty trusting others.

You have also learnt about the three factors which affect attachment. These are:

- Genetics, the unique cellular makeup each individual inherits.
- Temperament, which is the relatively stable disposition of each individual.
- Early life experiences, which involve experiences from before birth up to the age of around five and include occurrences such as premature birth, socioeconomic level, family support and so on.

4C QUESTIONS

Theory-review questions

Question 1

Fill in the blanks with the following terms.

- Attachment
- Attachment theory

_____ describes the emotional bond between two individuals.

_____ specifically addresses the bond between an infant and primary caregiver.

Question 2

There are two overarching forms of attachment styles. The difference between these styles is that *(Select one)*

A   insecure attachment is a rare style of attachment and secure is more common.

B   there are multiple forms of secure attachment but only one form of insecure attachment.

C   secure attachment involves a primary caregiver consistently meeting an infant's needs, as opposed to insecure attachment where needs may be addressed inconsistently.

Question 3

Attachment styles have an impact on emotional development. Emotional development involves *(Select one)*

A   individuals learning to only express their own and recognise others' positive emotions.

B   the development of skills which allow individuals to appropriately control, express and recognise emotions.

Question 4

Insecure attachment can lead to unhealthy or limited emotional development. How may unhealthy emotional development impact adulthood? *(Select all that apply)*

I   strong self-efficacy

II   inability to trust others

III   over or under depending on others

IV   increased ability to show resilience

Question 5

There are multiple factors which affect the style of attachment formed. Which of the following statements about these factors is correct? *(Select all that apply)*

I   Temperament impacts attachment and it involves the constantly changing mood of the infant.

II   Genetics have been shown to impact attachment as infants attach to caregivers as they look physically similar to them.

III   Early life experiences may impact attachment, with negative experiences such as abuse and neglect leading to infants being more likely to develop insecure attachment.

Skills

Perfect your phrasing

Question 6

Which of the following sentences is most correct?

A   Emotional development only involves the ability to express your emotions appropriately.

B   Emotional development involves appropriately expressing your emotions and recognising the emotions of others.

Question 7

Which of the following sentences is most correct?

A   Temperament refers to a relatively stable disposition, in which individuals have a range of emotions that they commonly display.

B   Temperament refers to a relatively stable disposition, in which individuals have a handful of emotions that they can only display.

Multiple-choice questions

Question 8   (1 MARK)

Attachment refers to the

A   bond developed only between an infant and their primary caregivers.

B   long-lasting emotional connections between any two individuals.

C   tendency for infants to look for their parents when distressed.

D   emotional connection between the two parents of an infant.

Question 9   (1 MARK)

Which of the following is **not** a correct statement about attachment theory?

A   Attachment only occurs due to the primary caregiver satisfying biological needs of the infant, such as hunger and thirst.

B   Secure attachment develops when the primary caregiver acts as a secure base from which the infant can explore.

C   There are two overarching styles of attachment: secure and insecure attachment.

D   The attachment style formed during infancy and childhood creates an internal working model which the child applies to future relationships.

Question 10   (1 MARK)

Which of the following correctly describes the two overarching styles of attachment?

	Secure	Insecure
A	'Unhealthy' attachment	There are multiple forms of insecure attachment
B	There are multiple forms of secure attachment	Occurs when the primary caregiver consistently meets the infant's needs
C	Occurs when the primary caregiver consistently meets the infant's needs	There are multiple forms of insecure attachment
D	Occurs when the primary caregiver does not consistently meet the infant's needs	The infant may not seek comfort from the primary caregiver or may be overly desperate for comfort

Question 11   (1 MARK)

Ruby is seven months old and is consistently ignored by her parents when she cries. What emotional occurrence is likely to occur in adulthood if Ruby develops a form of insecure attachment?

A   Easily trusting and opening up to others.

B   Experiencing high levels of self-confidence.

C   Looking for the positives in everyday life.

D   Clinging to others due to desiring affection.

Question 12   (1 MARK)

At three months of age, Luke's parents separated. After separating, Luke's parents did not communicate about Luke's needs when he moved from one house to another. Luke's father understood and correctly responded to Luke's cries for help, whereas his mother was often unable to understand why Luke was crying, leading to behaviours such as changing his nappy instead of feeding him when he was hungry. Both of his parents also found it very difficult to consistently respond to Luke's cries overnight.

This was due to Luke's sleep-wake cycle constantly changing, leading to both of his parents being extremely tired and often sleeping through his cries.

The factors which mainly affected Luke's style of attachment are

A temperament and early life experiences.

B genetics and temperament.

C genetics and early life experiences.

D genetics and parental temperament.

Short-answer questions

Question 13 (2 MARKS)

Define emotional development and use an example to explain how secure attachment can impact an individual's emotional development.

Question 14 (3 MARKS)

Neve is a midwife who encourages skin-to-skin contact between a newborn baby and its mother directly after birth. This practice is believed to encourage the development of a strong bond between the baby and its mother.

Referring to the factor of early life experiences, suggest how skin-to-skin contact may encourage healthy attachment.

Question 15 (4 MARKS)

Henry is a one-year-old child who is always smiling and has been a very good sleeper since birth. His primary caregivers have found it easy to anticipate when he is tired and needs to sleep, as well as when he is hungry.

a Referring to the scenario, how may the factor of temperament have impacted Henry's attachment style? State which attachment style he is likely to have. (2 MARKS)

b Identify two characteristics associated with the attachment style Henry is most likely to develop that may be present in Henry's emotional development as an adult. (2 MARKS)

Questions from multiple lessons

Question 16 (1 MARK)

The forebrain is closely linked to the ability to

A consolidate emotionally arousing memories.

B have healthy emotional development.

C recognise, understand and control emotions.

D regulate involuntary functions.

4D STUDIES OF ATTACHMENT

How did researchers discover that emotional bonds could form between infants and their primary caregivers? How did they learn about the different types of attachment styles? What could this cute monkey have to do with attachment theory? In this lesson, you will be learning about the research on attachment conducted by Harry Harlow and Mary Ainsworth. You will learn about the procedures of these studies, as well as the conclusions and results about attachment that were formed.

Image: svaga/Shutterstock.com

4A Nature versus nurture	4B Periods of psychological development	4C Attachment and emotional development	4D Studies of attachment	4E Cognitive development	4F Piaget's theory of cognitive development	4G Erikson's theory of psychosocial development

Study design dot point

- the importance of attachment on an individual's emotional development: genetics; temperament and early life experiences (with reference to the work of Harlow & Ainsworth)

Key knowledge units

Harlow's studies	1.2.3.3
Ainsworth's studies	1.2.3.4

Studies of attachment

Harlow's studies 1.2.3.3

Ainsworth's studies 1.2.3.4

Harlow's use of fear-inducing stimuli

Harlow's studies 1.2.3.3

OVERVIEW

Harry Harlow was an American psychologist. He studied attachment theory by investigating rhesus monkeys and the attachments they developed with inanimate, surrogate mothers when isolated.

THEORY DETAILS

Harry Harlow was an American psychologist who was best known for his 1959 study investigating *affectional* (emotional) attachment between infant rhesus monkeys and their mothers. Following on from Bowlby's research on attachment, Harlow wanted to research whether attachment developed to resolve biological needs such as hunger, or served a more sophisticated, emotional need by providing a source of physical contact and comfort (Harlow & Zimmerman, 1959).

To conduct his research, Harlow (1959) separated eight newborn rhesus monkeys from their mothers and isolated them in cages. Each newborn monkey had one cage, and within these cages, they had two separate cubicles: one with a fake cloth *surrogate mother* and one with a fake wire *surrogate mother*. A *surrogate mother* refers to an object or individual who carries out roles traditionally completed by the biological mother. The surrogates in this study were fake monkeys made of wooden bases, and wire and/or cloth, which provided the infant monkeys with either food or physical comfort. The infants stayed in these cages for at least 165 days and were exposed to a series of stimuli and events to measure their emotional attachments with each mother (Harlow & Zimmerman, 1959).

> ### ⊕ Want to know more?
>
> Within this lesson, you will see studies referring to the 'mother' instead of referring to the primary caregiver. During the time when Harlow and Ainsworth conducted their studies, society expected children to be raised by their mother. Researchers also believed at this time that women were better suited to meet the biological needs of their children, such as providing adequate food, leading to both Harlow and Ainsworth only referring to and researching mothers. In contemporary research, this assumption is widely contested.

Table 1 The experimental setup of Harlow's study (Harlow & Zimmerman, 1959)

Research aim	The aim of this experiment was to research the affectional attachments formed between infants and their mothers, specifically looking at whether physical contact and comfort or the resolution of biological needs led to attachment
Sample	Eight newborn rhesus monkeys
Independent variable	The form of the surrogate mother which provides food (either cloth or wire)
Dependent variable	The strength of affectional attachments between the infant monkeys and their surrogate mothers (measured by mean amount of time spent on either surrogate)
Condition 1	A *wire surrogate mother* provides food (but no physical comfort) and a *cloth surrogate mother* does not provide food as illustrated in figure 1.
Condition 2	A *cloth surrogate mother* provides food (and physical comfort) and a *wire surrogate mother* does not provide food, illustrated in figure 2.

Wire surrogate mother
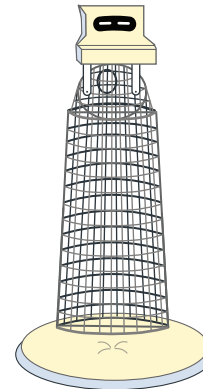
Figure 1 Condition 1 involved the monkey being provided with food by the wire surrogate mother

Cloth surrogate mother
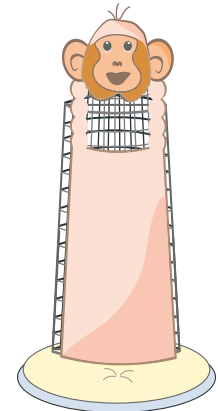
Figure 2 Condition 2 involved the monkey being provided with food by the cloth surrogate mother

Why did Harlow give half of the monkeys a cloth surrogate mother which fed them, and the other half a wire surrogate mother which fed them? Harlow did this to investigate whether the biological argument for attachment was correct. This argument states that bonds are formed between infants and their caregivers only due to the caregivers resolving biological drives, such as hunger. For the biological argument to be correct, greater affectional attachments would need to be formed between the infant and surrogate mother which provided food, regardless of whether they were the cloth or wire surrogate mother.

But what were the results of this study? Did they support the biological argument?

- Regardless of whether the monkey was fed by the wire surrogate or cloth surrogate mother, they still spent more hours a day on the cloth surrogate mother
- This was due to the cloth surrogate mother providing the monkeys with a sense of comfort as they could cuddle them and experienced more enjoyable physical contact than when making physical contact with the wire surrogate mother
- The sense of comfort that the monkeys received from the cloth surrogate mother provided them with a sense of comfort and safety, helping to induce a state of calm
- These results suggested that enjoyable physical contact between monkeys and their mothers contributed to the development of bonds between them
- It was suggested that *nursing* (breastfeeding a baby) also provides bonding between infants and their mothers due to the physical contact involved, not because it met the biological needs of the infant such as hunger

To widen the scope of the study, additional studies were conducted by Harlow. This included the use of fear-inducing stimuli.

Harlow's use of fear-inducing stimuli

In this study, Harlow and Zimmerman (1959) presented the monkeys with fear-inducing stimuli in the form of a metal robot that had bright, flashing lights and made loud noises that agitated the monkeys. Once the monkeys were exposed to this stimuli, Harlow observed which surrogate mother the monkeys went to. He hypothesised that the monkey would have a stronger bond with the surrogate mother it went to when it was scared.

The study particularly focused on which surrogate mother the monkey would go to when scared, and therefore have a greater bond with.
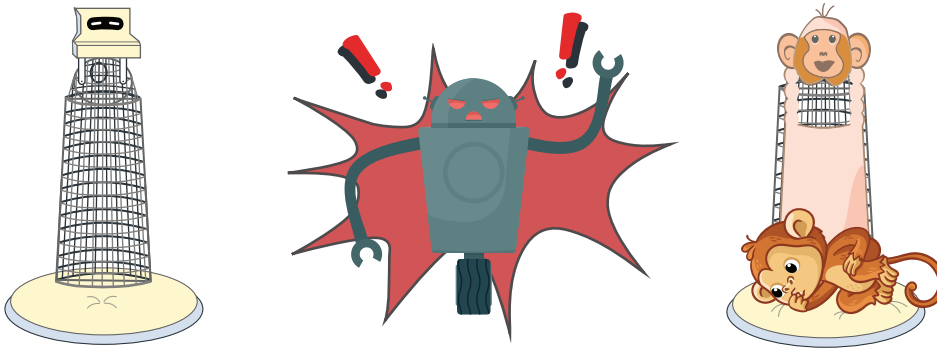
Image: Dzm1try, svaga/Shutterstock.com

Figure 3 When scared by the fear-inducing stimuli (metal robot), it was expected that the infant monkey would cling to the surrogate mother which it had a stronger bond with

The results of the study included:

- Monkeys rushing to the cloth surrogate mother and clinging to them for comfort, regardless of who fed them
- Monkeys appearing visibly soothed after seeking physical contact and comfort from the cloth surrogate mother, with some even choosing to explore the fear-inducing stimuli after initially seeking comfort

Harlow and Zimmerman (1959) also isolated additional monkeys in cages with only one form of surrogate mother. Those raised by the wire surrogate mother alone did not cling to the wire mother and seek comfort from them when they were exposed to the fear-inducing stimuli. These monkeys instead either hugged themselves, rocked backwards and forwards, or cried out.

Due to these results, Harlow concluded that:

- Monkeys formed affectional attachments with their mothers when their enjoyable physical contact allowed them to feel a sense of comfort, not when their biological needs were met
- Nursing (feeding) can help develop bonds between an infant and their mother due to acting as a source of enjoyable physical contact/comfort, not due to providing the infant with food
- The enjoyable physical contact with the cloth mothers provided the monkeys with a sense of comfort and sense of security, leading to them seeking this source of comfort when distressed

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⊕ _Want to know more?_

What happens when infants grow up without any social contact and without even a surrogate mother?

Harlow later did research where infant monkeys were privatised (Harlow & Zimmerman, 1959). This involved monkeys being kept in a cage completely alone. When exposed to fear-inducing stimuli or even when distressed due to their loneliness, they would appear visibly disturbed, go to the corner of the cage and rock backwards and forwards. It was also found that these privatised monkeys could not learn social skills in later life, and often were unable to care for their own offspring.

⊕ _Want to know more?_

You may be asking, why did Harlow choose to use rhesus monkeys for his studies? Rhesus monkeys were used because they are one of the closest related species to humans, sharing about 93% of our DNA (Arbanas, 2007). Rhesus monkeys had already been observed forming attachments to their mothers, inspiring this study due to the potential to generalise the results to attachment theory in humans.

Image: fontoknak/Shutterstock.com

Figure 4 Rhesus monkeys are closely related to humans

ACTIVITY 1

What are the implications of Harlow's studies of attachment?

Watch the YouTube video titled *'Harlow's Studies on Dependency in Monkeys'* (Baker, 2010) before answering the questions. This video shows footage from Harlow's studies of attachment which included the use of cloth and wire surrogate mothers for monkeys. In this video, you will see how the monkeys seek comfort in the cloth surrogate mother, even when the wire mother feeds them.

Warning: the footage in this video can be distressing for some students.

Ethical focus: In lesson **1E: Ethical considerations** you learnt about the use of animals in research and the ethics relevant to this research. Draw on this information to answer the following questions.

- Why may have Harlow used rhesus monkeys instead of human babies in this study?
- Do you believe that it was ethical to use rhesus monkeys in this study? Why or why not?
- Do you think the ethical value of *beneficence* justifies the use of rhesus monkeys in this study? Why or why not?

Evaluation of research focus: In lessons **1D: Sources of error and prevention** and **1H: Evaluation of research** you learnt about evaluating research investigations, how to draw conclusions, and different types of research methodologies. Draw on this information to answer the following questions.

- What are the benefits of Harlow using an observational study?
- How may the use of observational studies impact Harlow's ability to draw conclusions?
- Referring to the concept of *internal validity*, do you believe that the surrogate mothers used in Harlow's study are an adequate representation of real-life monkey mothers?
- Referring to the concept of *external validity*, do you believe that the results of Harlow's study on rhesus monkeys can be applied to attachment for human infants?

Although Harlow's studies provided great insight into attachment theory, it has also been criticised as a harsh and unethical study. Thinking back to lesson 1E: Ethical Considerations, can you think of some ethical guidelines that Harlow may have breached? Do you think this experiment would have been approved by an ethics committee today?

Animals are often used in research where the risk of harm to humans is too high. However, when using animals in research, ethics still need to be taken into consideration. Harlow has received substantial criticism for the significant violation of ethics in his studies using rhesus monkeys. As can be seen in the study, many of the rhesus monkeys experienced severe distress for prolonged periods of time, with some even being unable to care for their offspring later on. In such a way, it is clear that Harlow's studies significantly breached ethical standards due to extreme cruelty to animals.

Ainsworth's studies 1.2.3.4

OVERVIEW

Ainsworth conducted studies on attachment using infants and their mothers. Her most well-known contribution to attachment research was the *'Strange Situation'* procedure.

THEORY DETAILS

Around the same time that Harlow conducted his research on attachment theory, Mary Ainsworth, a *developmental psychologist*, also conducted her own research looking into attachment and the factors that affect these affectional bonds. Her most well known contribution to research is the *Strange Situation* procedure, which she used as an observational study in 1978, with follow up studies.

📑 *Psychology in practice*

Developmental psychology is a branch of psychology which has extensively researched attachment theory. The study of developmental psychology looks at the factors which impact an individual's growth across the lifespan across multiple areas, including emotional, social, cognitive and psychological development. Part of this field involves looking at the early life experiences of individuals, including the attachment style they formed with their primary caregivers, and how this has impacted their relationships as well their personality in later life.

Ainsworth wanted to conduct a study examining relationships between infants and their mothers. To do this, she created the *Strange Situation*, in which a mother and her young infant are studied in an unfamiliar room. During this study, the infant and their mother experience a series of separations and reunions to analyse the attachment style occurring (Ainsworth, 1979). The stages of the *Strange Situation* study are outlined in figure 5.

1. The infant and the mother enter the room

2. The mother observes the child exploring the room and playing with the toys

3. A stranger enters the room and attempts to interact with the infant (infant may react)

4. The mother leaves the infant with the stranger (separation anxiety may occur, infant's interaction with the stranger is observed)

5. The mother returns to the room and the stranger leaves (reunion is observed)

6. The mother leaves the room, leaving the infant alone

7. The stranger enters the room (it is observed as to whether the infant is comforted by the stranger)

8. The mother enters the room and interacts with the infant (reunion is observed), the stranger leaves

Figure 5   The stages involved in Ainsworth's *Strange Situation* study

At each of the stages, the behaviour of the infant was observed by the researchers and recorded. The researchers then analysed the infant's reactions to the separations and reunions with their mother, as well as the infant's reactions to the stranger. Through these observations, Ainsworth identified three distinct patterns of attachment: secure attachment, anxious (resistant) attachment & avoidant attachment. Both anxious and avoidant attachment were identified as forms of *insecure* attachment.
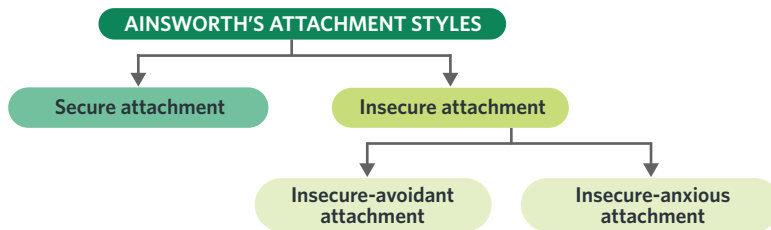
Figure 6   The breakdown of attachment styles identified by Ainsworth, grouped by secure and insecure attachment

These attachment styles can be described as:

- **Secure attachment:** a style of attachment in which a strong, healthy emotional bond is formed between the infant and their primary caregiver due to the caregiver consistently meeting the needs of the infant

- **Insecure-avoidant attachment:** a style of attachment in which the infant may be reluctant to or avoid contact from their primary caregiver, usually due to the caregiver not responding to the infant's needs

- **Insecure-anxious (resistant) attachment:** a style of attachment in which the infant fluctuates between clinging to and rejecting their primary caregiver, usually due to the caregiver inconsistently meeting the infants' needs

Ainsworth's research over time, as well as research by others, discovered the long term impacts of each attachment style on emotional development in adulthood. This, as well as how these attachment styles could be observed by behaviour of infants in *the Strange Situation* study, is outlined in table 2.

Table 2   Infant behaviours of each attachment style during the *Strange Situation*, and the impact of these attachment styles on emotional development in adulthood

Attachment style	*Strange Situation* infant behaviour	Impact of attachment style on emotional development in adulthood
Secure	• The infant explores the room, but frequently returns to the mother for safety, the mother acts as a safe base for the infant *(stage 2)*. • The infant is upset or distressed when the mother leaves *(stages 4 and 6)*. • The infant welcomes the mother returning to the room by smiling and seeking physical contact *(stages 5 and 8)*. • The infant is soothed by the mother's return and their distress is diminished *(stages 5 and 8)*.	• Being able to form healthy relationships and strong emotional bonds with others. • Being independent and self-sufficient. • Having high self-esteem. • Having high levels of resilience. *cont'd*

Secure attachment   a style of attachment formed by a strong emotional bond between the infant and their primary caregiver due to the caregiver consistently meeting the needs of the infant

Insecure-avoidant attachment a style of attachment in which the infant may be reluctant to or avoid contact from their primary caregiver, usually formed due to a lack of responsiveness to their needs

Insecure-anxious attachment a style of attachment in which the infant fluctuates between clinging to and rejecting their primary caregiver, usually due to the caregiver inconsistently meeting the infant's needs

Table 2 Continued

Attachment style	*Strange Situation* infant behaviour	Impact of attachment style on emotional development in adulthood
Insecure - avoidant	• The infant is unlikely to use mother as a safe base from which they can explore and may not play with the toys *(stage 2)*. • The infant may be indifferent and not care when the mother leaves the room *(stages 4 and 6)*. • The infant has no preference between the mother and stranger *(stages 5 and 8)*. • The infant may take a while to interact with their mother and welcome them upon their return *(stages 5 and 8)*.	• Finding it difficult to form strong bonds and be intimate with others. • Tending to ignore and dismiss own emotions. • Being scared to depend on others and avoid asking for help.
Insecure - anxious (resistant)	• The infant is likely to cling to their mother and not use them as a safe base from which they can explore and play with toys *(stage 2)*. • The infant may become very distressed when the mother leaves the room *(stages 4 and 6)*. • The infant may reject interaction with mother when they return to the room, but also may fiercely cling to her. The infant is assumed to be resentful at the mother for leaving them and may rapidly change between rejection of and clinging to their mother *(stages 5 and 8)*.	• Heavily relying on support from others. • Lacking independence. • Being described as 'clingy'. • Being more likely to be 'people-pleasers'. • Wanting their romantic partner to 'complete them' rather than to 'complement them' (the opposite is common for those with secure attachment).

Ainsworth's (1978) *Strange Situation* study analysed the percentage of children which fall into each attachment style. She found that:

- 60-65% of infants displayed *secure attachment*
- Around 20% of infants displayed *insecure-avoidant attachment*
- Around 10% of infants displayed *insecure-anxious (resistant) attachment*
- Around 5-10% of infants were 'unclassified', as they didn't display behaviours consistent with the attachment styles identified

Decades later, researchers Main and Solomon (1990) proposed that there was a fourth attachment style which consistently occurred. They labelled this **disorganised attachment**, stating that around 5% of infants fell into this attachment style. This style matched the behaviours that some of the infants in Ainwsworth's original study displayed that she labelled as 'unclassified'.

Disorganised attachment
a style of attachment in which the infant displays problematic and unpredictable behaviours, usually due to extremely negative early life experiences

Table 3 Infant behaviours of disorganised attachment style during the *Strange Situation* study, and the impact of these attachment styles on emotional development in adulthood

Attachment style	*Strange Situation* infant behaviour	Impact of attachment style on emotional development in adulthood
Disorganised	• The infant is more likely to display unusual, odd, inconsistent and contradictory behaviour during all stages. This may involve randomly laughing or randomly bursting into tears when mother is still in the room (Ainsworth, 2015). • The infant may appear dazed or freeze when the mother leaves the room. Other infants may begin screaming or appear very distressed *(stages 4 and 6)*. • The infant responds inconsistently to their mother's return, which can differ between the two reunions and may involve contradictory responses *(stages 5 and 8)*.	• Having extremely low levels of self-esteem. • Having extreme mood swings. • Being more likely to have low levels of emotional wellbeing, contributing to a greater likelihood to experience behavioural and mental health disorders. • Be very afraid to ask for help. • Be controlling of others. • Be more likely to have higher levels of anger which may lead to higher levels of aggression and violence.

You now know the four different attachment styles, but how do these different attachment styles form? What actions may the primary caregivers as well as infants carry out to make these attachment styles more or less likely?

- **Secure attachment:** the primary caregiver consistently responds to their infant's needs and infants are more likely to have 'easy' temperaments as well as positive early life experiences
- **Insecure-avoidant attachment:** the primary caregiver may not anticipate or may not be responsive to their infant's needs
- **Insecure-anxious (resistant) attachment:** the primary caregiver is likely to be inconsistent in responding to their infant's needs; they may be responsive at times and not responsive at other times, leading to a sense of confusion and fear of abandonment in the infant
- **Disorganised attachment:** the infant most likely experiences extremely negative early life experiences such as abuse and extreme neglect (Ainsworth, 2015)

Want to know more?

Other resources may differ in the names they use for each attachment style, as well as some only referring to the original three attachment styles, while others also refer to disorganised attachment.

Want to know more?

The research into the relationship between attachment styles and emotional development has led to a new understanding of the impacts of attachment styles on adult behaviour. These impacts are often linked to behaviour within intimate relationships. A study conducted by Hazan and Shaver (1987) explicitly linked attachment types to impacts on adult experiences of romance. Their findings are displayed in table 4.

Table 4 The impact of attachment styles on adults' romantic relationships

Attachment style	Impact on adult romantic relationships
Secure	• More likely to tolerate and support their partner's faults and flaws • More long-lasting relationships • More likely to report relationships as positive • More trusting of their partners
Insecure - avoidant	• More likely to find it difficult to be intimate with others • More likely to be jealous within a relationship • More likely to experience higher levels of *emotional turbulence* towards their partner (rapidly changing emotions and experiences of moodiness) • More likely to have negative feelings about love
Insecure - anxious	• More likely to rapidly become emotionally attached to and obsess over someone after a few meetings • More likely to experience higher levels of *emotional turbulence* towards their partner (rapidly changing emotions and experiences of moodiness) • More likely to experience extreme levels of jealousy within a relationship • More likely to intensely desire reciprocation from an individual they like • More likely to have negative feelings about love

Note: it is important to consider that this study only focused on three attachment styles (it has no mention of disorganised attachment) and that self-report was the main method of data collection. Therefore, the results may not be valid or reliable.

(Hazan & Shaver, 1987).

Theory summary

In this lesson, you have learnt about the studies conducted by Harlow and Ainsworth, and how these have contributed to understandings of attachment theory.

You learnt that Harlow's research involved:

- Investigating whether attachment developed due to the satisfaction of biological needs such as hunger or whether it developed due to physical contact and comfort
- The use of rhesus monkeys isolated with surrogate mothers, with a wire surrogate mother and a cloth surrogate mother
- The findings that attachments were formed between the infant monkeys and the cloth surrogate mothers due to providing comfort, as shown through greater time spent by the infants with them
- The monkeys seeking comfort from the cloth mother when distressed by fear-inducing stimuli
- The breach of ethics due to extreme animal cruelty

You learnt that Ainsworth's research involved:

- The *Strange Situation* study, in which infants and their mothers experienced a series of separations and reunions in an unfamiliar setting
- Identifying three styles of attachment: secure, insecure-avoidant and insecure-anxious (resistant) attachment
- The later discovery of a fourth attachment style called disorganised attachment

4D QUESTIONS

Theory-review questions

Question 1

Both Harlow and Ainsworth conducted studies on attachment theory. Harlow conducted *(Select one)*

A   an experiment, due to the manipulation of variables, whereas Ainsworth conducted an observational study.

B   an observational study, due to not manipulating variables, whereas Ainsworth conducted an experiment.

Question 2

Harlow was a psychologist who studied attachment theory. During his studies, he investigated *(Select one)*

A   whether rhesus monkeys sought physical comfort or only desired their biological needs to be met by their caregivers.

B   whether baboons preferred forming attachments by being comforted by food or being comforted by their mothers.

Question 3

Fill in the blanks of the sentence with two of the following four words.

- Emotional
- Biological
- Food
- Comfort

The results of Harlow's study demonstrated that attachment is created on a/an _____ basis, with infants seeking _____ from their mothers.

Question 4

Another researcher, Mary Ainsworth, also conducted a study on the bonds formed between infants and primary caregivers.

Fill in the blanks of the sentence with the following terms.

- Attachment
- Situation

Ainsworth investigated secure and insecure _____ of infants through the *Strange* _____ study.

Question 5

Ainsworth's study investigated infant attachment styles. Attachment styles can be thought of as *(Select one)*

A   a representation of the bond an infant formed with their primary caregiver.

B   a representation of an adults' emotional intelligence, with different styles having different average scores on emotional intelligence tests.

Skills

Understanding research

Use the following information to answer Questions 6–8.

Harlow conducted additional studies on the affectional attachment formed between rhesus monkeys and their surrogate mothers. One of these studies involved monkeys being fed by their cloth surrogate mother as well as being fed by their wire surrogate mother. These 'dual fed' monkeys were then placed in an 'open-field test' which involved the two surrogate mothers being in different corners of the room, and fear-inducing stimuli being placed in the centre of the room. Harlow observed and recorded which surrogate mother the baby went to when faced with the fear-inducing stimuli, as well as how much time the infant monkeys spent on the cloth and wire surrogate mothers. The results from the study are shown in the graph.
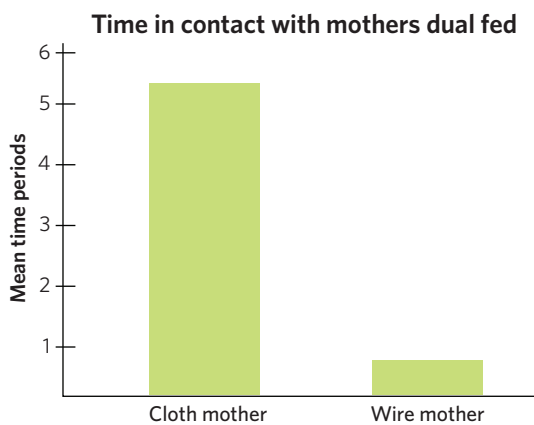
Graph The mean amount of time dual-fed monkeys spent on each surrogate mother in the open-field test (Harlow & Zimmerman, 1959)

Question 6

The type of data displayed in figure 7 is *(Select one)*

A   qualitative data.

B   quantitative data.

Question 7

A bar chart was used in figure 7 due to _____ being derived from the data. *(Select one)*

A   inferential statistics

B   descriptive statistics

Question 8

Figure 7 refers to the 'mean time periods'. In a data set, the mean refers to *(Select one)*

A   a value that differs significantly from the other values in a data set.

B   a measure of central tendency that represents the spread of data around the central value.

C   a measure of central tendency that represents the average of a data set.

Multiple-choice questions

Question 9 (1 MARK)

Harlow's original 1959 experiment with rhesus monkeys aimed to research the influences on affectional attachments between infants and caregivers. The variables of the experiment were as follows:

Variables	Operationalised variables
Independent variable: type of surrogate mother	Wire surrogate mother OR cloth surrogate mother
Dependent variable: strength of affectional attachment	X

Which of the following options best completes the table at point X?

A Measured by whether the monkey seeks comfort from the cloth or wire surrogate mother when distressed.

B Measured by the amount of time the monkey spent with either surrogate mother.

C Measured by the amount of time the monkey spent alone.

D Measured by how tightly the monkey clings to the surrogate mother.

Question 10 (1 MARK)

Harlow's use of fear-inducing stimuli rejected the biological explanation of attachment theory because

A infant rhesus monkeys sought contact and comfort when distressed.

B infant rhesus monkeys sought food when distressed.

C infant rhesus monkeys did not react when distressed.

D of measuring how infant rhesus monkeys can form an emotional attachment with themselves by hugging themselves.

Question 11 (1 MARK)

Why may an infant develop insecure-anxious attachment?

A The infant's needs are met sometimes, and ignored at others.

B The infant's needs are consistently ignored.

C The infant's needs are consistently met.

D The infant has likely experienced abuse.

Short-answer questions

Question 12 (3 MARKS)

Identify the attachment style an infant is most likely to reflect if they are comforted an equal amount by their mother and the stranger in the *Strange Situation* study. Explain the common causes of this attachment style and why this may be problematic for the infant in future adult relationships.

Question 13 (4 MARKS)

Franklin is a 16-month-old infant who is participating in the *Strange Situation* study. During the study, his mother Alicia acts as a safe base from which he explores to play with the toys around the room. He becomes upset when his mother leaves the room and is happy upon her return.

a Name the type of attachment style Franklin is most likely to have. (1 MARK)

b How may Franklin's attachment style impact his emotional development as an adult? Use an example to support your response. (2 MARKS)

c Outline one behaviour which is likely to have contributed to Franklin's attachment style. (1 MARK)

Questions from multiple lessons

Use the following to answer Questions 14 and 15.

One of Harlow's studies involved isolating rhesus monkeys with no form of social interaction and no form of surrogate mother. The results of this study showed that monkeys who were privatised were often *antisocial* in later life and were unable to communicate with other monkeys.

Question 14   (1 MARK)

The attachment style these privatised monkeys are likely to experience is

A   secure attachment.

B   disorganised attachment.

C   insecure-avoidant attachment.

D   insecure-anxious attachment.

Question 15   (1 MARK)

According to the nature versus nurture debate, the inability of the privatised monkeys to interact socially and care for their own children as an adult is due to

A   nature.

B   the genetics the monkeys inherited.

C   hereditary factors.

D   environmental factors.

4E COGNITIVE DEVELOPMENT

Our minds are constantly racing and producing new thoughts. How have your current thoughts been influenced by what you have learnt in the past? Our ability to produce these thoughts as well as carry out other mental operations is crafted over time as we age through the process of cognitive development. This lesson will explore the process of cognitive development and its components. More specifically, you will learn about the development of mental models and the ways in which they can change over time.

4A Nature versus nurture	4B Periods of psychological development	4C Attachment and emotional development	4D Studies of attachment	4E Cognitive development	4F Piaget's theory of cognitive development	4G Erikson's theory of psychosocial development

Study design dot point

- the development of cognitive abilities from concrete to symbolic thinking (with reference to the work of Piaget)

Key knowledge units

Cognitive development	1.2.4.1
Assimilation and accommodation	1.2.4.2

Cognitive development

- Cognitive development 1.2.4.1
- Assimilation and accommodation 1.2.4.2

Cognitive development 1.2.4.1

OVERVIEW

The ability to interpret and organise information as well as understand our own thoughts is referred to as cognition. Our cognitive abilities are shaped and developed over time.

THEORY DETAILS

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. Some psychologists once believed that babies were born as 'blank slates' and suggested that their experiences alone were responsible for their cognition. This led to the belief that newborns and infants had no capacity to develop their own thoughts independent of experience. However, we now know that we are born with at least some cognitive ability, with our cognitive skills being continuously nurtured and developed over time.

The development of increasingly complex thought processes leads to major changes in our understanding of and interactions in our world. The ability to think about, understand and organise information is referred to as **cognition**. We develop the mental processes involved in cognition through our interactions with our internal and external environment. We are generally not conscious of our mental abilities changing because they do so gradually with each interaction we have. The cognitive abilities we develop include memory, decision making, and reasoning. These and other cognitive abilities allow us to perform many functions every day in the most appropriate, efficient, and safe way. For example, if we were attacked by a dog, the collaboration of our memory and decision-making abilities might make us more wary around aggressive-looking dogs in the future.

> **Lesson link**
>
> Return to lesson *4A: Nature versus nurture* to revisit how our genetic makeup and experiences interact to form our cognitive development.

Cognition the ability to produce thought as well as comprehend and organise information from the internal and external environment

When you're exposed to a new object, how do you know how to respond to it? Have you always known that a calculator is used to help you solve a numerical equation? The schemas we hold help us learn about and understand new concepts. A **schema** is a mental representation of a concept which is developed through our experiences. For example, you probably hold a schema of the concept of a cat. In this schema, your mental representation of a cat is that it is a small furry animal with four legs and whiskers. As such, schemas influence our interactions with our environment, providing information in a 'mental model' on how we should respond to particular circumstances based on previous interactions.

As mentioned, the culmination of prior experiences about particular concepts combine to form schemas. For example, figure 1 displays the information a child may have learnt from multiple experiences which contribute to their schema of a giraffe. The child has developed a mental model from experience, such as learning at a visit to the zoo that giraffes have four legs.

Schema a mental representation of a concept developed through experience
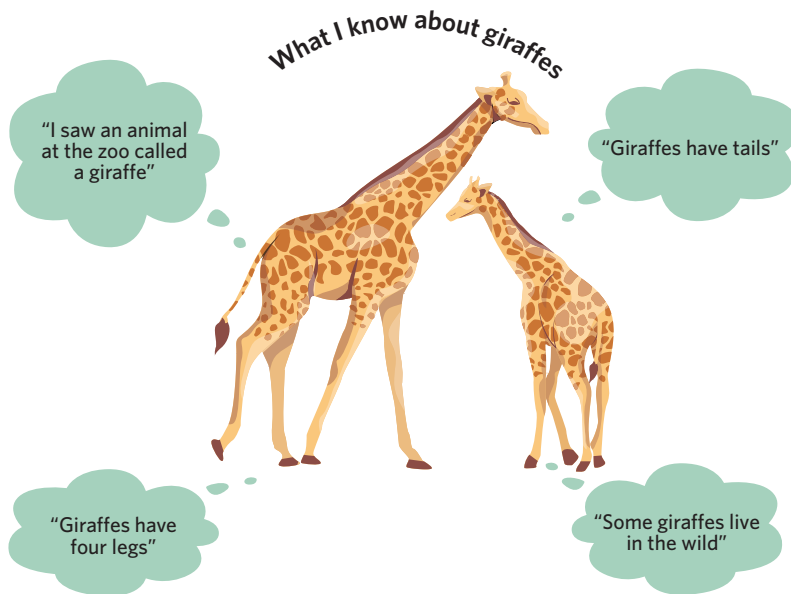
Image: AnnstasAg/Shutterstock.com

Figure 1 A representation of the pieces of information which make up an individual's schema of a giraffe

Assimilation and accommodation 1.2.4.2

OVERVIEW

During new experiences, we may learn things that challenge or contribute to our previously formed mental models. These mental models (or schemas) need to either incorporate the new information through the process of assimilation or be completely modified through the process of accommodation.

THEORY DETAILS

When we learn new information our knowledge and beliefs can be strengthened or even restructured. In terms of our cognition, this involves shifts in our pre-existing schemas. The schemas we hold continue to change over time to take into account new information; this occurs through the processes of assimilation and accommodation.

The process of **assimilation** involves new information being incorporated into an existing schema. This leads to the schema increasing in depth or complexity as we can include the additional, novel information which is aligned with what we already know about the concept. The process of assimilation increases our understanding of the concept and does not involve the new information challenging the schema, but simply deepening it.

When we are exposed to new information which does not fit in with our existing schema the process of **accommodation** occurs. Accommodation involves an existing schema being challenged, and subsequently, the restructuring of its 'shape' to integrate the new and challenging information. The process of accommodation can also lead to the creation of an additional schema to hold the information which does not fit in with an existing schema. These processes of assimilation and accommodation are visually represented with an example in table 1, as well as in figure 2.

Assimilation the cognitive process of incorporating new information into an existing schema

Accommodation the cognitive process of restructuring an existing schema in order to fit in new information

Analogy

The differences between assimilation and accommodation can be difficult to understand. You can use the analogy of puzzle pieces to help you.

- During assimilation, the new information acts as a puzzle piece which fits with the other pieces in the puzzle (schema). This adds to how much you know about the concept, causing your puzzle to be refined and therefore your understanding of the bigger picture (schema) to deepen.
- During accommodation, the new information is a puzzle piece which does not fit with the other pieces of the puzzle. In order for the new piece to fit, the existing puzzle would have to change shape entirely. Otherwise, the completed picture would not make sense and the piece could not fit.

Assimilation

Accommodation

New puzzle piece fits

New puzzle piece doesn't fit

Image: picoStudio/Shutterstock.com
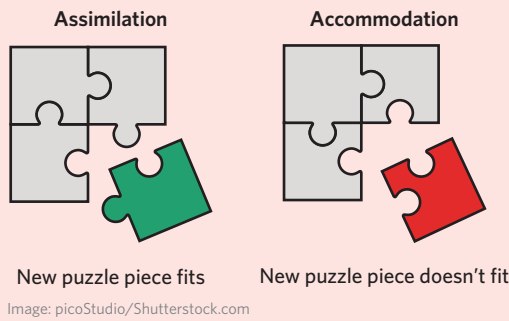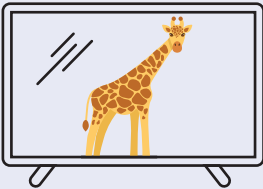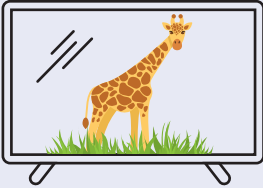
Figure 2 A representation of the processes of assimilation and accommodation

Memory device

To remember the difference between assimilation and accommodation, you can remember that the word accommodation has a 'C' in it and involves processes that start with 'C'. The new information **c**hallenges and **c**hanges the pre-existing schema during a**cc**ommodation, whereas assimilation involves incorporating new information into a pre-existing schema.

Table 1 Visual representations and explanations of assimilation and accommodation

Assimilation	Accommodation
1 **Pre-existing schema:** A child's schema contains the information that giraffes have four legs and a tail and live at the zoo. They learnt this on a visit to the zoo where they saw giraffes.	1 **Pre-existing schema:** A child's schema contains the information that giraffes have four legs and a tail and live at the zoo. They learnt this on a visit to the zoo where they saw giraffes.
2 **New information:** A child watches a TV show with an animal that lives in the wild.	2 **New information:** A child sees another animal in a picture book which also has four legs and a tail and therefore calls it a giraffe. The child's mum explains that although this animal in the book also has four legs and a tail, it is actually a zebra as it has stripes and giraffes have spots.
3 **Updated schema:** The child's schema has now been updated with the new information that giraffes have four legs and a tail, live at the zoo and the wild, therefore deepening the child's understanding of giraffes. This is due to the child recognising that the animal on the TV is the same animal that they saw at the zoo as it has the same features, calling it a giraffe. Assimilation has occurred here as the child has now learnt that giraffes can also live in the wild as well as at the zoo and has incorporated this new information into the existing schema.	3 **Changed schemas:** The child's giraffe schema has been restructured to include the information that giraffes have spots as well as four legs and a tail. Accommodation has occurred here because the child's schema of a giraffe has been challenged and restructured accordingly. The child has also learnt a new schema of a zebra.

Images: Pogorelova Olga, tanyaya/Shutterstock.com

Figure 3 The process of assimilation applied to the schema of a giraffe

Images: Pogorelova Olga, males_design/Shutterstock.com

Figure 4 The process of accommodation applied to the schema of a giraffe and a zebra

ACTIVITY 1

Can you make your own model of assimilation and accommodation?

Copy the template down on some paper to see if you can create your own model of assimilation and accommodation. To do this, you can think of a schema you have had in the past and how assimilation or accommodation can work with this concept, or make up your own. To help you create your model, you can refer to the figure in table 1.

Assimilation	Accommodation
1 [ ] Pre-existing schema	1 [ ] Pre-existing schema
2 [ ] New information	2 [ ] New information
3 [ ] Updated schema	3 [ ] [ ] Changed schemas
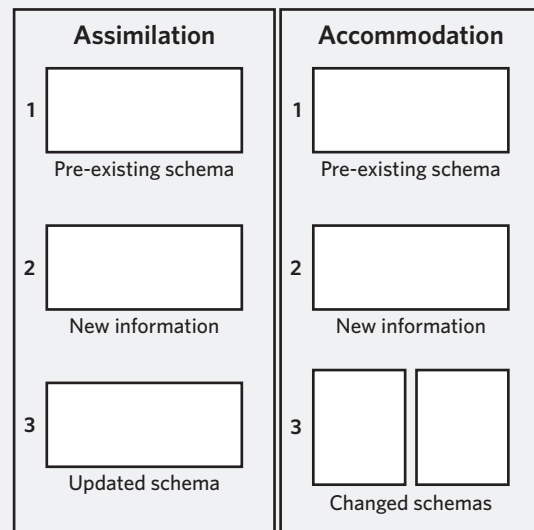
ACTIVITY 2

Assimilation or accommodation?

Read the following scenarios.

Scenario 1:

Daisy's parents own a cafe. Since she was young, she has spent time at the cafe while her parents work. As a four year old, she knows that there are different types of coffee that customers order, including lattes and cappuccinos. Yesterday, she heard a new order called a macchiato. Her mum served this drink in the coffee cups they use so she concluded that macchiatos must be another type of coffee.

Scenario 2:

Freya has two older brothers who take her to a pastry shop on the weekend to choose their favourite sweets. Both of her brothers love donuts and always choose it as the sweet they want. Freya knows that donuts have icing, sprinkles and that the dough is nice and fluffy. Today, she pointed to a sweet that she saw in the window and called it a donut. Her brothers told her it was actually a cupcake which is different from a donut as it is lined in a paper case and does not have a hole in the middle as donuts do.

Scenario 3:

Lottie and Luna love to eat broccoli. They both think that broccoli looks like a miniature tree with a long stalk and big, round, fluffy head on top. Their mum gave them some cauliflower for the first time the other day. Both Lottie and Luna thought that it looked like white broccoli and were excited to eat it. When they ate it, Lottie and Luna both spat the food out and asked their mum why the broccoli tasted so weird. They were confused when she said it was actually a different type of vegetable called cauliflower and now know that broccoli is green and cauliflower is white.

Complete the table with a tick to indicate whether each scenario demonstrated the process of assimilation or accommodation.

Table 2 Assimilation and accommodation

	Assimilation	Accommodation
Scenario 1	[ ]	[ ]
Scenario 2	[ ]	[ ]
Scenario 3	[ ]	[ ]

Theory summary

In this lesson, you learnt that cognition continually develops over the lifespan and involves the ability to produce thought as well as comprehend and organise information from the internal and external environment. You have also learnt about the cognitive processes of assimilation and accommodation in relation to schemas, which is represented in table 3.

Table 3 Summary table of the cognitive processes of schemas

Schema: mental representation of a concept developed through experience	
Process	**Description**
Assimilation	Cognitive process of incorporating new information into an existing schema • Increases depth of existing schema
Accommodation	Cognitive process of restructuring an existing schema in order to fit in new information • Alters structure of existing schema

4E QUESTIONS

Question 1

Our ability to independently think as well as understand and organise information from our environment is referred to as *(Select one)*

A cognition.

B perception.

C imagination.

Question 2

Cognition *(Select one)*

A is fully developed at birth and requires no further development.

B continues to develop over the lifespan.

Question 3

Fill in the blanks with the following terms.

- Environment
- Experiences

Cognitive abilities such as interpreting new information are informed by the existence of schemas.

A schema mentally represents concepts that have been created through our _____. Our schemas influence how we interact with our _____.

Question 4

Fill in the blanks with the following terms.

- Assimilation
- Accommodation

Schemas can be changed due to learning new information which we gain from our experiences. There are two ways in which schemas can change which are listed below.

I _____, in which new information is added to a pre-existing schema.

II _____, in which new information leads to a restructuring of a pre-existing schema.

Skills

Unpacking the scenario

Question 5

Saxton is a four-year-old boy who loves learning about cars. He has learnt lots about cars, such as that they drive on the road, have wheels, and have a driver and passengers. One day, Saxton went for a walk with his dad Marom and pointed to a bus and called it a car. Marom told his son that it was a bus, which is a larger vehicle which can transport more people than a car can. This new knowledge challenged Saxton's pre-existing understanding of cars and led to a change in his knowledge.

Fill in the blanks in the following paragraph based on the scenario provided.

Saxton's original schema, or mental representation of _____, was learnt through experience. This schema was challenged when _____ told him that a bus was a larger vehicle which can transport more people. The person experiencing accommodation in the scenario was _____, because he had to alter his original schema when it was challenged by new information.

Exam-style questions

Multiple-choice questions

Question 6   (1 MARK)

Cognition can be summarised as the ability to

A   coordinate movements and therefore effectively carry out tasks.

B   have a good memory.

C   produce logical thoughts as well as appropriately interpret and organise information.

D   have good conversations with others.

Question 7   (1 MARK)

The development of cognitive abilities occurs

A   solely as a foetus, with all abilities developed by birth.

B   only after birth, within newborns born without any cognitive ability.

C   when children go to school and start to learn new information.

D   partly as a foetus as well as after birth.

Question 8   (1 MARK)

Mental representations of concepts which are developed through experience are known as

A   assimilations.

B   schemas.

C   cognitive models.

D   mental models.

Question 9   (1 MARK)

Jacinda has grown up watching her dad play guitar in his band. She knows that guitars have strings which you strum to make music. On her first day at primary school, she watches year six students strum on what she thinks is a mini guitar. However, when they strum the mini guitar she is confused as to why it sounds so different from the guitar her dad plays. When she goes over to ask them why the mini guitars sound so different, they tell her that they are actually playing ukuleles. Due to the year six students explaining what a ukulele is, she learns that ukuleles are different to guitars.

Which of the following cognitive processes occurred for Jacinda in the scenario?

A   schema adaptation

B   accommodation

C   assimilation

D   cognitive dissonance

Question 10   (1 MARK)

Which of the following most accurately describes the processes of assimilation and accommodation?

	Assimilation	Accommodation
A	Making changes to an existing schema due to new information challenging its boundaries	Incorporating new information into a schema
B	Learning new information which restructures an existing schema	Challenging the boundaries of an existing schema
C	Incorporating new information into an existing schema	Restructuring a pre-existing schema in order to fit in new information
D	Learning new cognitive abilities	Losing old cognitive abilities

Short-answer questions

Question 11 (2 MARKS)

Outline the difference between the processes of assimilation and accommodation.

Question 12 (3 MARKS)

Using an example, explain what a schema is and how it functions as a cognitive tool.

Question 13 (6 MARKS)

Tamika and Charlie are family friends about to start their first day of primary school. During the day, their teacher encourages both of them to join in the sporting match being played. Tamika has older siblings who play soccer and immediately realises that it is soccer being played. After always playing with rubbish bins as goals at her house, she recognises that the poles and nets must be the goals at school. On the other hand, Charlie only plays Australian football with her cousins. Due to her knowledge of how to play Australian football, she picks up the ball and tries to pass it to Tamika. The rest of the kids shout and tell her that she is playing wrong. Tamika explains to Charlie that soccer is being played, which has a more round ball than Australian football, and tries to explain the rules.

a Referring to the scenario, identify and explain whether assimilation or accommodation occurred when Tamika recognised the soccer goals at school. (3 MARKS)

b Referring to the scenario, identify and explain whether assimilation or accommodation occurred when Charlie learnt that soccer was being played instead of Australian football. (3 MARKS)

Questions from multiple lessons

Question 14 (2 MARKS)

Name and describe the type of plasticity which facilitates the creation, updating and restructuring of schemas that occurs when we learn as we grow up and reach maturity.

4F PIAGET'S THEORY OF COGNITIVE DEVELOPMENT

Do you remember how old you were when you first understood addition and subtraction? What about the age when you could understand the perspectives of others? Do you think everyone experiences this at the same age?

Piaget is a psychologist who developed a theory of the stages of cognitive development, outlining when certain cognitive achievements are accomplished. In this lesson, you will learn about each of Piaget's stages and how they relate to the development of concrete and symbolic thought. You will also learn about the criticisms Piaget's work has received.

Image: cigdem/Shutterstock.com

4A Nature versus nurture	4B Periods of psychological development	4C Attachment and emotional development	4D Studies of attachment	4E Cognitive development	4F Piaget's theory of cognitive development	4G Erikson's theory of psychosocial development

Study design dot point

- the development of cognitive abilities from concrete to symbolic thinking (with reference to the work of Piaget)

Key knowledge units

Piaget's theory of cognitive development	1.2.4.3
Evaluation of Piaget's work	1.2.4.4

Piaget's theory of cognitive development

- Piaget's theory of cognitive development 1.2.4.3
  - Sensorimotor stage
  - Preoperational stage
  - Concrete operational stage
  - Formal operational stage
  - Concrete and symbolic thinking
- Evaluation of Piaget's work 1.2.4.4

Piaget's theory of cognitive development 1.2.4.3

OVERVIEW

Piaget identified four stages of cognitive development which span from birth to the age of 12. Each stage has cognitive accomplishments which facilitate more complex and sophisticated thought.

THEORY DETAILS

Jean Piaget is a psychologist who was interested in child development. Piaget's (1936) theory of cognitive development relates to his concepts of cognition and schemas you learnt in the previous lesson 4E. He believed that schemas operated as building blocks which form a 'bigger picture' understanding of the world and how it functions.

Piaget developed a theory of cognitive development after studying the cognitive processes which occur and change over time in children. Through his studies, Piaget concluded that the underlying processes of cognition function differently for children compared to adults. Primarily, he believed that the cognitive development of children relied more heavily on the formation of schemas, whereas cognitive development in adulthood often involves modifying schemas which already exist.

Building on this, Piaget identified stages of development which he observed in children. Each stage involves a period of time in which certain cognitive skills and abilities should be developed in. Piaget outlined four stages of distinct development in cognitive processes:

- the sensorimotor stage, which children experience from birth to two years old
- the preoperational stage, which lasts from two to seven years old
- the concrete operational stage, from age seven to twelve years old
- the formal operational stage, which is developed after the age of twelve.

Each of these stages has key accomplishments that the child needs to achieve in order to progress to the next stage. In order to determine whether these accomplishments had been met, Piaget developed a set of tasks to test the cognitive skills developed by children of different ages. Some of these tests are outlined within this lesson.

Sensorimotor stage (0-2 years)

The *sensorimotor stage* occurs during infancy. During this stage, infants heavily rely on their senses as they explore their environment and begin to develop an understanding of the world. Through their explorations, they begin to develop motor skills and the coordination of movements. Due to their motor development, they are then able to begin understanding the objects surrounding them as they are able to coordinate motor activities in line with their senses. The ability to coordinate movement and sensory processes strengthens and becomes more sophisticated over time, with it being a normal part of everyday life for adults.

Table 1 Cognitive abilities formed during the sensorimotor stage

Key cognitive accomplishment	Description
Object permanence	**Object permanence** involves the understanding that an object still exists when it is unable to be seen, heard, or touched. Before developing this ability, if an infant detects an object with their senses and this object then disappears behind a wall, they will not understand that this object is behind the wall and has simply changed location (instead believing the object ceases to exist). When object permanence is understood, the infant will visually follow a moving object and then continue to look for it when it disappears.
Goal-directed behaviour	In this stage, infants begin performing **goal-directed behaviour**, which involves the ability to behave in a way to meet a goal that has been purposefully planned. Using their senses and newly developed motor skills, they realise that they can interact with the environment around them and achieve goals through their own behaviour. For example, an infant might want a toy of theirs. 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.

⊕ Want to know more?

The *A-not-B error* is a phenomenon discovered by Piaget. This is an error which occurs when testing for object permanence. The error involves an object being continuously hidden in a certain location e.g. a barbie doll being hidden under a blanket. After repeated trials of the barbie being hidden under the blanket (location A) and continually being shown that it is hidden there, the toddler becomes familiar with the barbie being hidden there. However, when the toddler watches the barbie being hidden somewhere else e.g. under a rock (location B), they will still search for it in the familiar spot under the blanket (location A). This shows that they have not yet fully developed a sense of object permanence because they don't understand that the same object can move elsewhere.

🌐 Psychology applied

Have you ever played Peek-a-boo with a young infant? Did you wonder why infants found it so entertaining or even really scary?

The inability for early 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.

① Useful tip

One way to remember the key cognitive developments in the *sensorimotor* stage is to break down the term into its components: *sensory* and *motor*. In this stage, infants are developing their senses and motor skills.

Object permanence
the understanding that an object still exists when it is unable to be seen, heard, or touched

Goal-directed behaviour the ability to behave in a way which meets the demands of a goal that has been purposefully set out

Image: Sudowoodo/Shutterstock.com

Figure 1 The ability to reach for an object requires the development of goal-directed behaviour

Image: MIA Studio/Shutterstock.com

Figure 2 Playing peek-a-boo is fascinating for infants as they have not developed understanding of object permanence

At the completion of the sensorimotor stage, both of the key accomplishments have to be met before the infant moves on to the preoperational stage.

Preoperational stage (2-7 years)

As part of the *preoperational stage*, the cognitive skills of children continue to extend and develop. During this stage, children begin to understand how objects, events, and ideas can be represented using images and symbols, as well as developing additional skills such as acquiring language. Children reach multiple accomplishments by the end of this stage, including decentered thought, understanding centration, and understanding reversibility.

Table 2 Cognitive abilities formed during the preoperational stage

Key cognitive accomplishment	Description
Overcoming egocentrism (decentered thought)	At the beginning of this stage, children are *egocentric*. **Egocentrism** involves the inability to understand the perspectives of others. In such a way, children may believe that the way in which they produce thoughts about the world is exactly the same as how everyone else does. For example, a child may believe that the most delicious meal they could ever have is chicken nuggets and chips. If they go out for dinner and want their cousin, who is more than twenty years older than them, to get the same meal, they may be confused and even feel hurt when their cousin does not want this meal. At the conclusion of the preoperational stage, children experience *decentered thought* which involves the ability to understand the perspectives of others, comprehending that these perspectives differ from their own. Therefore, children overcome their egocentrism.
Overcoming centration	Another accomplishment achieved by the end of this stage is the overcoming of centration. **Centration** involves focusing only on one feature or characteristic of an object, leading to the exclusion of other existing features or characteristics. For example, a child may get upset that their brother has two cookies as he is holding a piece in each hand while they only have one cookie. In reality, the child's brother has one cookie which has been split in half, leading to two pieces. Due to centration, the child is unable to focus on the feature of the size of each cookie piece, solely focusing on the number of pieces being held. At the end of this stage, the child will be able to realise that although their brother has two pieces, they are smaller than his one cookie due to being able to simultaneously focus on the features of size and number of cookie pieces.
Reversibility	Additionally, the skill of reversibility is also met by the end of this stage. **Reversibility** involves the understanding that objects can experience change and then return to their original form. An example of this is the understanding that playdough which you roll out into a long, thin line can return to its original shape as a round ball.

Egocentrism the inability to understand the perspectives of others

Centration the act of focusing only on one feature or characteristic of an object to the exclusion of all others

Reversibility the understanding that objects can experience change and then return to their original form

Image: Alexandra Lande, Kansitang P/Shutterstock.com

Figure 3 The ability of a child to understand that both the ball and the long roll of playdough is the same piece and has simply undergone a physical transformation requires the ability to understand reversibility

Want to know more?

Children in the preoperational stage also experience *animism*, which involves the belief that all existing objects are conscious and can perform actions, as well as have thoughts, feelings, and sensations. This is due to the existence of *egocentrism* during this stage, in which children believe that everyone in their environment, including objects such as toys, think the same things that they do. This can lead to children believing that their teddy bear is hurt if they accidentally drop them and so on.

Image: PinkPeng/Shutterstock.com

Figure 4 A child can try to make a toy feel better after dropping it by giving it kisses, this is due to the existence of animism

Lesson link

Language is acquired during the preoperational stage. Language acquisition is developed during a critical period. Return to lesson **4B: Periods of psychological development** to revisit this concept.

Concrete operational stage (7-12 years)

The cognitive abilities of children continue to develop and become increasingly sophisticated during the *concrete operational stage*. These cognitive developments arise from the ability to make representations of, organise, and understand concepts in a more complex and accurate manner. These mental operations can be performed on concepts or objects that are tangible and concrete, but cannot be performed for more abstract and hypothetical concepts. The main achievements reached by the end of this stage involve the ability to categorise objects, to perform mental operations such as mathematical equations, and to understand conservation of objects. These are summarised in table 3.

Table 3 Cognitive abilities formed during the concrete operational stage

Key cognitive accomplishment	Description	
Conservation	**Conservation** involves the ability to understand that the properties of an object stay the same when the object's appearance is altered. These stable properties involve the object's weight, mass, and volume. A child's ability to understand conservation has been classically tested through the conservation of liquid. This task involves water from a short, wide glass being poured into a narrower and taller glass. The children who do not understand conservation believe that there is more water in the tall, narrow glass as this is taller, whereas a child who does understand conservation will know that there was the same amount of water in either glass, therefore understanding the property of volume.	 **Figure 5** Children who understand conservation will understand that both glasses (the tall, narrow one and the short, wide one) have the same amount of water
Classification	**Classification** involves the ability to group objects or concepts into categories which are organised on the basis of common features. These features therefore separate these categories from the existence of other categories which have different features. An example may involve a child understanding that fruits are sweet, therefore placing a strawberry in this category as the strawberry's feature aligns with the feature for fruits. Additionally, classification also equips children with the ability to organise objects into hierarchies, deciding which object belongs to a subgroup and which belongs to an overarching group. In this example, this would involve understanding that 'fruit' is an overarching group of a type of food, while 'strawberries' are part of the subgroup.	 Image: Inspiring, Viktoria Kurpas/Shutterstock.com **Figure 6** A child can group strawberries with other fruits due to the sweet taste, recognising that fruits fall into a separate category than vegetables
Mental operations - simple mathematical skills	Within the concrete operational stage the ability to perform simple mental operations is developed. This mainly involves *mathematical skills* such as the ability to comprehend addition, subtraction and multiplication. It is important to distinguish between the mathematical skills developed in this stage from the skills developed in the formal operational stage. Within the concrete operational stage, mathematical operations can only be performed for scenarios which can be explained in a tangible way. For example, children in this stage can understand addition by relying on concrete tools such as counting blocks.	 Image: DeawSS/Shutterstock.com **Figure 7** Do you remember using these counting blocks in primary school? The use of these blocks symbolises how the mathematical skills developed in the concrete operational stage are based on tangible concepts

Conservation the ability to understand that the properties of an object stay the same even when the object's appearance is altered

Classification the ability to group objects or concepts into categories which are organised on the basis of common features

Formal operational stage (12+ years)

The final stage of Piaget's theory of cognitive development is the *formal operational stage* which occurs from the age of 12 onwards. This stage equips individuals with the skills to comprehend and produce abstract and sophisticated thought, as well as to use reasoning

and logic. Therefore, the main accomplishments of this stage include the ability to produce abstract and logical thought, as well as to understand hypothetical situations. These accomplishments are summarised in table 4.

Table 4   Cognitive abilities formed during the formal operational stage

Key cognitive accomplishments	Description
Abstract thought	The ability to produce *abstract thought* involves the ability to consider concepts and ideas that are not tangible or concrete, relying on our faculties like the imagination instead of our senses. Words like 'love', 'happiness', 'fear', and 'freedom' are all examples of abstract concepts. In such a way, the ability to understand hypothetical scenarios requires the ability to think abstractly. These abstract thoughts usually involve complex ideas and questions surrounding concepts such as beliefs, values, and morals. A typical example of abstract thought is a person's belief system, such as following a religious faith.
Use of reason and logic	Additionally, the ability to *reason* and use *logic* is fully developed during the formal operational stage. Logic refers to the ability to objectively consider a problem or scenario and accurately consider all possible pathways which could be taken in order to resolve the problem. This is closely related to reasoning which involves using logic to process a concept and come to a sensible and valid conclusion. The development of these sophisticated cognitive processes enables individuals to engage with more complex mathematical operations, such as being able to understand algebra.

Memory device

To remember Piaget's stages of cognitive development in the correct order you can think of the acronym **S**mall **P**igs **C**an **F**ly.

S - **S**ensorimotor stage

P - **P**reoperational stage

C - **C**oncrete operational stage

F - **F**ormal operational stage

Image: Sudowoodo/Shutterstock.com

Figure 8   You can use the acronym Small Pigs Can Fly to remember Piaget's stages

Psychology in practice

Piaget's work on cognitive development has influenced the education system, specifically in determining what is included in school curricula. This is particularly evident in *educational psychology*, a branch of psychology which focuses on the processes of learning. This includes looking at different learning styles, processes such as memory, effective student testing, and effective teaching methods.

Concrete and symbolic thinking

During the process of cognitive development, children develop different types of thought. Building upon Piaget's stages of cognitive development, two distinct types of thought were identified: concrete and symbolic. The ability to produce concrete thought is developed first, with symbolic thought being produced later in development. In relation to Piaget's stages, the two types of thoughts develop in different stages.

- **Concrete thought:** developed during the *sensorimotor stage* and continually used across the lifespan
- **Symbolic thought:** begins to develop during the *preoperational stage*, becoming increasingly sophisticated and complex during the *concrete operational* and *formal operational stages*

Table 5   Description of concrete and symbolic thinking

Type	Description	When is it developed?	Examples
Concrete thinking	A production of thought based on knowledge acquired through personal experiences in the environment and literal interpretations. These thoughts are in response to familiar, tangible objects which individuals are exposed to through their senses.	Developed in the sensorimotor stage and is continually used across the lifespan (in Piaget's other stages).	• Understanding the concept of addition after using blocks to count
Symbolic thinking	The ability to represent concepts with concepts such as symbols and words, draw conclusions, and understand hypothetical constructs. This sophisticated ability is linked to using your imagination, creating mental images, and believing in 'make-believe' concepts.	Symbolic thought starts to develop in the preoperational stage. This ability becomes increasingly complex, with the development of symbolic thought ending in the formal operational stage where abstract thought can be produced.	• Pretend play e.g. Play-cooking by stirring an empty bowl attempting to "make soup"

Concrete thinking   a type of thought based on knowledge acquired through personal experience which involves literal interpretations of tangible concepts

Symbolic thinking   a more sophisticated type of thought based on the ability to represent concepts, draw conclusions, and understand hypothetical constructs

To help understand how the concepts of concrete and symbolic thought apply to Piaget's stages of cognitive development refer to figure 9.

Accomplishments at the end of each stage...
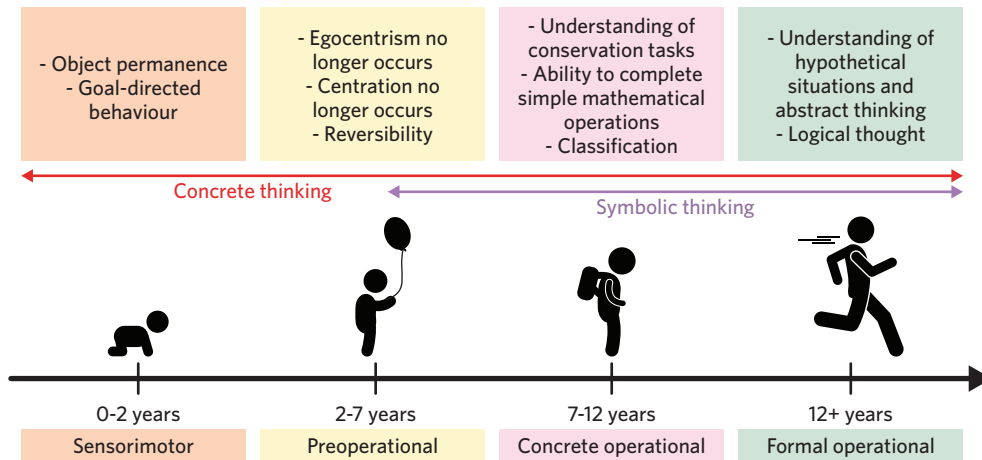
Image: Leremy/Shutterstock.com

Figure 9 The accomplishments of each of Piaget's stages of cognitive development with symbolic and concrete thought development applied

ACTIVITY 1 - MINI EXPERIMENT

Do Piaget's tests work?

Below are step-by-step instructions on how to complete commonly-tested Piaget tasks. Both tasks test the ability to understand object conservation. You can complete these tests working with younger siblings or cousins. To see the difference between children who understand the concept of conservation vs. children who don't, it is best to test a *preoperational stage child* (between two to seven years old who do not reliably understand conservation) and a *concrete operational child* (between seven to 12 years old who do reliably understand conservation).

Test 1: Water conservation task

Materials needed:

- Three glasses (two of the same height and width, one which is taller but smaller in width)
- Water

Instructions:

1 Fill the two glasses of the same height/width with water. Try to make the amount of water in each glass equal.
2 Ask the child 'Does this glass have more water (point to glass one), does this glass have more water (point to glass two), or do they have the same amount?' If the child does not think that they have the same amount, adjust the levels accordingly and repeat the question until they agree that both glasses have the same amount of water.
3 Pour the water from one of the two glasses into the taller, less wide glass in front of the child.
4 Ask the child the same question that you asked in step two.
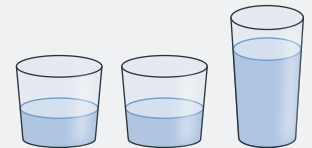
Typical results:

- Typical response of *preoperational stage* child:
  - At step 4, the child will think that the taller, less wide glass has more water as it is taller.
- Typical response of *concrete operational stage* child:
  - The child will realise at step 4 that both glasses have the same amount of water even though one glass is taller.
  - The child will understand the concept of conservation due to understanding that the amount of water in the glass has not changed from what was in the previous cup.

Test 2: Conservation of coins

Materials needed:

- 10 of the same coins

Instructions:

1 Line up the coins in two equal rows (five coins in each).
2 Ask the child 'does this row have more coins (point to the first row), does this row have more coins (point to the second row) or do they both have the same amount of coins?' If the child does not think that they have the same amount, adjust the spacing of the rows accordingly and repeat the question until they agree that both rows have the same amount of coins.
3 Move the coins in one row further apart from each other, making this row longer than the other row of coins.
4 Ask the child the same question that you asked in step 2.
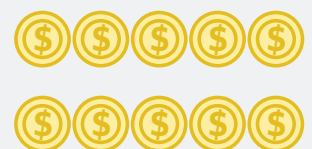
Typical results:

- Typical response of *preoperational stage* child:
  - At step 4, the child will think that the longer row of coins (the row which you increased the spacing between the coins) will have more coins than the other row.
- Typical response of *concrete operational stage* child:
  - At step 4, the child will realise that both rows have the same amount of coins even though one row is longer.
  - The child will understand the concept of conservation due to understanding that the amount of coins in each row has not changed despite one row being longer, as they will understand that the coins are simply more spaced out.

Notes: Some children nearing the end of the *preoperational stage* may be able to understand the conservation tasks, however they are not as reliable and consistent in providing these responses as children in the *concrete operational stage*. *Preoperational* children who are able to correctly answer the questions in these conservation tasks are unlikely to be able to explain why this occurs.

Evaluation of Piaget's work 1.2.4.4

OVERVIEW

Although influential within education, Piaget's theory of cognitive development is heavily debated and criticised. These criticisms mainly stem from the way in which Piaget developed his theory, as well as the tests he designed to test the cognitive abilities of children.

THEORY DETAILS

Piaget's theory of cognitive development has been heavily scrutinised. More contemporary research investigating the cognitive abilities of children and adolescents has led to the development of many criticisms.

Criticisms of Piaget's theory of cognitive development include:

- Underestimating children's abilities
  - Recent research has suggested that children are able to perform certain cognitive tasks earlier than Piaget specified
  - It was found that instead of children lacking certain abilities, they were actually unable to perform tasks in the tests Piaget created due to other factors, such as the lack of motor coordination and memory inabilities, that is, children may 'fail' object permanence tests due to the underdeveloped memory processes, rather than not having achieved goal-directed behaviour
- Lack of representation of cultures
  - Most of Piaget's research was conducted on white, Western children
  - Researchers have suggested that it may therefore be invalid to apply these results to children of all cultures
- The neglect of possible stages of cognitive development in adulthood
  - Piaget's theory outlines stages of cognitive development occurring from birth to the age of 12, with individuals over the age of 12 experiencing no further cognitive changes which can be classified into stages
  - Many researchers criticise the lack of stages past the age of 12, suggesting that this is simplistic and overlooks significant cognitive changes which occur past the age of 12
  - Research has discovered that further developments and changes in cognition occur across the lifespan, not just across childhood and these changes are likely to be able to form further stages of cognitive growth past the age of 12
- Invalid research method/s
  - The majority of Piaget's theory was based upon Piaget's research of his own children
  - Modern researchers have criticised this method, questioning the validity and generalisability of his methods

ACTIVITY 2

Consider the implications of Piaget's research

1 *Research focus:* Evaluate Piaget's research validity of basing his theory mainly upon his own observation of his children. To do this, you may want to refer back to the following concepts which are outlined in lessons *1C: Population, sample and sampling* and lesson *1D: Sources of error and prevention*.
Consider the following points:

   - The size of the sample and sampling method - is it representative?
   - Experimenter bias and expectations - could these have influenced the results?

2 *Education focus:* Piaget's research has had significant impacts on educational institutions, influencing curricula. One criticism of Piaget's theory of cognitive development is that he underestimated the cognitive abilities of children. Consider how this may lead to negative implications within education, particularly with how or when children learn certain concepts in line with Piaget's research.

Theory summary

In this lesson, you learnt about Piaget's theory of cognitive development and the accomplishments achieved in each stage. This is summarised in table 6. You also learnt about the concepts of concrete and symbolic thinking:

- Concrete thought involves thought produced from personal experiences which are literal and involve understanding tangible concepts.

- Symbolic thought involves the ability to represent concepts, draw conclusions and understand hypothetical constructs.

You also learnt about the evaluation of Piaget's theory of cognitive development, with common criticisms including the underestimation of children's abilities and the lack of focus on different cultures.

Table 6 Summary of each stage of Piaget's cognitive development

Stage	Age (in years)	Description	Abilities developed at the conclusion of the stage	Type of thought used
Sensorimotor	0-2	Infants utilise their senses to explore their environment and begin to develop motor skills.	• Understand object permanence • Ability to perform goal directed behaviour	Concrete
Preoperational	2-7	Children begin to understand images and symbols as representations and acquire language.	• Understands reversibility of objects • Centration no longer occurs • Egocentrism no longer occurs	Mainly concrete, with signs of symbolic thought starting to develop
Concrete operational	7-12	Mental operations such as sorting objects into categories and mathematical equations can be performed. These mental operations are limited to concrete objects or concepts.	• Ability to perform simple mathematical operations • Understands conservation tasks • Can classify objects	Concrete and symbolic (which is almost fully developed)
Formal operational	12+	Adolescents and adults are able to comprehend and produce abstract reasoning and thinking and can reason logically.	• Can produce abstract thought • Understands hypothetical scenarios • Can produce logical thought	Concrete and symbolic (fully developed)

4F QUESTIONS

Question 1

The development of cognitive skills over the lifespan was investigated by many psychologists. One influential psychologist conducted research and then developed a model of cognitive development which outlined the stages of cognitive development. This model has been extremely influential in the field of cognitive psychology.

The name of this psychologist is: *(Select one)*

A   Piaget

B   Milgram

C   Freud

Question 2

There are four stages of cognitive development, including the sensorimotor and concrete operational stage.
These stages involve *(Select one)*

A   children achieving cognitive abilities, with different stages requiring concrete and symbolic thinking.

B   critical periods in which cognitive processes must be achieved.

Question 3

There are two types of thought, concrete and symbolic. These types of thought are developed at different stages in Piaget's theory. Using your understanding of the accomplishments developed at each stage, fill in the blanks with the following terms.

- Symbolic thought
- Concrete thought

Accomplishments at the end of each stage...

- Object permanence - Goal-directed behaviour	- Egocentrism no longer occurs - Centration no longer occurs - Reversibility	- Understanding of conservation tasks - Ability to complete simple mathematical operations - Classification	- Understanding of hypothetical situations and abstract thinking - Logical thought

_____   _____
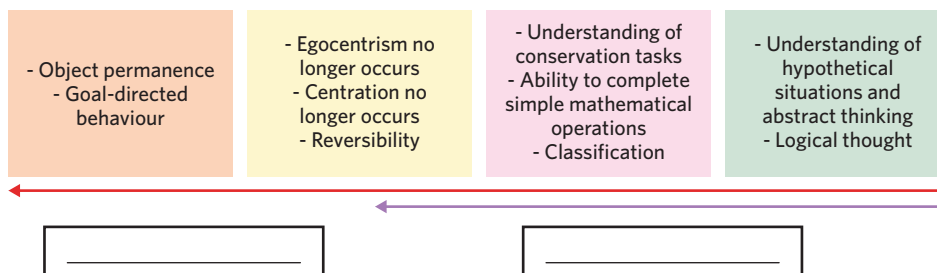
Question 4

Across the four stages of cognitive development, there are two types of thought which are developed: concrete and symbolic.
Fill in the blanks with the following terms.

- hypothetical
- literal

Concrete thoughts are more _____, whereas symbolic thoughts can be _____.

Question 5

Piaget has received criticism for his theory of cognitive development. One clear criticism is that Piaget *(Select one)*

A   overestimated the cognitive abilities of children.

B   needed to develop more cognitive tests.

C   underestimated the cognitive abilities of children.

Skills

Understanding research

Use the following information to answer Questions 6–8.

Search and watch the YouTube video '*Piaget's stages of development*' (Misssmith891, 2011). The video outlines Piaget's theory of cognitive development and traditional tasks that are used to test children's cognitive abilities.

Question 6

Internal validity *(Select one)*

A was evident in all the tasks, as changes in the dependent variable were caused by the independent variable and not other variables.

B may have not been evident in the tasks, as some of the changes in the dependent variable may have been caused by other variables such as motor or memory abilities, rather than the independent variable.

C was not evident in the tasks included in the video.

Question 7

The collection of data from the tasks in the video *(Select one)*

A may be subject to experimenter bias as the results may have been recorded incorrectly due to experimenter expectations.

B was shown to be objective and quantitative.

Question 8

The tasks conducted in the video were replicated from Piaget's original tests. It is important to replicate studies to ensure *(Select one)*

A that results are not a 'one-off', therefore testing the reliability of a study.

B that results are not a 'one-off', therefore testing the validity of a study.

Exam-style questions

Multiple-choice questions

Question 9   (1 MARK)

Which of the following correctly lists appropriate accomplishments achieved by the end of each of Piaget's stages?

	Sensorimotor	Preoperational	Concrete operational	Formal operational
A	Abstract thought	Overcoming of centration	Understands reversibility	Overcoming of egocentrism
B	Goal-directed behaviour	Overcoming of egocentrism	Classification	Abstract thought
C	Classification	Understand object permanence	Perform simple mathematical operations	Overcoming of centration
D	Understand object permanence	Understands reversibility	Logical thought	Classification

Question 10   (1 MARK)

A difference between concrete and symbolic thought is that

A concrete thought is more sophisticated than symbolic thought.

B concrete thought is developed later in the lifespan than symbolic thought.

C concrete thought involves the interpretation of tangible objects whereas symbolic thought involves the ability to represent concepts with symbols and words.

D concrete thought involves literal thinking whereas symbolic thought involves the ability to interpret tangible objects.

Question 11   (1 MARK)

Object permanence involves

A   detecting objects using the senses.

B   never looking away from novel objects.

C   performing behaviours to meet planned goals.

D   understanding that an object still exists when it is unable to be detected by the senses.

Question 12   (1 MARK)

The sensorimotor stage

A   occurs from age zero to two and involves the use of senses to explore the environment.

B   occurs from age nine and involves the use of senses to explore the environment.

C   occurs from age zero to two and involves the ability to represent concepts with symbols and words.

D   occurs from age nine and involves being able to produce abstract thought.

Question 13   (1 MARK)

Ms Stangherlin is a primary school, grade-three teacher who is developing part of her teaching curriculum. The children she teaches are in the concrete operational stage. The most appropriate things for Ms Stangherlin to include in this curriculum are

A   class discussions about morals and how they may influence your spiritual beliefs.

B   class discussions on the differences between different food groups and the different physical features each food group has.

C   class discussions about why being a vegan is ethical.

D   algebra and Pythagoras' theorem.

Short-answer questions

Question 14   (1 MARK)

Provide an example of a symbolic thought.

Question 15   (4 MARKS)

Mr Jenson is a researcher investigating children's abilities to use logic. As a part of his research, Mr Jenson conducts a test on children aged seven to nine. The results of his study suggest that children begin to use logic at the age of eight.

a   According to the ages Piaget outlines in his theory of cognitive development, which stage would these children be in? (1 MARK)

b   Referring to the scenario, explain why the results of the study do not align with Piaget's theory of cognitive development and refer to the criticism of Piaget's theory of cognitive development which relates to this occurrence. (3 MARKS)

Question 16   (4 MARKS)

Compare the concrete operational and formal operational stages. Provide an example of an accomplishment achieved in each stage to support your comparison.

Questions from multiple lessons

Question 17   (1 MARK)

One of the achievements of the concrete operational stage is the ability to classify objects on the basis of similar features. A child classified a dog as a mammal due to dogs having hair on the body, having different types of teeth and being warm-blooded. Which of the following cognitive processes occurred due to this classification?

A   accommodation

B   conservation

C   assimilation

D   reversibility

4G ERIKSON'S THEORY OF PSYCHOSOCIAL DEVELOPMENT

How does society impact our development? What are some of the factors that have shaped you to become who you are? How have these factors influenced your behaviours, personality, and the ways in which you think? The foundations of Erikson's psychosocial theory of development is formed by our desire to fit in with others and meet the expectations of society, as well as the influence of our social and cultural environments. In this lesson, you will learn about this theory, as well as the influence of psychosocial development on personality.

Image: Griboedov/Shutterstock.com

4A Nature versus nurture	4B Periods of psychological development	4C Attachment and emotional development	4D Studies of attachment	4E Cognitive development	4F Piaget's theory of cognitive development	4G Erikson's theory of psychosocial development

Study design dot point

- psychosocial development across the lifespan as an influence on the development of an individual's personality (with reference to the work of Erikson)

Key knowledge units

Psychosocial development	1.2.5.1
Erikson's theory of psychosocial development	1.2.5.2

Erikson's theory of psychosocial development

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                    ●
          ┌─────────┴─────────┐
   Psychosocial          Erikson's theory of
   development 1.2.5.1   psychosocial development 1.2.5.2
      │                        │
      ├─ Trust vs. mistrust    ├─ Identity vs. role confusion    ── Evaluation of Erikson's theory
      ├─ Autonomy vs. shame/doubt   ├─ Intimacy vs. isolation
      ├─ Initiative vs. guilt  ├─ Generativity vs. stagnation
      └─ Industry vs. inferiority   └─ Integrity vs. despair
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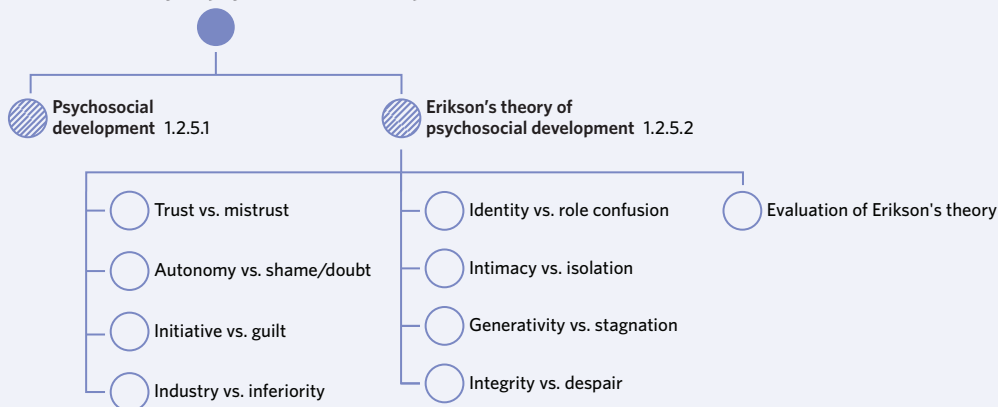
Psychosocial development 1.2.5.1

OVERVIEW

The social environment has significant impacts on human development, specifically influencing the development of our cognitive and social processes, behaviour, and personality.

THEORY DETAILS

As human beings, we are social creatures. Our innate desire to interact with others helps us thrive throughout our life. This desire enables us to successfully participate in groups, seek friends during childhood, and later seek romantic relationships, all of which are perceived as desirable by society. In such a way, we can see how our social interactions have a major impact on our life, influencing our thoughts, feelings, and behaviours. Throughout the lifetime, our social experiences and cognitive processes interact and progressively develop and change as we age. This process is known as **psychosocial development.** Refer to figure 1 for a visual representation of psychosocial development.

Psychosocial development the interactions between cognitive and social processes throughout the lifespan that affect development and growth
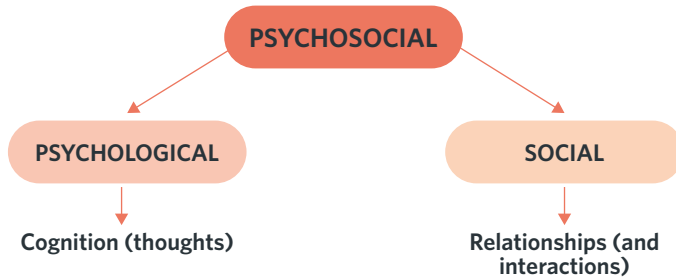
Figure 1 The concept of 'psychosocial' is made up of psychological components (our cognition and thoughts) and social components (our relationships and interactions)

At each stage of life, our relationships and social experiences shape our self-identity as well as our personality. Our **personality** is made up of the unique characteristics each of us holds and expresses through our thoughts, feelings, and actions. These characteristics are composed of our innate genetic traits as well as the traits we have acquired through our own experiences.

Personality the unique qualities and characteristics that an individual possesses and expresses through their thoughts, feelings, and behaviours

🧠 *Want to know more?*

Do you ever act differently around different people? How we express our personal traits can often change in line with the social circumstances we are in. For example, when going for a job interview, you may want to suppress your sense of humour and instead present yourself as someone who is dependable and serious.

🌍 *Psychology applied*

Psychosocial development is crucial for wellbeing across the lifespan. ABC's show *'Old People's Home for 4 Year Olds'* offers an insight into how social interactions can positively impact wellbeing for children, as well as elderly individuals. In the series, four year olds built relationships with elderly retirement village residents over seven weeks. During this time, the retirement village residents experienced dramatic improvements in mood and life satisfaction as well as significantly reduced levels of depression and feelings of helplessness.
(Cuell, 2019).

ACTIVITY 1

What personality type do you have?

There are many online quizzes which try to determine your personality or traits of your personality based on your answers to questions. Although they often don't provide conclusive or reliable results, they can be a fun task to give you some information about your personality traits.
Here is one widely used quiz: *16personalities.com/free-personality-test*.

(NERIS Analytics Ltd, 2020)

Individuals who experience 'healthy' psychosocial development across the lifespan experience significant positive impacts on other aspects of life. Not only does it lead to positive health and wellbeing, but it also translates to the development of desirable personality traits. An example of how psychosocial experiences can influence personality is shown in figure 2.

INPUT

Psychosocial experiences
Social: An individual is encouraged by parents to look out for other people and provide a hand if people seem like they are struggling. When the individual helps others in need they are thanked and have positive experiences.
Psychological (cognitive): The individual believes that it is the right thing to help those in need.

OUTPUT

Personality traits
Trait developed: *Agreeableness* (individual is perceived as warm, kind and helpful)

Figure 2 An example of how psychosocial development can affect personality traits

In such a way, it is clear how psychosocial development has an impact on personality development. Social processes, such as parental guidance, influence cognitive processes. For example, parental guidance may influence the production of thoughts and beliefs that it is important to help those in need. The interaction of these processes significantly impacts the traits individuals develop, with *agreeableness* being shown to develop here.

Erikson's theory of psychosocial development 1.2.5.2

OVERVIEW

Erikson's theory of psychosocial development proposed that there are stages and crises individuals need to confront to develop psychosocial health. The decisions and actions each individual takes when confronting a crisis determines their psychosocial development. This model includes eight stages which span the entire lifespan. This theory is one of many psychosocial theories proposed by theorists and researchers.

THEORY DETAILS

Erikson's psychosocial theory of development stemmed from his belief that the social and cultural environment has the largest impact on human development. As a part of his research, Erikson focused on the impact of culture and social environments on the development of personality. His theory outlines that the cognitive processes, behaviours, and personalities of individuals are shaped by their desire to meet social and cultural expectations. This led to Erikson developing this model to identify how humans develop across the lifespan.

Erikson's psychosocial theory of development a theory of development proposed by Erikson in which the behaviour and personality of individuals is shaped by the desire to meet social and cultural expectations

Erikson's theory outlines eight separate stages of development which span the entire lifespan. Researchers have assigned specific ages to each stage that Erikson identified, with the stages ranging from the age of zero to over 65 years of age. At each of these stages, Erikson proposes that there is a crisis point. These **psychological crises** are tension points 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 crisis point, the tensions need to be balanced out. Each crisis can lead to positive or negative impacts on personality development. Refer to figure 3 for a representation of each stage.

Psychosocial crisis a point of tension between an individual's capabilities and the desire to meet the expectations of society

Infant	Toddler	Pre-schooler	Primary school ager	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**

Image: VoodooDot/Shutterstock.com

Figure 3 A representation of the stages of Erikson's theory of psychosocial development

Appropriately resolving a stage's crisis allows the individual to go on and successfully resolve the crisis of the next stage. This is due to the resolution of each crisis providing individuals with a skill set which enables them to deal with the crisis of the following stage. If an individual is unable to resolve a crisis, it is unlikely that they will be able to successfully navigate and resolve the crisis point of the next stage. In contrast, being able to successfully resolve the crises of each stage enables individuals to have 'healthy' psychosocial development. This contributes to an individual's identity and personality formation.

Trust vs. mistrust (0-1 years)

In this stage, infants are completely dependent on their caregivers. If the infant is surrounded by reliable caregivers who consistently respond to and meet their needs, a sense of *trust* will be nurtured. This trust will help equip the individual to develop trusting relationships with others in their adult life. However, if caregivers are unresponsive to the needs of the infant, a sense of *mistrust* may develop. This lack of trust may lead to paranoia, fear, and a sense of a lack of safety in future relationships.

Image: VoodooDot /Shutterstock.com

Figure 4 Trust vs. mistrust

Autonomy vs. shame/doubt (1-3 years)

This stage involves toddlers experiencing an enhanced level of independence while learning about their world through exploration. When toddlers are encouraged to act independently in this way, such as being able to choose which toy to play with or which shoes they want to wear, a sense of *autonomy* is developed. This will allow the toddlers to act with independence in the future, having the skills to make important decisions and act independently as an adult. If a toddler's choices are repeatedly denied they may begin to doubt their own independence leading to *shame and doubt*. This is due to the adults in the toddler's environment eliminating their sense of self-sufficiency by forcing them to continuously depend on the decisions of others. This may lead to the individual questioning their own decisions in the future due to potentially feeling embarrassed or ridiculed from previous attempts of independent decision making.

Image: Griboedov/Shutterstock.com

Figure 5 Autonomy vs. shame/doubt

Initiative vs. guilt (3-6 years)

From the ages of three to six, children are beginning to actively interact with others. While interacting and playing with other children, a sense of initiative can be attained. *Initiative* involves the implementation of purposeful plans during social interactions as well as the ability to produce independent thought. When these plans are endorsed and 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. In contrast, *guilt* involves a lack of endorsement of initiative from other children or adults, often being harshly rejected or experiencing punishments, which leads to a sense of guilt due to believing that they have done something wrong.

Image: Griboedov/Shutterstock.com

Figure 6 Initiative vs. guilt

Industry vs. inferiority (6-12 years)

At the beginning of this stage, children start to be measured on their performance in multiple aspects of life. For example, this can include their academic performance at school, their performance in social situations, their sporting performance, and their ability to learn cultural knowledge. At this stage, children begin to compare their own performance to the performance of others. If they feel inadequate when comparing themselves to others, their sense of *inferiority* may become heightened.

Image: Griboedov/Shutterstock.com

Figure 7 Industry vs. 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 capabilities to perform well. Inferiority further involves children believing that they aren't good enough, as well as potentially feeling as though they don't fit in with their culture or society because they don't measure up. In contrast, if they are proud of their performances, a sense of *industry* will develop. Industry, therefore, involves the self-belief that you are competent and can fulfil the requirements of goals you set for yourself. A sense of industry is often established in children who have experienced encouragement from caregivers to try their best in all circumstances.

Identity vs. role confusion (12-19 years)

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. The ability to make choices which align to your beliefs and values and stay true to yourself occurs when a sense of identity is attained. In contrast, role confusion lacks this strong sense of self. *Role confusion* involves uncertainty about your identity as well as what you want to do in the future. This often involves multiple attempts at finding your own identity by trying different things 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.

Image: Griboedov/Shutterstock.com

Figure 8 Identity vs. role confusion

Intimacy vs. isolation (19-30 years)

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. This stage requires a strong sense of self-identity in order to intimately connect with others on a romantic basis. 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.

Image: Griboedov/Shutterstock.com

Figure 9 Intimacy vs. isolation

Generativity vs. stagnation (30-64 years)

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 contribute to the development and wellbeing of others, specifically considering if they have contributed to the lives of the next generation. This is called *generativity*, and can involve raising children, volunteering, or working with children. 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'.
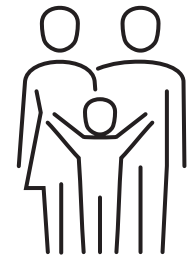
Image: VoodooDot/Shutterstock.com

Figure 10 Generativity vs. stagnation

Integrity vs. despair (64+ years)

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, feeling satisfied if so. This sense of satisfaction is called *integrity*, and 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.

Image: Alexandr III/Shutterstock.com

Figure 11 Integrity vs. despair

🌐 *Psychology applied*

The notion of a 'mid-life crisis' is renowned within society, often involving individuals making rash changes such as buying a sports car due to feeling as if they lack happiness and purpose in their own life. Although this is accepted by society, the concept of a 'mid-life crisis' is heavily flawed, with researchers asserting that it is purely an identity shift, with identity shifts equally likely to occur in other stages (Marcia, 2002). Do you think a 'mid-life crisis' is more significant and obvious than the identity shifts in other stages?

⊕ *Want to know more?*

The ages outlined for each stage of Erikson's psychosocial theory of development differ across multiple resources, with different researchers assigning different ages to each psychosocial stage. This is due to differences in opinion over the appropriate age for each stage. For example, the intimacy vs. isolation stage is outlined as 19-29 in some resources, as well as 20-25 or 19-40 in others.

Why do you think there is contention over the age range of each stage?

Evaluation of Erikson's theory

Erikson's theory of psychosocial development has significantly contributed to the wider understanding of psychosocial development across the lifespan. Particularly, the model has received praise for its focus on the impact of the social and cultural environment on development. However, it has also faced some criticism. These criticisms include:

- The ages outlined by each stage, with some psychologists believing that the age ranges are inaccurate.
- The prescriptive nature of the theory, with some psychologists arguing that some individuals may not experience all of the crises outlined in the model but still healthily develop psychosocial processes.
- Some stages have been criticised as invalid or inaccurate. For example, some say that it is invalid to say that all individuals who do not contribute to the lives of future generations will experience stagnation and therefore feel unfulfilled in their life.
- The model does not account for cultural differences, with all of Erikson's research being conducted in Western societies with research focusing on white individuals.

⧉ *Lesson link*

Some of the stages in Erikson's theory are connected to other theories of development. For example, during the trust vs. mistrust stage, the importance of caregivers supplying infants with continuous love by responding to their needs is outlined to develop trust in the infant. This refers to the creation of secure attachment which is outlined in lessons *4C: Attachment and emotional development* and *4D: Studies of attachment*. This stage highlights the profound impact of early social experiences on an individual's personality development, with the detrimental effects of *disorganised attachment* which can include a lack of empathy, low self-esteem, and manipulative behaviour in adulthood.

ACTIVITY 2 – CLASS DISCUSSION

Is Erikson's theory accurate and effective today?

- Erikson's theory of psychosocial development was developed in the 1950s. Are the crises in each stage still appropriate to development now? If so, should the ages outlined for each stage be changed or stay the same?
- Do you believe that the stages occur in the right order? Why or why not?
- Are the crises of each stage only experienced at that one stage of development? For example, can someone experience identity at age 17 and then later experience role confusion at age 50? What does this say about the necessity to resolve each crisis of each stage before moving to the next stage?
- Do you believe that individuals can still experience 'healthy' psychosocial development if they do not resolve all crises listed in Erikson's theory? What does this say about the theory?

Theory summary

In this lesson, you learnt about psychosocial development involving continued interactions between cognitive and social processes over the lifespan and its impact on personality. You also learnt about Erikson's theory of psychosocial development, which is summarised in table 1. You learnt that each stage of Erikson's theory of psychosocial development has a psychological crisis, which involves tension between an individual's capabilities and the desire to meet societal expectations.

Table 1 Erikson's stages of psychosocial development

Stage	Age range (in years)	Summary of stage
Trust vs. Mistrust	0-1	If the infant is surrounded by reliable caregivers who consistently meet their needs a sense of *trust* will be developed, but if caregivers are unresponsive to the infant *mistrust* may develop.
Autonomy vs. shame/doubt	1-3	When toddlers are encouraged to act independently and make their own choices, a sense of *autonomy* is developed. However, if a toddler's choices are repeatedly denied, they may begin to doubt their own independence, leading to *shame and doubt.*
Initiative vs. guilt	3-6	*Initiative* is achieved when purposeful plans and the production of independent thoughts are endorsed by others, whereas *guilt* results from a lack of endorsement of initiative from other children or adults, usually involving the sense that they have done something wrong.
Industry vs. inferiority	6-12	If children feel inadequate when comparing their performances to the performances of others, they may experience *inferiority*. By contrast, if children are proud of their performances, a sense of *industry* will develop.

cont'd

Table 1 Continued

Stage	Age range (in years)	Summary of stage
Identity vs. role confusion	12-19	*Identity* involves holding a strong belief in who you are and being able to stay true to yourself, whereas *role confusion* lacks this strong sense of self and involves uncertainty about your own identity.
Intimacy vs. isolation	19-30	*Intimacy* involves forming strong and committed romantic relationships, whereas *isolation* involves the inability to form close romantic relationships, therefore experiencing loneliness.
Generativity vs. stagnation	30-64	*Generativity* involves feeling fulfilled due to contributing to the lives of the next generation. In contrast, *stagnation* involves the lack of contributing to future generations, potentially involving a sense of disconnect from community and too much focus on the self.
Integrity vs. despair	64+	*Integrity* involves experiencing a sense of satisfaction and pride when reflecting on your life. In contrast, *despair* involves reflecting on your life and experiencing feelings of regret, bitterness, and a lack of pride.

4G QUESTIONS

Theory-review questions

Question 1

Psychosocial development involves *(Select one)*

A   the interaction of social and cognitive processes for human development.

B   social processes being solely responsible for human development.

Question 2

Psychosocial development impacts an individual's personality. All individuals *(Select one)*

A   are born with the same traits, with experiences leading to small changes in their personality.

B   hold unique qualities and characteristics which are formed from the interaction of genetic traits and experiences.

Question 3

Erikson's theory of psychosocial development involves the behaviour and personality of individuals being shaped by the desire to meet social and cultural expectations *(Select one)*

A   during childhood.

B   over the lifespan.

C   during the first fifty years of life.

Question 4

Erikson's theory of psychosocial development has eight stages, some of which include 'trust vs. mistrust' and 'generativity vs. stagnation'. Erikson outlines that each stage has a *(Select one)*

A   crisis which needs to be resolved.

B   traumatic experience which shapes personality development.

Question 5

Erikson's theory of psychosocial development has received praise from researchers. Circle whether the following statements are **true** or **false**.

I   Erikson's theory is accurate, with evidence that all individuals with healthy psychosocial development resolve all crises T/F

II   Erikson's emphasis on the impact of the social and cultural environment on development is a valuable perspective T/F

III   The model accounts for differences between all cultures T/F

Question 6

Fill in the blanks of the sentence with two of the following four words.

- Do
- Don't

- Psychosocial
- Psychosexual

Although Erikson's theory has received praise, it has also received a lot of criticism from researchers. One of these criticisms is listed below.

Some psychologists argue that individuals _____ have to experience all of the crises outlined in the model to experience healthy _____ development.

Skills

Understanding research

Use the following information to answer Questions 7 and 8.

Read the following journal article excerpt before answering the questions. This article focuses on developing criteria in line with Erikson's theory of psychosocial development which can be used to analyse the development of self-concept and identity.

> **Evaluating self-concept and ego development within Erikson's psychosocial framework: a formulation**
>
> There is, however, a noteworthy caution about Erikson's psychosocial framework. Miller (1983) suggested that Erikson's states are a 'loose connection of observations, empirical generalisations, and abstract theoretical claims [which] are laden with interpretations that are difficult to evaluate'(p. 174). It is true that most of Erikson's conclusions are based on highly personal and subjective interpretations that lack the hard empirical data necessary to support intuitions about their correctness.
>
> (Hamachek, 1988)

Question 7

The article includes the statement that the 'abstract theoretical claims…. are difficult to evaluate'. Which of the following is a problem that this may create?

A It may be difficult for researchers to conduct an ethical study.

B It may be difficult to ensure that the claims are valid and therefore be difficult to apply to the real world.

C It may be difficult to ensure beneficence in studies which apply Erikson's theory.

Question 8

The fact that the conclusions are based on subjective interpretations means that *(Select one)*

A the conclusions may be unreliable.

B the conclusions are definitely correct.

Exam-style questions

Multiple-choice questions

Question 9   (1 MARK)

Psychosocial development has the ability to impact personality development. An example of a psychosocial impact on personality which could occur is

A encouragement from caregivers in early childhood, leading to higher self confidence.

B a traumatic experience in infancy leading to the development of self doubt, with childhood experiences being the only time in which personality is impacted.

C playing soccer since being an infant, leading to the individual continuing to play soccer in adulthood.

D being taught how to play guitar as a child due to being in a musical family.

Question 10 (1 MARK)

Erikson's theory of psychosocial development includes the belief that

A biological processes have the biggest influence on personality development.

B each stage has a crisis, with at least six of the eight crises needing to be resolved for healthy psychosocial development.

C the crisis of each stage must be resolved for successful psychosocial development.

D personality is fully developed at 12 years of age.

Use the following information to answer Questions 11 and 12.

Hayden is a 21-year-old student living in Melbourne. He has a very busy schedule, working part-time and playing sports on top of studying. In the past, Hayden had a long-term relationship which ended on very bad terms. Ever since then, he has told himself that he doesn't have time to be in a relationship. Recently he has started to feel lonely after seeing all his friends in happy relationships.

Question 11 (1 MARK)

According to Erikson's theory of psychosocial development, the stage which Hayden is in is

A identity vs. role confusion.

B intimacy vs. isolation.

C isolation vs. integrity.

D generativity vs. isolation.

Question 12 (1 MARK)

In the scenario, Hayden is experiencing

A intimacy, as seen through him having had a previous long-term relationship.

B isolation, as seen through him having no friends or family that he communicates with.

C isolation, potentially occurring due to Hayden avoiding relationships after being hurt in his past relationship.

D integrity, as seen through him having a previous long-term relationship.

Short-answer questions

Question 13 (1 MARK)

Outline what psychosocial development involves.

Question 14 (2 MARKS)

With reference to psychosocial crises, explain what Erikson's theory of psychosocial development involves.

Question 15 (3 MARKS)

Clodagh is a refugee who has recently left her home country to gain a better high school education. Now in England, she is finding it difficult to adapt to the different cultural and social expectations. Due to being away from her friends and family, she is beginning to question her own values and doesn't know where she fits in.

a Identify the stage of Erikson's theory of psychosocial development that Clodagh is likely to be experiencing. (1 MARK)

b Explain which component of the stage's crisis Clodagh is experiencing. Refer to the scenario to justify your response. (2 MARKS)

Questions from multiple lessons

Question 16 (1 MARK)

The stage of trust vs. mistrust is linked to theories of attachments. If an infant experiences inconsistent and unreliable care from their primary caregiver they are most likely to experience

A secure attachment.

B disorganised attachment.

C positive experiences, leading to the development of desirable personality traits.

D organised attachment.

CHAPTER 4 REVIEW

CHAPTER SUMMARY

This chapter focused on the many processes involved in psychological development. As you now know, there are multiple components which make up psychological development, including emotional, social and cognitive development.

In **4A**, we learnt about the influence of environmental and hereditary factors on psychological development and how these have contributed to the nature versus nurture debate. Primarily, we learnt that psychological development involves an interaction of both factors. Twin (identical and non-identical) and adoption studies illustrate this interaction. You also learnt that there are multiple aspects of psychological development, mainly comprising cognitive, emotional and social development.

In **4B**, we learnt about the differences between critical and sensitive periods during development. In learning about these periods, we also learnt about the case study of Genie and how her story contributed to the understanding of language acquisition. Research on Genie suggested that certain components of language acquisition have critical periods while others have sensitive periods.

Critical periods	Sensitive periods
• Period in which skills which must be learnt during a predetermined period • More rigid periods Example: Acquisition of first language	• Period in which skills are most optimally learnt • Skills not learnt within the set period can still be learnt at a later time but will take longer and require more effort • More flexible periods Example: Acquisition of a second language

In **4C**, we learnt about attachment theory, in which there are two overarching attachment styles: secure and insecure attachment. We also learnt about emotional development and its relationship with attachment. We learnt about the three factors affecting attachment:

- Genetics: the unique cellular makeup inherited by an individual
- Temperament: the relatively stable disposition of each individual
- Early life experiences: the experiences from birth up to the age of five

In **4D**, we learnt about the studies on attachment conducted by psychologists Harlow and Ainsworth. We learnt about Harlow's use of rhesus monkeys and surrogate cloth and wire mothers, with the results suggesting that physical contact contributes to attachments formed between infants and their mothers. In Ainsworth's *'Strange Situation'* study, we learnt about the behaviours that were observed to determine whether an infant had secure, insecure-anxious, insecure-avoidant or disorganised attachment.

In **4E**, we learnt about the processes within cognitive development. Specifically, we learnt about the concept of schemas, which are mental representations of concepts developed through experience. We also learnt how schemas can change through the processes of:

- Assimilation, in which new information is incorporated into an existing schema
- Accommodation, in which an existing schema is restructured in order to fit in new information

In **4F**, we learnt about Piaget's theory of cognitive development. We learnt about the accomplishments within each of the four stages outlined in Piaget's theory, and the concept of concrete and symbolic thought within these stages. We also critically evaluated Piaget's theory, learning about some criticisms, including that he may have underestimated the cognitive ability of children. The four stages in his theory are the:

- Sensorimotor stage
- Preoperational stage
- Concrete operational stage
- Formal operational stage

In **4G**, we learnt about psychosocial development and its impact on personality. We also learnt about Erikson's theory of psychosocial development and how his theory proposes eight stages across the lifespan, with each stage having a crisis that needs to be resolved. We also critically evaluated Erikson's theory, examining its strengths and limitations. The eight stages are:

- Trust versus mistrust (0-1 years)
- Autonomy versus shame/doubt (1-3 years)
- Initiative versus guilt (3-6 years)
- Industry versus inferiority (6-12 years)

- Identity versus role confusion (12-19 years)
- Intimacy versus isolation (19-30 years)
- Generativity versus stagnation (30-64 years)
- Integrity versus despair (64+ years)
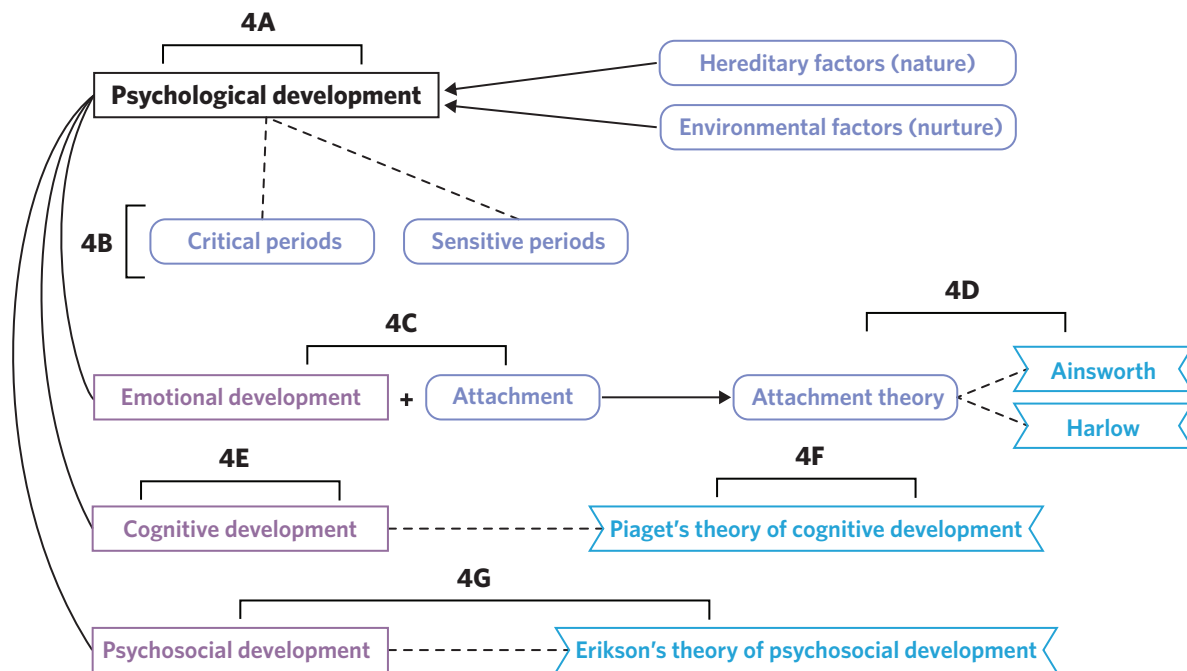
CHAPTER REVIEW ACTIVITIES

Review activity 1: Summary notes

On Youtube, search '*Monkeys and Morality: Crash Course Psychology #19*' (CrashCourse, 2014). Watch the video up until six minutes and 45 seconds.

Take notes on what is said about the following concepts from across chapter 4:

- Attachment
- Harlow's study on attachment
  - Ethics
- Critical periods
- Ainsworth's 'Strange Situation' study
  - Attachment styles
- Attachment and emotional development
- Factors on attachment
  - Early life experiences

Review activity 2: Label the scenario

For each scenario listed below, label which stage of Erikson's theory of psychosocial development the individual is in. Choose from the following stages:

- Trust versus mistrust
- Autonomy versus shame/doubt
- Initiative versus guilt
- Industry versus inferiority
- Identity versus role confusion
- Intimacy versus isolation
- Generativity versus stagnation
- Integrity versus despair

Scenario 1: Aurora often feels like her academic performance lets her parents down. This is due to her parents often admiring the accomplishments of her friends, but failing to recognise Aurora's own academic accomplishments. Due to this lack of recognition, Aurora feels as if she isn't good enough, and may as well stop studying and trying to do well in school.

Scenario 2: Noah has decided to retire early. He feels that he has achieved what he set out to do after teaching for the past thirty years. Across those years, he feels that he has built strong relationships with many of his students and has acted as a mentor and provided guidance for many of them.

Scenario 3: Luigi's parents always encourage him to do things for himself. As a toddler, he is allowed to pick out his own clothes each day. Due to this encouragement, many other parents and family members comment that he seems very independent for his age.

Scenario 4: Pia often feels as if she acts differently around different groups of people, such as with her family, at school, and at soccer practice. Due to this, she feels unsure about who she is and isn't sure what she believes in and is passionate about.

Review activity 3: Theory evaluation

Piaget's theory of cognitive development has been an extremely influential model within modern education, influencing how educational institutions develop curriculums and decide on the age at which students should learn certain concepts. However, further research has identified flaws in Piaget's initial research, which potentially have adverse effects on student learning. These flaws are outlined in the article '*When is a stage not a stage? A critique of Piaget's theory of cognitive development and its application to science education*'. In this article, Piaget's sampling methods and the implications of his research on education is noted.

With this information in mind, read the following excerpts which evaluate Piaget's model and then answer the questions.

Piaget's sampling

When developing his hypotheses on the nature of the developmental process, Piaget used children from local schools in Geneva, and little attempt has been made to study the same child's response in different situations or to do longitudinal studies of the same child.

Educational implications

We have seen the extent to which the level of children's thinking depends on the context of the tasks given, rather than on the logical structure of the task. This obviously calls into question our ability to test children and make statements about the level at which they are operating. Related to this, and perhaps even more important, it calls into question how useful such information is to teachers since they will not be able to predict the level of the child's thinking in a new context from his scores on those tasks.

If the aim of this type of research is to help teachers match the pupils' thinking abilities to the educational programme offered, it appears... that we are far from being able to be prescriptive in this way (even if it were considered educationally beneficial).

(Driver, 1978).

Work with a partner to discuss the following questions:

- Which extraneous variables may have occurred during Piaget's research due to him not conducting longitudinal studies? How does this affect the validity of the stages in Piaget's theory of cognitive development?
- The article outlines that 'Piaget used children from local schools in Geneva'. How may the lack of cultural diversity in Piaget's research impact his ability to generalise his findings? Are we able to say that Piaget's theory is 'universal'?
- The article states that teachers 'will not be able to predict the level of the child's thinking in a new context from his scores on those tasks'. What does this say about the application of Piaget's theory in the classroom? Are the impacts of Piaget's theory on school curriculums likely to be beneficial?
- Overall, do you think that Piaget's influence on education is or is not beneficial? Provide some examples or dot points on the positive or negative effects that could occur in the classroom.

CHAPTER 4 TEST

Multiple-choice questions

Question 1 (1 MARK)

About two thirds of the infants in Ainsworth's the 'Strange Situation' study demonstrated secure attachment. Which of the following would have occurred during the study for those infants with secure attachment?

A The infant would seek comfort from either the stranger or the caregiver when distressed, and be soothed an equal amount by either the stranger or caregiver.

B The infant would refuse to leave their caregiver's side at the start of the experiment and refuse to explore the room.

C The infant would have used their caregiver as a safe base to explore from and initiate contact with their caregiver for comfort when they return to the room.

D The infant would have avoided contact with their caregiver after they returned to the room after leaving them with the stranger.

Question 2 (1 MARK)

Ever since he was little, Levi has always been obsessed with butterflies. When he learnt about the process of metamorphosis, in which caterpillars turn into a butterfly, his schema of butterflies expanded to include the new information. This involved the process of

A maturation.

B assimilation.

C accommodation.

D conservation.

Question 3 (1 MARK)

Which of the following outlines an example of how the interaction between nature and nurture could most likely have worked together to contribute to the existence of a personality trait of an adopted child?

	Personality trait	Nature	Nurture
A	Conscientiousness (being reliable and carrying out tasks with care)	Biological parents are extremely reckless and often act on impulse	Individual was sent to an extremely strict private school which punished students for being reckless
B	Openness to experience (creative and adventurous)	Biological parents both have strong imaginations as they write children's fantasy narratives together	Adoptive parents encouraged the individual to express themselves through art
C	Introversion (gain energy from spending time alone)	Biological parents both seek out social interactions and hate spending time alone	Individual socialised with family members every weekend
D	Neuroticism (irrational and jealous)	Biological parents are both very calm and peaceful individuals	Individual was brought up in an over-stimulating environment, leading to excessive levels of moodiness

Question 4 (1 MARK)

How can early life experiences impact attachment?

A Those who experience positive early life experiences are more likely to experience secure attachment due to the creation of a trusting and loving prototype which they can apply to adult relationships.

B Those who experience negative early life experiences are more likely to experience secure attachment due to the creation of a trusting and loving prototype which they can apply to adult relationships.

C It is impossible for those who experience negative early life experiences to develop secure attachment, as early life experience is the most influential factor on attachment.

D Those who experience negative early life experiences, such as abuse, will always experience disorganised attachment.

Question 5   (1 MARK)

One of the main criticisms of Piaget's theory of cognitive development is that

A   he overrepresented too many cultures in his research.

B   his research was unethical as it caused distress for the participants.

C   he did not focus on childhood cognitive development enough.

D   he did not conduct culturally diverse research.

Question 6   (1 MARK)

Harlow's studies on attachment suggested that

A   attachment was purely biological, with infants attaching to their mothers to satisfy biological needs.

B   physical contact is not a necessary component of attachment.

C   physical contact was an important component of attachment, with physical contact having the ability to soothe infants in distress.

D   infants can grow up isolated without it influencing their emotional development.

Question 7   (1 MARK)

Psychosocial development refers to

A   the unique qualities an individual possesses.

B   the increasingly sophisticated ability to comprehend information over time.

C   the life-long development of skills which allows an individual to express their emotions.

D   the interactions between cognitive and social processes over time that affects an individual's growth and their interactions in the world.

Question 8   (1 MARK)

The accomplishments achieved in Piaget's sensorimotor stage are

A   object permanence and centration.

B   goal-directed behaviour and object permanence.

C   centration and classification.

D   abstract thinking and decentered thought.

Short-answer questions

Question 9   (1 MARK)

Outline what is meant by the term psychological development.

Question 10   (1 MARK)

Describe insecure-avoidant attachment.

Question 11   (1 MARK)

Describe the process of maturation.

Question 12   (2 MARKS)

Define concrete thought and provide an example.

Question 13   (2 MARKS)

Genie was discovered at the age of 13 after being neglected. Researchers worked with her to acquire language.
After a few years, she was able to verbally produce single words, but was unable to verbally produce a full sentence.
It took her longer to learn how to verbally produce single words than it does for young children.

With reference to these findings on Genie, explain whether the specific ability to verbally produce single words is likely to have a sensitive or critical period, justifying your response.

Question 14   (3 MARKS)

Since retiring, Harper has reflected on her past actions. She believes that she did not achieve what she wanted to in her career and personal life. Due to her reflections, she has been grumpier and seemed more irritable to her family for the past six months.

a   Identify which stage of Erikson's theory of psychosocial development Harper is in. (1 MARKS)

b   Referring to the scenario, comment on whether you think Harper is displaying healthy emotional development. (2 MARKS)

Question 15   (4 MARKS)

Piaget described his theory of cognitive development as 'universal', with every child achieving certain cognitive accomplishments at specific ages. Piaget's notion that his theory is 'universal' is one of the main criticisms of his theory.

a   Describe environmental factors and briefly outline how they shape psychological development. (2 MARKS)

b   Referring to the impact of environmental factors on psychological development, suggest how the prescriptive, 'universal' nature of Piaget's theory may be problematic and inaccurate. (2 MARKS)

Question 16   (5 MARKS)

Consider the statement, 'If someone develops a mental health disorder, it is entirely due to their genetics.'

a   Name the perspective of the nature versus nurture debate which this statement aligns with. (1 MARK)

b   Referring to what researchers now know about the nature versus nurture debate, evaluate whether this statement is true or false. (2 MARKS)

c   How might research into twin and adoption studies be useful to investigate the statement. What results would you expect to occur from twin and adoption studies? (2 MARKS)

Key science skills questions

Question 17   (1 MARK)

Emma is an educational psychologist who is conducting a study. Her study explores the relationship between forms of education provided before formal schooling (before primary school) and educational outcomes in high school.
Emma's study focuses on two forms of education before formal schooling (kindergarten and parent-provided education).
To measure educational outcomes in high school, Emma is using the students' ATAR scores. Which of the following correctly outlines the operationalised independent and dependent variables?

	Operationalised independent variable	Operationalised dependent variable
A	Form of education before formal schooling	High school educational outcome
B	High school educational outcome, measured by ATAR score	Form of education before formal schooling (kindergarten or parent-provided)
C	Form of education before formal schooling (kindergarten or parent-provided)	High school educational outcome, measured by ATAR score
D	Kindergarten educational outcome, measured by feedback from teacher	Kindergarten educational outcome, measured by feedback from teacher

Question 18 (4 MARKS)

Dr Farrell is a developmental psychologist who wants to investigate the cognitive abilities developed in four-year-old children. She visits her local kindergarten and asks the kindergarten teacher if she can conduct a study on 20 four-year-old children. After gaining approval from the teacher, she runs a quick 15 minute test on the 20 children.

a Outline the population and sample from the scenario. (2 MARKS)

b Identify and explain an ethical consideration Dr Farrell has violated. Justify your response. (2 MARKS)

Questions from multiple chapters

Question 19 (1 MARK)

During childhood, the rapid formation of new schemas facilitates an increasingly sophisticated neural network to be developed in a child's brain over time. In terms of neural plasticity, the formation of a large and sophisticated neural network is mainly due to the processes of

A cognition.

B developmental plasticity.

C synaptic removal.

D synaptic flexibility.

Question 20 (2 MARKS)

The ability to acquire a first language has a critical period. Language acquisition is a complex process with many components, including comprehending language and verbally producing language.

State the two areas of the brain that are involved in language comprehension and speech production.

05

UNIT 1 AOS2, CHAPTER 5

Atypical psychological development

5A Understanding normality and mental health

5B Factors influencing mental health and coping

5C Major categories of psychological disorder

5D Schizophrenia and the 'two-hit' hypothesis

Key knowledge

- the conceptualisation of normality including typical and atypical behaviours; adaptive and maladaptive behaviours; and mental health and mental disorder as a continuum

- mental health as a product of internal and external factors which assist individuals to cope with change and challenge

- major categories of psychological disorder: addiction disorders; anxiety disorders; mood disorders; personality disorders; and psychotic disorders

- the 'two-hit' hypothesis as an explanation for the development of particular psychological disorders, illustrated by schizophrenia

5A UNDERSTANDING NORMALITY AND MENTAL HEALTH

Is vegemite good? What about coriander? Should people wear shoes inside their house? Do your feelings about these things make you normal or abnormal? You may have wondered what constitutes normal thoughts and behaviours and if what you consider to be normal is the same for everyone else. There are different factors that influence what you consider to be normal. In this lesson you will be discovering the answers to these questions through developing an understanding of normality, how it is evident on an individual level, and how it relates to mental health, which can otherwise be a challenging concept to understand. Normality isn't necessarily 'good,' nor is abnormality necessarily 'bad', but rather it depends on the way in which normality is conceptualised.

Image: autumnn/Shutterstock.com

5A Understanding normality and mental health	5B Factors affecting mental health and coping	5C Major categories of psychological disorder	5D Schizophrenia and the 'two-hit hypothesis'

Study design dot point

- the conceptualisation of normality including typical and atypical behaviours; adaptive and maladaptive behaviours; and mental health and mental disorder as a continuum

Key knowledge units

Conceptualising normality	1.2.6.1
Typical and atypical behaviours	1.2.6.2
Adaptive and maladaptive behaviours	1.2.6.3
Normality and mental health	1.2.6.4

Understanding normality and mental health

- **Conceptualising normality 1.2.6.1**
  - Socio-cultural approach
  - Functional approach
  - Historical approach
  - Medical approach
  - Statistical approach
  - Situational approach
- **Typical and atypical behaviours 1.2.6.2**
- **Adaptive and maladaptive behaviours 1.2.6.3**
- **Normality and mental health 1.2.6.4**
  - The concept of mental health
  - Mental health and mental health disorders
  - Mental health as a continuum

Conceptualising normality 1.2.6.1

OVERVIEW

There is no one single and authoritative approach to conceptualising normality. Many different factors, such as your background, beliefs and the situation you find yourself in, will inform what you consider to be normal.

THEORY DETAILS

Normality, broadly speaking, refers to thoughts, feelings, and behaviours that are considered common and acceptable. This broad conception of normality can nonetheless be broken down through different approaches that seek to define normality according to different factors that influence what is considered regular and acceptable.

Normality the state of having thoughts, feelings, and behaviours that are considered common and acceptable

These approaches include, but are not limited to, socio-cultural, functional, historical, medical, statistical and situational approaches.

Socio-cultural approach

What is considered as normal varies depending on *socio-cultural* (social and cultural) context. No two societies and their cultural practices are the same, so the **socio-cultural approach to normality** suggests normality can be defined by the prominent social codes of a particular culture. What is standard and acceptable for one culture may therefore be different for another. Different cultural characteristics that can inform these differences include:

- religious beliefs
- cultural values relating to work (e.g. how often it is expected to work and on what days)
- cultural values relating to gender (e.g. what social roles are expected on the basis of gender identity)
- cultural values relating to sexuality.

Culture is complex and, as such, there are many other characteristics that define a culture and what it accepts as normal.

> **Socio-cultural approach to normality** defining normality according what is standard according to social and cultural beliefs and practices

> 🧠 **Want to know more?**
>
> You may have heard the phrases 'social norm' or 'cultural norm'. These phrases relate to what is considered as normal according to the socio-cultural approach to understanding normality.

> 🧠 **Want to know more?**
>
> Religious customs are one such example of a socio-cultural characteristic that can dictate what is considered as normal. For example, during *Ramadan*, the ninth month of the Islamic lunar calendar, all healthy adult Muslims are required to fast (abstain from food and drink) during daylight hours. Fasting is one of the pillars of Islam and is considered to promote piety (religious and spiritual devotion) through a newfound awareness and appreciation of what God has provided. It also serves to remind all Muslims of their duty to support the poor through empathy, which represents another pillar of the Islamic faith in *almsgiving* (donating to those in need). As such, fasting in this socio-cultural context can be considered as normal, whereas abstaining from food and drink may be considered as abnormal or unhealthy in other contexts.
>
> Image: Ievgenii Meyer/Shutterstock.com
>
> **Figure 1** During Ramadan, Muslims will often break their fast at night with dates, as was practiced by the Prophet Muhammad

Functional approach

The distinction between what is normal and abnormal has often been understood on the basis of what promotes, or alternatively impairs, our ability to function effectively. This is referred to as the **functional approach to normality**. Functioning refers to our ability to meet the demands of our everyday lives, so for example, to be able to go to school or work, meet deadlines, go shopping, cook meals, and all of the other activities that are necessary for us to succeed in maintaining a productive and healthy life. Using this approach, what is normal are all of these thoughts, feelings, and behaviours that enable us to function effectively. What is considered as abnormal, however, are thoughts, feelings, and behaviours that act as a barrier to functioning effectively, such as not being able to get out of bed in the morning, not having the energy to feed, wash or clothe properly, and anything else that may inhibit the ability to meet these basic conditions of living effectively.

> **Functional approach to normality** defining normality in terms of thoughts, feelings, and behaviours that enable the individual to meet the demands of everyday life

Historical approach

What is considered as normal changes throughout history, which demonstrates the need for a **historical approach to normality** that defines what is standard and acceptable according to the period of time that it occurred in. As such, a historical period and its dominant characteristics will often determine whether particular thoughts, feelings and behaviours are acceptable (normal) or unacceptable (abnormal). Certain behaviours that we may consider to be normal now may only have become historically dominant and therefore acceptable recently, and therefore, would have been considered abnormal in a different historical era. For example, while commuting via horseback, including in metropolitan regions, is not usually common in the 21st century and in many circumstances would be considered abnormal, such a practice has been incredibly

> **Historical approach to normality** defining normality in terms of the dominant customs of a specific period of time

common in previous historical eras and would therefore have been thought of as normal during these times. Reflecting upon this, it is important to recognise that our historical conception of normality is not timeless and is subject to changes in the future.

Medical approach

The **medical approach to normality** suggests that what is considered as abnormal can be diagnosed by a medical practitioner. For example, if certain thoughts, feelings, and behaviours (in this context, think 'symptoms') can be used to diagnose someone with a distinct condition, then it is abnormal. So long as any thoughts, feelings, and behaviours do not fit the clearly outlined diagnostic criteria for a particular condition, such as a mental health disorder, then it is normal. Treatment according to the medical approach therefore often involves prescribing medications that address the biological causes of the thoughts, feelings and behaviours that match a diagnosable condition.

Medical approach to normality defining normality in terms of thoughts, feelings, and behaviours that do not fit the clearly outlined diagnostic criteria for a particular diagnosable medical condition

Statistical approach

The **statistical approach to normality** suggests that thoughts, feelings and behaviours can be recorded and represented statistically through normal distribution (see figure 2). This incredibly measured approach to normality identifies what is normal based on what has been recorded to be the most frequently occurring response to a particular situation. For example, crying when cutting onions would be considered normal because a majority of any given population will react in this way when cutting onions.

Statistical approach to normality defining normality in terms of what has been measured as commonly occurring thoughts, feeling and behaviours

Figure 2 Certain thoughts, feelings, and behaviours can be recorded on a normal distribution, where the average results are considered as normal and that which falls outside of these results are statistically abnormal

🧠 *Want to know more?*

It is important to be critical about all approaches to normality because any specific approach in itself does not grasp all of its complexities. For example, just because a certain response can be considered as statistically normal, this does not mean that it should necessarily be performed by everyone. You will learn about the bystander effect in lesson *8D: Prosocial behaviour*, which involves people being unlikely to provide help in an emergency situation in the presence of other people. Just because the most statistically normal response in an emergency with other people around may be not to help, this does not mean that it is the most moral or acceptable response.

Image: N-sky/Shutterstock.com

Figure 3 Do not be fooled by the cute sheep. The concept of a 'herd mentality', which involves thoughtlessly following the statistically normal behaviours of a group, can have sinister social consequences

Situational approach

The **situational approach to normality** underlines that what is considered as normal depends on the specific situation where our thoughts, feelings, and behaviours emerge. For example, if you are at a concert, then singing out loud and dancing enthusiastically would be considered normal; it is standard and acceptable to be dancing and singing aloud in this context. The normality of this behaviour is nonetheless contingent on the situation that the individual finds themselves in. This same behaviour of dancing and singing out loud would be considered abnormal in other contexts, such as when on the street, when in a library, or when in a quiet waiting room for a doctor's appointment.

Situational approach to normality defining normality according to what is standard and accepted in specific contexts

Typical and atypical behaviours 1.2.6.2

OVERVIEW

Another way of approaching normality is through typical and atypical behaviours, which relate to how common behaviour is for an individual.

THEORY DETAILS

Typical behaviours relate to how an individual usually acts. If somebody is consistently enthusiastic and expressive, then behaviour that demonstrates these traits would be considered as typical. For example, if such an individual was to celebrate positive news, such as their favourite soccer team winning a match, by dancing and shouting, this would be typical behaviour for this person.

By contrast, **atypical behaviours** are unusual according to how an individual usually acts. It is important to note then, that any kind of behaviour that someone might consider to be intense or *provocative* (causing others a strong emotional reaction often intentionally) may not be considered as atypical if it reflects how an individual commonly behaves. Using the example of someone that is enthusiastic and expressive, if this person was to suddenly become detached and solitary, this would indeed be considered as atypical behaviour for this person. Their usual behaviour, that some people may interpret as inappropriate in certain situations, such as the example provided about dancing and shouting when receiving positive news, is nonetheless still typical regardless of being 'unusual' or 'intense' for some people.

Typical and atypical behaviours can nonetheless be influenced by the factors mentioned earlier in the lesson. Whether an individual's behaviour is typical or not may still be influenced by factors such as the situation that they are in, or their socio-cultural background. For example, an individual may be influenced by a set of cultural codes relating to punctuality. If their culture has particularly relaxed standards about punctuality, then not always being on time is both normal according to the sociocultural approach and typical for the individual given that they regularly follow these cultural codes. Yet approaching normality according to typical and atypical behaviours is nonetheless a distinct approach in its own right and may not always overlap with the previous approaches. For example, according to the medical approach to normality, disability can be considered as abnormal given that it reflects a diagnosable impairment to functioning. However, this does not mean that someone with a disability is incapable of demonstrating typical behaviour. Common behaviours for that individual are nonetheless still typical, demonstrating that typical and atypical behaviours offer an important alternative approach to normality.

Typical behaviours activity that is consistent with how an individual usually behaves

Atypical behaviours activity that is unusual or unnatural according to how an individual usually behaves
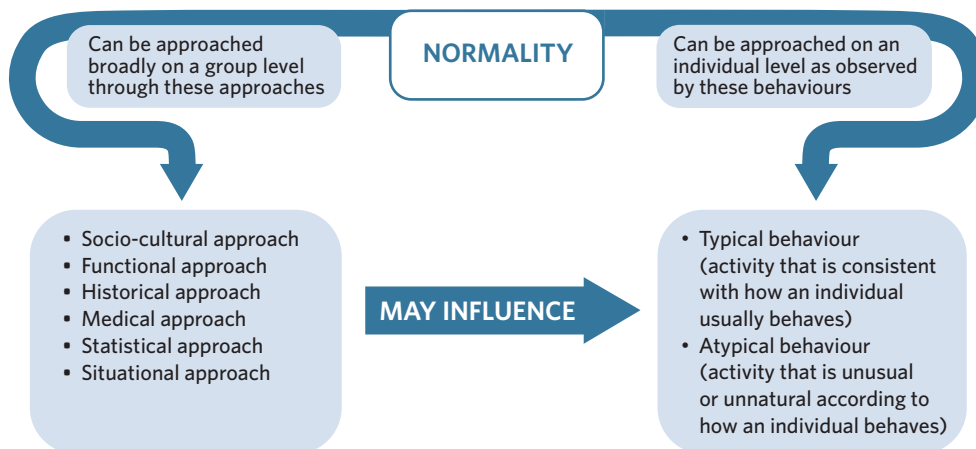
Figure 4 It is important to understand the distinction between typical/atypical behaviours and the aforementioned approaches as different ways of understanding normality

Adaptive and maladaptive behaviours 1.2.6.3

OVERVIEW

Another way of approaching normality is through adaptive and maladaptive behaviours, which relate to the extent to which behaviour enhances or impairs an individual's ability to match the changing demands of their everyday life.

THEORY DETAILS

Adaptive behaviours enable an individual to change (adapt) in order to meet the changing demands of their everyday lives. Often, the same type of behaviour may only be productive in certain situations, but unproductive in others. For example, if someone is usually quiet and withdrawn, this may not be an effective approach to dealing with all situations that they face. Upon having to do a group assignment or a public presentation, this person may have to change their behaviour to match the more social requirements that have been introduced to their lives. If this individual succeeds in being more open and communicative in these contexts, then this behaviour would indeed be considered adaptive.

By contrast, **maladaptive behaviours** impair an individual's ability to meet changing circumstances that they are faced with. Using the example of someone who is quiet and withdrawn, if they fail to communicate with others upon having to do a group assignment, this may be considered as maladaptive given that it impairs their ability to behave productively and effectively when faced with this new and challenging situation.

Like typical and atypical behaviours, adaptive and maladaptive behaviours can be influenced by the approaches to normality mentioned earlier in the lesson. Whether an individual is able to adapt to different circumstances may also be dependent upon factors such as their socio-cultural background and the situation that they are in. For example, some cultures have particularly strong values relating to work ethic, so working long hours in a workplace to meet the demands of their job would be both normal according to the socio-cultural approach and reflect adaptive behaviour. Likewise, the functional approach to normality aligns with adaptive behaviour. However, sometimes these factors may not overlap, as reflected by how certain reckless behaviour may be normal in certain contexts (e.g. parties), but ultimately be a change in an individual's behaviour that impairs their ability to meet the demands of their life in the future, reflecting maladaptive behaviour.

Normality and mental health 1.2.6.4

OVERVIEW

Mental health can be a complex and abstract concept to understand at times. While you may be well aware of the concept of physical health and understand, for example, that if you break your arm it represents a physical disorder of sorts, mental health and mental health disorders can be less visible or overt. The relationship between normality, as well as abnormality, and mental health can help to conceptualise the concept of mental health and mental health disorders.

THEORY DETAILS

The concept of mental health

When you think of your mental health, you may think of things like the emotions you are feeling, your behaviours and interactions with others, and maybe even your sleep patterns and appetite. These are all a part of your psychological and physiological state which contribute to your mental health. Some days, you may experience really positive emotions, while on other days, you may experience more negative emotions. Your state of mental health may change over time and there are many factors that can contribute to this, including biological, psychological, and social factors.

Mental health and mental health disorders

Mental health is the current state of a person's psychological wellbeing and functioning. This therefore includes all different kinds of psychological states that you may experience. While feeling overwhelmed, stressed and tired may lead to an impaired level of functioning, and feeling enthusiastic, joyful and amused may lead to an enhanced level of functioning, both constitute our mental health, albeit different mental health states. A **mental health disorder**, then, refers specifically to a diagnosed psychological state characterised by the presence of a *severe* disturbance, sense of distress, and thoughts, feelings and/or behaviour that are atypical of the person and significantly impact their ability to function independently. For example, mental health disorders could involve:

- showing low resilience to stressors
- not being able to complete everyday activities such as going to school or work
- not being able to regulate one's emotions or thoughts
- not being able to maintain or coordinate regular social relationships.

Adaptive behaviours activity that enhances an individual's ability to match the changing demands of their everyday life

Maladaptive behaviours activity that impairs an individual's ability to match the changing demands of their everyday life

Lesson link

In lesson *5B: Factors influencing mental health and coping*, you will learn about how these biological, psychological and social factors contribute to mental health and our ability to cope with adversity.

Mental health the current state of a person's psychological wellbeing and functioning

Mental health disorder a diagnosed psychological state characterised by the presence of a severe disturbance and sense of distress, involving thoughts, feelings, and/or behaviours that are atypical of the person and that significantly impact their ability to function independently

It is important to note that 'happiness' or feeling good isn't a baseline for human emotion, and that deviations from positive moods don't mean that you're not 'mentally healthy'. It is perfectly normal and common not to be happy or enthusiastic most of the time, but when negative mood states become *maladaptive* and significantly prevent functioning, this may be indicative of a mental health disorder, which can only be diagnosed by registered psychologists or psychiatrists.

Mental health as a continuum

Mental health can include many different kinds of mental health states that have different effects on our functioning. It is for this reason that mental health is often conceptualised as a *continuum* (a continuous sequence which includes distinct and marked points) so as to be inclusive of the variety of different psychological states that we experience. This approach to mental health proposes that mental health includes being *mentally healthy* (a psychological state that maintains or improves functioning), *mental health problems* (a temporary state markedly impairing levels of functioning), having a more enduring and diagnosable *mental health disorder*, and all that lies in between.

The different states of mental health can be represented at different points on a continuum. Positioning on the **mental health continuum** is not static and people instead can move along the period according to the changing challenges that emerge throughout the lifespan. Our state of mental health *fluctuates* (changes over time) across the mental health continuum.

Mental health continuum
a tool used to track progression of mental health which consistently fluctuates over time, progressing from mentally healthy, to mental health problems, to mental health disorders

The mental health continuum

| Mentally healthy | Mental health problem | Mental health disorder |
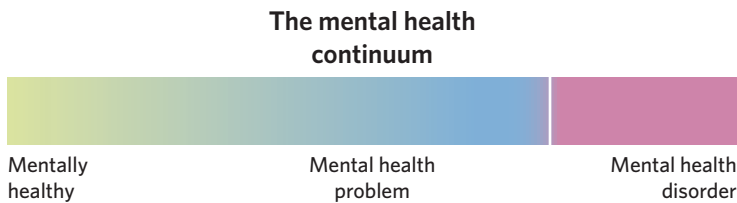
Figure 5 The mental health continuum, including the states of being mentally healthy, having a mental health problem, and having a mental health disorder/illness all as constituting mental health

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⊕ *Want to know more?*

You may have also heard the terms 'mental ill health'. This is another way to refer to experiencing mental health problems. You can also temporarily experience mental ill health in a similar way to how you can become temporarily physically ill.

Importantly, mental health problems tend to involve symptoms that are either shorter in duration and/or less severe than mental disorders. If someone manages to then display resilience and bounce back to optimal functioning then they will have moved on the continuum towards being mentally healthy. If, on the other hand, the inadequate functioning endures beyond the specific cause of the change in mental health, then they have moved on the continuum towards having a mental health disorder. This reflects the functional approach to normality that you learnt about earlier in the lesson. In the same way that normality can be defined using this approach in terms of behaviour that meets the demands of everyday life, mental health can be approached in terms of levels of functioning as one important factor. However, mental health is not assessed purely in terms of functioning, but also in terms of the presence or absence of general wellbeing. Specifically, being mentally healthy involves having high levels of wellbeing (which includes demonstrating high levels of functioning), having a mental health problem temporarily impacts wellbeing and functioning to a significant degree, and a mental health disorder has enduring effects on an individual's wellbeing and, by extension, the ability to function independently. Likewise, normality and mental health are further related by adaptive and maladaptive behaviour. If an individual is unable to demonstrate adaptive behaviour, they may be unable to meet changing demands in their everyday lives, therefore impacting their state of mental health.

Want to know more?

There are many avenues to seek support if you are experiencing a mental health problem or would like to speak to someone about your mental health.

These include:

- Speaking to your **GP**, **school counsellor/psychologist** or a **trusted adult**
- Online at **eheadspace**: *headspace.org.au/eheadspace*
- Online or over phone at **Beyond Blue**: *beyondblue.org.au*
- Or calling **Lifeline** on 13 11 14

Lesson link

In **Units 3 & 4 Psychology**, you will learn more about mental health and how it can be understood as a continuum. This means that people's state of mental health can change and fluctuate, and that it's very normal for this to occur.

Theory summary

In this lesson, you learnt about the conceptualisation of normality. More specifically, this involved leaning about:

- Different approaches to understanding normality, as summarised in table 1.

Table 1 Summary of the different approaches to understanding normality

Approach to normality	How it defines normality
The socio-cultural approach	What is accepted according to a particular set of codes relating to the social and cultural context that an individual is part of.
The functional approach	Experiencing thoughts, feelings and behaviours that allow the individual to cope with the demands of their everyday lives.
The historical approach	The understanding of normality changes throughout different historical periods of time.
The medical approach	In relation to the abnormal, which can be diagnosed clearly according to different symptoms.
The statistical approach	What has been measured as common thoughts, feelings and behaviours.
The situational approach	What is acceptable in different contexts.

- Typical and atypical behaviours.
  - Typical behaviours are those that are most common for an individual to display.
  - Atypical behaviours are those that are uncommon for an individual to display.
- Adaptive and maladaptive behaviours.
  - Adaptive behaviours enhance an individual's ability to match the changing demands of their everyday life.
  - Maladaptive behaviours impair an individual's ability to match the changing demands of their everyday life.
- Mental health as a continuum.
  - Mental health is a broad concept that includes different psychological states ranging from that which may impair our levels of functioning and that which will enhance it.
  - Mental health can be represented as a continuum ranging from mentally healthy to having a mental health disorder.

5A QUESTIONS

Theory-review questions

Question 1

Fill in the blanks with the following terms.

- Typical behaviours
- Adaptive behaviours
- Maladaptive behaviours
- Atypical behaviours
- Normality

_____ is a broad term that relates to common and accepted thoughts, feelings, and behaviours that can be understood from many different approaches. Normality emerges on an individual level through _____ that match someone's regular activity and can be distinguished from _____ which are uncommon for the individual. Normality is further understood through _____ that enable someone to change according to different demands. This can be distinguished from _____ that impair someone from coping with different challenges across time.

Question 2

True or false? Psychologists have agreed upon one universal approach to understanding normality.

A   true

B   false

Question 3

Which of the following options are examples of socio-cultural approaches to understanding normality? *(Select all that apply)*

I   What is recorded statistically as the most common response to a certain situation.

II   What can be diagnosed by a specialist.

III   Dominant religious beliefs that influence the way someone thinks, feels, and behaves.

IV   What people usually do in a particular situation.

V   Particular expectations in a certain country about how regularly and studiously people should work for their company.

Question 4

Fill in the blanks with the following terms.

- Mental health disorder
- Mental health

The current state of a person's psychological wellbeing and functioning at any given time is referred to as _____, whereas a _____ occurs when there is a severe disturbance and sense of distress which significantly impacts an individual's ability to function independently.

Question 5

True or false? The mental health continuum places someone at distinct points where they are expected to stay indefinitely.

A   true

B   false

Skills

Unpacking the scenario

Use the following information to answer Questions 6 and 7.

Harriet is usually upbeat and energetic. When her friend was upset about getting a bad mark at school, Harriet tried to cheer her up by making jokes about how they will never need to know the content they were tested on in the real world. This only upset Harriet's friend further, who claimed that Harriet is never sympathetic and sometimes should change her behaviour by becoming more sensitive when people are upset. Harriet's inability to be sensitive towards others makes it difficult for her to form long-lasting friendships and she sometimes finds herself too distracted or worried about keeping friends to concentrate during classes.

Question 6

Harriet's typical behaviour when her friend was upset is demonstrated through the statement that *(Select one)*

A   'her friend was upset about getting a bad mark'

B   'Harriet is usually upbeat and energetic'

Question 7

Harriet's maladaptive behaviour when her friend was upset is demonstrated through the statement that *(Select one)*

A   'Harriet is usually upbeat and energetic'

B   'Harriet is never sympathetic and sometimes should change her behaviour by becoming more sensitive when people are upset'

Exam-style questions

Multiple-choice questions

Question 8   (1 MARK)

Which of the following is an approach to understanding normality with regard to the specific context an individual finds themselves in?

A   musical

B   economic

C   philosophical

D   situational

Question 9   (1 MARK)

The functional approach to normality involves defining normality in terms of

A   thoughts, feelings and behaviours that meet the demands of everyday life.

B   what social codes are culturally accepted.

C   what is statistically common.

D   acceptable behaviours in specific situations.

Question 10   (1 MARK)

Atypical behaviour

A   is consistent with how somebody usually acts.

B   is inconsistent with how somebody usually acts.

C   fails to meet changing demands.

D   meets changing demands.

Use the following information to answer Questions 11-13.

Mary recently spoke to her teacher about how she didn't feel comfortable presenting in front of her class for an assignment because being reserved is part of her character. Her teacher told her that she had to present in order to get a mark and pass the subject. Mary decided that she could not speak in front of the class and wanted to drop out of school as a result. Before making her final decision, Mary spoke to the school psychologist who said that she should not drop out of school because she was experiencing a temporary mental health problem that would likely improve over time.

Question 11   (1 MARK)

Mary being unable to meet the demands of school and therefore of her everyday life could be considered abnormal in this respect according to the

A   socio-cultural approach to normality.

B   statistical approach to normality.

C   functional approach to normality.

D   historical approach to normality.

Question 12 (1 MARK)

Mary **not** being able to change her regular behaviour to present in the front of the class could be considered as

A atypical.

B typical.

C maladaptive.

D adaptive.

Question 13 (1 MARK)

Mary's psychologist saying that her mental health is likely to change over time reflects the conception of mental health as

A a continuum.

B the biopsychosocial approach.

C the socio-cultural approach.

D the state of being mentally healthy.

Short-answer questions

Question 14 (2 MARKS)

Using an example, describe the situational approach to normality.

Question 15 (2 MARKS)

Outline the difference between the historical and socio-cultural approach to normality.

Question 16 (3 MARKS)

Define a mental health disorder and explain how it relates to the mental health continuum.

Questions from multiple lessons

Use the following information to answer Questions 17 and 18.

Moses is usually a relaxed person. Ordinarily, he will not get stressed. However, upon moving to a new country, Moses finds himself getting stressed and worked up about tasks that would usually not bother him. His heart starts racing and he begins stressing when someone new introduces themselves to him.

Question 17 (1 MARK)

Moses being unusually stressed about everyday tasks that normally do **not** bother him demonstrates

A adaptive behaviour.

B medical behaviour.

C typical behaviour.

D atypical behaviour.

Question 18 (1 MARK)

Which division of the nervous system is dominant when someone new introduces themselves to Moses?

A sympathetic

B parasympathetic

C central

D somatic

5B FACTORS INFLUENCING MENTAL HEALTH AND COPING

Mental health can be a difficult concept to understand and you may have wondered what exactly defines such an abstract concept and what influences it the most. The biopsychosocial model of mental health is one approach to understanding mental health. This model breaks up the different factors that influence mental health into biological, psychological, and social factors that all combine and interact to influence mental health. These factors can also be further organised into internal and external factors.

Image: StonePictures/Shutterstock.com

5A Understanding normality and mental health	5B Factors affecting mental health and coping	5C Major categories of psychological disorder	5D Schizophrenia and the 'two-hit hypothesis'

Study design dot point

- mental health as a product of internal and external factors which assist individuals to cope with change and challenge

Key knowledge units

Factors affecting mental health   1.2.7.1

Factors influencing mental health and coping

Factors affecting mental health 1.2.7.1

The biopsychosocial of mental health

Internal and external factors
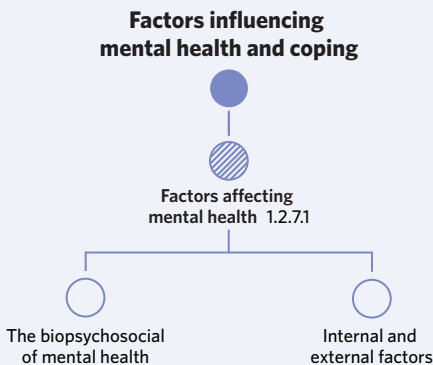
Factors affecting mental health 1.2.7.1

OVERVIEW

As you explored in the previous lesson, the concept of mental health is a broad and indeed at times difficult concept to understand. There are different frameworks that psychologists have developed that help to conceptualise mental health. These frameworks include the biopsychosocial model and internal and external factors that characterise what influence mental health, as well as what assists, or does not assist, individuals to cope with change and challenge.

THEORY DETAILS

As you learned in the previous lesson, **mental health** is the current state of a person's psychological wellbeing and ability to function effectively in everyday life. A **mental health disorder**, then, is when someone's mental health is in a state of severe disturbance and distress, experiencing thoughts, feelings, and/or behaviours that are atypical of the person and that compromise their ability to function effectively in their everyday life.

The biopsychosocial model of mental health

The biopsychosocial model characterises the factors that influence and make up mental health as either biological, psychological, or social. It also categorises the factors that help people to cope with change and challenge in their life. This model is widely used by mental health professionals to examine the influence of a range of factors on people's mental wellbeing. A description and example of each of these factors is provided in table 1.

Mental health the current state of a person's psychological wellbeing and functioning

Mental health disorder a diagnosed psychological state characterised by the presence of a severe disturbance and sense of distress, involving thoughts, feelings, and/or behaviours that are atypical of the person and that significantly impact their ability to function independently

The biopsychosocial model a framework for approaching mental health that suggests that biological, psychological, and social factors all interact and contribute to mental health

Table 1 Description and example of biological, psychological, and social factors that influence mental health

Type of factor	Description	Example
Biological factors	Relate to the functioning of the body and its systems. These are influenced by our genetics and by behaviours that moderate physiological activity and nervous system functioning, such as substance use and our sleep patterns.	If someone doesn't exercise regularly, their mental health may suffer. Genetic factors may place certain individuals at greater risk of developing a certain mental health disorder than other people who do not have this gene.
Psychological factors	Relate to patterns of cognitive and affective functioning. These can include our thought processes and patterns, our memory consolidation and how the brain functions to create emotions.	The tendency to repeatedly think about the negative aspects of a situation can compromise the ability to overcome it, instead allowing it to manifest into a state of psychological unease and compromising the ability to function effectively.
Social factors	Relate to an individual's interaction with their external environment. The behaviours of people we interact with closely, as well as the pressure placed upon us by society more broadly, significantly impacts our thoughts, feelings, and behaviours.	If somebody experiences a social interaction that is particularly traumatic, such as going through a break-up, it can put them into a state of psychological distress and impact their functioning.

Biological factors factors relating to genetic makeup and physiological functioning of the body

Psychological factors factors relating to cognitive and affective functioning

Social factors factors relating to an individual's interaction with their external environment and other people

Lesson link

There are a number of biological, psychological, and social risk factors that are explored in *Units 3 & 4 Psychology*. While these are not the only factors that influence mental health, they provide a comprehensive understanding of the biopsychosocial model. Risk factors increase the likelihood of developing a mental health disorder (as shown in table 2), whereas protective factors decrease the likelihood of developing a mental health disorder (as shown in table 3). These factors can also be seen as factors which affect an individual's ability to cope with change and challenge.

Table 2 List of biological, psychological and social risk factors

Biological risk factors	Psychological risk factors	Social risk factors
• Genetic vulnerability; i.e., if mental illness runs in the family genetically, you might be more likely to inherit it • Poor response to medication; i.e., if you take medication to help your mental health and it doesn't work, you may not be able to overcome mental health disorders • Poor sleep • Substance use	• Rumination (thinking about things over and over again) • Impaired reasoning and memory • Stress • Poor self-efficacy, such as feelings of self-doubt	• Disorganised attachment; i.e. if your early childhood experiences with a caregiver aren't healthy, you may find establishing relationships later in life difficult. You learnt about this idea in lesson 4C. • Loss of a significant relationship • Stigma (a sense of shame) as a barrier to accessing treatment

Table 3 List of biological, psychological and social protective factors

Biological risk factors	Psychological risk factors	Social risk factors
• Adequate diet • Adequate sleep	• Cognitive behavioural strategies	• Support from family, friends and community

Internal and external factors

Another way of looking at factors influencing mental health and our ability to cope with change and challenge is through internal and external factors. **Internal factors** stem from within an individual and relate to biological or psychological functioning, whereas **external factors** stem from outside an individual and arise from their environment, such as social influences. These different factors can interact to affect our mental health, and also how we respond to and cope with change and challenge.

Internal factors factors which arise from within the individual and contribute to their mental health

External factors factors which arise from the environment of an individual and contribute to their mental health

ACTIVITY 1

Label these factors as either internal or external.

1   Getting more sleep during a busy exam period
2   A friend offering support after a breakup
3   Exercising frequently to reduce stress levels after having moved to a new school

Coping can be understood as being able to meet and overcome the challenges and setbacks we may face. Coping with change and challenges is a part of life. Can you think of a challenging situation you have faced recently? Perhaps it was preparing for an upcoming SAC? What were some of the things that helped you cope?

When we are faced with change and challenge, our capacity to display resilience by recovering to normal levels of functioning is dependent upon factors that we control ourselves and those that are outside of our control in our external environment. For example, when changing year levels in school, our ability to be able to cope with increased work and pressure is dependent upon external factors like support from friends, family, and teachers as well as internal factors like our mentality, and physical condition. If friends, family, and teachers are encouraging and supportive, we adopt a positive mindset about approaching school work and we get adequate sleep, then these internal and external factors can help with the changes and challenges brought about by starting a new year in school.

Coping the ability to meet and overcome the challenges and setbacks faced during everyday life

Table 4 Internal and external factors which help us to face change and challenges

Internal factors	External factors
• Good sleep and a well-balanced diet • Exercise • Constructive thought patterns, such as thinking about the positive aspects of an otherwise challenging situation	• Supportive family and friends • Community-led support groups • Education

Theory summary

The concept of mental health can be difficult to understand. As such, there are different approaches that are used to understand the different factors that influence it. The biopsychosocial approach characterises different factors that influence mental health and assist with coping with change and challenge as biological, psychological, or social. Another approach to understanding the factors that influence mental health and assist individuals to cope with change and challenge is the use of internal and external factors.

5B QUESTIONS

Question 1

Fill in the blanks with the following terms.

- Mental health disorder
- Biopsychosocial model
- Internal
- External

There are different approaches to understanding mental health. The _____ characterises the different factors that impact mental health as either biological, psychological or social, which informs what could have led to the development of a _____ and therefore what needs to be addressed to improve the state of mental health. Biological and psychological factors can be considered _____, whereas social factors can be considered _____.

Question 2

The biopsychosocial approach proposes that *(Select one)*

A   all factors are biological, psychological and social and impair mental health.

B   biological, psychological and social factors all interact to affect mental health.

Question 3

Which of the following options are examples of an internal factor? *(Select all that apply)*

I   adequate diet

II   adequate sleep

III   exercising

IV   practising strategies that encourage positive thought processes

V   support from a family member

Question 4

Which of the following options constitute psychological risk factors? *(Select all that apply)*

I   a genetic vulnerability to develop a mental health disorder

II   loss of a significant relationship

III   negative thought patterns

IV   repeatedly thinking about the negative aspects of a situation (rumination)

Question 5

Fill in the blanks with the following terms.

- External
- Internal

The loss of a significant relationship can be considered a social factor because it relates to an individual's _____ environment as opposed to their _____ biological or psychological functioning.

Question 6

Biological factors can be distinguished from psychological factors because biological factors involve *(Select one)*

A   the functioning of the body and its systems.

B   cognitive functioning.

Skills

Perfect your phrasing

Question 7

Which of these sentences is most correct?

A   Factors which affect mental health can be organised into both the biopsychosocial model and internal and external factors.

B   Factors which affect mental health are either part of the biopsychosocial model or internal and external factors.

Exam-style questions

Multiple-choice questions

Use the following information to answer Questions 8–10.

Yara has recently separated from her long-term partner, causing her to feel incredibly distressed and not leave the house to go to work or do any shopping. Yara has been unable to process the break-up in a way that would help her to overcome it, instead fixating on all of its negative consequences and not being able to see any of the opportunities that it could give her. However, Yara's friends were ultimately able to support her by organising fun social events that made her excited to leave the house and meet new people and after this she was able to bounce back and restore her levels of functioning.

Question 8   (1 MARK)

Yara separating from her partner is an example of a/an

A   biological factor.

B   psychological factor.

C   social factor.

D   internal factor.

Question 9   (1 MARK)

Yara being unable to process the breakup in a helpful way is an example of a/an

A   biological factor.

B   psychological factor.

C   social factor.

D   external factor.

Question 10   (1 MARK)

Yara's friends supporting her through the break-up is an example of a/an

A   internal factor.

B   external factor.

C   the biopsychosocial model.

D   mental health.

Question 11   (1 MARK)

Salome is incredibly worried about her upcoming year 11 exams. She began to feel so upset about how much work she needed to do to prepare adequately that she stopped going to school and just wanted to stay at home to escape all of the pressure. A few of Salome's friends then messaged her about a series of study sessions they were running in preparation for all the exams. Salome then felt like the preparation was manageable and returned to school and felt much less overwhelmed about the exams.

Salome's friends messaging her to organise study sessions is an

A   biological factor.

B   risk factor.

C   internal factor.

D   external factor.

Short-answer questions

Question 12 (1 MARK)

Explain the biopsychosocial approach to mental health.

Question 13 (2 MARKS)

Provide an example of an external factor and explain how it can assist individuals to cope with change and challenge.

Question 14 (2 MARKS)

Orla's social environment has been causing her significant personal distress. She has separated from her long-term partner and is having conflicts with her close friends. This has significantly impaired her functioning and mental health. To restore her usual levels of functioning, Orla has been making sure that she gets enough sleep and begins to overcome the distress that she was experiencing.

In terms of internal and external factors, explain one factor which assisted Orla to cope with change and challenge.

Questions from multiple lessons

Use the following to answer Questions 15 and 16.

Jensen is a highschool student who has begun to feel overwhelmed with the pressure of keeping up with school work. His family are concerned about his mental health, claiming that his personality has changed dramatically from being bright and outgoing to quiet and reserved.

Question 15 (1 MARK)

Jensen's personality is moderated largely by which lobe of the cerebral cortex?

A temporal

B occipital

C parietal

D frontal

Question 16 (1 MARK)

The damage to an area of the cerebral cortex is an example of which type of factor for mental health?

A internal

B external

C social

D psychological

5C MAJOR CATEGORIES OF PSYCHOLOGICAL DISORDER

When a psychologist or psychiatrist diagnoses someone with a mental disorder, how do they know that they have made an appropriate judgement? Labelling someone with a mental illness or 'psychological disorder' can be a controversial and tricky process and it is very important that any judgements made are accurate. In this lesson, you will learn about five major categories of psychological disorder and the methods psychologists can use to diagnose someone with one of these mental health disorders.

Image: StonePictures/Shutterstock.com

5A Understanding normality and mental health	5B Factors affecting mental health and coping	5C Major categories of psychological disorder	5D Schizophrenia and the 'two-hit hypothesis'

Study design dot point

- major categories of psychological disorder: addiction disorders; anxiety disorders; mood disorders; personality disorders; and psychotic disorders

Key knowledge units

Diagnosing psychological disorders	1.2.8.1
Addiction disorders	1.2.8.2
Anxiety disorders	1.2.8.3
Mood disorders	1.2.8.4
Personality disorders	1.2.8.5
Psychotic disorders	1.2.8.6

Major categories of psychological disorder

- Diagnosing psychological disorders 1.2.8.1
  - The DSM-5
  - Mental ilness in Australia
- Addiction disorders 1.2.8.2
  - Types of addiction disorders
  - Risk factors and treatments
- Anxiety disorders 1.2.8.3
  - Types of anxiety disorders
  - Risk factors and treatments
- Mood disorders 1.2.8.4
  - Types of mood disorders
  - Risk factors and treatments
- Personality disorders 1.2.8.5
  - Types of personality disorders
  - Risk factors and treatments
- Psychotic disorders 1.2.8.6
  - Types of psychotic disorders
  - Risk factors and treatments

Diagnosing psychological disorders 1.2.8.1

OVERVIEW

When a person is diagnosed with a mental health disorder, they are placed into a category which has important implications. As such, psychologists and psychiatrists have great responsibility in diagnosing and labelling specific mental health disorders and use a clear set of diagnostic criteria to ensure their assessments are correct.

THEORY DETAILS

Earlier in this chapter, you learnt about the concept of **mental health disorders** (also known as *psychological disorders*, *mental disorders* or *mental illness*). In any scientific field, labelling and classifying phenomena according to certain characteristics is important as it allows scientists to investigate, communicate, and test hypotheses. In biology, for example, classifying organisms according to the group or category to which they belong helps scientists to make predictions about the things a group of organisms can be expected to do.

Mental health disorder (also known as psychological disorder, mental disorder and mental illness) a diagnosed psychological state characterised by the presence of a severe disturbance, sense of distress, and thoughts, feelings and/ or behaviour that are atypical of the person and significantly impacts their ability to function independently

On a more *pragmatic* (practical and realistic) level, classification helps scientists to create solutions when problems arise. For example, if a disorder can harm people, classifications help to succinctly communicate details about the disorder and the people which it affects in order to devise a targeted cure.

As a social science, psychology has undertaken the difficult task of labelling and categorising psychological disorders; this task does not go without criticism. In order to create these categories and individual labels for disorders, mental health professionals have had to devise clear descriptions of what each disorder involves in terms of the typical thoughts, feelings, and behaviours an individual with the disorder presents. When it comes to diagnosing an individual with a specific psychological disorder, there is an assessment of the individual's symptoms and their course and progression. Diagnosis occurs when the set criteria for a disorder are met by the individual. This can and should only be conducted by a mental health professional trained in clinical diagnosis. There are both clear benefits and limitations to diagnosing and labelling psychological disorders in this way.

Table 1 Benefits and limitations of diagnosing psychological disorders using labels and categories

Benefits	- Can provide an individual with a sense of understanding and reassurance with regard to what they have been feeling. If they have been suffering, a label may help them to recognise and more accurately comprehend their symptoms. It also may provide individuals with a sense of empowerment by providing them with a language to talk about their symptoms. - Can assist mental health professionals in devising targeted treatment for patients because they are aware of the typical symptoms, course, and progression of the disorder. - Provides a common language for professionals and researchers to succinctly and accurately communicate details about psychological disorders. It also provides avenues for targeted research, as psychologists can develop a comprehensive body of literature that can be shared to improve the understanding of distinct disorders. *Inter-rater reliability:* Studies have shown that when mental health professionals use the same diagnostic guideline to diagnose and label a psychological disorder, they often make the same diagnosis; i.e. their *rating between* mental health professionals is *reliable.*
Limitations	- Creates the possibility for self or social stigma. *Stigmatisation* refers to shameful attitudes or a lack of acceptance, which can lead to social alienation and discrimination for people with mental disorders. Self stigma can also occur when an individual holds these negative feelings toward themselves. This can negatively affect the way an individual interacts with many aspects of their life including schooling, employment and social relationships and can further negatively impact a person's mental health. - Similarly, labels may *pathologise* mental illness, making people feel that because they are given a label that they are strange and alienated from society in some way. - Can 'box someone in' to their label, in some cases leading to over-identification with the disorder or illness to the point in which it stifles recovery. If someone receives a label, consciousness of it may become unhealthy or excessive. - Underdiagnosis and overdiagnosis: someone may not meet all the criteria for a certain disorder and therefore not receive the label. This may mean they don't get the help required. Likewise, someone might fit too easily into a psychological disorder category, providing the label of 'disordered' when in fact they are highly functional despite demonstrating some symptoms. - Categories for mental health disorders may be too culturally specific and therefore inaccurate when applied to certain populations. For example, in Australia, the need for further research on mental health in Aboriginal and Torres Strait Islander Australians has been highlighted (National Mental Health Commission, 2020). *Diagnostic overshadowing:* In Australia, a problem in the mental health sector is the attribution of someone's physical symptoms to their psychological disorder (known is diagnostic overshadowing). While psychological disorders may sometimes have biological effects, as for anyone, people with a psychological disorder can suffer from physical ailments independent of their psychological disorder. As such, these physical symptoms require a treatment other than what is prescribed for the psychological disorder. Unfortunately, this does not always occur when these unrelated physical symptoms are attributed to the psychological disorder, leaving a person inadequately treated and suffering.

The DSM-5

In Australia, the most widely used guide to classify and diagnose psychological disorders is the 'Diagnostic and Statistical Manual of Mental Disorders' (Australian Institute of Family Studies, 2020). First published in 1952, it is now on its fifth edition which was released in 2013. It is often referred to shorthand as the 'DSM-5' or just 'DSM'. The DSM-5 is a book which mental health professionals can use to assist them with diagnosing and understanding psychological disorders (American Psychiatric Association, 2013). In the DSM, psychological disorders are referred to as 'mental disorders'.

The DSM-5 has 21 categories of psychological disorder. The categories of each psychological disorder, such as 'mood disorders' or 'personality disorders', include information on the traits and behaviours common to that category in a more general overview. Within each category, there are also a range of specific psychological disorders listed. Each individual and unique disorder has its own criteria which must be met by a patient in order for a diagnosis to occur. Often, the criteria for diagnosing a disorder has its own guidelines for mental health professionals to make an assessment of how severe a person's psychological disorder is (such as a grading as mild, moderate or severe). In addition to the diagnostic criteria provided, the DSM-5 also provides information about a disorder's:

- prevalence and population (how common it is and amongst who, detailing categories like age and gender)
- course (the normal progression of the disorder)
- effect on the individual and their relationships
- *comorbidity*: if a disorder occurs simultaneously with another disorder, it is said to be *comorbid*.

Although the DSM does *not* include information about the direct causes of psychological disorders, mental health professionals are generally aware of a range of **risk factors** involved in the development of various psychological disorders. In the previous lesson, you learnt that risk factors are biological, psychological, or social factors that can increase the likelihood or contribute to the onset of a psychological disorder and that they don't necessarily 'cause' one.

Risk factor a biological, psychological, or social factor which can increase a person's susceptibility to or contribute to the development of a psychological disorder

Mental illness in Australia

Studying psychological disorders in Australia is important because of its prevalence and effect on the community.

Some important figures to keep in mind when studying mental illness in Australia is that:

- 45% of Australians will experience mental illness in their lifetime
- Over half (54%) of the people in Australia with mental illness do not access treatment (Australian Institute of Health and Welfare, 2014). This is especially difficult when there are delays and difficulties with diagnosis
- Suicide is the leading cause of death for Australians aged 15-24 (Australian Institute of Health and Welfare, 2020)
- Men and Indigenous Australians are the most at-risk groups for suicide in Australia (Australian Bureau of Statistics, 2012)

45%

OF AUSTRALIANS WILL EXPERIENCE MENTAL ILLNESS AT SOME POINT IN THEIR LIFE.

Image: Pranch/Shutterstock.com

Figure 1 Mental illness affects almost half of all Australians (Australian Bureau of Statistics, 2009)

⊕ *Want to know more?*

There are many support services in the community if you want to talk to someone about your own mental health, or the mental health of someone you know, including many services which are free, easily accessible and confidential.

This includes visiting:

- Your GP
- Your school counsellor
- Non-profit organisation mental health resources. Headspace and BeyondBlue provide assistance for young adults, with many resources including online chats and forums. You can visit **Headspace** at *headspace.org.au* and **BeyondBlue** at *beyondblue.org.au*

Figure 2 Beyond Blue is an Australian organisation founded in 2000 working to address a range of mental health issues

Addiction disorders 1.2.8.2

OVERVIEW

Do you have a favourite game, food, or activity? Addiction disorders occur when our enjoyment of or dependence on something becomes so excessive that it prevents us from functioning in a healthy way.

THEORY DETAILS

Addiction disorders refer to a broad range of disorders characterised by a psychological and physiological dependence on a substance or behaviour. Someone with an addiction disorder engages with their addictive stimulus compulsively even though it could have harmful consequences. Addiction disorders are characterised by dependence on, or compulsion with, a substance or behaviour which takes over someone's life. Furthermore, many addiction disorders are characterised by the following:

- There are recurring and persistent behaviours, thoughts, and desires surrounding the addictive substance, behaviour, or activity *(biological, psychological, social)*
- A large amount of time is spent engaging with the addictive stimulus/stimuli *(social)*
- There is often difficulty ceasing to use or perform the addictive stimulus *(biological, psychological, social)*
- Social relationships, occupations and lifestyle may all be negatively affected *(social)*
- A *tolerance* is built up to the substance or behaviour, often requiring increased amounts of the substance or increased performance of the behaviour *(biological, psychological)*
- *Withdrawal effects* may be experienced. These are painful or undesirable feelings and thoughts when the substance or behaviour is no longer engaged with *(biological, psychological)*

(American Psychiatric Association, 2013).

Importantly, all addiction disorders (whether related to substance or behaviour) are said to involve and activate the brain's *reward system*. When we take a substance or perform a behaviour that produces pleasure, this is because our brain's reward system is activated and releases pleasurable chemicals such as *dopamine*. This feeling of pleasure reinforces the behaviour or the use of a substance which produced it, and strengthens in our memory that it results in a pleasurable feeling. It's easy to see how addiction can develop in so many people.

Addiction disorder a category of psychological disorder characterised by a dependence on a particular substance or behaviour despite negative consequences

Types of addiction disorders

The DSM category which corresponds to addiction disorders is 'Substance-related and addictive disorders'. *Substance-related disorders* include disorders which involve both abuse of or dependence on substances, such as alcohol and cannabis. Each substance corresponds to its own unique disorder category which includes a range of disorders, each with unique diagnostic criteria. For example, under the 'Alcohol-related disorder' category, one specific disorder is called 'Alcohol use disorder' and it has its own specific diagnostic criteria and severity grading based on these criteria, often ranging from mild, to moderate, to severe.

Other substance-related disorder categories in the DSM include:

- Caffeine-related disorders
- Cannabis-related disorders
- Hallucinogen-related disorders
- Inhalant-related disorders
- Sedative-related disorders
- Stimulant-related disorders
- Tobacco-related disorders
- Opioid-related disorders

Besides substance-related disorders, the DSM has also recognised one other disorder under the category of *addictive disorders*. This is **gambling disorder**. Gambling is an activity whereby someone risks their own money or some other object of value in an attempt to win back more of it. Common forms of gambling include pokie machines, scratchies, betting on sporting events and casino or card games. When gambling becomes compulsive, it may turn into a gambling disorder.

Gambling disorder an addiction disorder which involves an individual compulsively risking their own money or object of value in an attempt to win back more of it

As with substance-related disorders, gambling disorders involve an activation of the brain's reward system, and have similar criteria for diagnosis, such as a lack of self-control, needing to gamble with more money and/or time, strained relationships due to gambling and so on. Interestingly, gambling-disorders activate the brain's reward system in a similar way to drugs.

⊕ Want to know more?

Gambling disorders exist on a continuum; i.e., they range from one extreme to another, with some forms of gambling being much more severe than others. Gambling can range from:

1   No problem-gambling or no gambling. Most people fall within this category, either facing no problem-gambling tendencies or not gambling at all.

2   Problem-gambling. Some people develop into problem-gamblers, exhibiting some criteria of gambling addictions.

3   Severe problem-gambler. Some people develop severe gambling addictions, exhibiting at least eight DSM criteria. Behaviours and thoughts may include huge financial debt, *suicidal ideation* (thinking about suicide), loss of relationships, and so on.

1. No problem-gambling or no gambling	2. Problem-gambling	3. Severe problem-gambler

Figure 3 Gambling addiction continuum

While gambling is currently the only non-substance related addiction disorder in the DSM-5, more technologically-based disorders, such as internet-gaming disorder, are currently being researched and will potentially be included in the DSM-6.

Risk factors and treatments

Table 2 Risk factors and treatments for addiction disorders

	Risk factors	Treatments
Biological	Our dopamine reward system reinforces addictive behaviours biologically by releasing pleasurable chemicals and strengthening neural networks related to addiction. For gambling specifically, higher levels of the chemical dopamine in the brain has been found to increase gambling behaviour (Dodd et al., 2005).	Exercise or other physiological outlets may be used as a substitute for addictive stimuli in an attempt to provide an alternative outlet. For gambling, medication may be prescribed that reduces the amount of dopamine released while playing.
Psychological	Psychological stress and trauma are major risk factors which lead to both substance and behavioural forms of addiction disorder. If someone experiences these feelings, they may seek an outlet in the form of addictive stimuli. In relation to gambling, cognitive distortions, such as believing in one's own self-control and 'luck', lead to riskier more addictive behaviours. Most gambling systems are programmed in such a way that winning is statistically highly unlikely, yet psychological distortions may prevent a gambler from applying this logic.	Therapy which targets both addictive thought and behaviour compulsions, such as *cognitive behavioural therapy* (CBT), may be used. Therapy may also seek to address and reduce the psychological stress or trauma that led to seeking addictive behaviours and substances in the first place.
Social	The prevalence and acceptance of certain behaviours or substances culturally can lead to addiction disorder. For example, Australia has some of the highest numbers of gamblers in the world, and also is culturally very accepting of binge drinking. More social stress and trauma, such as loss of relationships, may also be a *precursor* (a preceding factor contributing to the development) to addiction disorders.	Social support, such as from peer support groups may be used, e.g. AA group (Alcoholics anonymous) or GA (Gamblers Anonymous). Targeted support from family, friends, and community can also help to address addiction.

Image: MSSA/Shutterstock.com

Figure 4 Phone addiction, although not in the DSM-5, is a disorder investigated by psychologists

Anxiety disorders 1.2.8.3

OVERVIEW

Anxiety is a normal feeling that we all experience from time to time. However, when this feeling is persistent and out of control, it may be a sign of an anxiety disorder.

THEORY DETAILS

Anxiety disorders refer to a group of disorders which are characterised by excessive and persistent worry and distress about certain stimuli or situations. Importantly, the fear and worry experienced in anxiety disorders is often apprehension of a perceived threat or stimulus that will occur *in the future*, rather than one that is current or that occurred in the past. Often, along with mental stress and arousal, a person with an anxiety disorder will also experience heightened physiological arousal in times of stress, including sympathetic responses like fast breathing, sweating, a dry mouth, and so on. Anxiety disorders can be differentiated from the more general feeling of anxiety that we all experience, being more severe in the degree, frequency and persistence of this feeling.

Common diagnostic criteria of anxiety disorders include:

- Persistent and excessive worry about a particular stimulus or situation. The worry felt may be disproportionate to the stimulus *(psychological)*
- Difficulty confronting the fear-inducing stimulus or situation *(social)*
- Sleeping difficulties *(biological, psychological)*
- Avoidance behaviours *(social)*
- Physical symptoms, including nausea, headaches, muscle tension, and an activation of sympathetic nervous system stress responses *(biological)*

Types of anxiety disorders

There are a range of different anxiety disorders in the DSM-5, including:

- *Separation anxiety*: a fear of separation from the primary caregiver/s, mostly experienced by children
- *Selective mutism*: the inability to speak in certain social situations
- *Specific phobia*: extreme fear surrounding a specific stimulus
- *Social anxiety disorder (also known as social phobia)*: extreme worry or distress during or in apprehension of certain social situations
- *Panic disorder*: repeated and unexpected panic attacks
- *Agoraphobia*: fear of open spaces and crowds
- *Generalised anxiety disorder*: excessive anxiety surrounding a number of things that occurs most days for at least six months

Anxiety disorder a category of psychological disorder characterised by extreme, ongoing worry and distress

📑 *Lesson link*

Some of these anxiety disorders relate to content you have already learnt or will learn in future.

In lesson *4C: Attachment and emotional development*, you learnt how the attachment a child forms with their primary caregiver can determine their confidence when alone and later in life. Separation anxiety occurs when a child feels extreme anxiety when away from their caregiver, and this may have something to do with the attachment style formed.

In *Units 3 & 4 Psychology*, you will learn lots about *specific phobia*, which is extreme and disproportionate fear to a specific stimulus e.g. heights or spiders. Specific phobia can be extremely difficult to overcome.

In lesson *2B: The nervous system*, you also learnt about the role of the sympathetic nervous system and the fight-flight-freeze response. Anxiety disorders trigger these sympathetic responses of the body.

Risk factors and treatments

Table 3 Risk factors and treatments for anxiety disorders

	Risk factors	Treatments
Biological	A genetic predisposition (i.e. inherited from parents) to develop anxiety. The biological stress response (i.e. sympathetic nervous system responses; the fight-flight-freeze response) can both arise from and contribute to anxiety disorders. Brain chemistry imbalances, such as an insufficient amount of the neurotransmitter GABA which usually helps to regulate bodily arousal.	Training for how to regulate the physiological arousal triggered by anxiety and stress may help people reduce their symptoms of anxiety. For example, learning how to perform controlled breathing. Exercise can sometimes help people to 'work off' their stress and provide mood-enhancing brain chemicals. However, there is a lack of rigorous and compelling evidence to conclusively suggest that anxiety may be 'treated' by exercise (Stonerock et al., 2015). Anti-anxiety medications may also be used, helping someone to restore brain chemistry imbalances. For example, some medications increase the uptake of GABA by neurons which helps to regulate the anxiety response.
Psychological	Repeated and negative thought patterns, such as catastrophic thinking (i.e. the thought that the worst thing is going to happen) and rumination contribute to anxiety disorders.	There are a variety of therapy forms which can help people address both their current symptoms of anxiety as well as the causes behind their anxiety. As with addiction disorders, CBT is commonly used to help patients address both the unhealthy thoughts and behaviours which contribute to and strengthen their anxiety disorder. For example, CBT might specifically target the unhealthy thought pattern of catastrophic thinking and seek to replace it with more realistic thoughts.
Social	Negative childhood experiences, such as the formation of unhealthy attachment styles or the experience of trauma can lead to anxiety disorders. Modelling (due to imitation or transference) of parents' fears can also contribute. Cultural expectations and pressures surrounding certain behaviours e.g. the pressure to join the workforce at a young age in some countries.	Support from family, friends, and the community may help to address anxiety. *Psychoeducation,* for example, may involve a therapist teaching a person with anxiety and their family or friends about ways to manage their stress response and unhealthy thought patterns.

> **Lesson link**
>
> Many psychological disorders in this lesson have a genetic predisposition to the disorder as a potential biological risk factor. This means that biological parents may pass on a predisposition to develop a disorder or traits relating to a disorder to their offspring. Keep in mind that inheriting a 'genetic predisposition' for something does not mean the offspring will definitely express the inherited trait or disorder, but rather that they may be more likely than a person who does not have this genetic predisposition to express it if certain environmental conditions are fulfilled.
> For a refresher on the concept of genetic predisposition, head to lesson **4A: Nature versus nurture.**

Mood disorders 1.2.8.4

OVERVIEW

We all experience low times and fluctuations of mood and emotion in our life. Mood disorders, however, are a category of psychological disorder that involve extreme and disabling moods.

THEORY DETAILS

It is normal to experience a broad range of emotions and experience suffering and difficulty from time to time. However, unstable or extremely low moods may be characteristic of a **mood disorder** when the moods regularly experienced by an individual become debilitating and cause considerable suffering, affecting the person's ability to function day to day.

Although mood disorders vary greatly from one another, some common characteristics and diagnostic criteria include:

- Persistent low mood (depressive disorders) or fluctuations between very low and very high mood (bipolar and similar disorders) *(psychological)*
- Sleeping difficulties *(biological, psychological)*
- Fatigue/low energy *(biological)*
- Suicidal ideation *(psychological)*
- Feelings of worthlessness *(psychological)*
- Unhealthy dietary habits (under or overeating) *(biological, psychological)*

Mood disorder a category of psychological disorder characterised by a disabling lowering or heightening of mood

While the DSM doesn't have a specific category called 'mood disorders', it does have two broad categories which can be considered as part of our general understanding of mood disorders. These include the 'Depressive disorders' category and the 'Bipolar and related disorders' category. Table 4 outlines *some* of the different types of disorders under these two categories.

In general, **depressive disorders** can be thought of as mood disorders characterised by persistent and severe low mood. These include disorders such as major depressive disorder. On the other hand, **bipolar disorders** are characterised by the fluctuation between episodes of extremely heightened mood (mania or hypomania) and episodes of lower or extremely low mood (depressive episodes). *Mania* is experienced in some bipolar disorders, and is described as the experience of abnormal and persistent elated or irritable mood. For a manic episode to occur, it must last at least a week or require hospitalisation. Manic episodes must occur alongside three to four symptoms such as increased execution of goal-directed behaviour, decreased need for sleep, inflated sense of ego and ability, 'racing thoughts', participation in risky behaviours such as spending sprees, and so on. *Hypomania* is similar to mania, except it requires the episode to last for just four days for diagnosis.

Depressive disorder a category of mood disorder characterised by a disabling low mood

Bipolar disorder a category of mood disorder characterised by disabling alternations between periods of low moods and periods of heightened moods (mania or hypomania)

Types of mood disorders

Table 4 Types of depressive disorders and bipolar and related disorders

Depressive disorders	• *Disruptive mood dysregulation disorder:* chronic and persistent feelings of irritation • *Major depressive disorder:* also known as depression, it involves an extremely low mood or loss of pleasure for at least two weeks alongside several other symptoms e.g. fatigue • *Persistent depressive disorder:* also known as dysthymia, it lasts for two years or more and the symptoms may be less severe than major depressive disorder • *Premenstrual dysphoric disorder:* significant mood disturbances in the week prior to menstruation
Bipolar and related disorders	• *Bipolar I disorder:* requires at least one *manic* episode to occur in a person's life, alongside other symptoms e.g. extreme involvement in goal-directed activities. It *can* involve fluctuation from and between depressive and hypomanic episodes • *Bipolar II disorder:* involves both a hypomanic episode *and* a major depressive episode. Although hypomania is less intense than mania, bipolar II is not overall less severe than bipolar I • *Cyclothymic disorder:* milder symptoms of depressive and hypomanic episodes that occur for at least two years, but do not actually meet all the criteria of these episodes

Risk factors and treatments

Table 5 Risk factors and treatments for mood disorders

	Risk factors	Treatments
Biological	Genetic predispositions to mood disorders. Chemical imbalances in the brain; for example, in some cases of depression, there may be a low production of the mood-enhancing chemical serotonin. In some cases of bipolar, there may be an overproduction. Medical conditions, such as brain trauma (as explored in lesson 3B), may result in mood disturbances if the condition directly or indirectly impacts daily functioning, relationships etc.	Medications which target mood. Selective Serotonin Reuptake Inhibitors (SSRIs) are a commonly used antidepressant which specifically act to inhibit serotonin reuptake by presynaptic neurons in the brain. This means that postsynaptic neurons are more likely to receive more serotonin. There are also alternative or more natural forms of medication used for mood disorders. As with other psychological disorders, exercise is recommended to enhance mood biologically.
Psychological	Recurrent negative or unhealthy thought patterns. For depressive disorders this may include rumination or highly pessimistic thoughts.	There are a range of evidence-based psychotherapy forms. Again, CBT is commonly used to help with mood disorders.
Social	Trauma such as the death of a close family member or friend, persistent bullying, facing widespread or environmental disaster, facing poverty, experiencing distressing displacement from one's home country and so on.	In-person or online support groups for people with specific mood disorders. Many people find hearing and learning from others' experiences helpful. Support from family and friends, particularly when they have a good understanding about the ways in which they can support negative behaviours and thought patterns.

Personality disorders 1.2.8.5

OVERVIEW

We all have a unique personality that is made up of certain patterns of thoughts, feelings, and behaviours that we commonly exhibit. Our personalities are relatively stable and make us who we are. However, what happens when the traits that make up our personality are so unconventional or inappropriate that they harm ourselves or the people around us? This is where personality disorders arise.

THEORY DETAILS

Personality disorders are characterised by persistent personality traits and behaviours that are significantly different from cultural or societal norms. Importantly, these patterns of personality and behaviour significantly disrupt an individual's life, causing distress and harm to themselves and/or the people around them. Given the nature of these disorders, sometimes, people with personality disorders do not know they have one, instead considering these maladaptive patterns to just be part of their identity.

The central characteristics of personality disorders include:

- A set of persistent personality traits and/or behaviours that differ significantly from what is acceptable within cultural or societal norms and disrupt the individual's life. These traits and behaviours are maladaptive in that they often cause significant distress and prevent an individual from carrying out regular functioning *(biological, psychological, social)*
- The maladaptive personality traits and behaviours are consistent and enduring *(psychological)*
- The maladaptive personality traits and behaviours affect any two of either cognition, affect (emotions and their expression), social relationships, or the ability to control impulses *(psychological, social)*
- The onset of the disorder generally occurs in adolescence or young adulthood

Personality disorder a category of mental disorders that are characterised by a set of enduring personality traits and behaviours which diverge significantly from cultural and societal norms, causing marked distress or harm for an individual

Types of personality disorders

Personality disorders are quite varied in the traits and behaviours that are maladaptive. Some personality disorders in the DSM-5 and their central characteristics include:

- *Paranoid personality disorder:* a person has an extreme distrust of others' intentions, believing others to be 'out to get them' or *malevolent* (with evil intention) in some way
- *Schizoid personality disorder:* distance is maintained in social relationships and the person has limited ways of showing and expressing emotion
- *Schizotypal personality disorder:* a person experiences cognitive and perceptual distortions, discomfort in social relations, and displays abnormal behaviours
- *Antisocial personality disorder:* a person exhibits behaviours and holds traits which demonstrate a lack of concern for other people and their needs. You may have heard this referred to as *sociopathy* or *psychopathy*
- *Borderline personality disorder:* a person has unstable social relationships, emotions (they may be loving one day and hostile the next) and conceptions of the self, and performs impulsive behaviour (e.g. shopping sprees). The person often holds a fear of abandonment

- *Histrionic personality disorder:* a person exhibits extreme attention seeking behaviours and displays of emotion. Often, the behaviours include inappropriate attempts at sexual seduction
- *Narcissistic personality disorder:* a person exhibits an extreme involvement in the self and holds an excessive sense of self-importance, need to be admired, low empathy and *grandiose* (ambitious and exaggerated) ideas
- *Avoidant personality disorder:* a person demonstrates avoidance of social situations, deep self-consciousness, and extreme sensitivity to rejection or criticism
- *Dependent personality disorder:* a person shows extreme clinginess and submissive behaviours, demonstrating a deep and excessive need to be cared for and almost complete dependency on others
- *Obsessive-compulsive personality disorder:* a person exhibits highly controlling behaviours and traits which aim for extreme perfection and order

ACTIVITY 2

Research a personality disorder

Select one of the personality disorders which interest you from the list provided in this lesson. Conduct a brief review of research using Google to find out some more information about it. When researching, you may wish to answer some of the following questions:

- What are the personality traits a person with this disorder may hold?
- What are the behaviours a person with this disorder may display?
- Who most commonly has this disorder? (Think about age group, gender, country, or cultures)
- What is the prevalence of this disorder?
- Are there any strongly established risk factors to this disorder?
- Are there any specific treatments that are consistently used to treat this disorder by mental health professionals?

Risk factors and treatments

Table 6 Risk factors and treatments for personality disorders

	Risk factors	Treatments
Biological	There is evidence that people can inherit a genetic predisposition to developing a personality disorder. For example, for both borderline and antisocial personality disorders, it has been shown that the risk of developing the disorder is more likely if it runs in the family. Certain traits or temperaments, such as neuroticism, may also serve as biological risk factors for personality disorders when they are inherited from parents. Similarly to other psychological disorders, having other medical conditions, such as head trauma or nervous system diseases, may serve as biological risk factors for developing a personality disorder.	Some medications may be used to help with certain symptoms of personality disorders, but the type and dosage are highly dependent on the specific personality disorder.
Psychological	Patterns of cognition and affect (emotions) which significantly deviate from cultural or societal norms both contribute to and are a result of personality disorders. For example, a decreased ability to control impulses contributes to and is a characteristic of some personality disorders. In terms of cognition, risk factors include persistent and negative thought patterns, generally involving unrealistic perceptions of self, other people, and the environment. These may range from overly-negative perceptions (such as those in paranoid personality disorder), to overly-grandiose perceptions (such as those in narcissistic personality disorder). In terms of affect, risk factors include a reduced ability to control, read, and display emotions to an appropriate extent. For example, while schizoid personality disorder is characterised by a limited range of emotional expression, histrionic personality disorder is characterised by extreme displays of emotion (American Psychiatric Association, 2013).	Psychotherapy can be used to treat personality disorders in a variety of ways. CBT may help individuals by targeting maladaptive thought patterns and behaviours. *Psychodynamic therapy* is also used with specific personality disorders, such as borderline personality disorder (Gunderson, 2000). These forms of therapy help individuals to address their maladaptive thoughts and behaviours by connecting them consciously to experiences (such as childhood trauma) that may have led to or shaped their present maladaptations.
Social	Early life experiences, such as those in childhood and adolescence, may contribute to the development of maladaptive personality traits and behaviours. Childhood trauma, for example, has been found to contribute to disorders such as schizoid or borderline personality disorder (Yen et. al, 2002). Parental modelling and family environment may also serve as a social risk factor for some personality disorders. Studies have shown that children of adoptive parents with antisocial personality disorders are more likely to develop one themselves (American Psychiatric Association, 2013).	Support groups may be particularly helpful for people with a personality disorder, as often their disorder has caused strain within regular social relationships.

Psychotic disorders 1.2.8.6

OVERVIEW

How do we know that the way that we view the world is the same as other people? We all have a unique conception of the world around us which governs the way we think, feel and act in our environment. However, when a person cannot grasp or conceive reality to an appropriate extent that allows them to function effectively or 'normally' in society, they may have a psychotic disorder.

THEORY DETAILS

Psychotic disorders refer to a group of disorders marked by a disconnect from reality (psychosis). **Psychosis** is part of all psychotic disorders, describing this state of being disconnected or 'out of touch' with reality. A person experiencing psychosis may perceive reality to be different from how it really is, but be unable to detect this misperception in themselves. In other words, the experiences of psychosis can feel very real to a person experiencing them. The length of time someone experiences psychosis can vary greatly: some people may experience a psychotic episode for just a few days, while for others it may be part of their everyday experience of reality. **Schizophrenia** is the most commonly diagnosed psychotic disorder and will be explored more in the next lesson.

Psychotic disorder a category of psychological disorder characterised by the state of psychosis

Psychosis a psychological state in which an individual's grasp of reality is impaired and inaccurate

Schizophrenia a specific kind of psychotic disorder characterised by the presence of longer-term psychosis and impairment to functioning

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(+) Want to know more?

Stigma and psychosis

People who experience psychotic disorders are often unfairly stereotyped and stigmatised. Contrary to popular belief, the term 'psychotic' is not related to 'psychopathy' (antisocial personality disorder), nor does it mean that someone is violent, dangerous, or malevolent in some way. 'Psychotic', rather, is a broad term that can include a wide range of symptoms. Many psychotic disorders do not endanger the lives of others in any way, and are often more detrimental to the individual experiencing the disorder themselves. Further, experiences of psychosis can be temporary and do not necessarily have a bearing on an individual's perceptions of reality later life. Education and improved mental health literacy (a deeper understanding of mental health and mental illness) around psychosis can help to reduce the stigma that people who experience psychotic disorders face.

Image: Kubko/Shutterstock.com

Figure 5 People with psychotic disorders commonly face unfair stigmatisation from society

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While psychosis is common to all psychotic disorders, the length of the psychotic episode required depends on the particular disorder. Psychotic disorders may also require other symptoms to be present for diagnosis. In general, the key symptoms of psychotic disorders according to the DSM include, but are not limited to, those outlined in table 7. Not all of these characteristics must be present in every psychotic disorder for diagnosis to occur.

Table 7 Key characteristics of psychotic disorders according to the DSM-5

Characteristic	Description
Delusions	*Delusions* are fixed and rigid beliefs that are not easily changed by another person, even when they present strong counterevidence. It is sometimes difficult to determine whether someone is just highly stubborn and firm in their beliefs or is deluded. Someone is more likely to be deluded if they maintain their beliefs despite significant counterevidence.
	Delusions may be divided into bizarre and nonbizarre beliefs. A delusion is *bizarre* if it is highly unlikely or impossible e.g. a belief that someone has transported you to another parallel universe without you realising. Delusions may be nonbizarre if they are possible, but there is a lack of evidence to support the claim e.g. believing one is being watched but without evidence that this is occurring.
	Delusions may be held toward a range of areas, including:
	• *Persecution:* a person unreasonably believes they will be harmed in some way
	• *Referential:* a person unreasonably believes things are directed at or targeting them when they are not
	• *Grandiose:* a person unreasonably believes they are special or extraordinary in some way
	• *Erotomanic:* a person unreasonably believes another is in love with them
	• *Nihilistic:* a person unreasonably believes a catastrophe will occur
	• *Somatic:* a person unreasonably believes or focuses on something related to their body or health
Hallucinations	*Hallucinations* are experiences that feel like a real perception of something despite there being no real stimulation or event in reality. In other words, they are a perception of something that isn't really there. Hallucinations may occur in any sense perception (visual, auditory) etc. and feel very real. In most disorders, including schizophrenia, auditory hallucinations such as hearing voices are common.
Disorganised thinking (speech)	*Disorganised thinking* refers to patterns of thought which differ significantly from regular, more logical thought. Thoughts may be 'jumbled up' or 'scrambled', not following a regular sequence of events or being disconnected from what is being prompted by another speaker or reality. Disorganised thinking is detected and inferred from a person's speech: when a person's speech seems severely jumbled or unrelated to reality, this may reflect disorganised thinking.
Grossly disorganised or abnormal motor behaviour (including catatonia)	*Grossly disorganised or abnormal motor behaviour* refers to irregular modes or ways of movement (motor behaviour). Abnormal movement may range from childlike movements, to strange and rigid posture or gesture.
	Catatonia specifically refers to abnormal behaviour that demonstrates a lack of engagement or reactivity to the environment. Catatonic behaviour may include not responding to stimuli with words or movement, rigidity in movement or posture, displaying purposeless movement with no clear environmental trigger, and trance-like staring or echoing of speech. Catatonia may be experienced in a variety of disorders, including schizophrenia and some mood disorders.
Negative symptoms	*Negative symptoms,* as opposed to positive symptoms, refer to symptoms which demonstrate a *decrease or loss* (negative meaning detracting or taking away something as opposed to 'bad') of a behaviour, thought, or feeling that would occur in a person without the disorder. Negative symptoms are most prominent in schizophrenia and include:
	• *Diminished emotional expression:* reduced expression of emotions in facial expression, speech and movement
	• *Avolition:* a lack of goal-directed behaviour. A person may stay standing or sitting for prolonged periods
	• *Alogia:* decreased speech
	• *Anhedonia:* diminished experience of pleasure
	• *Asociality:* social inhibition and lack of interest in social relationships

Types of psychotic disorders

Some of the DSM psychotic disorders include:

- *Schizotypal personality disorder* (as outlined in personality disorders. This disorder is both a personality and psychotic disorder)
- *Delusional disorder:* the experience of delusions for at least one month, but they do not severely impair functioning nor are they particularly bizarre
- *Brief psychotic disorder:* the presence of at least one central symptoms of psychotic disorders, with the episode lasting more than one day but less than a month
- *Schizophreniform disorder:* the presence of two or more of the central symptoms of psychotic disorders for a significant portion of a one-month period. An episode lasts at least one month but less than six months
- *Schizophrenia:* the presence of two or more of the central symptoms of psychotic disorders for a significant portion of a one-month period. The overall disturbance to a person must last at least six months, and functioning (in relationships, work, self-care etc.) must be significantly impaired
- *Schizoaffective disorder:* the presence of mood disorder symptoms alongside symptoms of schizophrenia

Risk factors and treatments

Psychotic disorders are highly varied and can occur for a variety of reasons. As such, the risk factors and treatments are also highly varied, with just some detailed in table 7. There remain a lot of 'unknowns' surrounding both the risk factors and treatments of psychotic disorders but the majority of research has been conducted on schizophrenia.

Table 8 Risk factors and treatments for schizophrenia and other psychotic disorders

	Risk factors	Treatments
Biological	There is strong evidence for genetic risk factors in the development of schizophrenia; family members may pass on a genetic predisposition for developing the disorder. Again, this does not mean that family members must experience psychoses themselves, but rather, they may just pass on the genetic predisposition which can be expressed as the disorder if certain environmental conditions are fulfilled. Chemical imbalances in the brain, such as those relating to neurotransmitters like dopamine, have been linked ask a risk factor for psychosis (Kapur et al., 2005). Less commonly, complications throughout pregnancy and during birth, particularly a lack of oxygen (hypoxia) or a mother suffering from infectious disease, may serve as a risk factor for a child developing schizophrenia (Miller et al., 2011; Pickard, 2011). As with other psychological disorders, psychosis may result from substance use and other medical conditions (such as brain trauma). The *two-hit hypothesis* as a risk factor for schizophrenia will be explored in the next lesson.	Medications, such as antipsychotic medications, may be used to limit experiences of psychosis like delusions and hallucinations.
Psychological	Psychological trauma and significant stress may worsen the cognitive impairments associated with psychotic disorders. Further, psychological trauma may serve as an environmental trigger which acts upon a person's inherited genetic predisposition for a psychotic disorder, causing it to be expressed. In this sense, psychological stress does not cause psychotic disorders but rather contributes as a risk factor to their expression. Cognitive impairments (such as those to reasoning and memory) both contribute to and are the result of psychotic disorders.	A wide range of psychotherapy may be used to treat psychotic disorders depending on the patient's needs. CBT, psychodynamic therapies, and other forms of therapy can help individuals to identify and address their unhealthy cognitions and behaviours.
Social	Traumatic experiences and life events may also increase a person's susceptibility to developing a psychotic disorder. Again, this is by fulfilling the environmental events required to act upon a genetic predisposition and express a psychotic disorder, rather than a direct cause. Childhood trauma, neglect, and sexual abuse have been associated with higher numbers of psychotic disorders (Read et al., 2005), suggesting that these environmental conditions may also contribute to the expression of an inherited psychotic disorder.	Support groups are particularly helpful for those with psychotic disorders: given the social isolation and stigmatisation they may face as a result of their disorder, support from people in similar situations can assist the individual both emotionally and pragmatically. Community-led initiatives surrounding providing work and education for people with psychotic disorders, as well as awareness campaigns, can help individuals with psychotic disorders as well as lead the way for community understanding and acceptance for sufferers as a whole.

Theory summary

In this lesson, you learnt how psychologists and psychiatrists follow diagnostic criteria in order to diagnose someone with a psychological disorder. You also learnt about five of the major categories of psychological disorder:

Table 9 Summary of major categories of psychological disorder

	Description	Example
Addiction disorders	A category of psychological disorder characterised by a dependence on a particular substance or behaviour despite negative consequences.	Gambling disorder Image: NotionPic/Shutterstock.com
Anxiety disorders	A category of psychological disorder characterised by extreme, ongoing worry and distress.	Social anxiety disorder Image: CoolVectorStock/Shutterstock.com
Mood disorders	A category of psychological disorder characterised by a disabling lowering or heightening of mood.	Major depressive disorder Image: iconvectorstock/Shutterstock.com
Personality disorders	A category of psychological disorders that are characterised by a set of enduring personality traits and behaviours which diverge significantly from cultural and societal norms, causing marked distress or harm for an individual.	Narcissistic personality disorder Image: magic pictures/Shutterstock.com
Psychotic disorders	A category of psychological disorder characterised by the state of psychosis (a state in which an individual's grasp of reality is impaired and inaccurate).	Schizophrenia Image: mamormo/Shutterstock.com

For each of these categories, you have learnt about some of the diagnostic characteristics and criteria for mental disorders, as well as the possible risk factors and treatments from a biopsychosocial perspective.

5C QUESTIONS

Theory-review questions

Question 1

True or false? In Australia, psychologists can diagnose someone with a psychological disorder.

A   true

B   false

Question 2

In order to be diagnosed with a psychological disorder, a person must *(Select one)*

A   know that they are mentally unwell.

B   meet the necessary criteria of a certain psychological disorder.

Question 3

Addiction disorders, anxiety disorders, mood disorders, personality disorders, and psychotic disorders are *(Select one)*

A   specific psychological disorders someone can be diagnosed with.

B   categories of psychological disorders within which there are a range of specific psychological disorders.

Question 4

Fill in the blanks with the following terms.

• Personality disorders

• Psychotic disorders

As categories of psychological disorder, _____ are defined by the presence of persistent socially abnormal traits and behaviours, whereas _____ are defined by a state in which there is a psychological misunderstanding of or break from reality.

Skills

Understanding research

Use the following information to answer Questions 5–8.

Read the following abstract from an Australian twin study called 'Comparing the potential causal influence of two indicators of early alcohol use on later alcohol use disorder symptoms.' This study investigated influences on alcohol use disorder (a type of addiction disorder).

Abstract

Age of first drink (AFD) has repeatedly been found to be associated with alcohol use disorder (AUD); however, some studies suggest this is a noncausal effect that may be due to childhood risk factors or familial influences. In contrast to indicators of any early alcohol use, such as AFD, indicators of a pattern of repeated drinking may be more likely to be causally associated with later problematic alcohol use. The current study examined AFD and age of onset of regular drinking (ARD; defined as drinking at least once a month for 6 or more months) as quasi-causal predictors of lifetime AUD symptoms. Participants were 3,005 adult Australian twins who reported having been regular drinkers in their lifetime. Semi-structured interviews were conducted to assess AFD, ARD, AUD, ...symptomatology, and other substance use. Personality traits were assessed via questionnaire... Results...controlling for familial confounds provided evidence for a causal influence of ARD on AUD symptoms, whereby twins with an earlier age of regular drinking than their cotwin had more lifetime AUD symptoms. However, AFD did not significantly predict AUD symptoms after adjusting for confounds. These results suggest that early regular drinking may serve as a causal risk factor for future problems, while early initiation of any alcohol use may indicate genetic liability.

(Davis et al., 2020)

Question 5

This study investigated whether age of first drink (AFD) and age of onset of regular drinking (ARD) had an influence on alcohol use disorder (AUD). The abstract begins by saying that other studies have suggested that AFD 'is a noncausal effect that may be due to childhood risk factors or familial influences.' In a study investigating whether there is a causal relationship between AFD and AUD, what would these 'childhood risk factors' and 'familial influences' be? *(Select one)*

A independent variables

B extraneous variables

C control variables

Question 6

Which of the following methods of investigation did the study use? *(Select all that apply)*

I questionnaire

II case study

III semi-structured interview

IV observational study

Question 7

True or false? The study's population was '3,005 adult Australian twins who reported having been regular drinkers in their lifetime'.

A true

B false

Question 8

Which of the following statements might be regarded as one of the study's conclusions? *(Select one)*

A 'These results suggest that early regular drinking may serve as a causal risk factor for future problems, while early initiation of any alcohol use may indicate genetic liability.'

B 'Age of first drink (AFD) has repeatedly been found to be associated with alcohol use disorder (AUD); however, some studies suggest this is a noncausal effect that may be due to childhood risk factors or familial influences.'

Exam-style questions

Multiple-choice questions

Question 9 (1 MARK)

Which of the following most accurately describes personality disorders?

A A psychological disorder characterised by frequent and unpredictable changes in personality.

B A psychological disorder in which a person's personality does not match their thoughts and behaviour.

C A psychological disorder characterised by culturally abnormal traits and behaviours which cause distress to the individual and those around them.

D A psychological disorder characterised by only negative or malevolent personality traits.

Question 10 (1 MARK)

Which of the following is a potential social risk factor for a psychological disorder?

A childhood trauma

B rumination and pessimistic thinking

C genetic predisposition

D exercise

Question 11   (1 MARK)

Anxiety disorders and mood disorders can both negatively affect a person's emotional state and ability to function. However, a difference between these disorders is that

A   anxiety disorders are more severe and have a greater impact on functioning than mood disorders.

B   anxiety disorders are characterised by heightened arousal, whereas mood disorders can involve lowered or heightened arousal.

C   anxiety disorders have physiological and psychological symptoms, whereas mood disorders only have psychological symptoms.

D   anxiety disorders are more temporary than mood disorders.

Question 12   (1 MARK)

Which option best describes delusions and hallucinations as key symptoms of psychotic disorders?

	Delusions	Hallucinations
A	The perception of a stimulus that is not really there.	A firm belief in something even though there is strong evidence that it is not true.
B	A persistent low mood.	The perception of supernatural stimuli when other people cannot see them.
C	A firm belief in something even though there is strong evidence that it is not true.	The perception of a stimulus that is not really there.
D	The perception of supernatural stimuli when other people cannot see them.	The belief that one is invincible even though one is in danger.

Question 13   (1 MARK)

Increased tolerance to, dependence on, and withdrawal effects when removed from a certain substance or activity are common characteristics of which type of psychological disorder?

A   personality disorders

B   mood disorders

C   anxiety disorders

D   addiction disorders

Short-answer questions

Question 14   (2 MARKS)

Outline one benefit and one limitation of labelling someone with a psychological disorder.

Question 15   (2 MARKS)

Describe one similarity and one difference between bipolar disorders and depressive disorders.

Question 16   (3 MARKS)

Hank has recently been diagnosed with a gambling addiction.

a   Explain one possible social risk factor to Hank's psychological disorder. (1 MARK)

b   Describe one behaviour and one cognition that Hank may have experienced in the past month. (2 MARKS)

Question 17   (3 MARKS)

Isobel doesn't have many friends at school and often spends lunch time sitting by herself reading. Her peers think that she is weird because she doesn't talk to anyone and dresses differently. Isobel doesn't mind spending time alone at school and isn't upset by her peers' judgements.

Based on this information, is Isobel likely to be diagnosed with a personality disorder? Justify your response.

Question 18   (4 MARKS)

Thi has been seeing a psychologist and has told them that they have been having a hard time lately. She describes her experiences, saying that she always feels constantly like something bad is going to happen and that the burden of even small everyday tasks and responsibilities make her fret. Thi also says that whenever she wakes up in the morning, she feels immediately alarmed and starts worrying again, noticing that she feels nauseous and that her heart is racing.
Thi's psychologist has diagnosed her with generalised anxiety disorder.

Identify two characteristics of anxiety disorders that Thi describes and describe two relevant treatments or interventions that Thi's psychologist might suggest.

Questions from multiple lessons

Question 19   (1 MARK)

Which of the following treatments for psychotic disorders could be considered to be an internal factor?

A   supportive family and friends

B   attending a community-led support group for people with psychotic disorders

C   taking antipsychotic medication

D   attending workshops about ways to navigate the workplace with a psychotic disorder

5D SCHIZOPHRENIA AND THE 'TWO-HIT' HYPOTHESIS

Is there a tipping point or single event which can lead to someone experiencing schizophrenia? As you learnt in the last lesson, there is not one clear single cause of schizophrenia as it can result from various combinations of factors. However, one theory, called the 'two-hit' hypothesis, narrows down these combinations, suggesting that schizophrenia results from the combination of two distinct types of factors. In this lesson, you will learn what exactly these two factors are and what this hypothesis says about them.

5A Understanding normality and mental health	5B Factors affecting mental health and coping	5C Major categories of psychological disorder	5D Schizophrenia and the 'two-hit hypothesis'

Study design dot point

- the 'two-hit' hypothesis as an explanation for the development of particular psychological disorders, illustrated by schizophrenia

Key knowledge units

Schizophrenia and the 'two-hit' hypothesis   1.2.9.1

Schizophrenia and the 'two-hit' hypothesis

Schizophrenia and the 'two-hit' hypothesis 1.2.9.1

The 'two-hit' hypothesis   Evaluation of the 'two-hit' hypothesis
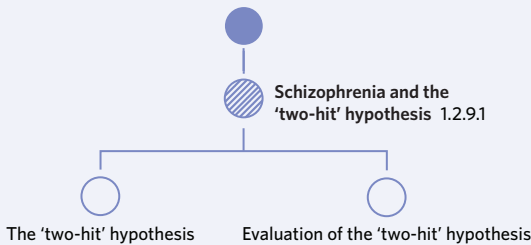
Schizophrenia and the 'two-hit' hypothesis 1.2.9.1

OVERVIEW

As you now know, there are a range of risk factors which can contribute to the onset of a psychological disorder. The 'two-hit' hypothesis is one framework for explaining schizophrenia as resulting from the interaction between genetic and environmental factors.

THEORY DETAILS

In the last lesson, you learnt about **schizophrenia**. This is the most commonly diagnosed psychotic disorder and involves significant impairment due to psychosis, with the disturbance lasting at least six months (American Psychiatric Association, 2013). Some symptoms of schizophrenia include hallucinations (particularly auditory hallucinations, such as hearing voices), negative symptoms (particularly a reduced expression of emotions and avolition), delusions, disorganised speech, and catatonia. Schizophrenia is significantly debilitating, having a major impact on a person's ability to take care of themself and function effectively at work, school, and in social relationships.

Schizophrenia a specific kind of psychotic disorder characterised by the presence of longer-term psychosis and impairment to functioning

The 'two-hit' hypothesis

As you also learnt in 5C, psychological disorders like schizophrenia are not easily attributable to one clear cause, but rather result from a combination of biological, psychological, and social risk factors. Although the biopsychosocial model is now the predominant framework used by psychologists to analyse and treat psychological disorders, other frameworks have been useful for specific disorders.

One such framework is the **'two-hit' hypothesis**, which is used to explain how schizophrenia results from the combination of both genetic and environmental factors.

The 'two-hit' hypothesis or model suggests that schizophrenia develops when two separate 'hits' or events occur in a person's life. The *first hit* is a genetic factor which can create a vulnerability to developing schizophrenia later in life. This can involve inheriting a genetic predisposition for schizophrenia from a family member, or alternatively, it may involve a genetic mutation due to some sort of abnormal embryonic development (i.e. development before birth) that could occur, for example, after experiencing an infection in utero (Bayer et al., 1999). This first genetically-determined hit occurs before birth and primes a person's central nervous system, making it more susceptible to the blow of a second hit later on in the lifespan.

The *second hit* is an environmental event (or events) that cause significant stress. These events may be, but are not limited to, abuse, family trauma, a loved one's death, substance use (e.g. cannabis use), and disease. According to the hypothesis, it is only when this second hit occurs that symptoms of schizophrenia are expressed. In this way, the environmental event of the second hit interacts with the vulnerability caused by the first hit, resulting in the onset of schizophrenia. Most commonly, symptoms arise in late adolescence (Maynard, 2001).

The 'two-hit' hypothesis
a framework which suggests that schizophrenia arises when a person experiences two different types of events: a genetic factor followed by an environmental factor

Lesson link

In lesson **4A: Nature versus nurture**, you learnt about how both hereditary and environmental factors can influence development. The 'two-hit' hypothesis explains schizophrenia in terms of hereditary factors (genetics) and environmental factors.

> (!) **Useful tip**
>
> The *second hit* in the 'two-hit' model may be a biological, psychological, or social environmental influence. In this sense, the biopsychosocial model is not necessarily incompatible with the 'two-hit' model. However, the 'two-hit' hypothesis does differ in that it dictates that a genetic (biological) factor *must* be the first relevant factor leading to a disorder like schizophrenia.
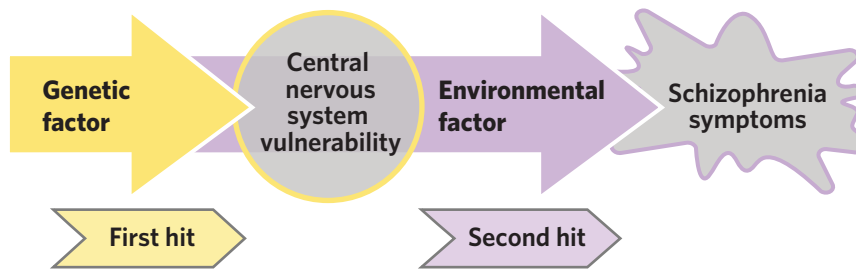
Image: Adapted from Maynard T. M., Sikich, L., Lieberman, J. A., & LaMantia, A. S. (2001). Neural development, cell-cell signalling, and the "two-hit" hypothesis of schizophrenia. Schizophrenia Bulletin, 27(3), 457–476. https://doi.org/10.1093/oxfordjournals.schbul.a006887

Figure 1 The 'two-hit' hypothesis proposes that the onset of schizophrenia arises from two 'hits'. The first hit is a genetic factor which results in long-term central nervous system vulnerability to the effects of a second, environmental hit, which then brings about the symptoms of schizophrenia

Importantly, the two hits must occur in this order; that is, a genetic vulnerability followed by an environmental hit later in the lifespan. When symptoms arise, it is because this second hit has met the disorder's threshold, which can be different for each individual (Maynard et al., 2001). For example, while one person may require several or a more intense 'second hit' to bring about symptoms, for another person, the threshold may be lower. Ultimately, the 'two-hit' hypothesis suggests that while schizophrenia involves genetic factors, these factors are generally not enough on their own to cause the onset of the disorder.

> ◉ **Analogy**
>
> You can think of the 'two-hit' hypothesis for schizophrenia as being similar to a boxer being knocked out after two punches. The first punch or 'hit' weakens their ability to fight with a clear head (just like a genetic factor may increase central nervous system vulnerability), while the second hit is what knocks them out (just like an environmental factor may cause the onset of schizophrenic symptoms).
>
>
>
> **Figure 2** Just like a boxer might need two punches to be knocked out in a match, the 'two-hit' hypothesis suggests that schizophrenia only arises after two hits
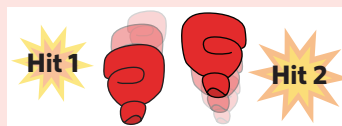
> **⊕ *Want to know more?***
>
> **The 'two-hit' hypothesis and other disorders**
>
> The 'two-hit' hypothesis, while most commonly used for analysing schizophrenia, may also be used to understand the onset of other disorders which result from a combination of genetic and environmental factors. For example, 'two-hit' hypotheses have also been used to explain the onset of cancer, with the first hit being a genetic vulnerability to cancer and the second hit also being environmental factors (Maynard et al., 2001).

Evaluation of the 'two-hit' hypothesis

While the 'two-hit' hypothesis has been especially useful for highlighting the importance of genetic factors interacting with environmental factors in the development of schizophrenia, it has also been criticised for its simplicity. Some research suggests that the development of the disorder is more nuanced, requiring a more complex back-and-forth progression between a range of genetic influences, environmental influences, and other biological influences that must occur at more specific stages of development (Davis et al., 2016).

The complexity and nuanced individual expression of psychological disorders means that psychologists and psychiatrists work within these hypothetical frameworks, but are unable to determine a definite causal relationship. Like most constructs in the field of psychology, further research is needed to better understand the causes of schizophrenia in order to support those who live with it.

Theory summary

This lesson explored the 'two-hit' hypothesis as an explanation for the development of schizophrenia. This theory suggests that schizophrenia develops when two 'hits' occur:

- First, there is a genetic factor that causes a vulnerability to the disorder early in development;
- Second, a stressful environmental factor later in life interacts with this vulnerability, causing the onset of the disorder.

5D QUESTIONS

Theory-review questions

Question 1

Fill in the blanks of the diagram representing the 'two-hit' hypothesis with the following terms.

- Genetic factor
- Environmental factor
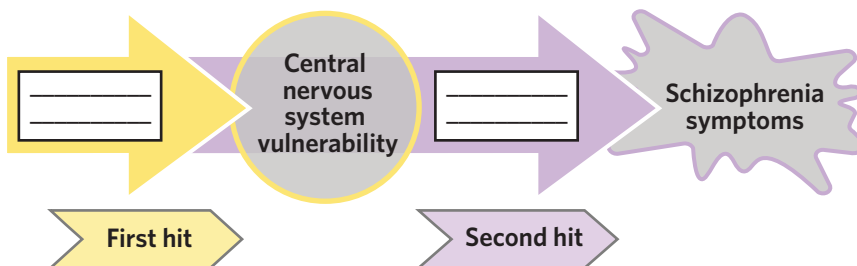
Question 2

True or false? The first 'hit' in the 'two-hit' hypothesis for schizophrenia must be an inherited gene passed on from a family member.

A   true

B   false

Question 3

True or false? The second 'hit' must involve a social stressor, involving the death of a loved one or traumatic experience involving an interaction with another person.

A true

B false

Question 4

Which of the following factors are examples of a potential second 'hit'? *(Select all that apply)*

I growing up in an abusive family environment

II having a loved one die in adolescence

III suffering from an infection in utero

IV illicit drug use

V having an inherited genetic predisposition for schizophrenia

VI suffering from a traumatic breakup

Question 5

True or false? The 'two-hit' hypothesis is a better model than the biopsychosocial model for analysing most psychological disorders.

A true

B false

Skills

Perfect your phrasing

Question 6

Which of the following sentences is most correct?

A The 'two-hit' hypothesis states that schizophrenia develops from the general interaction of environmental and genetic factors.

B The 'two-hit' hypothesis states that schizophrenia develops when an environmental factor interacts with a vulnerability to schizophrenia caused by a genetic factor.

Exam-style questions

Multiple-choice questions

Question 7 (1 MARK)

According to the 'two-hit' hypothesis, schizophrenia results from

A two genetic factors.

B two environmental factors.

C a genetic factor followed by an environmental factor.

D an environmental factor followed by a genetic factor.

Question 8 (1 MARK)

According to the 'two-hit' hypothesis, which of the following options best describes the effect of the first 'hit'?

A It brings about schizophrenic symptoms, which only the second environmental hit can reverse.

B It increases central nervous system vulnerability to schizophrenia, but does not cause the onset of symptoms.

C It increases central nervous system vulnerability to schizophrenia and causes the onset of symptoms.

D It has no effect on a person, with the second hit being the only hit which causes schizophrenia.

Question 9   (1 MARK)

Some research has shown that smoking marijuana in adolescence has been linked to the onset of schizophrenic symptoms. In the 'two-hit' model for schizophrenia, smoking marijuana would be a

A   first hit, as it is a biological influence.

B   first hit, as it is a genetic influence.

C   second hit, as it is an environmental influence.

D   second hit, as it is a social risk factor.

Short-answer questions

Question 10   (2 MARKS)

Describe how the 'two-hit' model for schizophrenia differs from the biopsychosocial model in its explanation for the development of schizophrenia.

Question 11   (3 MARKS)

Using examples, explain the 'two-hit' hypothesis as an explanation for schizophrenia.

Questions from multiple lessons

Question 12   (4 MARKS)

Julian developed symptoms of schizophrenia when he was 17 years old after his mother died in a boating accident. His psychiatrist was able to diagnose the disorder after carefully observing his symptoms for over six months. One such symptom that Julian displayed was the firm belief that after his mother's death, he gained the ability to control the tides at sea.

a   According to the 'two-hit' hypothesis, explain how Julian's mother's death might be accounted for as a contributing factor to the onset of Julian's schizophrenia. (2 MARKS)

b   What kind of symptom is Julian's belief that he is able to control the tides at sea? Justify your response. (2 MARKS)

CHAPTER 5 REVIEW

CHAPTER SUMMARY

This chapter focused on atypical psychological development. Specifically, we learnt about the conceptualisation of normality, mental health as a product of both internal and external factors, the major categories of psychological disorders, and the 'two-hit' hypothesis as an explanation for the development of schizophrenia.

In **5A**, we learnt about the conceptualisation of normality. You now know that what is considered normal is determined by the way in which normality is conceptualised. Approaches to conceptualising normality include:

- the socio-cultural approach
- the functional approach
- the historical approach
- the medical approach
- the statistical approach
- and the situational approach.

We also learnt about typical and atypical behaviours, adaptive and maladaptive behaviours, and mental health, which fluctuates across a continuum ranging from mentally healthy, to mental health problems, to mental health disorders.

In **5B**, we learnt about mental health as a product of internal and external factors which assist individuals to cope with change and challenge. We also learnt about the biopsychosocial approach, which suggests that biological and psychological (internal) factors, as well as social (external) factors, all combine and interact to impact an individual's mental health.

In **5C**, we learnt about five major categories of psychological disorders. Psychological disorders are characterised by the presence of a severe disturbance and sense of distress which significantly impacts an individual's ability to function independently. Diagnosing a psychological disorder comes with benefits and limitations and the DSM-5 is the most widely used guide to classify and diagnose psychological disorders. The five different categories of psychological disorder that we covered were:

- addiction disorders
- anxiety disorders
- mood disorders
- personality disorders
- and psychotic disorders.

In **5D**, we learnt about the 'two-hit' hypothesis as an explanation for the development of particular psychological disorders, illustrated by schizophrenia. The 'two-hit' hypothesis is a framework which suggests that schizophrenia arises when a person experiences two different types of events: a genetic factor ('first hit') followed by an environmental factor ('second hit').

Approaches to understanding normality as a concept:
- the socio-cultural approach
- the functional approach
- the historical approach
- the medical approach
- the statistical approach
- and the situational approach.

Approaches to examining normality as expressed by an individual's behaviour:
- typical behaviour
- atypical behaviour
- adaptive behaviour
- and maladaptive behaviour.

The mental health continuum as a reflection of normality in relation to mental health:

The mental health continuum

Mentally healthy — Mental health problem — Mental health disorder

Used to conceptualise mental health as a continuum

5A Conceptualising normality

5B Factors influencing mental health and coping

The biopsychosocial model

Internal and external factors

5C Psychological disorder

The DSM-5 and diagnosing psychological disorder

Different types of psychological disorder:
- addiction disorders
- anxiety disorders
- mood disorders
- personality disorders
- and psychotic disorders.

5D The 'two-hit' hypothesis

Suggests that the development of a particular psychological disorder involves an individual experiencing a genetic factor followed by an environmental factor

Can be illustrated through schizophrenia

CHAPTER REVIEW ACTIVITIES

Review activity 1: Summary notes

On YouTube, search *'Psychological Disorders: Crash Course Psychology #28'* (CrashCourse, 2014). Watch the video from two minutes and 34 seconds.

Take notes on what is said about the following concepts from across chapter 5:

- Diagnosing psychological disorders
- The socio-cultural approach to normality
- The situational approach to normality
- The medical approach to normality
- The biopsychosocial approach to mental health
- The DSM-5
- Addiction disorders

Review activity 2: Summary table

Copy out the following table and fill in the details to summarise your knowledge on these important components of the different types of psychological disorders.

	Characteristics	Example
Addiction disorders		
Anxiety disorders		
Mood disorders		
Personality disorders		
Psychotic disorders		

Review activity 3: Flowchart

Copy out the flowchart and fill in the blanks to explain the difference between typical and atypical behaviour in terms of conceptualising normality on an individual level.

Typical and atypical behaviour

What is their difference?

Which behaviour reflects 'normal' behaviour for the individual?

Which behaviour reflects 'abnormal' behaviour for the individual?
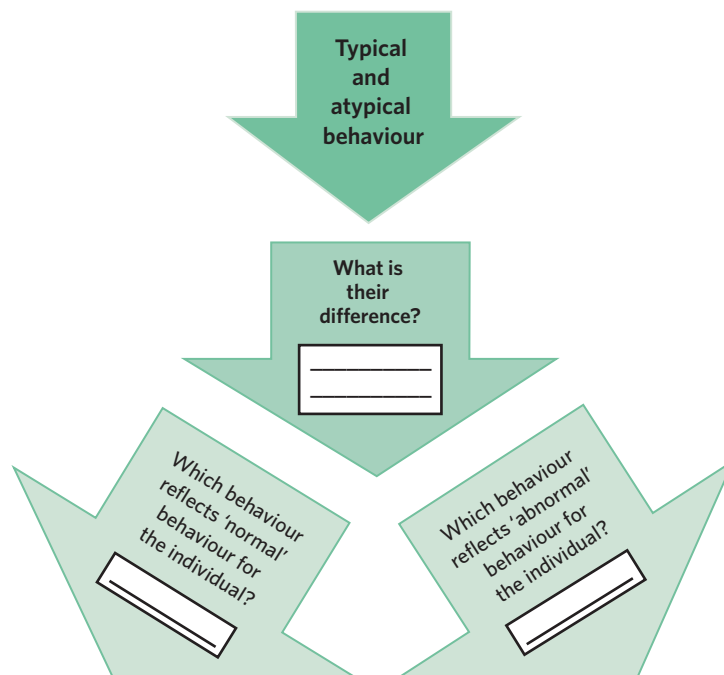
CHAPTER 5 TEST

Multiple-choice questions

Question 1 (1 MARK)

The socio-cultural approach to normality involves defining normality in terms of

A   what can be diagnosed by a specialist according to symptoms that correlate to a particular disorder.

B   what enables an individual to meet the demands of everyday life.

C   what has been measured as the most frequently occurring thoughts, feelings, and behaviours.

D   what is standard according to the norms within a specific society and their dominant cultural beliefs and practices.

Question 2 (1 MARK)

Having supportive friends that assist someone to cope with the change and challenge brought about by a difficult break-up is a/an

A   internal factor.

B   external factor.

C   biological factor.

D   psychological factor.

Question 3 (1 MARK)

Which of the following most accurately describes addiction disorders?

A   A category of psychological disorder characterised by a dependence on a particular substance or behaviour despite negative consequences.

B   A category of psychological disorder characterised by extreme, ongoing worry and distress.

C   A category of psychological disorder characterised by a disabling lowering or heightening of mood.

D   A category of psychological disorders that are characterised by a set of enduring personality traits and behaviours which diverge significantly from cultural and societal norms, causing marked distress or harm for an individual.

Question 4 (1 MARK)

According to the 'two-hit' hypothesis for schizophrenia, which of the following options best describes the second 'hit'?

A   A genetic factor which can create a vulnerability to developing schizophrenia later in life.

B   An environmental event that causes significant stress and results in the expression of symptoms of schizophrenia.

C   A psychological factor arising later in life that causes a genetic predisposition for developing schizophrenia.

D   A genetic factor which guarantees the development of schizophrenia later in life.

Question 5 (1 MARK)

Which of the following options is an example of atypical behaviour?

A   A regularly relaxed person telling his friends to calm down.

B   A regularly reserved person being unable to perform in a play in order to meet the requirements of a drama subject.

C   A regularly sociable person suddenly not leaving their room or seeing any friends.

D   Dancing and shouting at a music festival.

Question 6 (1 MARK)

Taking a prescribed medication to help to overcome symptoms of mental illness is a/an

A   biological factor.

B   psychological factor.

C   social factor.

D   external factor.

Question 7   (1 MARK)

An individual with a psychotic disorder may believe they see somebody that is **not** real. This is an example of

A   catatonia.

B   delusions.

C   disorganised thinking.

D   a hallucination.

Question 8   (1 MARK)

Having a blood relative with schizophrenia can sometimes increase an individual's susceptibility to developing schizophrenia themselves when a genetic predisposition for schizophrenia is passed on. In the 'two-hit' model for schizophrenia, this would be a

A   second hit, as it is a biological influence.

B   first hit, as it is a genetic influence.

C   first hit, as it is an environmental influence.

D   second hit, as it is a social risk factor.

Short-answer questions

Question 9   (1 MARK)

Describe the functional approach to normality.

Question 10   (1 MARK)

Explain what is meant by internal factors that assist an individual to cope with change and challenge.

Question 11   (1 MARK)

Explain what characterises the category of anxiety disorders.

Question 12   (2 MARKS)

Tracy was recently diagnosed with schizophrenia after her psychiatrist carefully monitored her symptoms for a number of months. The psychiatrist cited Tracy's family history of schizophrenia as being a contributing factor.

According to the 'two-hit' hypothesis, explain how Tracy's family history of schizophrenia was accounted for as a contributing factor to the onset of Tracy's schizophrenia.

Question 13   (4 MARKS)

Jessie is worried about her upcoming school exams. In the face of the challenges of having to study in order to get the marks that she desires, Jessie begins to exercise in order to use up stress hormones such as cortisol and adrenaline. Jessie also asks for help from her teacher and her friends in order to best prepare herself for the exams.

a   Identify an internal factor in the scenario and explain how it helped Jessie to cope with the challenge of her exams. (2 MARKS)

b   Identify an external factor in the scenario and explain how it helped Jessie to cope with the challenge of her exams. (2 MARKS)

Question 14   (4 MARKS)

Fiona recently went to see a psychologist to describe some symptoms that she had been experiencing that interfere with her functioning. She describes feeling as though the world is going to end despite not having any evidence to suggest why this would happen, as well as and sometimes seeing objects that are not really there.

Identify and describe two characteristics of psychotic disorders that Fiona describes to her psychologist.

Question 15   (4 MARKS)

Jasmine has experienced a challenging past few days. After breaking up with her long-term partner, she struggled to complete daily tasks such as shopping and washing because she was familiar with an arrangement where she would share these tasks with her partner. She has also been ruminating about what went wrong between them, thinking about it over and over again, to the extent that she cannot concentrate on completing her work.

Identify a social and psychological risk factor and describe how it impacted Jasmine's functioning.

Question 16   (2 MARKS)

Identify an approach to understanding normality and provide an example of normal behaviour according to this approach.

Key science skills questions

Question 17   (1 MARK)

Dr Binto is investigating if playing sport regularly decreases the likelihood of developing a mental health disorder. To investigate this, Dr Binto puts his regular patients into two groups, one group with those who exercise regularly and the other with those that do not exercise at all. Dr Binto has patients from each group meet with a psychologist regularly and records if they develop a mental health disorder across a period of six months.

The dependent variable in this experiment is

A   if patients exercise regularly or not.

B   the likelihood of developing a mental health disorder.

C   if patients are Dr Binto's patient or not.

D   hours of exercise per week.

Question 18   (2 MARKS)

Dr Lieberman is trialling a new medication for depression. He set up two groups, one with participants with depression taking the new medication, and the other with participants with depression taking a placebo pill. Dr Lieberman records whether participants experience an alleviation of depression symptoms across the three-month course of the experiment. Dr Lieberman realises that participants were not asked if they were already taking prescribed medication for depression after having conducted the experiment.

What type of variable is reflected by the potential for participants to already be taking depression medication? Justify your response.

Questions from multiple chapters

Question 19   (1 MARK)

Aphrodite has an addiction disorder. She gets incredibly excited when she is waiting to see if she will win money from a bet, with her heart rate increasing and her pupils dilating.

Which division of Aphrodite's nervous system is dominant when she is waiting to see if she has won a bet?

A   sympathetic

B   parasympathetic

C   central

D   spinal cord

Question 20   (2 MARKS)

As a child, Lotte fluctuated between clinging to and rejecting her mother. Lotte reported that her needs were inconsistently met by her mother, often not being fed regularly enough and only receiving emotional support on rare occasions. As an adult, Lotte describes this impacting her relationships with friends and family, often not asking people for help when she feels as though she really needs it.

Identify the type of attachment that Lotte is describing and explain how it could act as a social factor that increases the likelihood of developing a mental health disorder later in life.

UNIT 1

AOS3

Student-directed research investigation

In this area of study students apply and extend their knowledge and skills developed in Areas of Study 1 and/or 2 to investigate a question related to brain function and/or psychological development. Students analyse the scientific evidence that underpins the research in response to a question of interest. They then communicate the findings of their research investigation and explain the psychological concepts, outline contemporary research and present conclusions based on the evidence.

Outcome 3

On completion of this unit the student should be able to investigate and communicate a substantiated response to a question related to brain function and/or development, including reference to at least two contemporary psychological studies and/or research techniques.

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STUDENT–DIRECTED RESEARCH INVESTIGATION GUIDE

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 as a digital presentation, an oral presentation, or a written report.

*To conduct this research investigation, you will need to refer to the skills you have learnt in **Chapter 1: Science skills and research methods.** 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.*

Study design dot points

- the characteristics of effective science communication: accuracy of psychological information; clarity of explanation of psychological concepts, ideas and models; contextual clarity in terms of importance and implications of findings; conciseness and coherence; and appropriateness for purpose and audience
- the psychological concepts specific to the investigation: definitions of key terms; use of appropriate psychological terminology, conventions and representations
- the use of data representations, models and theories in organising and explaining observed phenomena and psychological concepts, and their limitations
- the nature of evidence and information: distinction between opinion, anecdote and evidence, weak and strong evidence, and scientific and non–scientific ideas; validity and reliability of data including sources of possible errors or bias
- the influence of social, economic, cultural and ethical factors relevant to the selected psychological investigation

A step–by–step guide on research investigations

This assessment task will involve a range of research steps that need to be carried out in a research investigation. To help you approach this task, this guide will break down each of the steps for you and provide examples of each step.

The research investigation will involve an analysis of the scientific evidence which underpins the research question you choose to focus on. After you have looked at the scientific evidence, you will communicate your findings, explain relevant psychological theories and concepts, refer to contemporary research and present your conclusions from the available evidence. You will need to refer to **at least** two contemporary psychological studies and/or research techniques.

The research question you investigate will be selected from the list of questions from six topics outlined in the VCAA study design, or be created with your teacher about a topic covered in Areas of Study 1 and 2.

(VCAA, 2020)

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, including validity and reliability, accuracy, the use of data and errors to name a few. However, there are other key knowledge points which you may not have come across until now. Make sure to learn about these research skills which are introduced and explained below before you start your investigation.

Effective scientific communication

For this assessment, it is important to consider who the target audience is. This is most likely to 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 a more formal language style. 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?

☐ Is the information appropriately presented for my target audience?

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 we need to consider before starting this assessment.

Evidence involves information which either supports or rejects claims, beliefs, or ideas. When looking at the strength of a source of evidence, there are many things we need to consider. These include:

- What form of evidence is it?
- Do we 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.

> ### 📖 *Research spotlight*
>
> If you choose to study at university, you will most likely hear of *peer-reviewed studies/research*. In the field of psychology, this usually involves research articles which 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 of 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 which are peer-reviewed are said to generally have strong evidence and have 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 1.

Figure 1 Simple pyramid of evidence

To understand why the forms of evidence are ordered as they are in figure 1, we need to understand what these sources of evidence are. The three sources of evidence include:

- **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 which may not have been scientifically tested.
  - Expert opinions differ from and are more valuable and reliable than normal opinions. If an individual who is not educated on a topic gives an opinion, this form of evidence is significantly weaker.
- **Anecdotal evidence:** a personal recount of an event or experience. This can help to provide insights on 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, the distinction between these two ideas are:

- **Scientific ideas:** ideas which have developed using the scientific method, which involves rigorous testing and empirical observation
  - The scientific method is visualised in figure 2 and involves a rigorous process with multiple steps to test a hypothesis and collect empirical evidence
  - These ideas are well regarded by other scientists and can lead to strong evidence
- **Non-scientific ideas:** ideas which are developed through non-empirical methods, such as anecdotal evidence
  - Less likely to lead to strong evidence for your psychological investigation

You have already learnt about the concepts of *reliability* and *validity*, as well as *sources of error* in studies. When conducting your research and drawing conclusions on the information, it is important to consider whether these studies are valid and reliable, and any errors they may have.
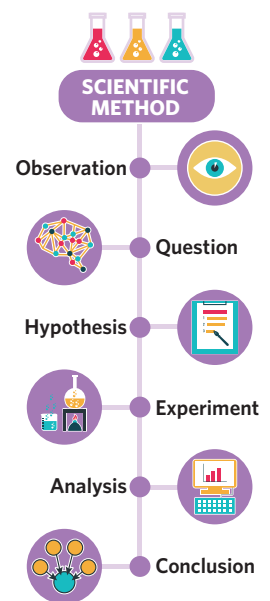
Image: Becris/Shutterstock.com

Figure 2 The process of the scientific method

Influence of social, economic, cultural and ethical factors

When looking at psychological research studies, 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:

- **Social factors**: the conditions of an individual's lifestyle, most of which are assigned from birth. These factors include an individual's sex, race, early life experiences, support network and social class, and can often lead to discrimination and prejudice.
    - The unique social conditions of a researcher may create biases as they may record or report data subjectively or incorrectly as they do so in accordance with their beliefs and expectations.
    - There also may be individual differences among different participants which may negatively affect the results of a study.

- **Economic factors**: financial factors such as the income of each individual and the exchange of goods and services that affect participants, 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 research 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?'

- **Cultural factors**: the social norms, expectations, rituals, practices and beliefs of certain societies or groups. Cultural factors, such as rituals and beliefs, are often passed through generations.
    - Different cultural factors may lead to differences in behaviours between participants, which need to be controlled for.
    - Different studies may be relevant to some cultures but not others depending on their cultural practices.

- **Ethical factors**: the individual beliefs of what is right and wrong, including an individual's morals and values.
    - In psychological research, this mostly pertains to whether the researcher followed the ethical guidelines and principles and safeguarded the rights of the participants during the study.

When looking at any psychological studies, it is important to consider the influence of any of these factors on how the study was conducted, as this could affect the reliability and validity of the results of the study.

We will now go through the steps required to undertake a research investigation. Each step provides guidelines and advice of what is typically included in each section.

Sex

Image: bsd/Shutterstock.com

Figure 3 Sex is one type of social factor

Funding

Image: bsd/Shutterstock.com

Figure 4 How much funding a study receives and who provides this funding is an economic factor

Traditions

Image: bsd/Shutterstock.com

Figure 5 The cultural traditions of each individual is a cultural factor

Morality

Image: bsd/Shutterstock.com

Figure 6 Morals are an ethical factor

Step 1 – 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 finding a 'gap' in the literature which needs to be examined. The researcher then uses this to create a research question. For your assessment, your teacher will most likely ask you to choose one of the questions listed in the VCAA study design. There are over 60 questions which fall under the six topics of:

1 Biopsychology
2 Brain and the use of technology
3 Cognition
4 Psychological development
5 Mental health and disorder
6 Changing thoughts, feelings, and behaviours

These questions are all related to content you look at in Unit 1 of VCE Psychology. You also have the option to work with your teacher to develop a new research question. To complete this assessment, your teacher may ask you to work alone or in a group.

Step 2 - 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 need to find at least two contemporary psychological studies or research techniques. 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.

On top of the two or more contemporary psychological studies or research techniques, you may need a few other sources which provide an in depth explanation of the key terms and concepts referred to in these studies. This will vary depending on the research question you have chosen.

> **Research spotlight**
>
> 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, others think 15 or 20. It's important to consider when the research was published as social, economic and cultural 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. 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 and/or research techniques you have found are a reliable source of evidence? Should you use these as part of your investigation? 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 which 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, but it is still important to see if the sources provide strong evidence. It is also helpful to check to see if the source is *peer-reviewed*.

> **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.

Step 3 - Collate the information you have found

Now that you have completed your research (remember that you need at least two psychological studies and/or research techniques), you need to collate and synthesise (bring together) this information. In 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**
>
> 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 assessment task 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 4 – 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. VCAA suggests digital presentations (such as a powerpoint), oral presentations, and written reports as possible presentation methods you could use for this assessment task.

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 7 presents a funnel which demonstrates the order in which you could present your information.
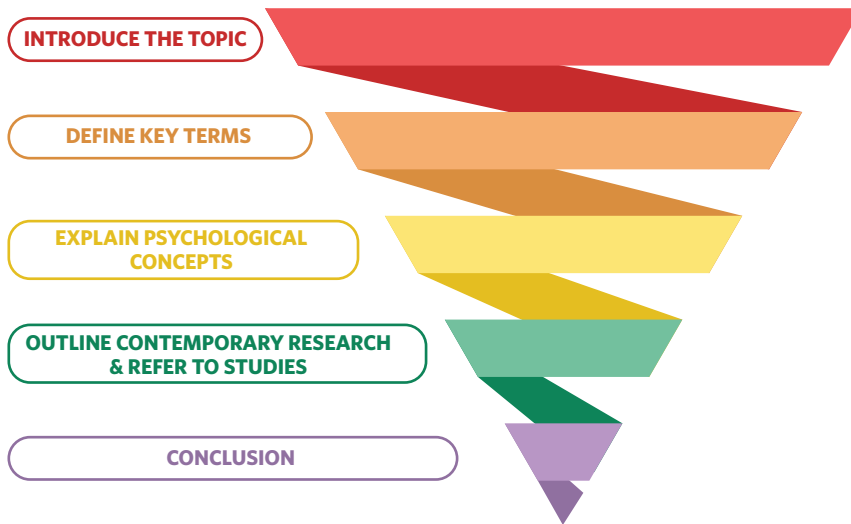
Figure 7   The 'funnel' method of presentation

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 provides more specific information for 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 which 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.

Refer to the example below of what the first two sentences for a topic introduction could look like. Throughout this guide, we will work through the research question *'How does Freud explain the 'preconscious', 'conscious' and 'unconscious' mind?'* from the third topic 3 *cognition* in order to provide you with examples on how to write and structure your investigation.

Figure 8   Introducing the topic is the first, and most broad section according to the 'funnel' method of presentation

The paragraph below is an example of how you could introduce a topic. 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.

Psychoanalysis is an approach to therapy developed by Austrian neurologist Sigmund Freud in the 1890s. Freud's psychoanalytic theory saw the discovery of three different levels of consciousness; the preconscious, the unconscious and the conscious mind (McLeod, 2015; Zepf, 2011). In analysing the relationships between these levels of consciousness, Freud suggested that the deep-rooted memories, thoughts and feelings of patients, which were believed to be inaccessible, could be procured during psychoanalytic therapy (Zepf, 2011). 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.

! **Example**

For the example research question, the key terms 'preconscious', 'conscious' and 'unconscious' in relation to Freud need to be defined.

For example, the definition of the 'preconscious mind' as according to McLeod (2015) is *'the mental state which contains thoughts and feelings an individual is not currently aware of but can be brought to conscious awareness with little effort'*.

Figure 9 The second section of the 'funnel' method of presentation is to define 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.

! **Example**

Although the key term 'preconscious' 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 the contemporary psychological studies or research techniques. An example explanation of the 'preconscious' mind is:

Freud described the preconscious mind as a 'waiting room', where thoughts and feelings are stored so that they can be easily accessed and drawn into conscious awareness (McLeod, 2015). In such a way, the preconscious mind acts as a mediator between the unconscious mind, where thoughts and feelings are extremely difficult to access, and the conscious mind, where a person is aware of their thoughts and feelings.

Figure 10 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 first 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 also 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 the more in depth explanation of the psychological concept.

Outline contemporary research/research techniques

It is now time to outline what you have found from your examination of contemporary psychological studies or research techniques.

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 kind of evaluation of weaknesses may link to ideas for future studies.

Figure 11 The fourth section involves outlining contemporary research and/or research techniques

> ⓘ *Example*
>
> 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 one of the contemporary research sources 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.
>
> *The study conducted by Dehaene et al. (2006) relied on neuroimaging techniques to analyse the processing abilities of the unconscious, preconscious and conscious mind. During the study, the researchers compared neuroimaging results from multiple past studies. These comparisons involved the researchers examining the general differences between the attention levels of the unconscious, preconscious and conscious mind across multiple studies (Dehaene et al., 2006). The findings of the study suggested that the presentation of different stimuli to activate specific levels of consciousness led to varied results among previous studies. Although this discovery contributes to the existing body of knowledge, the researchers were unable to explicitly identify the exact levels of attentional activation which would categorise each level of the mind (Dehaene et al., 2006). For this reason, further research should focus on being able to identify the exact quantifiable differences between these different mental states.*

Outline your conclusions

In lesson 1H: Evaluation of research, you learnt that a conclusion is a statement regarding the results of an investigation as to whether the hypothesis was supported or not. 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 which provides an answer to your research question. In such a way, it is not so much stating whether a hypothesis is supported or not, but more involves 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 12 The final section of the 'funnel' method of presentation involves outlining your conclusions

> ⓘ *Example*
>
> This example shows you how to write a conclusion referring to one psychological study. However, when you write your own conclusion, you should refer to all psychological studies/research techniques (remember that you need at least two) that you used.
>
> *This investigation has revealed that Freud explains the unconscious, preconscious and conscious mind to function as an interrelated and complementary process. Contemporary research supports Freud's theory in which individuals are least aware of their thoughts and feelings in the unconscious mind to the most aware in their conscious mind (Dehaene et al., 2006). The preconscious mind serves the purpose of storing thoughts and feelings which an individual is not consciously aware of, but can access with minimal effort (Dehaene et al., 2006). Future research should address the quantifiable differences of attentional processes for each of these three mental states.*

Step 5 – 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.

Refer to figures 13 and 14 for an example of one powerpoint slide which effectively communicates key terms, and another powerpoint slide which ineffectively communicates key terms.

Figure 13 A powerpoint slide with effective communication

Figure 14 A powerpoint slide with ineffective communication

When comparing figure 13 with figure 14 there are some clear differences which impact their communication effectiveness. These include:

- The smaller font size, the cursive and unclear font style, and the big chunk of text in figure 14 making it much more confusing and requiring more effort to read than the slide in figure 13.

- Figure 13 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 7.

If you have chosen to present your work as a written report, refer to figure 15 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.

As presented in figure 15, the largest proportion of your report should focus on the research you find, either as contemporary psychological studies and or/research techniques. This is due to the contemporary research acting as the main form of evidence that you should use to answer your chosen research question. The guide in figure 15 can also double as a structure you can use for an oral presentation, with your oral presentation spending the least amount of time introducing the topic and the most amount of time outlining contemporary research.

It is important to understand the differences between this guide and the funnel displayed as figure 7. The proportions of each box in figure 15 demonstrate the amount of time (in an oral presentation) or words (in a written report) you should spend for each section. This is different to the funnel in figure 7 which involves the widest band showing the most broad section of the presentation, and the least wide band showing the least broad and most specific section.
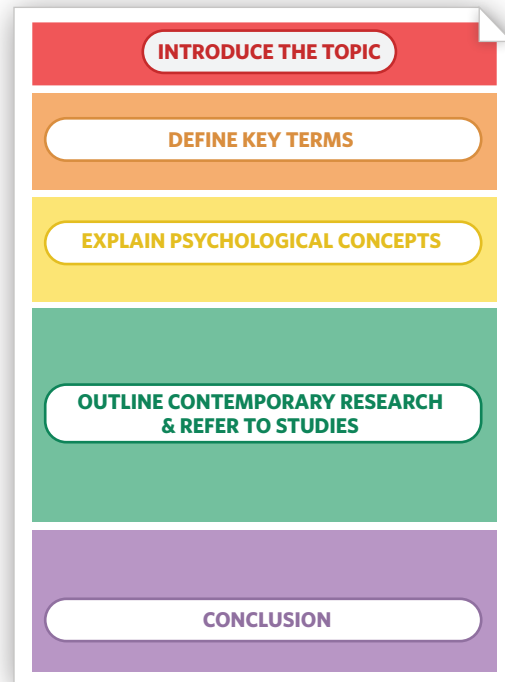
Figure 15   A guide on how much information you should include for each section of your report

---

Useful tip

You will most likely 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 which 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. Here is an example of a reference list for the sources used in this guide:

Dehaene, S., Changeux, J., Naccache, L., Sackur, J., & Sergent, C. (2006). Conscious, preconscious, and subliminal processing: a testable taxonomy. *Trends in Cognitive Sciences, 10*(5), 204–211. https://doi.org/10.1016/j.tics.2006.03.007

McLeod, S. (2015). *Unconscious mind.* Simply Psychology. https://www.simplypsychology.org/unconscious–mind.html

Zepf, S. (2011). The relations between language, consciousness, the preconscious, and the unconscious. *The Scandinavian Psychoanalytic Review, 34*(1), 50–61. https://doi.org/10.1080/01062301.2011.10592883

Note: 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.

UNIT 2

How do external factors influence behaviour and mental processes?

A person's thoughts, feelings and behaviours are influenced by a variety of biological, psychological and social factors. In this unit 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. They 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 an individual and groups. They examine the contribution that classical and contemporary research has made to the understanding of human perception and why individuals and groups behave in specific ways.

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UNIT 2

AOS1

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 two aspects of human perception – vision and taste – and analyse the relationship between sensation and perception of stimuli. They consider how biological, psychological and social factors can influence a person's perception of visual and taste stimuli, and explore circumstances where perceptual distortions of vision and taste may occur.

Outcome 1

On completion of this unit the student should be able to compare the sensations and perceptions of vision and taste, and analyse factors that may lead to the occurrence of perceptual distortions.

UNIT 2 AOS 1, CHAPTER 6

Sensation and perception

06

6A   Sensation and perception

6B   Vision

6C   Taste

6D   Perceptual distortions, fallibility and synaesthesia

Key knowledge

- sensation and perception as two complementary but distinct roles in the reception, processing and interpretation of sensory information

- taste and vision as two examples of human sensory systems, including the roles of sensory receptors and receptive fields, transmission of sensory information to the brain, and representation of sensory information in the cerebral cortex

- the influence of biological, psychological and social factors on visual perception, including depth cues, visual perception principles and perceptual set

- the influence of biological, psychological and social factors on gustatory perception, including age, genetics, perceptual set (including food packaging and appearance) and culture

- the fallibility of visual and gustatory perception systems, demonstrated by visual illusions and the judgment of flavours (influence of perceptual set, colour intensity and texture)

- distortions of perception of taste and vision in healthy, intact brains as providing insight into brain function related to perception, illustrated by synaesthesia

6A SENSATION AND PERCEPTION

You're walking past a bakery and see fresh fruit buns being made in the window. Without even seeming to think, you feel warm inside and even feel a little hungry. But how do our senses even pick up on this image from our environment? And how do we go so quickly from seeing something, to registering it, and noticing its effect on our body and emotions? There are two fundamental processes at play here: sensation and perception. In this lesson, you will learn the difference between these two processes and how psychologists explain the operations that occur within them.

6A Sensation and perception	6B Vision	6C Taste	6D Perceptual distortions, fallibility and synaesthesia

Study design dot point

- sensation and perception as two complementary but distinct roles in the reception, processing and interpretation of sensory information

Key knowledge units

Sensation	2.1.1.1
Perception	2.1.1.2
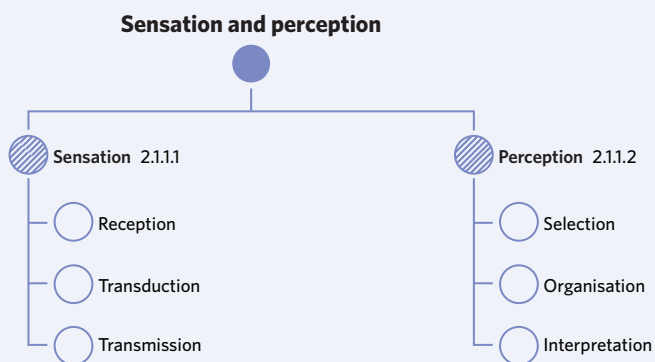
As mentioned, when we see the fruit buns being made, the processes of sensation and perception occur. It is important to note that although related, these are two distinct processes.
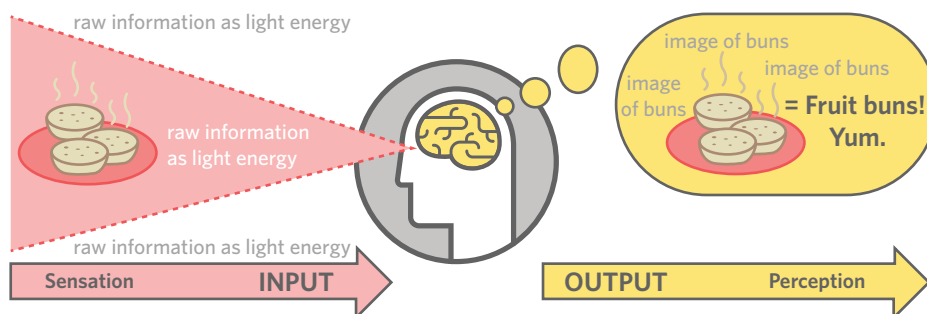
Image: Vectorfair.com/Shutterstock.com

Figure 1 Sensation occurs when an input of raw sensory information is first received from our environment and then sent to our brain. Perception occurs when the brain processes this information and creates an output of conscious registration of this information

Here, sensation occurs when our senses, in this case, our sight, receive a stimulus (i.e. the light energy reflected from the buns) and send this unprocessed (raw) input to the brain. Next, perception occurs, involving our brain processing this raw input and assigning meaning to it. Perception allows us to 'see' an image (the output) of the buns and understand consciously what we are looking at. Within sensation and perception, there are important processes that allow them to occur. We will now explore these in detail.

ACTIVITY 1

In the following scenarios, fill in the gaps with either 'S' for sensation or 'P' for perception depending on what is occurring.

1   Your nose picks up a smell _____ and you realise there is something stinky in the air _____, so you check your shoes to make sure you haven't stepped in dog poo.

2   You slap your arm because you realise _____ that your skin has received the stimulus of a bug biting you _____.

3   Your tongue picks up a taste _____ and you spit out your coffee because you register that it has salt in it instead of sugar _____.

> (!) **Useful tip**
>
> One way to think about the difference between sensation and perception broadly is to remember that:
>
> - In sensation, we are *not* consciously aware of the sensory stimuli that we are dealing with. Further, sensation is made up of biological processes that are relatively similar for everyone.
> - On the other hand, perception is what enables us to become aware of the sensory stimuli we are dealing with. Unlike sensation, the process of perception is more subjective and involves an individual's own interpretation of sensory information. Differences in perception can explain the way two different people can understand the same sensory stimulus in different ways.

Sensation 2.1.1.1

OVERVIEW

Sensation refers to the process of our sensory organs detecting and receiving raw sensory information about a stimulus and responding to it. It comprises three stages: reception, transmission, and transduction.

THEORY DETAILS

Sensation is the process involving our senses detecting some stimulus and then sending this unprocessed sensory information to the brain. By the end of sensation, the brain is not yet able to consciously register the sensory stimulus. In other words, at this stage, you are not yet aware of what your senses have picked up.

Sensation the process of receiving and detecting raw sensory information via our sensory organs and sending it to the brain

Sensation occurs in three distinct stages:

- Reception, where we first receive the sensory information
- Transduction, where this information is converted into a neural impulse
- Transmission, where the information is transmitted (sent) to the brain for processing

Reception

The very first stage of sensation is reception. **Reception** is simply the process in which our sense organs first receive information about a stimulus from our internal or external environment.

Reception when a sensory stimulus is first detected by a sensory organ

> (+) **Want to know more?**
>
> How many senses do we have? Most people answer this with five: sight, touch, taste, smell, and sound. Did you know that there are actually other senses? For example, we have an awareness of our body movement and the orientation of our body in space. This is known as 'proprioception' and is often referred to as our sixth sense. There are other senses too, including our sense of balance, time and so on.

Sensory receptor

Figure 2 Our skin has various types of sensory receptors that can receive information such as the pressure or temperature of water

Sensory receptors

Reception occurs when information about a stimulus is *received* by our **sensory receptors**, which are the receptors on the ends of a neuron that specialise in detecting and receiving information about certain sensory stimuli. Our sensory organs, such as our eyes, tongue, and skin, each have their own unique sensory receptors that are designed to receive specific sensory data. For example, the sensory receptors of our eyes are designed to receive light, and the sensory receptors of our skin are designed to receive things like pressure or temperature.

Sensory receptors the receptors on a neuron that specialise in receiving information about specific kinds of sensory stimuli

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🧠 *Want to know more?*

Do you ever wear clothes with a really itchy tag rubbing against your skin? Have you noticed how this sensation of the tag against your skin fades away over time? This is due to the process of *sensory adaptation*, which involves a reduction in the responsiveness of sensory receptors to sensory information when it remains unchanged over time. If sensory adaptation did not occur, we would be extremely overwhelmed due to our constant awareness of all our sensations at any given time, such as the pressure of our earphones inside our ear and the sensation of our glasses pressing against our nose.

Receptive fields

The stimuli that we are able to receive with our sensory receptors are limited by something called a receptive field. **Receptive fields** are the section of space in which a stimulus must be present in order for our sensory receptors to detect and respond to it. Each individual sensory receptor has its own receptive field. Anything outside a receptive field is not detectable by that receptor, and therefore unable to be sent to the brain.

Receptive field the space in which a sensory stimulus can be detected by a sensory receptor

Use one of your fingers to touch your arm. You are able to feel this touch because a sensory stimulus (in this case, your finger) has been detected by your skin's sensory receptors because it is within their receptive field. If you hover your finger over your skin, you cannot feel the touch anymore because the sensory stimulus (your finger) is no longer within these particular skin receptors' receptive fields. This shows that the sensory receptors that receive pressure have a very small receptive field; i.e., something must be in direct contact with them. Contrast this with the sensation of heat: you don't have to touch a hot object directly to feel its warmth radiating on your skin. This would mean that sensory receptors that receive temperature have larger receptive fields than those for touch. Each of our organ's sensory receptors have different receptive fields, some larger than others.

ACTIVITY 2

Visual receptive fields

You can tell the difference between what is in the receptive field of one eye's sensory receptors compared to the other eye's. Hold your finger in front of your face and close one eye. Then try closing the other eye instead. Do you notice that your finger appears to move slightly each time, even though it is remaining still?

This is because the sensory receptors in each eye have slightly different receptive fields (portions of space that they can see) due to our eyes being a few centimetres apart. Even though your finger isn't really moving, the portion of sensory space detectable by each eye is different because of its receptive field, giving rise to the different angles of your finger.

Image: Vectorfair.com/Shutterstock.com

Transduction

The data that is first received by our sensory receptors is not in a format which can be sent to the brain. As mentioned, the kind of data first received depends on the type of sensory receptor; for example, stimuli received by the sensory receptors of the tongue are in the form of chemicals from our food. **Transduction** is the process in which this raw sensory data received by receptors is converted into a new form which can be sent to the brain. As you learnt in chapter 2, messages sent to the brain travel along neural pathways, and therefore, must be in the form of an *electrochemical* neural message or impulse (also known as an *action potential*).

Transduction the conversion of raw sensory information detected by sensory receptors into a form that can be sent to the brain
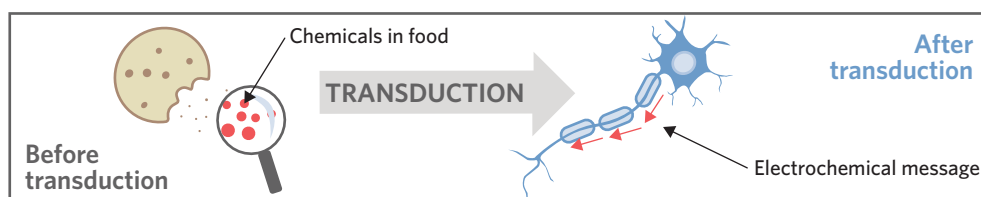
Figure 3 Transduction is the conversion of raw sensory data (e.g. chemicals in our food) into another type of data (i.e. electrochemical signals) that can be sent along neurons to our brain

Transmission
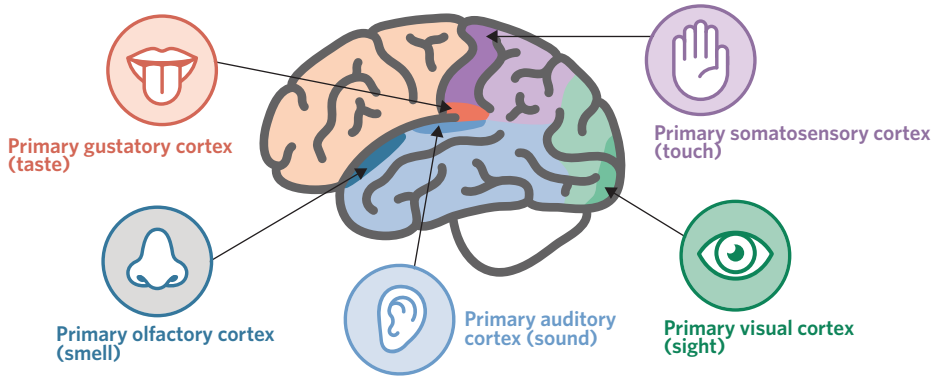
Image: Sudowoodo, Pikovit/Shutterstock.com

Figure 4 Transmission involves sending sensory information to the relevant area of the cerebral cortex

Once the sensory data has been converted into a sendable neural impulse, transmission occurs. **Transmission** is the process of sending these action potentials to the areas of the brain responsible for processing sensory information. Most sensory data sent in this form travels via the thalamus and ends up in an area of the cerebral cortex. The type of sensory message sent (smell, taste, sight, etc) determines which area of the cerebral cortex the message is sent to. You can see where various types of sensory messages are first sent in figure 4. For a refresher on the cerebral cortex, head to lesson 2E. Once these three processes have occurred, perception is able to take place in the brain.

Transmission the process of sending sensory information as a neural impulse to the part of the brain responsible for processing sensory information
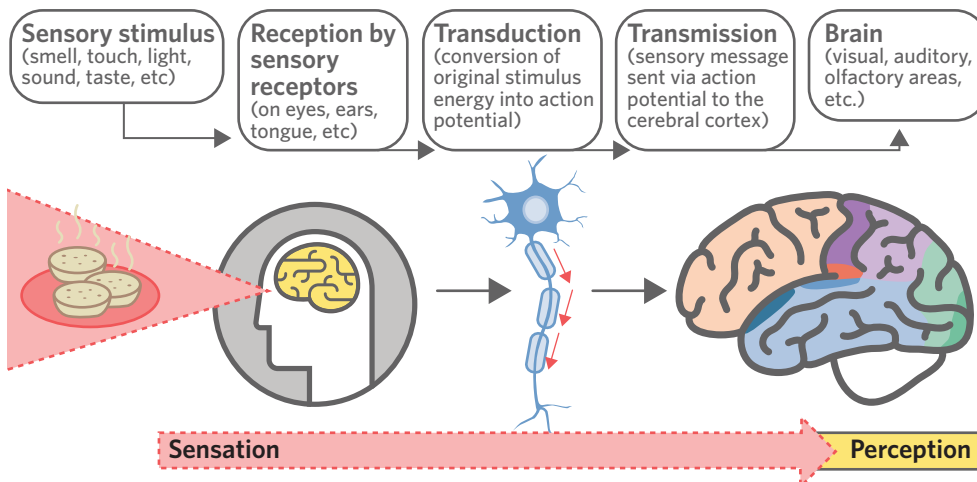
Image: Sudowoodo, Pikovit/Shutterstock.com

Figure 5 The processes of sensation, including reception, transduction, and transmission, all need to occur before perception can take place

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📖 *Psychology in practice*

Psychophysics and absolute thresholds

Psychophysics is a branch of psychology that studies the relationship between the energy of physical stimuli and how they are processed as mental events. A psychophysicist may ask questions like, 'How much energy does a stimulus need to have for it to be detected by someone's sensory receptors?', or more specifically, 'How bright does a light source need to be in order for someone to see it?'. These questions can be answered with a number that is called the *'absolute threshold'*; i.e., the lowest possible level of energy a sensory stimulus needs to have in order for it to be detected by an organism (at least *half* the time).

Have you ever had a hearing test or vision test? These use psychophysical measures, including absolute thresholds, to compare your level of hearing or vision to what is considered normal. Your absolute threshold for hearing would be the lowest level of a tone you can hear at least half the time.

Image: lenoleum/Shutterstock.com

Figure 6 Hearing and vision tests use techniques developed by psychophysics

Perception 2.1.1.2

OVERVIEW

Once our brain has received sensory data, we need to conduct some processes to make sense of it. This overall process is called perception, and like sensation, it consists of three important substages: selection, organisation, and interpretation.

THEORY DETAILS

Perception is able to occur once the relevant brain areas have received the sensory message. Perception refers to the general process in which we come to understand sensory stimuli and assign meaning to it. Although the processes within perception can occur automatically and unconsciously, perception allows sensory information to enter the level of conscious awareness.

Perception the process of selecting, organising, and interpreting sensory information to be able to understand it

Selection

Recall your first day of psychology class. Can you remember the classroom? What about the posters that were on the wall or the amount of light in the room? Were you even paying attention to all these things?

Selection is the process of attending to certain features of sensory stimuli to the exclusion of others. Before this stage of perception, our sensory organs have sent our brain many sensations about our environmental stimuli. However, if we were to pay attention to all of these sensations, our brain would become overloaded with information. Selection helps us to narrow down the information that has been sent to us, allowing our brain to attend to just a few features of sensory stimuli at a time. This process can occur consciously or unconsciously: we may consciously choose to block out distracting stimuli, such as background noise, to concentrate on one stimulus such as an essay we are writing. On the other hand, selection can occur unconsciously, such as as only attending to the most significant or *salient* features of an image e.g. its bold lines or sharp edges.

Selection the process of attending to certain features of sensory stimuli to the exclusion of others

So perhaps instead of paying attention to the posters on the wall of your psychology classroom, or how much light was coming into the room, you selected information like your friends or what the teacher was saying in that first psychology class.

Organisation

Once our brains have selected the features of stimuli to attend to, we need to organise them in a way that allows us to then interpret them and make sense of them. **Organisation** refers to the process of regrouping together the individual components of sensory information that we have *selected* so that we are presented with meaningful wholes and cohesive information. Once organised, stimuli is in a more digestible form that allows us to recognise patterns or categories in *interpretation*.

Organisation the process of regrouping features of sensory stimuli together in order to form cohesive and meaningful information

---

⊙ *Analogy*

Have you ever done a 1000 piece puzzle? Did you start by organising the pieces into groups that would then create certain sections of the puzzle? This is kind of like what our brain does during the selection and then organisation stage of perception.

- First we *select* which pieces we want to work with
- Then we *organise* the pieces into meaningful groups that could form a whole section of the puzzle
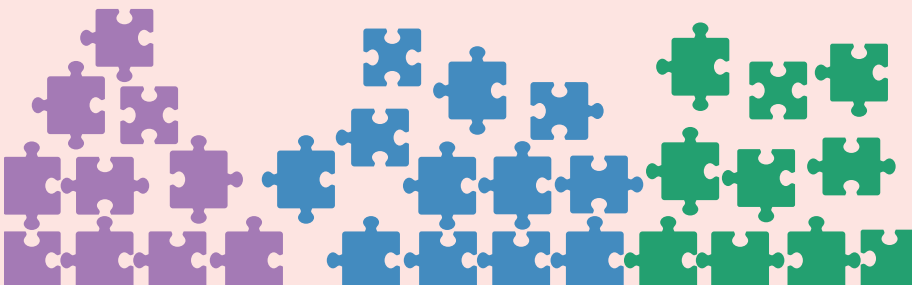
Figure 7 Like when doing a giant puzzle, our brain selects the pieces we want to attend to and then organises them into a group ready to be interpreted

Interpretation

The final component of perception is interpretation. **Interpretation** specifically refers to the assignment of meaning to sensory information. After stimuli is *selected* and then grouped together in *organisation*, we can begin to make sense of it. We can also become consciously aware of sensory stimuli; without interpretation, we would not register and understand what we are looking at, smelling, feeling, etc.

Importantly, interpretation relies on a range of factors including our memory of past events, our current mood, concentration levels, expectations, and beliefs. For example, when we see an unfamiliar flashing light at night, the way we interpret it might be dependent on our memory (do we know a house nearby that the light could have come from?), our mood (are we scared or relaxed?), our beliefs (do we only believe in scientific explanations?) and our expectations (would we expect someone to be using a light at this time?).

Several parts of the brain are utilised to interpret one sensory stimulus. As mentioned, the type of stimulus determines where the sensory message is first sent, but this initial area of the brain may then send the message on to other areas of the brain for further processing.

Theory summary

Whenever we are aware of a stimulus in our environment, we can be sure that both sensation and perception have occurred.

- Sensation is the process by which we receive sensory information from our surroundings with our senses, and send this raw data to the brain
- Perception is the process in which we process this information and make sense of the world around us

Interpretation the process of understanding and assigning meaning to sensory information

Image: Creative Instinct/Shutterstock.com

Figure 8 How we interpret stimuli is dependent on a range of factors. We may see an ambiguous figure in the distance as a ghost depending on our factors such as our own beliefs and mood.

Sensation	Perception
1. Reception. Our sensory organs receive stimuli.	**1. Selection.** Our brain attends to certain features of sensory stimuli (consciously or unconsciously).
2. Transduction. The sensory data is converted into a form that can be sent as a neural impulse.	**2. Organisation.** Our brain organises information into meaningful groups.
3. Transmission. The sensory message is sent to the brain.	**3. Interpretation.** Our brain makes sense of the information using the present context and past experiences.

Figure 9 Summary of the stages of sensation and perception

6A QUESTIONS

Question 1

Which of the following processes deals with sensory data? *(Select one)*

A   sensation

B   perception

C   both

Question 2

Fill in the blanks with the following terms.

- Conscious
- Unconscious

When sensation occurs, we are _____ of the sensory stimuli we are receiving. When perception occurs, we are able to become _____ of it.

Question 3

Fill in the blanks with the following terms.

- Processed
- Raw

Sensation and perception involve detecting and responding to sensory data. During sensation, sensory data is _____. During perception, the data is _____.

Question 4

Fill in the blanks of the diagram with the following terms.

- Perception
- Transduction
- Transmission
- Sensation

Image: Sudowoodo, Pikovit/Shutterstock.com
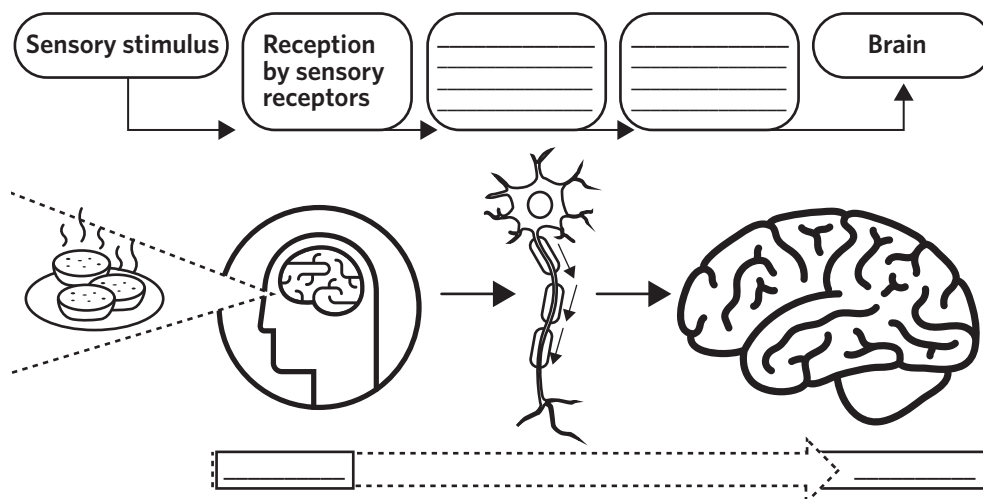
Question 5

True or false? We can be aware of sensory information even if perception has **not** occurred.

A true

B false

Question 6

Which of the following sentences is most correct?

A Our sensory organs *receive* and *respond* to incoming sensory stimuli.

B Our sensory organs *interpret* and *process* incoming sensory stimuli.

Exam-style questions

Multiple-choice questions

Question 7 (1 MARK)

Sensation differs from perception in that

A sensation occurs after perception.

B sensation is not able to bring sensory information into conscious awareness.

C sensation involves four stages, whereas perception involves three.

D sensation processes sensory information in some way.

Question 8 (1 MARK)

Which of the following describes the function of transduction?

A Sending sensory information to the brain.

B Converting sensory information from its original form into a form that can be sent as a neural impulse.

C Converting sensory information from an action potential into its raw form.

D Unconsciously processing sensory data in the brain.

Question 9 (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 10 (1 MARK)

Which of the following processes allows us to make sense of and understand sensory stimuli?

A reception

B transmission

C organisation

D interpretation

Question 11 (1 MARK)

Marco was sitting in the backseat of his parents' car, watching the streetlights through the window as he passed them. His dad gasped and asked Marco whether he had heard the screeching of a bat. His dad was surprised when Marco said he didn't hear anything because the bat was so loud.

Which of the following options best describes a process that Marco likely did perform in relation to the stimuli of the bat, and one which he did **not** perform?

	Did perform	Did not perform
A	selection	organisation
B	interpretation	reception
C	reception	selection
D	selection	interpretation

Short-answer questions

Question 12   (1 MARK)

Outline the process of reception.

Question 13   (2 MARKS)

Describe receptive fields and explain how they can limit sensation.

Question 14   (3 MARKS)

Using an example, explain how transduction and transmission would work to send the sensory data of a smell to the brain.

Question 15   (5 MARKS)

Nyjah was flossing his teeth in the mirror. He was concentrating on the image of his mouth to make sure that he didn't miss any gaps.

a   Explain the function of sensation and perception for Nyjah when he is flossing his teeth. (2 MARKS)

b   Identify the processes of perception that Nyjah would be experiencing and explain how they would occur in order for him to be able to floss his teeth. (3 MARKS)

Questions from multiple lessons

Use the following to answer Questions 16 and 17.

Zeke is a two-year-old boy who was sitting inside watching the heavy rainfall during a storm. For the first time, he saw the strange sight of a lightning flash. Surprised, he turned to his parents and said, 'light, light', and pointed to the light on the kitchen ceiling. His parents told him that the light outside was actually something called 'lightning' which is different to the light Zeke sees inside.

Question 16   (1 MARK)

Which of the following processes did Zeke struggle with?

A   sensation

B   selection

C   reception

D   interpretation

Question 17   (1 MARK)

In terms of cognitive development, for Zeke to be able to perform this process, he would need to

A   develop an accurate schema of lightning.

B   assimilate light into his schema of lightning

C   understand conservation.

D   understand object permanence.

6B VISION

What do you see here? If you said a penguin, how did you know? If you look closely at this image, you will notice that it is made up of separate parts that don't touch each other. Further, although it is also not a realistic or anatomically correct penguin, you were likely still able to identify it as one. In this lesson, you will learn how our internal biological mechanisms allow us to sense visual information. You will also learn how processes of perception allow us to make sense of images like this penguin.

Image: hartgraphic/Shutterstock.com

6A Sensation and perception	6B Vision	6C Taste	6D Perceptual distortions, fallibility and synaesthesia

Study design dot point

- taste and vision as two examples of human sensory systems, including the roles of sensory receptors and receptive fields, transmission of sensory information to the brain, and representation of sensory information in the cerebral cortex
- the influence of biological, psychological and social factors on visual perception, including depth cues, visual perception principles and perceptual set

Key knowledge units

Vision as a sensory system	2.1.2.1
Influences on visual perception	2.1.3.1

Vision

- **Vision as a sensory system** 2.1.2.1
  - Sensation in vision
  - Perception in vision
- **Influences on visual perception** 2.1.3.1
  - Visual perception principles
  - Depth cues
  - Perceptual set
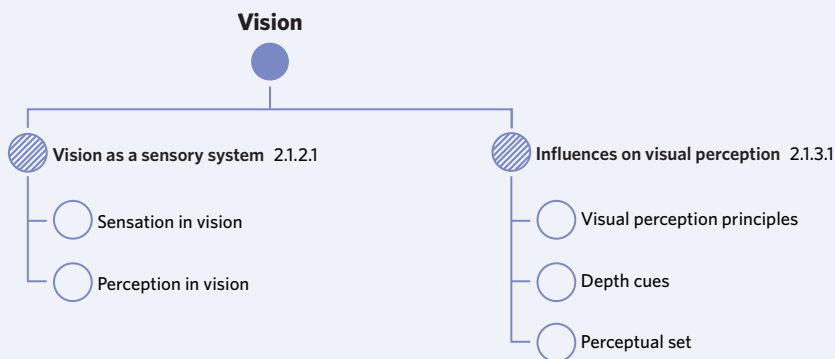
Vision as a sensory system 2.1.2.1

OVERVIEW

Now that you are familiar with the processes of sensation and perception, you can apply your understanding of them to the human sensory system of vision.

THEORY DETAILS

Vision, like other sensory systems, follows the processes of sensation and perception. But how do these processes actually allow us to see? From lesson 6A, you may recall that the three stages of sensation are reception, transduction and transmission. The details of how these work in visual sensation are outlined in table 1. Similarly, you should 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.

Vision the sensory system which allows us to see our internal and external environment

Sensation in vision
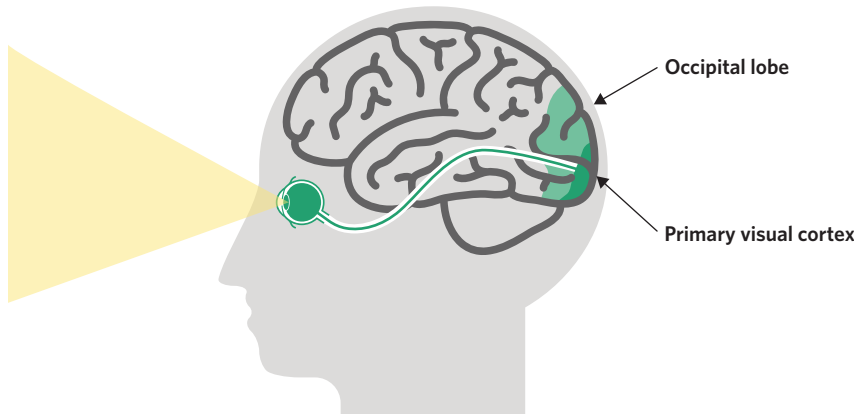
Image: Puwadol Jaturawutthichai, Pikovit, igor kisselev/Shutterstock.com

Figure 1 Sensation in vision involves detecting stimuli with our eyes and sending this information to the occipital lobe, specifically the primary visual cortex, in our brains

Table 1 The processes of sensation in vision

Sensation		
1. Reception	• The sensory stimuli *received* by visual sensory receptors is light. Light comes in the form of *electromagnetic energy* (as waves across space). • Light travels through the **eye,** which is the sensory organ for vision, before reaching an area at the back of the eye called the *retina*. • Once at the retina, the light is then received by sensory receptors. (Look at figure 2 for more details on how light travels through the eye.) • The sensory receptors on the retina which receive light are called **photoreceptors**. • There are two kinds of photoreceptors: rods and cones. **Rods** work to detect images in low levels of light and do not allow us to see colour, whereas **cones** work to detect images in well-lit conditions and are able to pick up on small details and colour. As you have learnt, these photoreceptors each have their own receptive fields.	**Eye** the sensory organ for vision **Photoreceptors** the sensory receptors of the eye which receive light and are responsible for the process of transduction **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
2. Transduction	• The rods and cones are responsible for the *transduction* of electromagnetic light energy into *electrochemical* energy, which is a form which can later be sent to the brain for processing. • They then send this electrochemical signal to another kind of neuron in the eye called the *ganglion cells*.	
3. Transmission	• The *ganglion cells* then create an action potential, which allows the visual sensory message to be sent to the brain via the *optic nerve* and then the *thalamus* for processing. • The **optic nerve** extends from the back of the eye to the brain, and the thalamus is a structure in the brain that is responsible for relaying sensory impulses to the brain. • Specifically, the thalamus sends the message to the *primary visual cortex* in the *occipital lobe* as it is visual information that is being processed (see figure 1).	**Optic nerve** the two nerves which extend from the back of the eye to the brain, along which visual information is transmitted to the brain

📝 *Memory device*

The two types of photoreceptors are rods and cones.
One way of remembering their functions is through alliteration:
Colourful **C**ones. Cones detect colour and fine detail, whereas rods allow us to see in low-lit conditions.
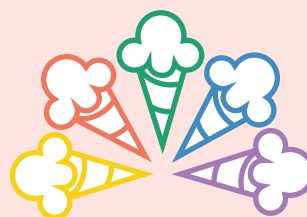
Figure 2 'Colourful cones'

Want to know more?

How light travels through the eye
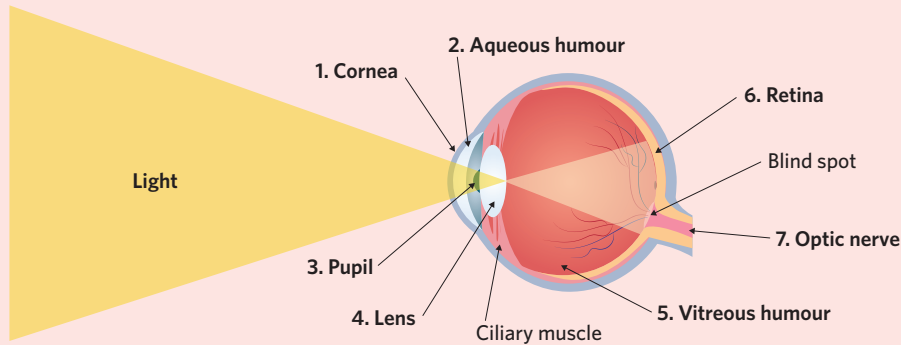
Image: Aliona Ursu/Shutterstock.com

Figure 3 How light travels through the eye before reception

1   Light enters the eye through the *cornea*. This is the glassy outer "window" of our eye which protects it. It focuses light waves onto the retina.

2   Light then travels through the *aqueous humour*. This is a watery substance of the eye which helps it to maintain its shape.

3   The light then travels through the *pupil*. This is the black centre of our eye which is actually a hole. You will have noticed that in the dark, our pupil opening is the biggest. This is because the bigger the hole, the more light the eye is letting in to see. The coloured part of our eye called the *iris* is actually a muscle which controls the expanding (opening) and contracting (closing) of our pupils.

4   Light then passes through the *lens* behind the pupil, which, as well as the cornea, focuses the incoming light onto our retina. It does this by changing shape in accordance with how far away the object in sight is. By looking at your finger up close and then further away, you'll be able to notice the shape of your eye changing: the closer an object is, the more it bulges. The *ciliary muscles* are what controls this change of shape at the lens.

5   The light then passes through the *vitreous humour*, another substance of the eye which helps to maintain the eye's shape.

6   The light finally reaches the *retina*. The retina is made up of tissue and various kinds of neurons, and receives the light and image. At this stage, the image received is upside-down and backwards, but the brain later fixes this image so we can see reality as it is.

7   Within our retinas are those important photoreceptors, rods and cones, which *receive* the sensory data before *transducing* it from electromagnetic energy into electrochemical energy. As mentioned, it is then sent to the *ganglion cells* which are able to turn this new type of energy into an action potential. The action potential can then be sent along the *optic nerve* to the brain. You'll notice that we have a 'blind spot' in our eye: if light is focused on this area of our retina, we won't be able to see it because there are no rods or cones here.

Want to know more?

How messages about light travel to the brain

Did you know that the image cast onto our retina is actually upside-down and back-to-front? Once this image has reached the brain, it is rearranged so we can see our world correctly.

In order to reach our brain, action potentials travel via the optic nerve. However, the process is not so simple:

- Information from our left visual field is cast onto the right side of our retinas in either eye.
- From there, it reaches the right side of the visual cortex in our brain.
- This also occurs vice versa (images from the right visual field, to left side of the retina, to the left visual cortex).
- The X-shaped point at which the optic nerves cross over is known as the *optic chiasm*.
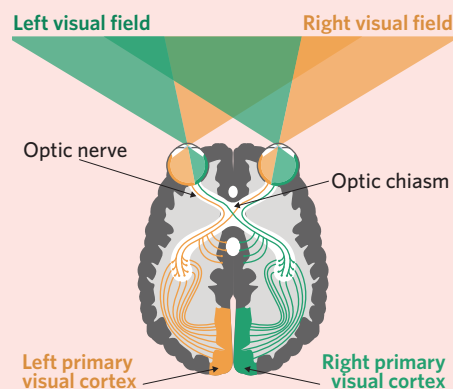
Image: VectorMine/Shutterstock.com

Figure 4 How visual signals travel from the eye to the brain

Perception in vision

Table 2 The processes of perception in vision

Perception	
4. 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 *optic nerve* and in 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. This helps us reduce what will later be interpreted by the brain, so that we only select for what is significant to our context and, evolutionarily-speaking, survival.
5. Organisation	Once selected, the visual signals are regrouped and *organised* to reflect an accurate image of reality. There are certain guiding principles which help us to organise these fragmented signals together again, including our visual perception principles (including Gestalt principles). These will be explored in the next part of the lesson.
6. Interpretation	The primary visual cortex works with other lobes of the brain to interpret and make sense of the visual stimuli. As you learnt in 6A, this is done by combining information from memory and the present context. Our interpretation of images is also influenced by things such as our motives and beliefs, and what is called our *perceptual set*. This will also be explored in the next part of the lesson.

Influences on visual perception 2.1.3.1

OVERVIEW

Although sensation is a fairly straightforward and biologically more objective process, there are a range of factors which can influence the perceptual processes of vision and give rise to our subjective interpretations of visual phenomena.

THEORY DETAILS

Visual perception is subject to a range of influences which can determine the images we see and how we come to understand them through organisation and interpretation. Visual perception principles, depth cues, and our perceptual set all influence the images we perceive, and these influences help to explain why you might see something one way but your friend sees it another way.

Visual perception principles

Visual perception principles are guiding rules that we apply to incoming visual signals that determine the way we *organise* and *interpret* them. 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.

Visual perception principles
guiding rules that apply to visual signals and determine how they are organised and interpreted

Gestalt principles

Gestalt principles are a large subset of visual perception principles. Specifically, they refer to the principles that help us to make sense of visual stimuli by *grouping* together separate phenomena into meaningful wholes. We do this via processes of pattern and object recognition: rather than seeing the individual lines of pages piled on top of each other for example, we are able to perceive a book. There are several Gestalt principles, and we will explore some of these. We tend to apply these 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.

Gestalt principles guiding rules of perception that allow us to organise independent visual signals into meaningful wholes

Table 3 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 6** 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 7** 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 the way we 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 8** Without the similarity principle, we would see an image of random black and white triangles	*'Group together figures that look similar or related to one another.'*	 **Figure 9** 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 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'.	 Image: montree meejaroen/Shutterstock.com **Figure 10** 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.'*	 Image: montree meejaroen/Shutterstock.com **Figure 11** Because of figure-ground, we tend to automatically see the bump symbol on this sign as being at the foreground of the image, and the yellow as being the background
The closure principle The closure principle refers to our ability to mentally complete images that are otherwise incomplete.	 Image: Cookiechoo/Shutterstock.com **Figure 12** 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.'*	 Image: Cookiechoo/Shutterstock.com **Figure 13** The closure principle allows us to mentally fill in the gaps of the image and perceive a whole soccer ball

Image: igor kisselev/Shutterstock.com

Figure 14 Rubin's vase

Want to know more?

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. They 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.

ACTIVITY 1

Gestalt principles in children's dot-to-dot games

Dot-to-dot games rely on children's ability to concentrate and draw accurately. However, before they even begin, they can employ a range of Gestalt principles to make sense of the image.

1   Which of the following Gestalt principles might help a child make sense of the image of the camel before they have connected the dots in their recommended order?   *(Select all that apply)*

   I   Proximity

   II   Similarity

   III   Figure-ground

   IV   Closure

2   Can you explain how each of these apply to the unconnected image?

Image: davorana/Shutterstock.com

Visual constancies

Visual constancies are a phenomenon which clearly demonstrates that sensation and perception are two separate processes. Visual constancies refer to our ability to perceive objects in our vision as staying the same, even though they may appear to change or do change in our sensation. Three visual constancies that affect our interpretation of visual stimuli include:

- Shape
- Size
- Brightness

For example, if we hold a banana in front of our face and throw it to our friend across the room, our perception of *size constancy* allows us to perceive that although the banana gets smaller in our visual field, it is actually staying the same size. The same applies to shape and brightness constancy: if we look at an object from another angle or under different light conditions, we know that the object itself is not changing thanks to perception, even though our sensations present to us a changing image.

Visual constancy our ability to perceive visual objects as staying the same even though the sensation of the objects may change

Depth cues

How do we see the world as three dimensional and not flat like a cartoon? **Depth cues** allow us to perceive the world in three dimensions and to judge the distance and position of objects in space. Because the retinal image is received in a two-dimensional way, seeing in depth requires the application of these depth cues during perception. *Monocular depth cues* rely on clues perceived by just one eye to be able to make these judgements, and *binocular depth cues* rely on clues from both eyes.

Depth cues visual clues that allow someone to judge the distance or depth of stimuli in their environment

Monocular depth cues

There are three monocular depth cues:

- accommodation
- motion parallax
- pictorial depth cues

Accommodation involves our eye muscles 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 eye muscles need to bulge. However, when focusing on an object in the distance, our eye muscles flatten. Our brain receives this information about our eye muscles changing, and uses this information to infer the distance of an object from the eye.
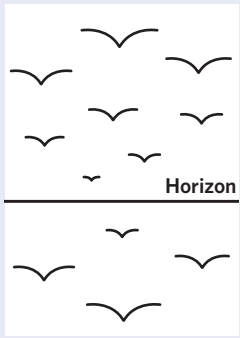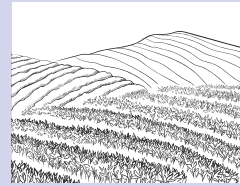
Image: Puwadol Jaturawutthichai/Shutterstock.com

Figure 15 Accommodation involves the bulging or flattening of the eye depending on the distance of objects in our visual field

Motion parallax is a monocular depth cue that uses our perception of movement to help us gauge how far away things are. 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 phenomenon helps us to measure depth: the less objects in our visual field move, the further they are away from us.

Pictorial depth cues are a subset of monocular depth cues. They are named as such because they are often clues that artists manipulate when painting or drawing a picture.

Table 4 Monocular pictorial depth cues

Relative size	Height in visual field	Linear perspective	Interposition (also known as overlap)	Texture gradient
The *relative size* of objects to one another in our visual field helps us to judge distance. 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 size and our ability to compare them *relative* to one another.	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.	Parallel lines within our visual field appear to meet in the distance, but are separated up close. In this way, our perspective of lines (*linear perspective*) allows us to gauge distance.	When objects overlap one another, we perceive the object that is covered by another as being further away than the one obscuring it.	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: bungacengkeh/ Shutterstock.com	Horizon	Image: VVadyab Pico/ Shutterstock.com		Image: Vectorgoods studio/ Shutterstock.com
Figure 16 Because of relative size, we see the bigger water bottle as being closer	**Figure 17** The birds closest to the horizon appear furthest away	**Figure 18** We perceive the point at which the road lines converge to be the furthest away	**Figure 19** We perceive the buildings overlapping other buildings as being closer	**Figure 20** 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. In this sense, the judgement of depth is dependent on the comparison between or combination of the images projected onto both the left and right eye.

Table 5 Binocular depth cues

Retinal disparity	As demonstrated in lesson 6A, 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, they have different receptive fields and so produce slightly different images from their different angles.
	Retinal disparity refers to the difference or 'disparity' between the different retinal images received by 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 the images from either eye. That is why the angle 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 differing 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.

Image: Vectorfair.com/Shutterstock.com

Figure 21 We can see both retinal disparity and convergence at play when looking at our finger up close

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ACTIVITY 2

Magic eye

Have you ever seen or completed a 'Magic Eye' activity?

These visual games, popularised in the 90s, draw on the depth cue of retinal disparity to allow some people to see a hidden 3D figure in what at first seems like a 2D image. Within Magic Eye images, there are actually two overlapping images made up of many dots. When we relax the focus in our eyes, the brain combines the dots from either eye, and through this combination, a hidden 3D image can emerge.

3D movies also rely on our retinal disparity for their effect.

Search on the internet some Magic Eye games and see if you can make out the hidden objects. Keep in mind that they are often easier to see when printed as opposed to on a computer screen!

Perceptual set

As you have learnt, a range of psychological and contextual factors can influence our perception. These include our emotional state, motivation, context, culture, and past experiences and memories.

All of these things can predispose us to interpret stimuli in a certain way, and this *predisposition* is known as our **perceptual set**. In other words, the way we *expect* something to be influences how we end up perceiving it. For example, if we expect a music concert to be exciting based on our past experiences at concerts, we may be more likely to pay attention to the factors that confirm this expectation and then actually perceive it as exciting.

Our perceptual set can affect our processes of perception, including:

- *Selection.* We may select or ignore certain stimuli according to our predispositions.
- *Interpretation.* We may interpret stimuli 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.

Perceptual set a predisposition to perceive stimuli in a certain way due to a range of factors including a perceiver's mood, motivations, context, and past experiences

Table 6 Factors that make up our perceptual set

Factor	How this factor contributes to perceptual set
Emotional state	The mood we are in might make us interpret information in a certain way. For example, if we are happy ourselves, we may be more likely to interpret other people's actions or facial expressions as reflecting happiness.
Motivation	Our motivations might make us more likely to understand stimuli in a certain way. As mentioned, if we are hungry, we may be more likely to interpret certain images as food.
Social or environmental context	The context we are in may make us more likely to understand stimuli as being congruent with surrounding information. For example, in a fruit shop, we might be likely to perceive round, red and shiny objects as fruit or vegetables, even if they are not.
Culture	Our cultural background and experiences may make us more or less likely to perceive stimuli in certain ways. For example, if using lots of hand gestures in our own culture is not common, we may be more likely to perceive outsiders using gestures in conversation as showing aggression or extreme excitement.
Past experiences and memory	Our past experiences with and exposure to stimuli may make us perceive stimuli and assign meaning to it in certain ways. For example, exposure to red stop signs and traffic lights may make us perceive future red signs as indicating for us to 'stop' or 'halt' in some way.

ACTIVITY 3

Perceptual set and past experience

What do you see in this image?

(Bugelski & Alampay, 1961)

Do you see a rat or a man? Which did you see first?

This image is from a famous study on perceptual set by Bugeleski and Alampay (1961). In their research, they presented participants with this ambiguous figure, known as 'rat-man', which could either be perceived as a rat (the bottom curve of the image being its tail, and the two circles being its ears), or, it could be perceived as a man (the two circles being his glasses sitting on top of his nose). The two researchers manipulated the participants' prior experience before they saw the figure by showing them a series of drawings of either human faces or of animals. This meant that an element of their perceptual set, i.e. their prior experience, was manipulated. The results found that even showing just one image of either a human face or an animal before exposure to the figure significantly impacted what participants would perceive: if they were shown a human face, they were much more likely to see a human face in the ambiguous figure. Likewise, if shown even one picture of an animal prior to seeing the figure, participants were much more likely to see a rat.

Independent of this study, how do you think the following factors might influence someone's perceptual set, and therefore the image they see in the rat-man figure?

- The person perceiving the image is a veterinarian
- The person perceiving the image is an aged-care worker
- The person perceiving the image was just reading a fashion magazine

Theory summary

In this lesson, you applied your knowledge of sensation and perception to vision and learnt more about the specific processes within vision. As with other sensory systems, vision involves:

- Sensation, including:
  - Reception (of light energy onto our photoreceptors)
  - Transduction (from electromagnetic into electrochemical energy)
  - Transmission (from the eye, via the optic nerve, to the primary visual cortex in the brain)
- Perception, including:
  - Selection
  - Organisation
  - Interpretation

You now know that these three substages of visual perception can be influenced by a range of factors, including:

- Visual perception principles, including Gestalt principles and visual constancies
- Depth cues
- Perceptual set

6B QUESTIONS

Question 1

In order to see it, a visual stimulus undergoes *(Select one)*

A   sensation and then perception.

B   perception and then sensation.

Question 2

In the visual sensory system, a visual stimulus is first received by the *(Select one)*

A   receptive field.

B   sensory receptors, specifically photoreceptors.

Question 3

In vision, receptive fields are *(Select one)*

A   the area of space in which a visual stimulus must be in order for us to see it.

B   the area of space our sensory receptors are in.

Question 4

In vision, the primary visual cortex is *(Select one)*

A   where some perception occurs.

B   where all perception occurs.

Question 5

Visual perception principles, depth cues and perceptual set are all factors that can influence someone's visual *(Select one)*

A   sensation.

B   perception.

C   sensation and perception.

Question 6

True or false? A perceptual set is a range of factors which can predispose a person to perceive visual stimuli in a certain way.

A   true

B   false

Question 7

A difference between depth cues and perceptual set is that *(Select one)*

A   depth cues influence sensation whereas perceptual set influences perception.

B   depth cues influence perception and rely on information sent from or about our eyes, whereas perceptual set influences perception and relies more on psychological and social information.

Question 8

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.

Skills

Understanding research

Use the following information to answer Questions 9-11.

Read the following excerpts from the introduction and method section of Bugelski and Alampay's famous 1961 study 'The role of frequency in the developing perceptual sets'. This was the study involving the ambiguous rat-man figure that you looked at earlier in this lesson.

Introduction section

[The rat-man figure] can be perceived as belonging to either of two cognitive categories or classes or objects: animals and humans. Thus the figure can be seen as either a rat or an old man. It is possible to induce either response by showing the viewer pictures of other animals or of people without any further instruction. Thus, if we want a subject to "see" a "rat," we merely show him pictures of a dog, cat, etc.; if we want a response of "old man," we show pictures of children, men, women, etc.

Method section

For half of the group the human series was shown first with 1, 2, 3, or 4 pictures offered for inspection. Without any pause the ambiguous figure was then shown, and again without pause the animal series was exposed, with all six animal pictures shown. The ambiguous figure was shown again at the end of the animal series. For the other half of the groups, 1, 2, 3, or 4 animal pictures were shown before the ambiguous figure and this was followed in all cases with the six human figures with the ambiguous figure again being shown last (Bugelski & Alampay, 1961).

Question 9

This study investigated the effect of induced perceptual sets on the interpretation of the ambiguous rat-man figure.
The operationalised independent variable of this study was *(Select one)*

A   a perceptual set induced by 'pictures of other animals or of people'.

B   the interpretation of an ambiguous figure, which 'can be seen as either a rat or an old man'.

Question 10

The operationalised dependent variable was *(Select one)*

A   a perceptual set induced by 'pictures of other animals or of people'.

B   the interpretation of an ambiguous figure, which 'can be seen as either a rat or an old man'.

Question 11

The experimental research design used in this study was *(Select one)*

A   repeated measures.

B   independent groups.

Exam-style questions

Multiple-choice questions

Question 12   (1 MARK)

The sensory receptors of the eye, known as photoreceptors, are responsible for

A   focusing light onto the retina.

B   transmitting light energy to the brain.

C   the transduction of light energy into electrochemical energy.

D   selecting the light signals to pay attention to.

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)

Johann is on a road trip around Tasmania and is busting to go to the toilet. 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 motivation meant that he had a predisposition to look out for toilet signs.
B	Perceptual set	Johann's emotional state meant that he had a predisposition to look out for toilet signs.
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 closure principle meant that Johann filled in the space between the two words 'to' and 'let' with the letter 'i'.

Question 15   (1 MARK)

Visual reception is

A   the first stage of visual sensation, in which light travels through the eye and reaches the sensory receptors on the retina.

B   the second stage of visual sensation, in which light travels through the eye and reaches the sensory receptors on the retina.

C   the first stage of visual perception, in which visual signals are filtered and selected according to what is important.

D   the second stage of visual perception, in which visual signals are filtered and selected according to what is important.

Question 16   (1 MARK)

Which of the following best describes when Gestalt principles are applied and their role?

	Role	Applied during
A	to accurately judge the depth or distance of objects in the environment	sensation
B	to create meaningful wholes from separated visual information	sensation
C	to accurately judge the depth or distance of objects in the environment	perception
D	to create meaningful wholes from separated visual information	perception

Short-answer questions

Question 17   (2 MARKS)

Explain how one monocular depth cue allows a person to judge the depth of their environment.

Question 18   (3 MARKS)

Referring to feature detectors, describe the process and purpose of selection in visual perception.

Question 19   (4 MARKS)

Explain how two different Gestalt principles allow a person to make out the image on this road sign.

Image: Cool Vector Maker/Shutterstock.com

Questions from multiple lessons

Question 20   (1 MARK)

Visual transmission differs from transmission in other sensory systems in that

A   information is sent to a different place in the cerebral cortex, specifically the occipital lobe (via the thalamus).

B   information is sent to a different place in the cerebral cortex, specifically the temporal lobe (via the thalamus).

C   information is sent from the sensory receptors to the brain.

D   information does not undergo transduction until it reaches the brain.

6C TASTE

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, nutritious, and that we should eat it! However, modern food production means that not all sweet and delicious food is nutritious anymore, and it can even contain unhealthy addictive ingredients (what's your favourite lolly? Do you think it is healthy for you?). As such, studying taste in psychology is important not only for understanding taste as a survival tool, but also understanding the sensory system that gives rise to modern-day health issues such as obesity in Australia.

Image: Light-Dew/Shutterstock.com

6A Sensation and perception	6B Vision	6C Taste	6D Perceptual distortions, fallibility and synaesthesia

Study design dot points

- taste and vision as two examples of human sensory systems, including the roles of sensory receptors and receptive fields, transmission of sensory information to the brain, and representation of sensory information in the cerebral cortex

- the influence of biological, psychological and social factors on gustatory perception, including age, genetics, perceptual set (including food packaging and appearance) and culture

Key knowledge units

Taste as a sensory system	2.1.2.2
Influences on taste perception	2.1.4.1

Taste

- **Taste as a sensory system** 2.1.2.2
  - Sensation in taste
  - Perception in taste
- **Influences on taste perception** 2.1.4.1
  - Age
  - Genetics
  - Perceptual set
  - Culture

Taste as a sensory system 2.1.2.2

OVERVIEW

As with vision and other sensory systems, taste involves the processes of sensation and perception.

THEORY DETAILS

Sensation in taste

Taste sensation largely occurs when we eat. When we chew food, the chemicals within our food are received in our mouth, and then information about our food's flavour is sent to our brain. As with all of our senses, this process starts with the three stages of sensation: reception, transduction and transmission. These are detailed in table 1.

Taste the sensation and perception of flavour
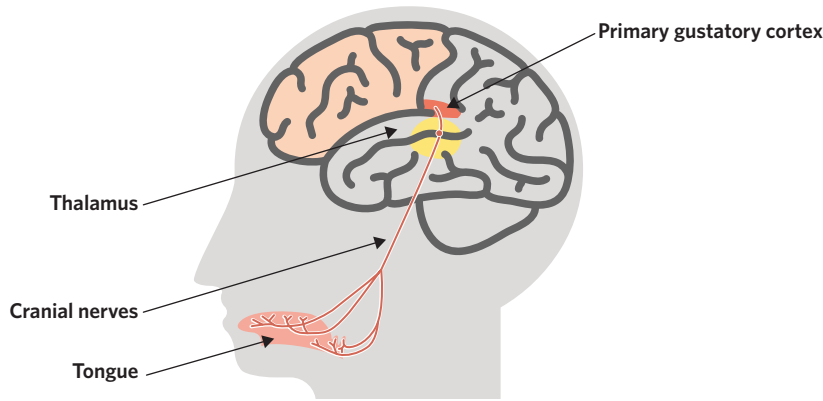
Image: Pikovit, igor kisselev/Shutterstock.com

Figure 1 Sensation in taste involves detecting stimuli at our tongue and sending this information to the primary gustatory cortex in our brains

Table 1 The processes of sensation in taste

Sensation	
Reception	The primary sensory organ for taste is our **tongue**.
	Before reception begins, when chewing, our saliva breaks down our food into chemical molecules which can be tasted. These molecules are known as *tastants* and are the sensory stimuli *received* during taste.
	Tastants are first received by our **gustatory receptors** (i.e. the sensory receptors for taste).
	The gustatory receptors are located within our **taste buds.** Our taste buds are mostly located on our tongue, but also around the mouth, throat, and back of the nose. Each taste bud contains around 100 gustatory receptors.
	As with other sensory receptors, gustatory receptors have their own receptive field. Remember, this is the area of space in which a sensory stimulus must be present in order to be detected by sensory receptors. As such, food molecules outside a gustatory receptor's receptive field will not be received by the gustatory receptor.
Transduction	The chemical form of tastants is converted into electrochemical energy so that it can be transmitted to the brain.
Transmission	The sensory data about the tastants we have received is sent to the brain as a neural impulse via **cranial nerves,** primarily the facial cranial nerve.
	Specifically, it is first sent to the thalamus, which then sends the information on to the primary gustatory cortex.
	Importantly, each tastant has different sensory information about the type and intensity of its flavour. These coded details, first detected by the gustatory receptors, are transmitted to the brain for processing.

Tongue the primary sensory organ involved in taste

Gustatory receptors the sensory receptors which detect chemical molecules in food

Taste buds clusters of gustatory receptors on the tongue
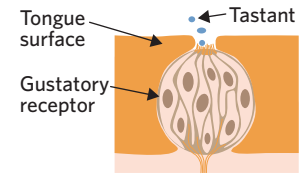
Figure 2 Taste reception involves tastants being received by our gustatory receptors

Cranial nerves the nerves which extend from the tongue to the brain, along which gustatory information is transmitted

Want to know more?

Where reception occurs on the tongue

- Contrary to popular belief, the small bumps we can see on our tongue are *not* our taste buds. These are actually what are called *papillae*.
- Most of our papillae contain our taste buds, which are less visible to the naked eye.
- As mentioned, our taste buds contain many gustatory receptors.
- The gaps or spaces between our papillae are called *taste pores*, which separate our papillae and taste buds.
- We have tiny hairs that reach from our taste receptors into our taste pores. These hairs come into contact with our tastant, and signal to our taste receptors to respond to them.
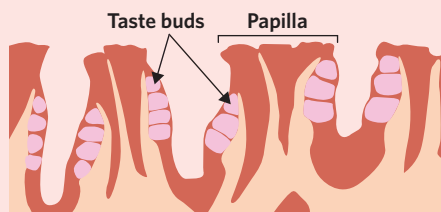
Figure 3 Cross-section of the tongue. Our gustatory receptors are located inside our taste buds

Did you know our taste receptors are replaced approximately every 10 days? There are also a range of different types of sensory receptors on our tongue. Similar to skin, they are not all for the sensation of taste: some receptors are for temperature, pain and pressure.

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?

We can detect five basic flavours: sweet, salty, sour, bitter, and umami (also known as savoury).

Table 2 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 misperception regarding these flavours is that we have specific areas of the tongue that are most sensitive to them. You might have seen some outdated 'tongue maps', indicating that one area of the tongue perceives 'bitter' and another 'sweet' etc. These tongue maps are largely inaccurate: instead of specific areas of the tongue being sensitive to certain flavours, it is individual taste receptors which are dispersed around the mouth which can be more sensitive to certain flavours than others.

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.

Smell is especially involved in the pleasurable aspects of flavour, such as the perception of more complex and interesting flavours (Spence, 2015).

Image: kar/Shutterstock.com

Figure 4 Our sense of flavour is largely informed by our sense of smell

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Perception in taste

The process of perception in taste 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 which 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 other senses such as the texture, colour, and smell of the food.

As with vision, perception occurs in the cerebral cortex (head to lesson 2E for a refresher on the cerebral cortex). After the information is relayed from the thalamus, taste 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.

As with vision, our perception of flavour can be influenced by our perceptual set. There are also a range of other factors which influence our gustatory perception which we will explore in the next part of this lesson.

ACTIVITY 1 – CLASS EXPERIMENT

A jelly bean test

This jelly bean test can show you how much our sense of taste is dependent on our other senses, including our sense of smell and vision.

Materials needed:

- A packet of jelly beans with different flavours
- A friend

Steps:

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   Record how accurate your flavour judgement is. 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. Record how accurate your flavour judgement is.
4   Repeat steps 1 to 3 as many times as you'd like.

Part 3. Discussion questions

1   Summarise your results. How many times did you guess the flavour correctly compared to incorrectly? Were your guesses more accurate when you couldn't smell or couldn't see the flavour of the jellybean?
2   What do your results suggest about different areas of the cerebral cortex and the perception of flavour? Discuss the role of the primary gustatory, olfactory, and visual cortices.
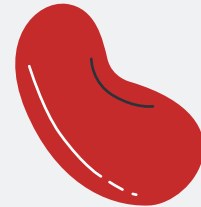
Influences on taste perception 2.1.4.1

OVERVIEW

Our age, genetics, perceptual set, and culture can all influence the way we perceive flavour.

THEORY DETAILS

As with vision, there are a range of factors that can influence the way we perceive flavours. Remember that perception is a more personal and individual process than sensation, and is subject to our unique biological, psychological, and social characteristics.

Age

Our age has a biological influence on the way we perceive flavour. Essentially, as we age, our perception of flavours becomes less sensitive. Although more research is required, this is speculated to result from factors within taste sensation, such as a decline in the number of taste buds we have (thereby decreasing our number of taste receptors, which peak in childhood), as well as a general age-related decline in the sensitivity of our senses including both smell and taste. Because we are receiving and transmitting less during sensation, as a result, we are unable to perceive as much flavour. This fact may help to explain why many children are particular about what they eat, not being able to stand tomatoes or bitter greens, or why, unlike for adults, the taste of wine and other alcoholic beverages seems disgusting.

Genetics

Do you like chilli or spicy food? How about coriander or brussel 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.

- 'Supertasters' are highly sensitive to flavour, including bitterness and sweetness. They inherit more taste buds than the average person.
- 'Medium-tasters' make up the majority of the population. They have medium sensitivity to flavours.
- 'Non-tasters' have a lower sensitivity to flavour, inheriting less 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).

Perceptual set

As you learnt in lesson 6B, a range of factors can give us a predisposition to perceive sensory stimuli in our environment in a certain way. This concept of **perceptual set** also applies to taste. Our past experiences, mood, motivation, the appearance of food and its present context can all psychologically cause us to expect flavour to be a certain way. As a result, we become more likely to perceive flavour in line with these expectations (i.e. have a perceptual set), paying more attention to features which confirm our predictions.

This has an evolutionary function: our ability to judge food based on its appearance or our past experience allows us to safely navigate and ingest food from our environment. For example, the colour of food allows us to determine its ripeness.

Perceptual set a predisposition to perceive in a certain way due to a range of factors including a perceiver's mood, motivations, context, and past experiences

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 integrates information from the primary visual cortex when perceiving flavour. Think of a green milkshake: its colour 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, our brain might trick us into thinking we are tasting mint. Our judgement of flavour based on appearance also interacts with information from our past experience: we know green is often minty because of past interactions.

Some influences from the appearance of food on flavour perception include:

- Colour: the colour of food can influence our perception of its flavour (Spence, 2015). If the colour of a food does not match our expectations, say, a blue apple, then we may actually taste something wrong with it even if this is not the case. Alternatively, we might enjoy an apple more if it is intensely red. Studies have shown that when we artificially change the colour of a food or drink, a person's ability to accurately assess its flavour is lowered (Zampani et al., 2007).
- Shape: The shape of our food or drink, or the vessel it is in or on, may also influence our taste perception. For example, 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).

Food packaging

As well as the colour of food packaging, other visual information on food packing such as brand names, brand logos, and images can all influence the way we perceive the flavour of food.

- Our familiarity with a brand name or logo and our associations with the brand may cause us to judge flavour in certain ways. For example, if we know the contents of a packet is 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.
- Do you prefer Coke or Pepsi? If someone secretly put some Pepsi in a Coke bottle and gave it to you, this would contribute to your perceptual set and potentially influence the flavour you perceive when you drink the secret Pepsi. Based on your past-experience with Pepsi, the deceptive label on the bottle, and your knowledge of the brand, your brain might trick you into thinking you are tasting Coke.
- 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.

Image: CRStocker/Shutterstock.com

Figure 5 What brand does this bottle remind you of?

Culture

A social influence on our perception and enjoyment of flavour comes from our culture. The foods we have grown up with and become accustomed to eating are likely to be tolerated and enjoyed more than foods which are foreign to us. This demonstrates that there are also social influences on our taste perception, and that flavour perception can be learnt through experience.

As you will 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. 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.

Theory summary

Our ability to taste and judge the flavour of the food we eat involves both taste sensation and then perception. The sensory system of taste involves:

- Sensation, including:
  - Reception (of tastants by our gustatory receptors)
  - Transduction (of chemical molecules into electrochemical energy)
  - Transmission (from the mouth, via the cranial nerves, to the primary gustatory cortex in the brain)
- Perception. Perception is influenced by a range of factors summarised in figure 6.
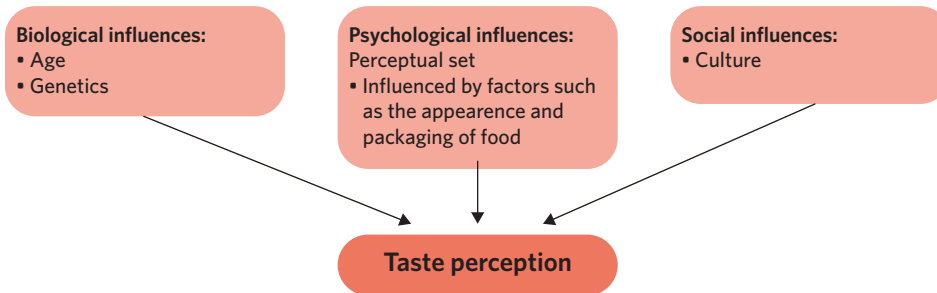
Figure 6   Biological, psychological, and social influences on taste perception

6C QUESTIONS

Theory-review questions

Question 1

Sending information about the flavour of food from the mouth to our brain occurs during   *(Select one)*

A   sensation.

B   perception.

C   both.

Question 2

We can become consciously aware of the flavour of food during   *(Select one)*

A   sensation.

B   perception.

C   both.

Question 3

Fill in the gaps with the following terms.

- Tastant
- Tongue
- Gustatory receptor

The primary sensory organ for taste is the _____. A sensory stimulus we sense during taste is called a _____. During sensation, these are first received by a _____.

Question 4

True or false? Receptive fields are the areas of a tongue which can sense flavour.

A true

B false

Question 5

Age, genetics, perceptual set, and culture can all influence a person's *(Select one)*

A taste sensation.

B taste perception.

Question 6

Which of the following can contribute to a person's perceptual set regarding flavour? *(Select all that apply)*

I the colour of food

II past experience with food

III the packaging of food

Skills

Perfect your phrasing

Question 7

Which of the following sentences is most correct?

A When we perceive flavour, our brain combines information about the appearance, smell, texture and taste of food from different cerebral cortices.

B When we perceive flavour, our brain combines information about the appearance, smell, texture and taste of food all within the gustatory cortex.

Exam-style questions

Multiple-choice questions

Question 8 (1 MARK)

Which of the following factors has a biological influence on a person's taste perception?

A The colour of food.

B The shape of food.

C The number of sensory receptors on a person's tongue.

D A person's familiarity with the brand of food they are consuming.

Question 9 (1 MARK)

The gustatory receptors are responsible for

A receiving the chemical molecules in food.

B breaking down food molecules before reception.

C bringing the flavour of food molecules into conscious awareness.

D receiving the image of food molecules.

Question 10   (1 MARK)

Perception of flavour in the brain occurs

A   only in the primary gustatory cortex.

B   only in the primary visual cortex.

C   by integrating information from the primary gustatory cortex, visual cortex, and somatosensory cortex.

D   in the primary gustatory cortex and thalamus.

Question 11   (1 MARK)

If food molecules are outside a receptive field this will mean that

A   the gustatory receptors will not perceive the food.

B   the taste buds will not perceive the food.

C   the gustatory receptors will not receive the food.

D   the taste buds will not receive the food.

Question 12   (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 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 past experiences with other lolly packets.

C   His perceptual set, influenced by his genetics.

D   His perceptual set, influenced by his age.

Short-answer questions

Question 13   (2 MARKS)

With reference to the relevant areas of the brain, describe the process of transmission in taste sensation.

Question 14   (2 MARKS)

Explain how age can act as a biological factor which can influence someone's taste perception.

Question 15   (3 MARKS)

Using an example, explain how a person's culture can act as a social factor which can influence a person's taste perception.

Question 16   (5 MARKS)

Hasan bit into an apple and noticed a funny taste.

a   Describe the processes of sensation that would have occurred before Hasan became consciously aware of the apple's funny taste. (3 MARKS)

b   Identify and explain one factor which may have influenced Hasan's perception of the funny flavour. (2 MARKS)

Questions from multiple lessons

Question 17   (2 MARKS)

Outline the difference between how transmission occurs in the sensation of vision and taste.

6D PERCEPTUAL DISTORTIONS, FALLIBILITY AND SYNAESTHESIA

Do these vertical lines look straight to you? Well, they are! The small horizontal lines trick our eyes into thinking that the vertical lines aren't straight parallel lines.

Unfortunately for us, our sensory systems aren't perfect: we're prone to making errors of judgement and we can experience distortions of reality. This doesn't mean something is wrong with us, but rather demonstrates that even normal and intact brains are susceptible to error! In this lesson, we will discuss the variables that cause our sensory systems of vision and taste to make errors or have perceptual distortions, and we will also discuss the phenomenon of synaesthesia.

Image: Peter Hermes Furian/Shutterstock.com

6A Sensation and perception	6B Vision	6C Taste	6D Perceptual distortions, fallibility and synaesthesia

Study design dot points

- the fallibility of visual and gustatory perception systems, demonstrated by visual illusions and the judgment of flavours (influence of perceptual set, colour intensity and texture)
- distortions of perception of taste and vision in healthy, intact brains as providing insight into brain function related to perception, illustrated by synaesthesia

Key knowledge units

Visual illusions	2.1.5.1
Judgement of flavours	2.1.5.2
Synaesthesia	2.1.6.1

Perceptual distortions, fallibility and synaesthesia

Visual illusions 2.1.5.1   Judgement of flavours 2.1.5.2   Synaesthesia 2.1.6.1
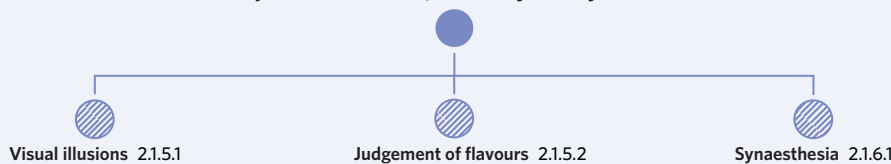
Visual illusions 2.1.5.1

OVERVIEW

Visual illusions are some of the greatest examples of how our visual sensory system is prone to errors of judgement and perceptual distortions.

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? The **fallibility** (i.e. a tendency to make errors of judgement) of our senses is clear when we notice these kinds of perceptual distortions. **Perceptual distortions** are errors in the judgement or interpretation of sensory stimuli. All of our senses are subject to making errors from time to time, and they occur when the meaning we attach to stimuli in the process of perception mismatches the information in our physical environment.

Visual illusions are one kind of perceptual distortion which occur when we misinterpret visual information and see stimuli in a way that conflicts with how it is in reality. It is not entirely understood as to how all visual illusions occur, but they can result from a variety of sources (Gregory, 1997).

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

Visual illusion the perception of a visual stimulus in a way that conflicts with how it is in physical reality

These include:

- something in our *physical external environment* 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 *biological* 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 changing reality after intense light and giving rise to a perceptual illusion.
- 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 illusions.

Image: makieni/Shutterstock.com

Figure 1 Perceptual distortions occur when our brain incorrectly interprets stimuli from our physical reality

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ACTIVITY 1

Can you 'unsee' these visual illusions?

Take a look at these visual illusions. Can you force yourself not to see them? Even if you know what you're looking at is an illusion, this doesn't mean you can't 'unsee' it. This demonstrates a common characteristic of many visual illusions: no matter how much logic and reasoning we apply to their interpretation, our sense of vision does not allow us to 'unsee' the illusion.
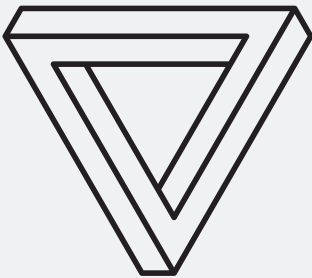
Image: ANNA ZASIMOVA/Shutterstock.com

Can you work out how this 'Impossible triangle' is connected?
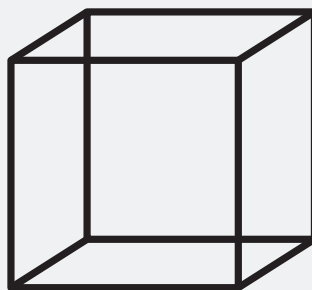
Which is the front face of this 'Necker cube'? Can you see the cube in two different ways?
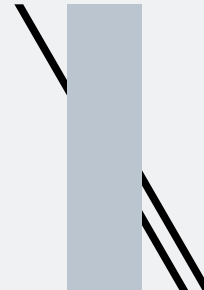
Image: Peter Hermes Furian/Shutterstock.com

Follow the line from the left side of the rectangle. Which line is it meeting up with?

In this 'Poggendorff illusion', it looks as though it is continuing to meet the top line, but if you use a ruler, you'll see it is actually meeting the bottom line.

Müller-Lyer illusion

One famous visual illusion is the *Müller-Lyer illusion*, named after the man who first described it. Take a look at figure 2. Which line is longer? The one on the left or the one on the right?

As you may have measured, they are the same. However, upon first glance, most people say the line on the right is longer.

Why does the Müller-Lyer illusion occur? As you may have guessed, the trick of the illusion has something to do with what is on either end of each line, i.e. the inverted-arrowhead end versus the regular-arrowhead end. However, exactly how these ends make us see different lengths is debated. As mentioned, we can understand visual illusions from different perspectives. Only psychological and environmental/social explanations have been found for the Müller-Lyer illusion. These are outlined in table 1.
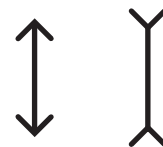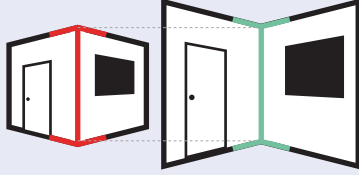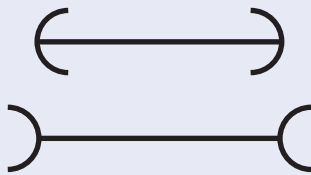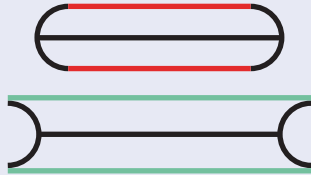
Figure 2 The Müller-Lyer illusion is seen when comparing the length of two lines like this
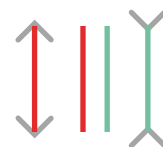
Figure 3 It's easy to 'unsee' the Müller-Lyer illusion when we look at it like this.

Table 1 Explanations of the Müller-Lyer illusion

Psychological	1. Explanations from learning and memory	2. Explanations from visual perception principles
	Some psychological explanations of the Müller-Lyer illusion emphasise the role of our personal learning and memory. This is most clearly understood in an idea called 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'*). **Figure 4** The carpentered world hypothesis is one theory of why the Müller-Lyer illusion occurs • 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). • Due to the misapplication of depth cues, 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. • 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 create 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 emulate the pointed outside corner of a building which extends toward us. On the other hand, the inverted arrowhead shows two "parallel" lines which begin converged and then separate upward. Where the inverted arrowhead lines are converged is therefore the inside corner of a room which extends away from us • This also results from a misapplication of *size constancy* which tells us that when two images cast the same size image on our retina (in this case, the same line length), the more "distant" image is larger. If the inverted arrowhead line is perceived to be further away, but casts the same sized retinal image, we interpret the line as being larger.	Our use of visual perception principles, including constancies and Gestalt principles (outlined in lesson 6B), have also been used to psychologically explain the causes behind the illusion. Essentially, the illusion is said to occur when we apply visual perception principles in a certain way. As mentioned, one primary explanation is the misapplication of *size constancy.* This explanation stands if we are truly applying the lines to objects in a carpentered world. However, the illusion can still occur when we look at the lines horizontally, or, with other shapes on the end as shown in figure 5. **Figure 5** The Müller-Lyer illusion still occurs with other arrow ends and horizontally Our application of the Gestalt principle of *closure* can help to explain why the illusion still occurs in spite of changes to the orientation and ends of the image. In both lines in figure 5, the U-shaped ends create a kind of 'open' figure which our mind mentally closes (figure 6). This gives rise to different lengths of the closed image (shown by green lines) which help to close or complete the image. We then misperceive the real central lines to be different lengths, based on our perception of the truly different line lengths that we created through the closure principle. **Figure 6** The closure principle applied to the Müller-Lyer illusion Our mind's completed image of the bottom line compared to the top is longer, potentially giving rise to the illusion.
Environmental /Social	Environmental or social explanations for the illusion have also been suggested. 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 from the 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* shown in figure 7. This illusion occurs when a person views two people in a special Ames Room through a peep hole that looks front on into the room.

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. Why do we see this illusion? Primarily, the illusion occurs because the shape of the room has been constructed in a specific way.

Image: Artazum/Shutterstock.com

Figure 7 The Ames Room

As you can see in figure 8, 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 depth cues in order to stifle a viewer's ability to correctly apply visual constancies:

- When viewing the room through the peephole, we are not able to apply *size constancy* as we normally would. 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, not affecting our perception of a person's true size compared to the image of them cast on our retinas. However, because the room is deceptively designed, their change in distance is not seen and so we are unable to apply size constancy. We also have limited depth information, due to viewing the room with one eye through a peephole and not being able to make use of *binocular depth cues* from different angles that allow us to accurately apply size constancy.

- We also mistakenly apply *shape constancy* to 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 trapezoid.
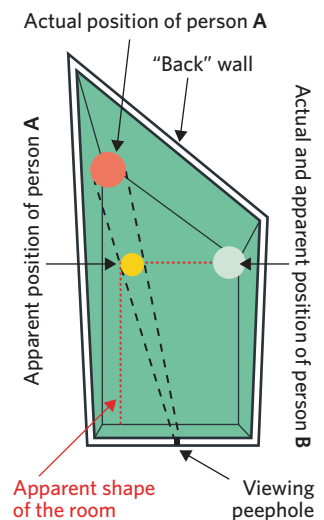
Figure 8   Even though from front-on, the Ames Room appears to be the shape of a normal rectangular room, it is actually trapezoid in shape

ACTIVITY 2

Create your own Ames Room

Type this URL into your browser and print out the PDF. This will allow you to make your own miniature Ames Room. You'll also need some scissors and glue or tape.

rigb.org/docs/ames_room_template_experimental_0.pdf

Once you've built your room, experiment by putting objects of the same size in each side of the room to see how the Ames Room works.

(Royal Institution, n. d.)

Judgement of flavours   2.1.5.2

OVERVIEW

We are also prone to errors or perceptual distortions when judging the flavour of food. However, there are also variables, such as a food's texture, which change our experience of flavours without distorting them.

THEORY DETAILS

We know from lesson 6C that our perception of flavour involves information integrated from other sensory systems including vision, touch, and smell. Perceptual distortions or difficulties in our judgements of flavour often occur due to confounding 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 actually there. Our perceptual set, the intensity of the colour of our food, and its texture can all influence the way we judge flavour.

Influence of perceptual set

In the last lesson (6C), we mentioned that our perceptual set can influence our taste perception. 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. The appearance of food and its packaging, for example, can give us certain expectations and then actually influence the flavours we taste. For example, if we eat food that is in the packet of an expensive brand, we may be predisposed to expect a high quality taste and therefore actually believe we are tasting better food.

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.

Lesson link

For a refresher on how perceptual set influences our taste perception and more examples, head to lesson *6C: Taste*.

As a general rule, the more intense the colour of food, the more flavour we perceive that we are tasting even when this is not the case. This information is part of 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 is why food brands sometimes artificially dye their products, especially confectionary.

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 our mouth, or its 'texture', can affect our experience and judgement of a food's flavour. Texture can affect our judgement of flavour in a variety of ways:

- 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, all 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.

- 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.

Synaesthesia 2.1.6.1

OVERVIEW

Synaesthesia is a perceptual phenomenon experienced by certain individuals that involves cross-communication between sensory systems and can distort an individual's perceptual experiences. It demonstrates how healthy intact brains can still experience perceptual distortions.

THEORY DETAILS

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'. Importantly, even though synaesthesia involves perceptual distortions, it is not a mental health disorder, and can occur in people who have healthy, intact brains.

Figure 9 Synaesthesia is a perceptual phenomenon. One specific type can involve seeing normal black letters as each having their own colour

What is synaesthesia?

Synaesthesia is a phenomenon of perception that occurs when two sensory systems cross over in an abnormal and involuntary way. 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, including that:

- synaesthesia is automatic and cannot be controlled. The perceptual experiences elicited in the secondary sense feel very vivid and real.
- synaesthesia is generally experienced *one-way:* 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 a perceptual phenomenon characterised by the experience of unusual perceptions in one sensory system after another sensory system has been activated

Synaesthete a person who experiences synaesthesia

- synaesthesia is usually *consistent:* a person who sees the number 4 as green will usually always see it as green and not some other colour.

- the way 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 4s 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).

- there are many different forms of synaesthesia. Some more common forms are outlined in table 2.

Table 2 Some forms of synaesthesia involving vision or gustation sensory systems

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).
Sound-colour	Sound-colour synaesthesia occurs when sounds cause the secondary perception of colours.
Lexical-gustatory	In lexical-gustatory synesthesia, when a person sees a word (a 'lexeme'), a taste is triggered (Simner et al., 2009).

How does synaesthesia occur?

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.
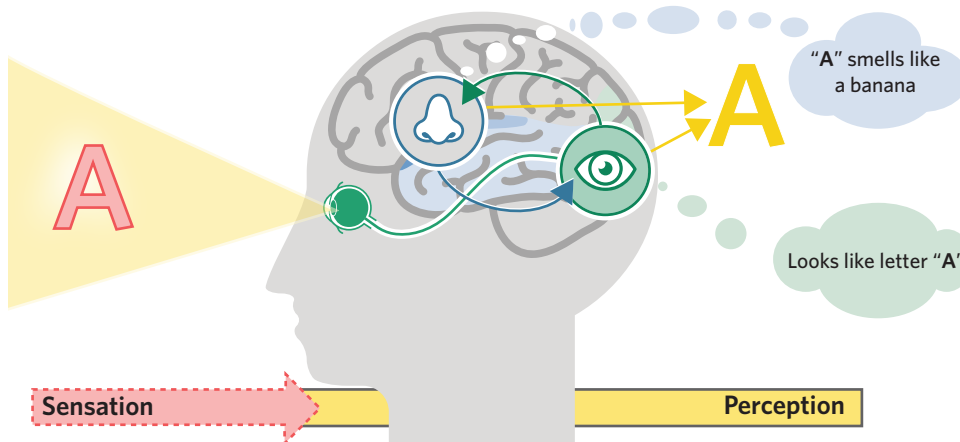
Image: Pikovit, Sudowoodo, igor kisselev, Puwadol Jaturawutthichai/Shutterstock.com

Figure 10 Synaesthesia occurs when one sensory system (here it is vision) is activated and another sensory system also experiences perceptions in an unexpected, unusual way

How does the process of synaesthesia occur?

- A sensory stimuli undergoes sensation within one sensory system.

- Once at the cerebral cortex and during perception, information from another secondary area of the brain is integrated and combined as though it belongs to the same true sensory experience.

- For example, if a person experiences different smells for each letter, their visual sensory system would be involved in sensation and perception of the figures of each letter, but smell information from the olfactory (smell) cortex and association areas would be integrated during the perception process of these letters. This would happen even though no smell stimuli has undergone sensation.

- This confirms that it is the brain that is in charge of our perception, and for synaesthetes, the brain is responsible for their unique perceptual distortions.

- Synaesthesia also demonstrates that sensation and perception are clearly two distinct processes and that perception is a highly subjective process. Many synaesthetes are, at least at first, unaware that they are experiencing unusual perceptions and this shows how perception is by nature unique to the individual.

> ⊙ *Analogy*
>
> 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 definitely want to turn on the "switch" for visual perception; however, a person who experiences synaesthesia might automatically also turn on their "switch" for taste perception.
>
>
>
> **Figure 11** Synaesthesia 'turns on' the switch for a sensory system's perception even though it has not experienced any sensations

Why does synaesthesia occur?

Theories behind why synaesthesia occurs are still largely unclear and controversial. There are a range of proposed explanations for synaesthesia, and broadly speaking, include suggestions like:

- synaesthetes are highly sensitive to the associations a sensory stimulus triggers. In childhood development, unusually strong networks are formed through learning between a sensory stimulus and its associations. 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.
- the brain networks of synaesthetes are structurally unique. The connections and associations between different areas of the brain may be connected in ways such that the activation of one area automatically triggers the activation of another (Neckar et al., 2014).
- the amount of synaptic pruning that would occur for non-synaesthetes may not occur as much for synaesthetes, leaving unpruned connections that can be activated in an unusual way. This does not mean that the brain is unhealthy or not intact.

Theory summary

In this lesson, we learnt that our senses are fallible and subject to experiencing a range of perceptual errors and distortions. These occur even in healthy intact brains.
Using our knowledge of the sensory systems of vision and taste, we can clearly see how these concepts apply:

- In vision, we can experience visual illusions, which are a type of perceptual distortion.
- In taste, we can experience perceptual distortions (such as those influenced by the colour intensity of food or our perceptual set), or, the textural properties of food can actually influence the flavour of food.
- In the phenomenon of synaesthesia, we can see how any one of the senses, including taste and vision, can be subject to experiencing perceptual distortions, due to an involuntary cross activation of perceptual experiences in the brain..

6D QUESTIONS

Theory-review questions

Question 1

True or false? Our sensory systems, such as vision and taste, are entirely accurate and make very little errors of perception.

A true

B false

Question 2

Visual illusions are *(Select one)*

A a distortion in visual perception.

B a distortion in visual sensation.

Question 3

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 4

True or false? When judging flavour, the texture of food causes us to experience perceptual distortions.

A   true

B   false

Question 5

Fill in the blanks with the following terms.

- Sensation
- Perception

Synaesthesia is a perceptual phenomenon. It occurs when a sensory stimulus first undergoes _____ within one sensory system, but then during _____, perceptions from another sensory system are integrated and this causes the synaesthete to experience unusual or abnormal perceptual experiences.

Question 6

True or false? Perceptual distortions, errors of judgement, and synaesthesia occur only in brains that are damaged or have some sort of mental disorder.

A   true

B   false

Skills

Perfect your phrasing

Question 7

Which of the following sentences is most correct?

A   Perceptual distortions occur when we perceive sensory information, such as a flavour or an image, that has strange or abnormal properties.

B   Perceptual distortions occur when we make an error of judgement in the way that we interpret and understand sensory information, such as a flavour or an image.

Question 8

Which of the following sentences is most correct?

A   Synaesthesia is a perceptual disorder and involves the experience of unusual sensory perceptions in a sensory system that has not experienced any sensations.

B   Synaesthesia is a mental disorder and involves the experience of hallucinations of a sensory stimulus after it has been received and transmitted to the brain.

Exam-style questions

Multiple-choice questions

Question 9   (1 MARK)

A visual illusion is

A   a misunderstanding of an image due to the way visual information is received at the eye during sensation.

B   a 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 10   (1 MARK)

Frankie made cupcakes for his two sons with pink icing. When he was icing them, he ran out of the pink icing and had to make some more to cover the rest of his cupcakes. Frankie accidentally added two more drops of flavourless food colouring to the second lot of icing, meaning some of the cupcakes were more intensely pink than others.

When his two sons ate the cupcakes, Alfred, who got one of the pinker cupcakes, made fun of his brother with a less pink cake, saying that his cupcake was 'sweeter and tastes better' than his.

In terms of flavour judgement, which of the following best describes what Alfred was experiencing?

A   A perceptual distortion, due to the intensity of the colour of the icing.

B   A perceptual distortion, due to the texture of the icing.

C   Flavour sensation that is more intense than his brother's.

D   Transmission of more flavour information from his tongue to the brain.

Question 11   (1 MARK)

Whenever Neeha reads certain words, she is able to taste them. For example, the word 'boat' tastes like peanut butter and the word 'cat' tastes like fairy floss.

It is most likely that Neeha is experiencing

A   flavour distortions, due to her perceptual set.

B   visual illusions, due to her past experience.

C   synaesthesia, with her sensory system of taste being unusually activated by certain words.

D   synaesthesia, with her sensory system of vision being unusually activated by certain words.

Question 12   (1 MARK)

Perceptual distortions can be said to occur in

A   the brain.

B   the sensory organ.

C   the sensory stimulus being perceived.

D   the environment.

Short-answer questions

Question 13   (2 MARKS)

Describe two ways in which the texture of food can influence our judgement of its flavour.

Question 14   (3 MARKS)

Identify and describe one visual illusion and provide one explanation for why it occurs. You may use a diagram in your response.

Question 15   (3 MARKS)

Explain synaesthesia as a perceptual phenomenon and describe two characteristics of it.

Questions from multiple lessons

Question 16   (4 MARKS)

Using examples, describe the concept of a perceptual set and explain how it can lead to perceptual distortions in both vision and taste.

CHAPTER 6 REVIEW

CHAPTER SUMMARY

This chapter was all about the processes of sensation and perception. As you now know, these are the two processes that our sensory systems use to respond to and become aware of our environmental stimuli.

In **6A**, we learnt about the differences between sensation and perception. Primarily, you learnt that sensation involves the unconscious biological processes that allow our body to receive and respond to sensory stimuli. You also learnt that perception involves the processes that occur after sensory data has reached the brain. Importantly, it is perception that allows us to become consciously aware of and assign meaning to stimuli.

Processes of sensation	Processes of perception
• Reception • Transduction • Transmission	• Selection • Organisation • Interpretation

Some of the most important things we learnt that apply to all sensory systems include:

- Sensory receptors are the cells which receive sensory data.
- Receptive fields are the area of space a sensory stimulus must be present in order to be received.
- Sensory data is sent to the brain and represented in relevant areas of the cerebral cortex.

In **6B**, we applied our knowledge of sensation and perception to the sensory system of vision. Importantly, sensation involves sending visual data from the eye to the brain, while perception involves assigning meaning to the visual data and comprehending visual images. You also learnt about the factors that can influence visual perception, including:

- Depth cues (a biological and psychological influence)
- Visual perception principles (a psychological influence)
- Perceptual set (a mostly psychological influence)

In **6C**, we applied the same knowledge to the sensory system of taste (gustation). Taste sensation involves receiving flavour stimuli in the mouth, and sending this data to the brain so that the flavours can be interpreted. Again, you learnt that there are factors which may influence taste perception including:

- Age (a biological influence)
- Genetics (a biological influence)
- Perceptual set, specifically one that is influenced by food packaging and appearance (a mostly psychological influence)
- Culture (a social influence)

Finally, in **6D**, we expanded all of this knowledge by learning about the fallibility of our sensory systems, including perceptual distortions. Specifically, we learnt that the fallibility of vision may be understood through visual illusions and that the fallibility of taste may be understood through our judgement of flavours (as influenced by perceptual set, colour intensity, and the texture of food). These distortions or errors of judgement can occur in healthy brains.

We also learnt about the perceptual phenomenon of synaesthesia, which involves cross-communication between sensory systems at the level of perception in the brain, resulting in unusual perceptual experiences of stimuli specific to the individual e.g. hearing a colour. This demonstrates an important distinction between the processes of sensation and perception: perception is a highly subjective process unique to the individual that occurs in the brain. For a synaesthete, this occurs even though sensation has only stimulated one sense.
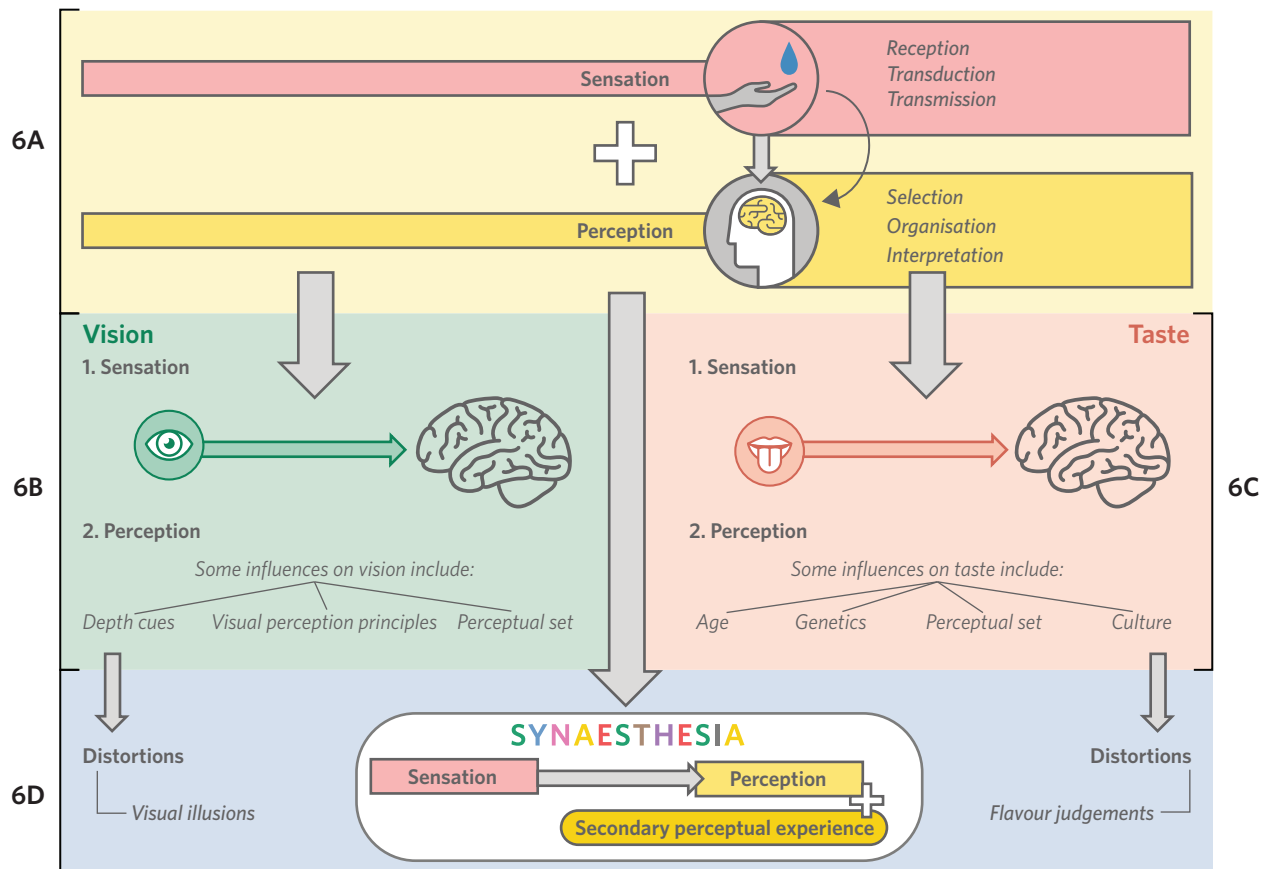
Image: Sudowoodo, Pikovit/Shutterstock.com

CHAPTER REVIEW ACTIVITIES

Review activity 1: Summary table

Copy out the following table and fill in the details to summarise your knowledge on these important components of vision and taste.

	Vision	Taste
Sensory receptors		
Receptive field		
Representation in the cerebral cortex		

Review activity 2: Flowchart

For the following forms of synaesthesia listed, copy out the flowchart and fill in the blanks to explain the details of how each type of synaesthesia occurs.

- Lexical-gustatory synaesthesia (when a person reads a certain word, they perceptually experience the taste of a certain flavour)
- Sound-colour synaesthesia (when a person hears a certain sound or pitch, they perceptually see a certain colour)
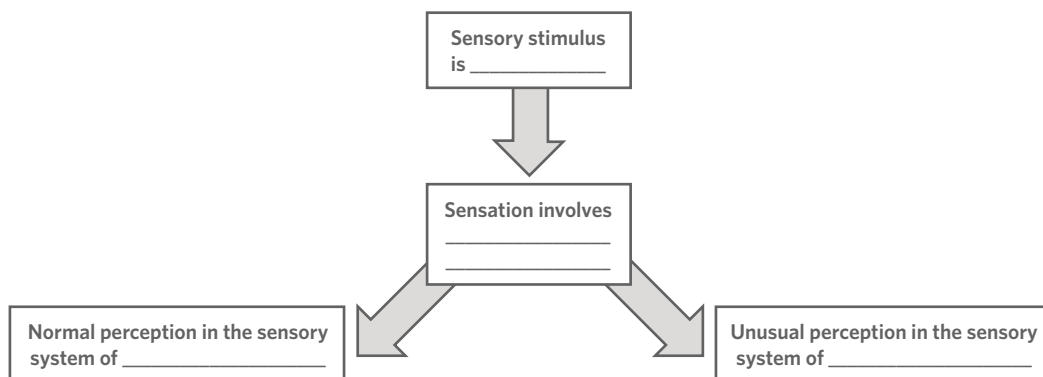
Review activity 3: Summary table

Copy out the following table and fill in the details to summarise your knowledge and how the factors in the left column influence either taste perception, visual perception, or both types of perception.

	Influence on perception in vision, taste, or both
Perceptual set	
Depth cues	
Genetics	
Visual perception principles	
Age	
Culture	

CHAPTER 6 TEST

Multiple-choice questions

Question 1   (1 MARK)

In experiences of synaesthesia, the sensory system that is **not** directly stimulated by environmental stimuli

A   has experienced sensation and then perception of that stimulus.

B   has experienced perception and then sensation of that stimulus.

C   has only experienced sensation.

D   has only experienced perception.

Question 2   (1 MARK)

The Ames Room is a visual illusion that occurs when a viewer looks through a peephole at a specially designed room. Two people standing on either side of the room appear to be very different sizes, when in reality they are both regular-sized humans. Which of the following options best describes why the Ames Room illusion occurs?

	Environmental reason	Psychological reason
A	The way the room is constructed.	People are not able to apply size constancy correctly.
B	The way the room is constructed.	People are not able to transmit sufficient visual information to the brain.
C	The peephole.	People are not able to apply size constancy correctly.
D	People are not able to apply size constancy correctly.	People are not able to transmit sufficient visual information to the brain.

Question 3   (1 MARK)

This image shows the Orbison illusion. This visual illusion occurs when a shape, such as a square, looks misshapen or lopsided due to the lines in the background, when it is actually perfectly symmetrical. Which of the following options best describes why this occurs?

A   A person experiences a perceptual distortion due to elements of the physical image, such as the background lines.

B   A person experiences a perceptual distortion due to a biological factor, such as not being able to use binocular depth cues.

C   A person experiences synaesthesia, in which their visual sensory system only perceives but does not sense the image.

D   A person experiences synaesthesia, in which distortions from another sensory system distort perceptions of the visual sensory system.
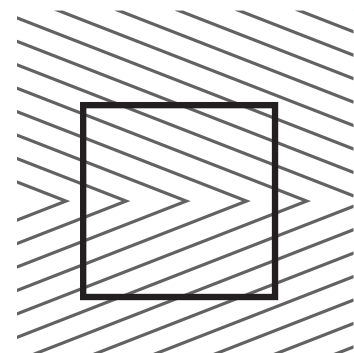
Image: Peter Hermes Furian/Shutterstock.com

Question 4 (1 MARK)

Which of the following processes involves sending a neural message containing sensory information?

A reception

B transduction

C transmission

D interpretation

Question 5 (1 MARK)

Perceptual set refers to a predisposition to interpret sensory stimuli in a certain way and

A affects taste perception only.

B affects both visual and taste perception.

C affects visual perception only.

D affects both visual and taste sensation.

Question 6 (1 MARK)

Which of the following is a biological influence on taste perception?

A genetics

B culture

C colour intensity

D texture

Question 7 (1 MARK)

Which of the following best describes the purpose of sensation and perception?

	Sensation	Perception
A	Making sense of sensory information.	Receiving sensory stimuli and sending information about it to the brain.
B	Receiving sensory stimuli and sending information about it to the brain.	Making sense of sensory information.
C	Converting sensory stimuli into a sendable message.	Receiving sensory stimuli at the sensory receptors.
D	Receiving sensory stimuli at the sensory receptors.	Converting sensory stimuli into a sendable message.

Question 8 (1 MARK)

The processes of sensation, in their correct order are

A transduction, transmission, reception.

B transmission, reception, transduction.

C reception, transduction, transmission.

D reception, transmission, transduction.

Short-answer questions

Question 9 (1 MARK)

Outline the process of reception in taste sensation.

Question 10 (1 MARK)

Outline one difference between sensation and perception.

Question 11   (3 MARKS)

In terms of the sensory system of taste, explain the relationship between sensory receptors and receptive fields.

Question 12   (3 MARKS)

Explain the process of transduction and compare how it occurs in the visual and gustatory sensory systems.

Question 13   (4 MARKS)

Name two pictorial depth cues and explain how they allow a person to see depth in this image.

Image: canadastock/Shutterstock.com

Question 14   (4 MARKS)

Compared to humans, cats have much better night vision, however cannot see fine details or vibrant colours. Referring to the role of rods and cones, explain why this might be the case.

Question 15   (4 MARKS)

Whenever Joan listens to music, she sees different colours floating around in her head with each note of music. When Joan hears high-pitched notes, she sees brighter colours, and when she hears lower notes, she sees darker colours. When she was 10, she was told that she has sound-to-colour synaesthesia.

In terms of sensation and perception, explain how Joan's sound-to-colour synaesthesia occurs.

Question 16   (5 MARKS)

Alex and Kurt are practising yoga together. Kurt has recently learnt a new pose which he calls 'the praying mantis pose', and shows Alex how to do it. Alex watches Kurt closely so she can try it herself.

a   Describe the processes of visual sensation that occur which allow Alex to see Kurt's new pose. (3 MARKS)

b   Explain the process of organisation in visual perception and explain how it might occur in Alex's perception of Kurt's pose. (2 MARKS)

Key science skills questions

Question 17   (1 MARK)

A researcher wanted to investigate the relationship between pain and flavour perception. To do this, she asked participants to eat burning hot food with their eyes closed and then to describe the ingredients that they could taste. The researcher then recorded the accuracy of their responses.

An ethical principle which the researcher most likely breached by the nature of the study is

A   confidentiality.

B   the no-harm principle.

C   withdrawal rights.

D   informed consent.

Question 18 (5 MARKS)

Doctor Kenickie wanted to test the effect of priming participants on how quickly he could get them to experience a 'Gestalt switch'. A Gestalt switch occurs at the point when a person suddenly sees an image in a new way, after seeing it another way to begin with.

To test this, Doctor Kenickie used the visual illusion shown in the image which can be seen in two ways: a participant may see one square of the cube as being its 'front' face, or they may see another square of the cube as being its 'front' face. He divided his participants into two groups at random and got one group to do condition 1 and the other group to do condition 2.

In condition 1, participants were told to tell the research assistant as soon as they noticed 'the cube switch'.

In condition 2, participants were asked to tell the research assistant if they noticed anything unusual about the cube. The research assistant recorded the amount of time it took each participant to say they noticed the cube switch using a digital stopwatch.
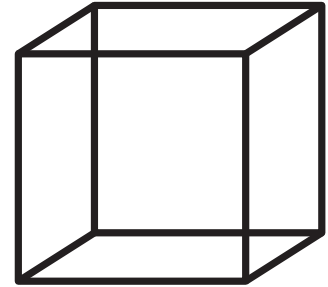
a Identify the experimental research design used by Doctor Kenickie. (1 MARK)

b Describe one reason why Doctor Kenickie may have got a research assistant to collect the data. (2 MARKS)

c Doctor Kenickie found that participants in condition 1 had a far quicker mean time for noticing the 'Gestalt switch' than participants in condition 2.

Explain how the concept of perceptual set might help to explain these results. (2 MARKS)

Questions from multiple chapters

Question 19 (1 MARK)

If a person has damage to their occipital lobe, which of the following might they have difficulty with?

A processing gustatory information

B movement

C planning and executive functions

D processing visual information

Question 20 (2 MARKS)

Stavros was cooking when he burnt his finger on a hot plate. The sensory receptors of his finger received the information about the pain and temperature and sent a message to his brain.

Name the divisions of the nervous system responsible for the sensation and perception of Stavros' pain.

UNIT 2

AOS2

How are people influenced to behave in particular ways?

A person's social cognition and behaviour influence the way they view themselves and the way they relate to others. In this area of study students explore the interplay of biological, psychological and social factors that shape the behaviour of individuals and groups. They consider how these factors can be used to explain the cause and dynamics of particular individual and group behaviours, including attitude formation, prejudice, discrimination, helping behaviour and bullying. Students examine the findings of classical and contemporary research as a way of theorising and explaining individual and group behaviour.

Outcome 2

On completion of this unit the student should be able to identify factors that influence individuals to behave in specific ways, and analyse ways in which others can influence individuals to behave differently.

Image: Ink Drop/Shutterstock.com

UNIT 2 AOS 2, CHAPTER 7

Social cognition

07

7A   Attitudes

7B   Judging and perceiving others

7C   Explaining behaviour through attribution

Chapters 7 and 8 cover concepts from the field of social psychology. Social psychology examines how our mental processes, feelings and behaviour can be affected by the real or imagined presence of other people. In this chapter, we will look specifically at social cognition, which is how we use mental processes to make sense of and navigate our social world.

Key knowledge

- the applications and limitations of the tri-component model of attitudes
- the role of person perception, attributions, attitudes and stereotypes in interpreting, analysing, remembering and using information about the social world
- attitudes and stereotypes that may lead to prejudice and discrimination

7A ATTITUDES

Do you like pineapple on pizza? Do you believe climate change is real? Your answer to these questions reflect an attitude you hold. In this lesson, we explore what it means to hold an attitude, what attitudes are made up of, and how they can be expressed. Understanding attitudes is a foundational element of the study of social cognition in psychology.

7A Attitudes	7B Judging and perceiving others	7C Explaining behaviour through attribution

Study design dot point

- the applications and limitations of the tri-component model of attitudes

Key knowledge units

Attitudes	2.2.2.1
The tri-component model of attitudes	2.2.2.2
Limitations of the tri-component model of attitudes	2.2.2.3

ACTIVITY 1

Show your attitude

Read the following statements and decide where you sit on the Likert scale for each of them.

1 All high school students should wear a uniform.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
○	○	○	○	○

2 VCE students should not have a school formal as it is a major distraction from study.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
○	○	○	○	○

3 Units 3 and 4 in VCE should be assessed solely on the basis of an end of year examination.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
○	○	○	○	○

4 The voting age in the federal election should be lowered to 16.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
○	○	○	○	○

5 Climate change as a result of human action is real.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
○	○	○	○	○

6 Pineapple belongs on pizza.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
○	○	○	○	○

The answers you gave to the statements in this activity reflect just some of the many attitudes you hold.

Attitudes 2.2.2.1

OVERVIEW

In social cognitive psychology, attitudes are an evaluative judgement we hold towards something.

THEORY DETAILS

Attitudes refer to the way we evaluate and look at something, be it a person, object, concept, circumstance or event.

Where you put yourself on the scale for each item in activity 1 reflects the strength of your attitude. Perhaps you felt more strongly about pineapple on pizza than climate change. The attitudes we hold and their relative strength are informed by a range of factors, including our prior knowledge and unique experiences.

Attitude criteria

For something to be considered an attitude, as opposed to say, a value or belief, there are some criteria which must be met. As mentioned, attitudes inherently involve an 'evaluation' of something. This means that they involve an assessment: for example, you might be able to place your attitude to something along the continuum from negative, to neutral, to positive.

Attitude an evaluation of something, such as a person, object, event, or idea

Negative   **Neutral**   **Positive**

Figure 1 Attitudes involve an evaluation of something, involving an assessment of something along the scale from negative to positive

Furthermore, attitudes are relatively *settled and stable.* This does not mean that our attitudes can't change, but just that they are 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.

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. Keep in mind, in some circumstances the attitudes we hold might be influenced by genetic factors such as our physical appearance, predisposing us to hold certain attitudes independent of learnt experience (Olson et. al., 2001).

Experience + **Attitude** = **Future actions**

Image: Sudowoodo, Motortion Films/Shutterstock.com

Figure 2 Our actions are informed by our attitudes, which are informed by our experiences (either directly or indirectly) with a stimulus

In contrast to attitudes, values or beliefs don't necessarily require an active evaluation process, nor do they have to be as stable or learnt the way attitudes are. For example, we may believe that we are full because we just finished eating, but this isn't an attitude as it doesn't meet all these criteria.

The tri-component model of attitudes 2.2.2.2

OVERVIEW

The tri-component model of attitudes is the most commonly used theory and method to explain how we form, express or reflect attitudes we hold.

THEORY DETAILS

Aside from the attitude criteria outlined earlier in this lesson, some psychologists suggest that for an attitude to be present, it must have three interacting components that reflect the attitude. The **tri-component model of attitudes** (also known as the 'A-B-C' or 'tripartite' model) dictates that 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.
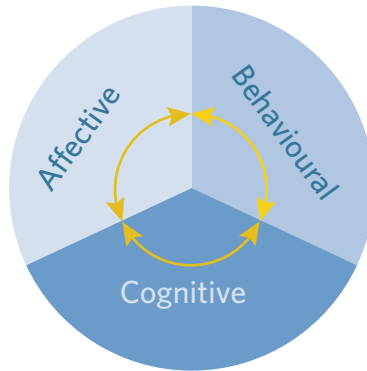
Figure 3 The tri-component model of attitudes

Tri-component model of attitudes a model which illustrates the relationship between the affective, behavioural and cognitive components of our attitudes

Affective component

The **affective component** refers to our feelings and emotions (affect) and how they reflect our attitude. You can think of the affective component as the automatic feeling you get when presented with something. As mentioned, these might be positive, neutral or negative feelings.

You can think of the affective component as being verbally expressed by statements such as:

Affective component our emotions and intuitive feelings towards something

> I love pineapple on pizza

> I hate salami

> I couldn't care less about whether we wear uniform or not

Notice that these statements all reflect evaluative *feelings*.

Behavioural component

The **behavioural component** of the model describes how our outward actions reflect the point of view we hold. For example, if we are saddened by the way animals are treated in the meat industry and believe it is wrong to eat them, our attitude might be reflected by the behaviour of not eating meat. However, in reality our behaviour is not always consistent without feelings and thoughts. You will see this idea explored in the limitations of the model later in this lesson.

Behavioural component our outward and observable actions that reflect our point of view of something

Cognitive component

The **cognitive component** involves our thoughts and beliefs about 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:

Cognitive component our thoughts and beliefs towards something

> 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)*
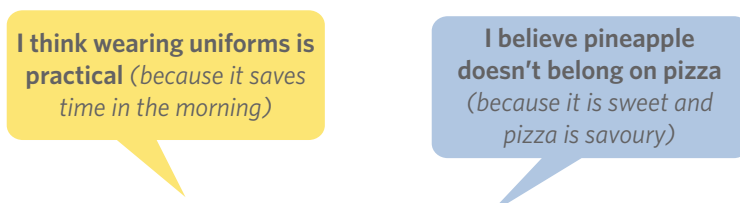
Notice that all these statements reflect *beliefs and thoughts* that sound more separated from emotion.

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.

If all three components of attitudes are consistent, then an example of an attitude might be represented like this:
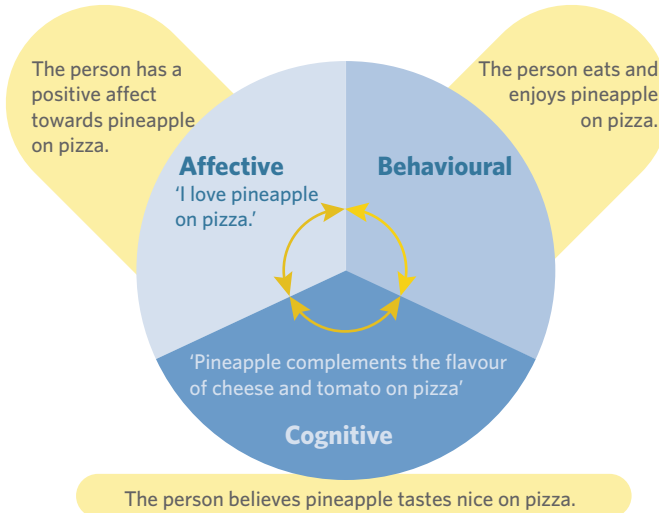
Figure 5 A worked of example of how a positive attitude towards pineapple and pizza might be expressed via the tri-component model of attitudes

Limitations of the tri-component model of attitudes 2.2.2.3

OVERVIEW

Although the tri-component model is the most common model to explain attitudes, it does have some significant shortcomings.

THEORY DETAILS

A common criticism of the tri-component model of attitudes 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.
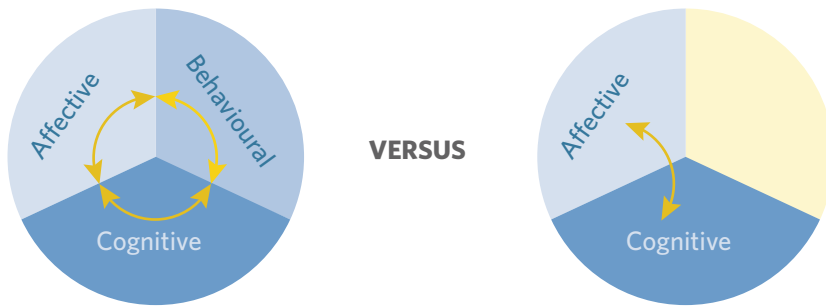
Figure 6 Many psychologists suggest that an attitude only requires the interaction of our affective and cognitive components

Can you think of any examples in which you held an attitude, but were not able to perform 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).

Cognitive dissonance

As mentioned, one of the main criticisms of the tri-component model is that the behavioural component commonly does not align with the other two components. Psychologists use the term *cognitive dissonance* to refer to occurrences when either our thoughts, feelings, and/or behaviour don't align with our overall attitude. It does not have to be the behavioural component which doesn't align for this to occur. The term cognitive dissonance also refers to the psychological stress that results from this misalignment. For example, a person who knows smoking cigarettes is bad for them but smokes them at parties might feel a discomfort when they consciously think about how their behaviour does not conform to their knowledge. Can you think of any other examples in which people might experience cognitive dissonance? How about circumstances in which either emotions or cognitions don't align with the other components of an attitude?

Theory summary

Attitudes can be thought of as our point of view or opinion of a certain stimulus. One way psychologists measure attitudes is using the tri-component model of attitudes, which can be used to analyse how a person's affect, behaviour and cognition all form and reflect their attitude. However, as demonstrated by cognitive dissonance, the model cannot explain why sometimes our thoughts, feelings and behaviour towards something do not align.

ACTIVITY 2

Summarise your knowledge on attitudes

1   Using an attitude you hold in your own life, draw the model into your notes and fill it in to summarise your knowledge on attitudes.
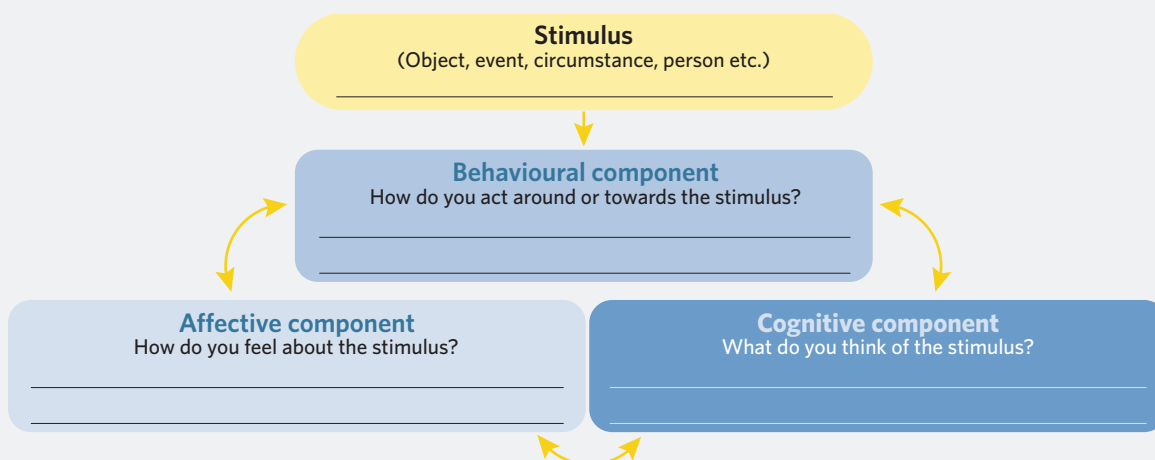
2   Do the three components of your attitude all align? Or are you experiencing cognitive dissonance?

7A QUESTIONS

Theory-review questions

Question 1

An attitude must be *(Select all that apply)*

I   an evaluation.

II   positive.

III fairly stable.

IV   known from birth.

Question 2

The tri-component model of attitudes is a theory of attitudes that *(Select one)*

A   suggests that there are three components that need to be present for an attitude to exist.

B   suggests that there are three types of attitudes a person can have.

Question 3

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 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 4

True or false? 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 5

True or false? Showing a behaviour that doesn't match your thoughts and feelings about something means you don't have an attitude.

A   true

B   false

Question 6

Fill in the blanks with the following terms.

*   social cognition
*   experience
*   future action

Attitudes form a central component of our _____. We learn what our attitudes are from _____ and apply them to _____.

Skills

Understanding research

Use the following information to answer Questions 7 and 8.

Read the following extract adapted from Olson et al.'s study, *'The Heritability of Attitudes: A Study of Twins'*.

This study investigated the genetic basis of individual differences in attitudes, examining the influences which make certain components of attitudes genetic.

> **Conclusion**
>
> Attitudes are learned. But attitudes also depend on biological factors. In this research, we obtained evidence that variation across individuals on a wide variety of attitudes is partly attributable to genetic factors...
>
> Several personality traits and supplementary variables were implicated as possible mediators of attitude heritability. Presumably, these characteristics—themselves highly heritable—predisposed individuals to form particular kinds of attitudes, thereby contributing to the genetic determination of individual differences in those attitudes. Sociability, in particular, was correlated at a genetic level with several attitudes. Athletic ability and physical attractiveness also yielded substantial genetic correlations with relevant attitudes. Finally, academic achievement appeared to be capable of predicting the heritability of the set of attitudes measured in our sample. We think that the primary value of our... analyses is to raise interesting questions about the sources of attitude heritability that can be examined in future research. (Olson et. al., 2001).

This excerpt explains how traits that we can inherit from our parents can contribute to the formation of our own attitudes. For example, if our parents are highly athletic, we may inherit this athletic ability ourselves and therefore be more likely to hold relevant attitudes towards athletic activity (e.g. feelings of confidence or enjoyment surrounding sport).

Question 7

Which other genetically inherited variables does the excerpt identify as having an influence on attitudes? *(Select all that apply)*

I   physical attractiveness

II   sociability

III   height

IV   academic achievement

V   musical ability

Question 8

The statement that 'we obtained evidence that variation across individuals on a wide variety of attitudes is partly attributable to genetic factors...' is an example of a *(Select one)*

A   hypothesis.

B   conclusion.

Exam-style questions

Multiple-choice questions

Question 9   (1 MARK)

The idea that horse racing is unacceptable and cruel is an example of a/an

A   cognitive component of attitudes.

B   affective component of attitudes.

C   behavioural component of attitudes.

D   positive attitude formation.

Question 10   (1 MARK)

Cognitive dissonance is a feeling of stress that occurs when

A   the three components of our attitudes align strongly.

B   we hold a negative attitude.

C   we hold a positive attitude towards a negative stimulus.

D   the three components of our attitudes don't align.

Question 11   (1 MARK)

Sasha didn't invite her uncle to her birthday because she believes he is racist. Not inviting her uncle is an example of which aspect of her attitude towards him?

A   affective

B   behavioural

C   cognitive

D   negative

Short-answer questions

Question 12   (2 MARKS)

Using an example, outline a limitation of the tri-component model of attitudes.

Question 13   (3 MARKS)

Nikhil is 18 years old and never learnt how to swim as a child. Whenever his friends go to the pool, he makes up an excuse not to go because he feels very anxious about swimming. The smell of chlorine and salt water even make him uncomfortable. Because he doesn't know how to swim, Nikhil believes that swimming for him would be too dangerous.

Using the tri-component model of attitudes, identify the different components of Nikhil's attitude towards swimming.

Questions from multiple lessons

Question 14   (3 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   Explain how one biological factor may have influenced Achmad's negative attitude towards the taste of sour lollies. (2 MARKS)

b   Using the tri-component model of attitudes, explain how one component of Achmad's attitude occurs in this scenario. (1 MARK)

7B JUDGING AND PERCEIVING OTHERS

In this lesson, you will apply the tri-component model of attitudes you learnt in the previous lesson to explain the relationship between stereotypes, prejudice and discrimination. More generally, you will learn how these things contribute to how we perceive and judge other people.

7A Attitudes	7B Judging and perceiving others	7C Explaining behaviour through attribution

Study design dot point

- the role of person perception, attributions, attitudes and stereotypes in interpreting, analysing, remembering and using information about the social world
- attitudes and stereotypes that may lead to prejudice and discrimination

Key knowledge units

Person perception	2.2.1.1
Stereotypes	2.2.1.2
Prejudice	2.2.3.1
Discrimination	2.2.3.2

Judging and perceiving others

Person perception 2.2.1.1   Stereotypes 2.2.1.2   Prejudice 2.2.3.1   Discrimination 2.2.3.2

First impressions
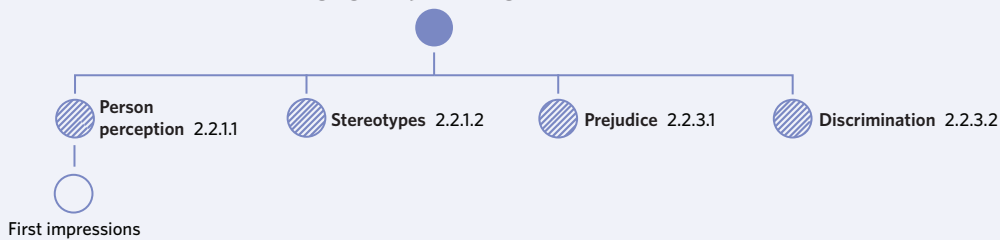
ACTIVITY 1 – CLASS EXPERIMENT

Draw a scientist

Step 1. Get everyone in your class to get a blank piece of paper and a pen. Give everyone and yourself two minutes to draw a scientist before looking at step 2.

Step 2. Make a tally of how many people in your class drew a

- **a**   woman.
- **b**   person wearing glasses.
- **c**   person in a laboratory setting.
- **d**   person wearing a lab coat.

Keep your drawings and tallies for later.

Was there a common scientist drawn by your class? Why do you think this was the case? By the end of this lesson, you should be able to understand and explain why you and your class drew scientists the way you did. You will answer further questions throughout this lesson based on the results of your class.

Person perception 2.2.1.1

OVERVIEW

Person perception is an umbrella term referring to the variety of mental processes we use to make impressions of other people.

THEORY DETAILS

What do you notice when you first see someone? Their facial expression, clothing, or their posture? **Person perception** is an element of social cognition and refers to the processes we use to form impressions of other people. Whether we like it or not, we make all sorts of judgements about other people when we encounter them. Information that determines our person perception can be provided *directly* from the person we are judging e.g. through observing them or interacting with them, or *indirectly* e.g. by hearing information about them from another person or source. The impressions we derive are determined by the affective, behavioural and cognitive components of our own attitude formation. Importantly, the social cognitive processes within person perception are often subject to fallibility and bias.

Person perception the different mental processes used to understand and form impressions of other people

First impressions

Have you ever heard people say, 'first impressions are important'? This is because when we first meet someone, we make a snap judgement about them in less than a second, based on the perceptual information most readily available to us. These judgements, called first impressions, are a type of direct person perception which can have a lasting impact on the way we perceive and behave towards a certain person. This is why it's often recommended to dress professionally and look your best for a job interview.

🧠 ***Want to know more?***

Who has the most trustworthy face?
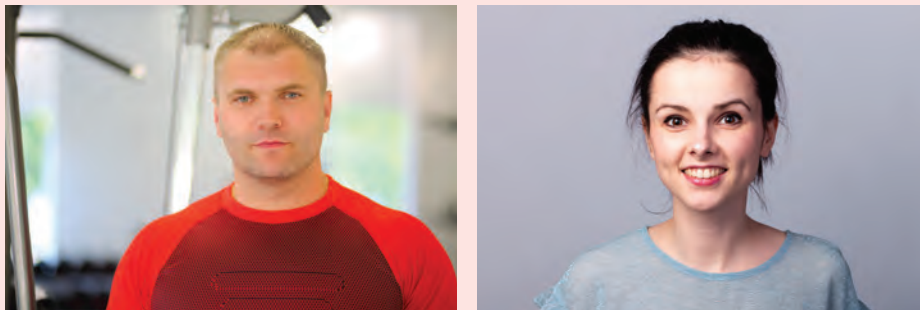
Image (L-R): Pavel L Photo and Video, Diana Shilovskaya/Shutterstock.com

Figure 1 Which of these faces do you feel is more trust-worthy? Why?

Although someone's personality can't be detected from appearance alone, the impressions we gain from people are often based on the way they look. Studies have shown that faces with more feminine, symmetrical and baby-like features such as large eyes elicit feelings of trust.
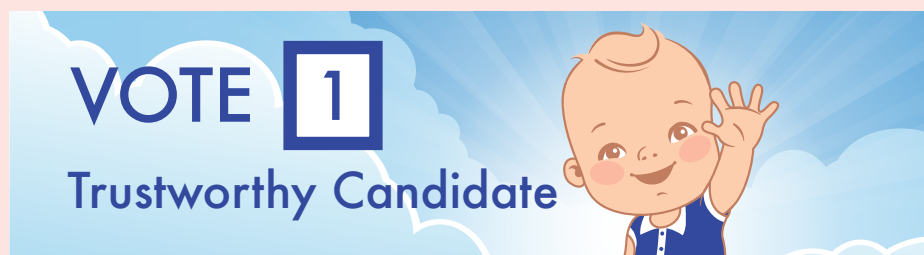
Image: Natalia Zelenina, Sky vectors/Shutterstock.com

Figure 2 Person perception has been shown to influence our voting decisions

Person perception not only affects the way we treat and interact with people in our own social circles, but can also have far-reaching consequences for society. Research studies have found that people make snap judgements about electoral candidates' competence from a photo alone, and that these judgements regularly predict who a population will vote for in an election (Ballew & Todorov, 2007).

Stereotypes 2.2.1.2

OVERVIEW

Stereotypes are a belief we hold about a group of people and the characteristics that members of that group share.

THEORY DETAILS

What type of person do you see in your head when you think of a CEO, a nurse, or a teacher? **Stereotypes** are a component of how we perceive other people and make sense of the social world. As a process of social cognition, stereotyping involves 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 that:

- 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
- Asians are smart and dedicated to their work
- 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.

Stereotype a widely held belief and generalisation about a group of people
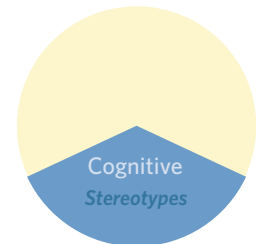
Figure 3 Stereotypes correspond to the cognitive component of our attitudes

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⊙ *Analogy*

The cognitive miser

Psychologists have used the analogy of the *cognitive miser* to explain the nature of the way we think and process social information. Outside of psychology, a 'miser' is someone who holds onto their money and spends as little of it as possible. This is comparable to the way we make judgements of other people in that we are inclined to expend as little mental energy as possible. Rather than considering the enormous list of characteristics a person might have, we tend to make a quick snap judgement of what a person might be like based on their appearance or other obvious features. Because of this, we tend to subconsciously and automatically fit people into stereotypes as it is an easier cognitive process, subjecting our judgement to many biases and errors that are an inherent part of intuitive judgements. With conscious effort,

we may be able to avoid the pitfalls of our cognitive miser tendencies. Remember this analogy, as it helps to explain many aspects of social cognition that you are learning throughout this chapter.

Image: Mascha Tace/Shutterstock.com

Figure 4 The cognitive miser analogy helps to explain how we take shortcuts in many areas of social cognition

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ACTIVITY 2 – CLASS EXPERIMENT

Draw a scientist: Results

Step 3. Looking at the tallies generated in activity 1, determine the common features of a scientist drawn by your class. Discuss what this might suggest about the stereotype of a scientist amongst your class. Do you think this stereotype is held by the rest of society? Were your class cognitive misers?

Prejudice 2.2.3.1

OVERVIEW

Stereotypes can often lead us to hold negative feelings towards social groups. These feelings are called prejudices.

THEORY DETAILS

In social cognition, **prejudice** is a negative feeling held against people within a certain group or social category. Prejudices generally stem from negative stereotypes. More often than not, they are unfounded and stem from emotion as opposed to reason. You can think of prejudice as being the *affective* component of stereotypes in the tri-component model of attitudes. In this sense, stereotypes are the thoughts we have about people, while prejudices are the more reflexive feelings that result from stereotypes towards them. 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. You can remember that prejudices are the ones that usually end with 'isms', such as racism and sexism.

Prejudice a negative feeling held against people within a certain group or social category

Figure 5 Prejudice corresponds to the affective component of our attitudes

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🧠 **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.

ACTIVITY 3

Are you prejudiced?

One famous test that continues to collect data for psychological research is the Harvard Implicit Association Test (IAT). You can take their tests designed for Australian participants here *implicit.harvard.edu/implicit/australia/takeatest.html*.

The tests are designed to uncover subconscious (implicit) attitudes and feelings you might hold towards certain social groups and categories. It does this by testing the strength of association we hold between different groups of people and certain concepts or values. For example, one test called the Gender-Science IAT is designed to test our association of different genders with different fields of research (IAT Corporation, n.d.). You may also wish to research some of the criticisms and evaluations of the IAT's accuracy.

ACTIVITY 4 – CLASS EXPERIMENT

Draw a scientist: Results

Refer back to your class' scientist drawings and results. As your class may have demonstrated, people tend to have a stronger association between men and science. See if the people in your class who complete this IAT produce results that reflect the scientist they drew in the previous activity.

Discrimination 2.2.3.2

OVERVIEW

When prejudiced views are acted upon, this is known as discrimination.

THEORY DETAILS

When prejudice and negative attitudes escalate or are strongly held, it may manifest as a behaviour called **discrimination**. Discriminatory behaviour involves excluding or treating people differently on the basis of the group to which they belong. As such, it is the *behavioural* component of our attitude towards other people. While stereotypes and prejudice are sometimes reflexive and involuntary, discrimination is not.

Discrimination the unjust treatment of people due to their membership within a certain social category

There are two different kinds of discrimination:

- *Direct discrimination* is when someone is treated unfairly because of feelings and thoughts surrounding their identity. For example, not hiring someone because they are too old or because they are an Aboriginal person.
- On the other hand, *indirect discrimination* occurs when something 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.

You can see the relationship between the three attitude components in the table within the theory summary activity.
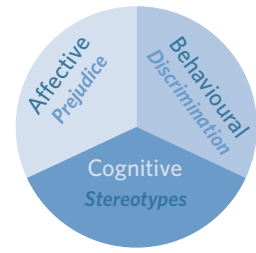
Figure 6 Discrimination corresponds to the behavioural component of our attitudes

ACTIVITY 5

Indigenous Australians and discrimination

Watch the episode of the Australian TV Show 'You Can't Ask That' called 'Indigenous' (Porter, 2016 - present). Make notes on what the interviewees say about indigenous:

1   Stereotypes

2   Prejudices

3   Discrimination

You can watch the video here: *iview.abc.net.au/show/you-can-t-ask-that/series/1/video/LE1517H008S00#playing*

Theory summary

In this lesson, you learnt about the idea of person perception and how it involves the processes that help us to make sense of and understand other people.

You also learnt about how we understand and interact with people through the lens of the tri-component model of attitudes. Specifically, you learnt that:

- Stereotypes comprise the cognitive component of understanding and judging others
- Prejudice comprises the affective component of understanding and judging others
- Discrimination comprises the behavioural component of interacting with others

ACTIVITY 6

Summarise your knowledge

Fill in this table to summarise your knowledge from the lesson.

Stereotype	Prejudice	Discrimination
	Racism	Not hiring a person for a job on the basis of their nationality.
	Sexism	
	Homophobia	
All old people are mentally and physically unfit.	**Ageism**	
	Classism	

7B QUESTIONS

Theory-review questions

Question 1

Fill in the blanks with the following terms.

- Behavioural
- Affective

In terms of the tri-component model of attitudes, stereotypes are cognitive, prejudices are _____ and discrimination is _____.

Question 2

Person perception is influenced by affective, behavioural and cognitive components and includes when we *(Select one)*

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.

Question 3

The ideas that men are strong, like sport, don't cry and are good at maths is an example of a *(Select one)*

A stereotype.

B prejudice.

Question 4

Making fun of men for crying would be an example of *(Select one)*

A prejudice.

B discrimination.

Question 5

Luka feels uncomfortable around Hispanic men because he is scared of them being aggressive as he's heard they can be threatening. However, he is still nice to them whenever he encounters them. Which of the following are occurring in the scenario? *(Select all that apply)*

I Stereotypes

II Discrimination

III Prejudice

Skills

Unpacking the scenario

Question 6

Sara has been homeless for ten months and has a bad chesty cough. She goes to the doctor for help, who infers that she is homeless because she has no permanent home address on her records. At the time of the appointment, Sara manages to stifle her cough for the duration of the consultation. The doctor takes this as a sign that Sara is not seriously sick and tells her she does not need antibiotics. Because she is homeless, he thinks Sara might be mentally ill or on drugs and that she is imagining her cough. Immediately, he asks her whether she has heard any voices or felt mentally unstable lately, and whether she is a smoker or takes any drugs. He does not check her throat or inspect her physically. Sara leaves feeling unheard and very upset.

Fill in the blanks in the following paragraph based on the scenario provided.

The person forming an attitude through processes of person perception in this scenario is the _____. The doctor holding a stereotype of homeless people is evidenced by his thoughts that Sara is _____ and might be imagining her cough.
This stereotype has probably led to feelings of prejudice against homeless people, and led to some discriminatory behaviour.
The doctor discriminating against Sara is clear in his actions of _____.

Exam-style questions

Multiple-choice questions

Question 7 (1 MARK)

Discrimination and stereotypes are, respectively,

A   a behaviour and a feeling.

B   a feeling and a behaviour.

C   a belief and a behaviour.

D   a behaviour and a belief.

Question 8 (1 MARK)

Jess believes all cat lovers are lonely women. This is an example of a

A   prejudice.

B   stereotype.

C   discriminatory behaviour.

D   first impression.

Short-answer questions

Question 9 (2 MARKS)

Using an example, outline what is meant by the term prejudice.

Question 10 (4 MARKS)

Using examples, explain the difference between direct and indirect discrimination.

Question 11 (5 MARKS)

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. Although the girls in the club were very welcoming, when Solomon walked by the boys' toilets, some boys snickered at him and made jokes about him.

a   Describe how stereotypes might have contributed to Solomon's worries. (2 MARKS)

b   Explain how a stereotype may have led to discrimination in this scenario. (3 MARKS)

Questions from multiple lessons

Question 12 (4 MARKS)

Using the tri-component model of attitudes, comment on the difference between a prejudice and a stereotype. Use examples to justify your response.

7C EXPLAINING BEHAVIOUR THROUGH ATTRIBUTION

Why didn't the man on the street smile back at you? Why did the waiter laugh when you entered the restaurant? Why did the chicken cross the road?

People are naturally inclined to make all sorts of judgements about themselves and other people. Attribution is the name of a process in social cognition and is when we make a judgement about the causes of our own or other people's behaviour. These inferences can determine the way we feel and act towards ourselves and those around us.

7A Attitudes	7B Judging and perceiving others	7C Explaining behaviour through attribution

Study design dot point

- the role of person perception, attributions, attitudes and stereotypes in interpreting, analysing, remembering and using information about the social world

Key knowledge units

Attribution	2.2.1.3
Factors that affect attribution	2.2.1.4

Explaining behaviour through attribution

- Attribution 2.2.1.3
  - Cognitive process
  - Internal versus external attributions
  - Effects of attribution on future actions
- Factors that affect attribution 2.2.1.4
  - Attribution biases
  - Personal factors
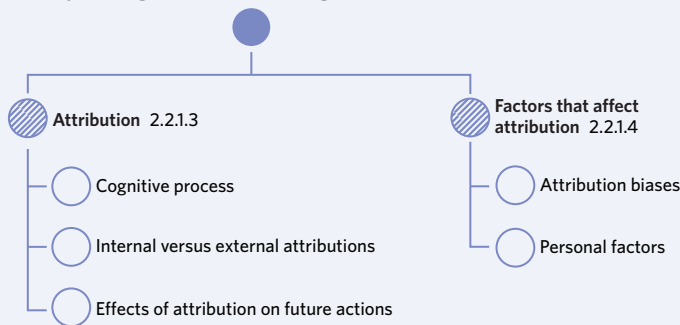
Attribution 2.2.1.3

OVERVIEW

Attribution is a cognitive process in which we ascribe causes to actions and behaviour. It is also the name we give to these judgements.

THEORY DETAILS

When we interact with others in the social world, we are constantly observing outward acts of behaviour and thinking about the causes behind them. We can say we have made an **attribution** once we have decided on a potential cause for our own or someone else's actions.

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:

1 Firstly, there is an *observation* of an outward act of behaviour.

2 Then, there is a *conscious determination* or acknowledgement of the behaviour.

3 Finally, we decide on or *'attribute'* causes to this observed behaviour.
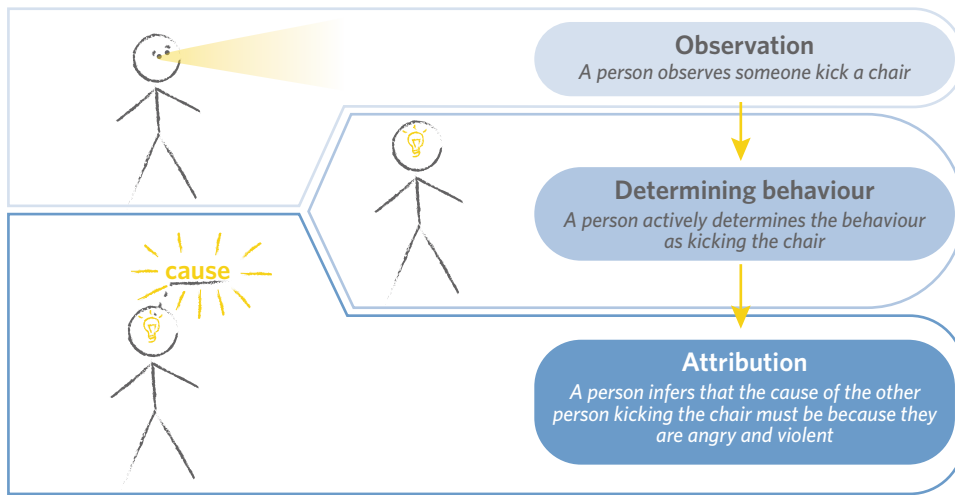
Figure 1 The cognitive processes involved in attribution

ACTIVITY 1

Can you explain and make attributions?

1   Explain what attribution means in terms of social cognition.

2   Discuss the possible attributions you might make to the following scenarios.

   a   You see a person walking along the footpath, hunched over and holding their stomach.

   b   You see a car broken down on the side of the highway with a person sitting in it who is appearing to do nothing.

   c   Your friend arrives wearing white pants that are covered in mud.

Internal versus external attributions

The types of attributions we make are generally categorised into two types: internal (also known as personal or dispositional) and external (also known as situational) attributions.

Internal attributions occur when we judge behaviour as being caused by something personal within the individual. From birth, people are constantly making internal attributions about the way we act. The parents of the newborn baby have to make all kinds of inferences: is the baby crying because she is hungry, sleepy, or is she in pain? As we age, the internal attributions made about us become more nuanced: 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? Some examples of internal attributions include judging behaviour as the result of someone's:

- psychological state
- age
- gender
- intellect
- motivation
- ability
- desire
- past behaviour

On the other hand, **external attributions** occur when we determine the cause of a behaviour as resulting from situational factors outside the individual. Situational factors include things like the environment a person is in when they produce a behaviour, as well as the events that have happened to that individual that are beyond their control.
For example, when a person falls off their bike we might attribute this behaviour to the icy and slippery road they were travelling on (the environment and cause) which caused them to lose control (the behaviour).

Internal attribution (also known as personal attribution)
a judgement of the causes of a behaviour as resulting from features of the individual performing the behaviour

External attribution (also known as situational attribution)
a judgement of the causes of a behaviour as resulting from forces outside the individual performing the behaviour
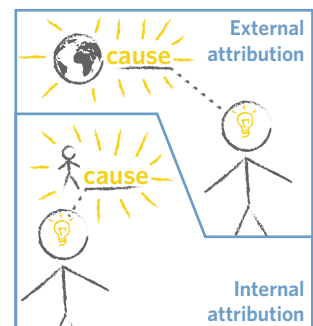
Figure 2 Internal attributions involve attributing the cause to something within the individual performing the behaviour, whereas external involve attributing the cause to something from the outside world

ACTIVITY 2

Can you imagine a mother's attributions?

Complete the following two diagrams by filling in the attribution. For the left diagrams, provide an example of a possible internal attribution for the given scenario. For the right diagrams, provide an example of an external attribution.

Observation
You see a mother in the supermarket yelling at their child to be quiet

Behaviour
You identify the behaviour as the mother yelling at her child

cause

Internal attribution
You attribute the mother's yelling to
_____

Observation
You see a mother in the supermarket yelling at their child to be quiet

Behaviour
You identify the behaviour as the mother yelling at her child

cause

External attribution
You attribute the mother's yelling to
_____

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 attributed the behaviour to an internal or external cause. For example, if we attribute a person's weight gain to laziness rather than a medical condition or life difficulty, we may be more likely to perceive them negatively and treat them on the basis of this judgement.

Similarly, the way we attribute our own success 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.

Behaviour
Failing a test.

Internal (and unstable) attribution
'I didn't study hard enough for that test.'

Future behaviour
Studying harder for the next test. Performing better on next test.

Behaviour
Failing a test.

External attribution
'That test was unfair.'

Future behaviour
Not studying harder for the next test. Performing the same or worse on next test.
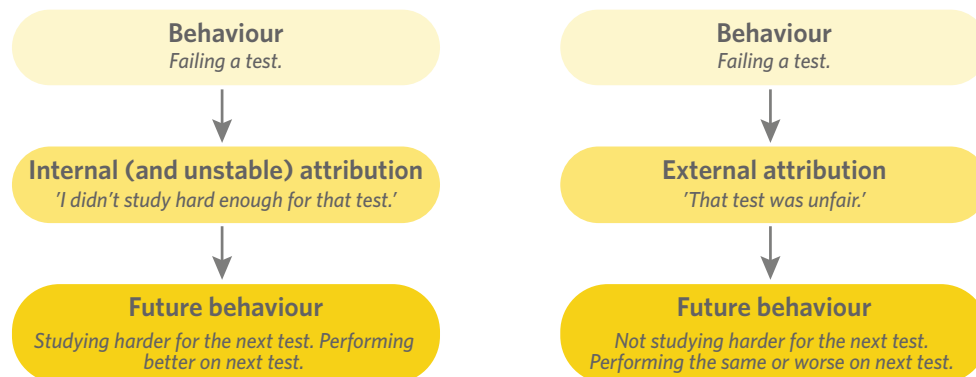
Figure 3 How different types of attribution can determine future behaviour

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* (able to be changed; not fixed) and internal cause is more likely to actively try to modify their behaviour in the future.

Attributional style tendencies and repeated patterns in the way someone makes attributions. Also known as a person's explanatory style

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. This feeling of internal control is the opposite of what psychologists deem as 'learned helplessness'. *Learned helplessness* is a feeling we get when we continually attribute failures to a stable (fixed), internal inability to do a certain task; or, as shown in figure 3, 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.

In general, the type of attributions we tend to make as a person is referred to as our attributional style. For example, someone who regularly attributes behaviour to negative causes might be labelled as having a pessimistic attributional style.

Factors that affect attribution 2.2.1.4

OVERVIEW

There are a range of factors that can influence how we make attributions, including a range of psychological biases.

THEORY DETAILS

Attribution biases

When waiting for someone who is late for a date at a restaurant, we might attribute their lateness to bad traffic... or perhaps it's the nasty weather?

Surely they aren't late because they want to spend less time with us? They couldn't be late because they are rather apathetic about seeing us and they didn't make sure to get ready hours before the date like us.

The judgements we make when attributing behaviour are often subject to our own internal biases. Attributing our late date's behaviour to an external cause protects us psychologically from feelings of self-doubt and unworthiness. This is just one type of cognitive bias that affects the way we make attributions known as the *self-serving bias*.

But how do cognitive biases affect our attribution?

As shown in figure 5, when we go to attribute behaviour to a cause, our own **cognitive biases** get in the way and influence the final attribution we make. These biases generally occur immediately and unconsciously, and so it can be good practice to consider the mental errors we may have made when making judgements that affect ourselves and other people. Again, this is the result of our nature as cognitive misers as seen in lesson 7B.

A list of some of the most common biases that affect our attributions are detailed in table 1.

Image: jesadaphorn/Shutterstock.com

Figure 4 When waiting for a date, we are likely to make all sorts of attributions as to why they're late

Cognitive bias an error in thought processes that impacts rational decision making and reasoning
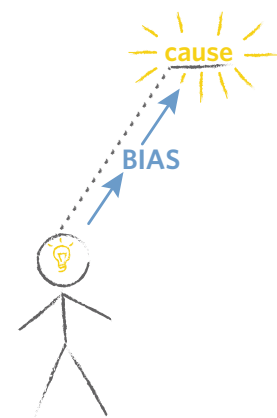
Figure 5 Our own subjective biases act as an 'input' to our attributions, affecting the kind of cause we are likely to attribute a behaviour to

Table 1 Cognitive biases that influence our attributions

Cognitive bias	Explanation
Self-serving bias	The self-serving bias refers to the tendency to attribute our shortcomings and failures to external causes, and successes and achievements to internal causes. This bias serves to shift blame and responsibility to causes beyond our control when something goes wrong while allowing us to feel proud of our wins and uphold our self-esteem. Even though our date might be late because we made such an awful impression the first time round, the self-serving bias suggests we will attribute this 'failure' to an external cause like the traffic.

Own behaviour	Attribution
Positive	*Personality, effort, intelligence*
Negative	*Circumstances, other people, bad luck*

Figure 6 The self-serving bias

cont'd

Table 1 Continued

Cognitive bias	Explanation
The fundamental attribution error	Another observed bias is the fundamental attribution error. This refers to our tendency to explain other people's behaviour in terms of internal factors, while ignoring possible external factors. This can lead to an overemphasis of people's responsibility for their actions and the assumption that a person's nature always dictates their behaviour.
	Research suggests that this phenomenon arises because the most salient physical feature when perceiving another's behaviour is the person themselves. Being cognitive misers, we tend to quickly attribute actions to something within the performer of the actions, when in reality external forces might be at play.

Figure 7 We have a stronger tendency to attribute other people's behaviour to internal causes than external causes

Cognitive bias	Explanation
Actor-observer bias	The actor-observer bias explains our tendency to explain others' (the actors) behaviour in terms of internal factors, but our own (the observer) in terms of external factors. This is particularly the case for negative events. Like the fundamental attribution error, this phenomenon can be explained in terms of what is most significant in our own perception. While we are well equipped to observe all of the external factors that impact our own behaviour, this does not occur as much when observing other people.
	When judging another person, the most salient feature in our perception is them and so we attribute their actions to something within their nature or personality. Ultimately, this asymmetry in social cognition places more responsibility on the other for their actions when something bad happens, while we tend to let ourselves off the hook.

	Myself	Another person
Negative behaviour	*Circumstances, luck*	*Personal factors*

Figure 8 The actor-observer bias

Cognitive bias	Explanation
Defensive attribution	Defensive attributions occur when we learn of another person in crisis or adversity and attribute that event to something internal and controllable. This is supposed to occur as a means of reducing or 'defending' ourselves from the belief that the same thing could happen to us. Essentially, this bias allows us to think that if a person is responsible for the bad thing that happened to them, then it couldn't happen to us. This often occurs in cases of 'blaming the victim' for sexual assault, attributing their crisis to internal factors such as what they were wearing or doing at the time of their assault.

	Another person
Negative event	*Personal factors*

Figure 9 Defensive attribution

ACTIVITY 3

Can you uncover the biases affecting these attributions?

For the following attributions, name the kind of bias/es that could have led to them.

1 That woman on Centrelink payments doesn't work hard enough to find a job and change her situation.

2 He got the job because he sucked up to the employer while I missed out because the employer was having a bad day when I met him.

3 She got into a fight at the pub because she was acting drunk and aggressive.

Personal factors

Personal factors such as our culture, ideology and past experiences all contribute to our own personal attributional style and the biases we are susceptible to. As shown in figure 10, the personal factors that make us who we are create cognitive biases or tendencies that determine our attributional style.

Culture as a personal factor

One of the most extensively studied personal factors is how cultural backgrounds can impact attributional styles and tendencies. Psychologists have found significant differences between the way Easterners and Westerners make attributions. It is suggested that this is because of the differences embedded within individualist (largely western) and collectivist (largely eastern) modes of thought and practice.

Western societies such as those in Australia and America tend to perceive the world as being comprised of unique and separate individuals. For these individualist nations, there is a societal emphasis on personal success, independence and growth. As a result, attributions are generally made with the individual in mind, resulting in a greater number of internal attributions than in collectivist cultures. Unsurprisingly, the self-serving bias and the fundamental attribution error are committed more commonly by those in western nations.
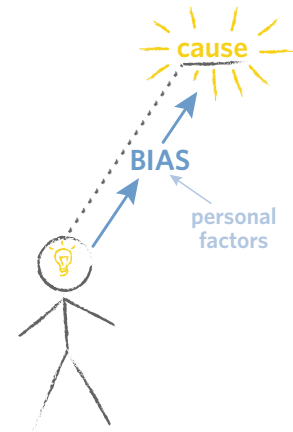
Figure 10 A person's attributional style is determined by their own personal factors and biases
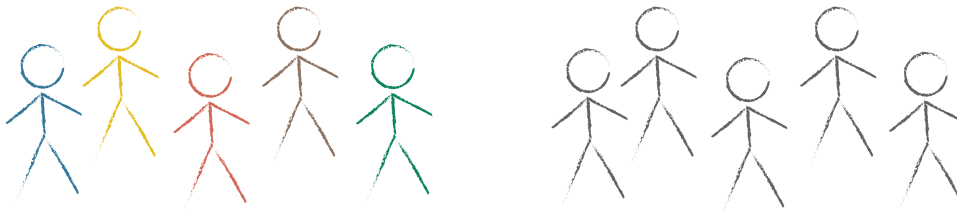
Figure 11 While individualists tend to see individuals (left), collectivists are more likely to see individuals as belonging to a group (right)

In contrast, collectivist societies such as those in South East Asian countries tend to view the world as being made up of groups, whether these are familial or communal (Choi et al., 1999). As a result, there is more societal emphasis on flourishing as a group, with individual action being of lesser importance than the group's. Collectivist nations also tend to perceive the world as consisting of a whole rather than separate parts. This is reflected in collectivist attributional style that more commonly considers situational causes for behaviour.

ACTIVITY 4

What biases do you hold?

With people in your class, discuss some of the key areas of your own background (age, gender, culture, nationality, and socioeconomic status). Pick three background factors and think of one way each of these might influence the attributions you make. If you can, think of an attribution you have made in the past that may have been influenced by this factor. You can use the table to record your notes. An example has been provided for you.

Personal factor	Effect on attribution	Attribution you have made in the past
Culture (western)	Can make me more likely to consider internal factors for good things (self-serving bias).	When considering reasons for my own academic success in the past, I have attributed them to studying hard when it could also be due to external factors in my environment.

> **📖 Psychology in practice**
>
> **Challenging attributional styles**
>
> As demonstrated by the previous activity, we can become more conscious of the kinds of biases and errors we have when making attributions. This can help us to make fairer judgements on ourselves and other people. In *clinical psychology*, psychologists often work with people dealing with problems of depression and anxiety to adjust their thought patterns. Often, this can involve attempting to challenge attributions that lead to low self-esteem, such as believing that one is too weak or stupid to complete a task. Although many of the cognitive biases outlined in this lesson seem to be self-serving, there are people whose attributional styles lead to low mood and low confidence. This method of challenging thought patterns and attributional style is often used as a process in a treatment known as Cognitive Behavioural Therapy (CBT).

Theory summary

This lesson explored the social cognitive process of attribution. An attribution is made when we make a judgement about the causes behind our own or other people's behaviour. There are two main types of attribution: internal and external attributions.

Our attributions have an *influence on* the way we act in future, and are *influenced by* a range of factors including our own personal background and experiences, and various cognitive biases.

7C QUESTIONS

Theory-review questions

Question 1

In social psychology, attribution refers to *(Select one)*

A the judgment we make about the cause of a person's behaviour.

B the process of determining the causes of a person's behaviour.

C both.

Question 2

Attributing someone's behaviour to their psychological state is an example of an *(Select one)*

A internal attribution.

B external attribution.

Question 3

The tendency for someone to regularly attribute behaviour to stable, internal causes may be referred to as an *(Select one)*

A attributional style.

B actor-observer bias.

Question 4

True or false? Attributions follow a rigorous scientific method and are generally very accurate.

A true

B false

Question 5

Cognitive biases can affect the *(Select one)*

A internal attributions we make.

B external attributions we make.

C both.

Question 6

The fundamental attribution error and the actor-observer bias are examples of *(Select one)*

A   biases that may decrease the accuracy of our attributions.

B   biases that may increase the accuracy of our attributions.

Skills

Unpacking the scenario

Use the following information to answer Questions 7-10.

Ringo's dog Musty has been howling all night. To try and stop the howling, Ringo let Musty inside and gave him some treats, but he still kept howling. Then he tried patting him to comfort him, but that didn't work either. After a while, Ringo realised his computer was making a very high pitched ringing noise and turned it off. Immediately, Musty stopped howling.

Question 7

Who was making attributions in this scenario? *(Select one)*

A   Ringo

B   Musty

Question 8

What kind of attributions were being made? *(Select one)*

A   internal

B   external

Question 9

What evidence from the scenario supports this? *(Select one)*

A   That Ringo tried to give Musty treats and pat him to comfort him.

B   That Ringo turned off his computer.

Question 10

The type of attribution that would have correctly identified the cause of Musty howling would have been *(Select one)*

A   internal.

B   external.

Exam-style questions

Multiple-choice questions

Question 11   (1 MARK)

Which of the following is an example of an external attribution?

A   mood

B   effort

C   intelligence

D   the weather

Question 12 (1 MARK)

Isla was late to school on Monday and told the teacher it was because her bus got stuck in traffic, when really she knew it was because she didn't get out of bed in time. Isla's explanation to her teacher for being late and the real explanation she had in her head were respectively examples of

A internal and external attributions.

B external and internal attributions.

C the fundamental attribution error and self-serving bias.

D self-serving bias and an external attribution.

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.

Short-answer questions

Question 14 (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 often 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 feels there is no use in studying 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)

Question 15 (2 MARKS)

Using an example, explain what is meant by the fundamental attribution error.

Questions from multiple lessons

Question 16 (8 MARKS)

Li was reading in the newspaper about a murder in which a man was killed and cut into 100 pieces. The murder suspects were the man's wife, his elderly father, and his next door neighbour. Li discounted the elderly father as a suspect as he believed that he would be too frail to commit such a crime. On the other hand, Li thought it might be the wife because, being married himself, he believes married people often hold resentment towards each other. Li put away the paper and felt relieved, believing his wife could never resent him enough to do such a thing to him.

a In terms of person perception, Li thinking the elderly father would be too frail to murder is an example of what? (1 MARK)

b Describe the three steps of attribution involved in Li attributing the murder to the wife. (3 MARKS)

c Describe how one personal factor relating to Li may have influenced the attribution Li made. (2 MARKS)

d How did Li make a defensive attribution in this scenario? (2 MARKS)

CHAPTER 7 REVIEW

CHAPTER SUMMARY

This chapter was all about social cognition. As you now know, we use a range of cognitive tools and processes to interpret and make sense of other people and the social world around us.

In **7A**, we covered the range of factors that influence the formation of our attitudes. This was covered through the tri-component or A-B-C model of attitudes. The components include:

- Affective components
- Behavioural components
- Cognitive components

In **7B**, we learnt about person perception and how the tri-component model of attitude can be used to explain how we analyse other people. Specifically, we learnt that

- Stereotypes form the cognitive component
- Prejudices form the affective component
- Discrimination forms the behavioural component

In **7C**, we applied our knowledge of social cognition to explain the cognitive process of attribution and how it helps us make sense of our own and other people's behaviour. We also learnt that it is influenced by biases and our own personal attitude formation.

Understanding the world through social cognition

CHAPTER REVIEW ACTIVITIES

Review activity 1: Example bank

For the following key terms from the chapter, write a definition and provide an example in your own notes.

- Attitude
- Affective component (of attitudes)
- Behavioural component (of attitudes)
- Cognitive component (of attitudes)
- Person perception
- Stereotype

- Prejudice
- Discrimination
- Internal attribution
- External attribution
- Cognitive bias

Review activity 2: Label the scenario

Fill in the blanks with the following terms.

- First impression
- Stereotype
- Prejudice
- Attitude
- Affective

- External attribution
- Attribution style
- Discrimination
- Personal factor

Hannah works in an aged care facility and has been there 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 and hanging out with 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 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.

CHAPTER 7 TEST

Multiple-choice questions

Question 1   (1 MARK)

The actor-observer bias involves the tendency to

A   attribute others' actions to internal factors, and our own to external factors.

B   attribute others' actions to external factors, and our own to internal factors.

C   attribute other people's and our own actions to internal factors.

D   attribute other people's actions and our own to external factors.

Question 2   (1 MARK)

Enjoying classical music because it makes you feel relaxed is an example of

A   a positive stereotype towards classical music.

B   a negative stereotype towards classical music.

C   a positive attitude towards classical music.

D   a negative attitude towards classical music.

Question 3   (1 MARK)

Which of the following is an example of an internal attribution for someone being late to school?

A   the month of the year

B   mood

C   the weather

D   the traffic

Use the following information to answer Questions 4-6.

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 4   (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 5   (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 6   (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 7   (1 MARK)

If a stereotype were to inform our attribution of someone's behaviour, this would be an example of

A   an internal attribution.

B   an external attribution.

C   a social source of cognitive bias.

D   a self-serving bias.

Question 8   (1 MARK)

The difference between a stereotype and prejudice is that

A   stereotypes are a cognitive component of our attitudes towards others, whereas prejudices are affective.

B   stereotypes are an affective component of our attitudes towards others, whereas prejudices are cognitive.

C   stereotypes are generalisations about groups of people, whereas prejudices are about seeing people as unique individuals.

D   stereotypes rationally examine the individual differences between people, whereas prejudices involve intuitive feelings that govern how we feel about people.

Short-answer questions

Question 9 (1 MARK)

Define stereotype.

Question 10 (2 MARKS)

Outline what is meant by the term discrimination using an example.

Question 11 (3 MARKS)

Using an example, explain what defensive attribution is.

Question 12 (3 MARKS)

According to the tri-component model of attitudes, provide examples to explain what a negative attitude towards non-fiction books might look like.

Question 13 (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 14 (4 MARKS)

Leo is a very tall man with broad shoulders. He has a big beard and often wears a big black hoodie covering his head. At night, whenever he sees a woman walking on her own towards him, he takes off his hood, smiles, and skips across the road. He does this to avoid intimidating women because he knows he looks like a strong and possibly threatening man.

a Explain how Leo's behaviour might reflect an attitude he holds towards women. (2 MARKS)

b Describe how stereotypes of men might have influenced Leo's behaviour. (2 MARKS)

Question 15 (2 MARKS)

Using an example, explain what is meant by the term cognitive dissonance.

Question 16 (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 an argument between researchers about a species of sea turtle at her bar while working. Having happened to have just completed an assignment on this species, Scarlett chimed in with an opinion. The researchers looked up at Scarlett annoyed, and smiling condescendingly, asked her what a pretty, young bartender could possibly know about sea turtles.

Describe how the researchers in the bar demonstrated discrimination and explain how it could be informed by a stereotype.

Key science skills questions

Question 17 (1 MARK)

In a study on stereotyping, a researcher asked participants to say whether they believe they fit into a stereotype, and if so, what characteristics of the stereotype they adhere to. The type of data collected was

A numerical.

B quantitative.

C objective.

D qualitative.

Question 18   (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.

Questions from multiple chapters

Question 19   (1 MARK)

Tony was harassed in primary school by a tall skinny boy who made fun of Tony for his Lebanese heritage. Scarred by this experience, whenever Tony now encounters tall and skinny men, he breaks out into a sweat and can feel his heart pumping.

Which of the following options best identifies the division of Tony's nervous system which is active when he encounters tall and skinny men now, and the type of harassment that he received in primary school?

	Division of nervous system	Type of harassment
A	central	prejudice
B	peripheral	discrimination
C	sympathetic	discrimination
D	sympathetic	prejudice

Question 20   (6 MARKS)

Jun is a Japanese boy who loves acting. He is currently on exchange in Australia, and is very excited to take drama class as this is not offered at his school at home. In drama class, when it was Jun's time to perform, he got up and played a very eccentric old man. He noticed the class begin to laugh at him and make faces as though he was weird.

Afterwards, they told him they were so surprised because they thought Japanese people were quiet and reserved. After this, even though Jun still loved drama and acting, he felt uncomfortable and upset and no longer volunteered to perform for the class. Instead, he believed he should stay quiet so as not to challenge his class's beliefs regarding how he should behave.

a Explain how stereotypes in this scenario acted as a social factor and explain how this may have impacted Jun's mental health. (3 MARKS)

b Identify Jun's affective component of his original attitude towards acting, and explain whether his behaviour over time was consistent with this component. (3 MARKS)

UNIT 2 AOS 2, CHAPTER 8

Social influences on behaviour

08

8A   **Experiments on status and power**

8B   **Experiments on obedience**

8C   **Experiments on conformity**

8D   **Prosocial behaviour**

8E   **Bullying**

8F   **Media and behaviour**

Key knowledge

- the influence of status and social power within groups, and obedience and conformity on individual behaviour, with reference to theorists including Asch, Milgram and Zimbardo

- the influences on helping behaviour (or reluctance to help) including personal, situational and social factors

- factors that influence bullying (including cyberbullying) behaviour and the effects of bullying behaviour on an individual's psychological functioning

- positive and negative influences of media on individual and group behaviour, illustrated by advertising, television, video games and social media

8A EXPERIMENTS ON STATUS AND POWER

Have you noticed that certain people in groups can sometimes have control and power over others? Why do these individuals have power over other group members? How is this power assigned to them? In this lesson, you will learn about status and social power, specifically learning about how these exist within groups. You will then learn about the famous Stanford prison experiment. This will include looking at the ethics of the study.

Image: Andy Dune/Shutterstock.com

8A Experiments on status and power	8B Experiments on obedience	8C Experiments on conformity	8D Prosocial behaviour	8E Bullying	8F Media and behaviour

Study design dot point

- the influence of status and social power within groups, and obedience and conformity on individual behaviour, with reference to theorists including Asch, Milgram and Zimbardo

Key knowledge units

Status and social power	2.2.4.1
Stanford prison experiment	2.2.4.2
Ethics of the Stanford prison experiment	2.2.4.3

Experiments on status and power

- Status and social power 2.2.4.1
- Stanford prison experiment 2.2.4.2
  - Zimbardo's experiment (Zimbardo, 1973)
- Ethics of the Stanford prison experiment 2.2.4.3
  - No-harm principle
  - Withdrawal rights
  - Debriefing
  - Beneficence
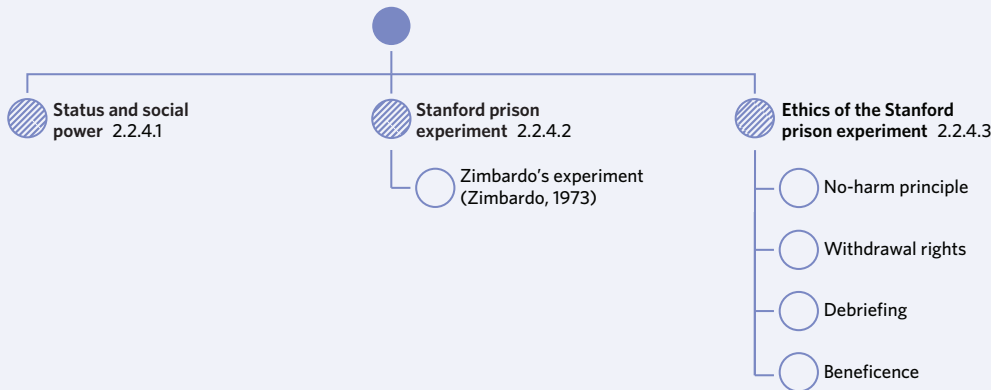
Status and social power 2.2.4.1

OVERVIEW

For a collection of people to be classified as a group, multiple conditions have to be met. As well as learning about these conditions, you will also learn about the difference between status and power. More specifically, you will learn about the multiple types of social power.

THEORY DETAILS

Are you part of any groups? Maybe sporting teams 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? It is likely that you are unsure of how to define the term 'group' due to being involved in multiple groups which vary greatly and serve different purposes. In the field of psychology, a **group** is defined as two or more people who interact with and influence each other, as well as sharing a common purpose or goal.

Group two or more people who interact and influence each other and share a common objective

For a group of people to be classified as such, four conditions need to be met. These conditions are:

1   That there are two or more individuals or 'members'; one person alone cannot be classified as a group.

2   That the members interact with each other.

3   That the members need to influence each other, such as influencing a member's thoughts or behaviour.

4   That 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.

Image: Yummyphotos/Shutterstock.com

Figure 1 A group of individuals interacting through a discussion with the common goal of expressing ideas and creating bonds

> **Want to know more?**
>
> You are most likely part of many formal and informal groups. *Formal* groups are established by a governing body or individual with power. For example, formal groups can include a professional sporting team or a leadership team at a workplace. In contrast, *informal* groups occur naturally and usually serve the purpose of providing social interaction and bonds. Informal groups include friendship groups.

ACTIVITY 1

Which of the following scenarios include groups?

1   Five people take the same bus route to school every day. They never speak to each other on these trips, but sometimes smile at one another.

2   At an accounting firm, Steph, Kat and Brian have to ensure that they complete the tax returns of all their clients in the next month. To do this, they have been staying back late to help each other.

3   Axel carpools to work with his neighbour. They always try to communicate with each other during the week to make sure that they leave for work at a time that suits them both.

Within each group, status and social influence can lead to changes in group behaviours or thoughts. But what is the difference between status and power? **Status** is the perception of an individual's position within a group and contribution to a group, as perceived by other members of the group. An individual's status within a group equips them with a level of power within that group. For example, individuals with higher status within a group tend to have more power over the members of that group.

Power involves the extent to which an individual can influence or control another individual's thoughts, feelings, and behaviour. For those individuals within a group who have power, they can exert their power either consciously or unconsciously. For example, a teacher can consciously exert power by commanding that their class be quiet and continue on with their work. In contrast, some social groups can have an unofficial group leader or 'leader of the pack'. They can inadvertently exert their power over other group members by influencing their thoughts on other group members, or even influencing what music group members like as they can try to fit in with and please the group member with power. As can be seen in figure 2, there are multiple forms of social power.

Status an individual's position within a group as perceived by other members of that group

Power the extent to which an individual can influence or control another individual's thoughts, feelings and behaviour

Legitimate power	**Coercive power**	**Reward power**	**Expert power**	**Referent power**
Power given to individuals due to their status or position over others e.g. the power held by a school principal, boss of a company	Power given to individuals who have the ability to provide punishments or negative consequences e.g. the power held by police	Power given to individuals who have the ability to provide positive consequences or benefits e.g. the power held by a parent (can give child a treat)	Power given to individuals who have heightened knowledge or skills in a particular field which are valued e.g. the power held by a doctor	Power given to individuals due to others wanting to be like them or be liked or accepted by them e.g. the power held by a celebrity

Figure 2 Types of power

As can be seen in figure 2, there are multiple forms of power. Individuals can even hold multiple forms of social power simultaneously. For example, a lead scientist might hire a new employee and inform them that if they find a cure for a rare disease in a year they

could get a raise (reward power). The lead scientist has also been nick-named a 'genius' at work due to previous groundbreaking research (expert power), and is well liked and respected by his employees, with many of them doing little favours for him such as getting him coffee (referent power). Due to the combination of multiple forms of social power, this lead scientist is likely to be extremely influential over his employees, potentially leading to them being extremely productive and working well in their teams.

Psychology in practice

The behaviour of groups, as well as the influence of status and social power over groups, is researched by social psychologists. *Social psychology* examines how an individual's behaviour and thought is influenced by their social interactions and the presence and expectations of others. Findings in the field of social psychology are applied to many aspects of society due to the innate desire for individuals to socialise. Some of these areas include being applied to workplaces and organisations, sports, politics, health and law.

Stanford prison experiment 2.2.4.2

OVERVIEW

The Stanford prison experiment is well known for its shocking discoveries. This experiment was even made into a movie in 2015 so you may have heard of the study. The study involved assigning male university students as either 'prisoners' or 'prison guards' in a social experiment. The results helped researchers to understand more about social power and status.

THEORY DETAILS

Zimbardo's experiment (Zimbardo, 1973)

The Stanford prison experiment is an extremely famous study. It was conducted in 1971 and published in 1973 by psychologist Philip Zimbardo. In the experiment, Zimbardo (1973) wanted to investigate the impact of assigning some students with the role of 'prison guard', and assigning other students with the role of 'prisoner'. It was intended to investigate the impact of status and power on group behaviour. Due to the severe distress of participants, the study came to an end after only six of the planned 14 days.

Aim

The study aimed to investigate the effects on behaviour of assigning individuals with roles in a simulated prison environment. In such a way, Zimbardo wanted to examine the effects of assigning some individuals with greater status and more power than others.

Participants and materials

The sample comprised 24 male American Stanford University students. The participants came from a pool of people who responded to newspaper advertisements, in which the study was described to investigate prison life. They were told that they would receive $15 (USD) a day for the two-week duration of the study. These participants underwent pre-tests to ensure that they had no underlying medical conditions or mental health disorders. Through these pre-tests, Zimbardo deemed the chosen 24 participants to be average, healthy Americans.

Of the 24 in the sample, nine participants were randomly allocated to the role of 'prisoners', nine to the role of 'prison guards', and the remaining six were kept as a backup.

The study was conducted in a mock prison setting which was set up in a basement on the Stanford University campus. In this prison, there were fake cells. The behaviour of participants was observed through video recordings from within the mock prison, as well as through one-way glass. Both the prisoners and prison guards had uniforms that they wore for the duration of the study.

Procedure

1 The participants assigned the role of a prison guard had a training day with Zimbardo and the other research assistants. During the day Zimbardo told the prison guards to maintain order within the prison and were told that they could do anything to the prisoners to maintain order except directly engage in violence. The guards were given uniforms that were described to be 'military-style', including reflective sunglasses and batons.

2 The participants assigned the role of prisoners were arrested by real, local police officers. Although the arrest was fake (as the participants had not actually done anything wrong), it looked extremely realistic to onlookers. Police unexpectedly arrested them and placed them in a police car which took them to the mock prison. Once at the prison, the prisoners had fingerprints and photographs taken and were stripped of their clothes and given prisoner uniforms.

3 The prisoners were then told their assigned numbers and were told that they were only allowed to refer to themselves and other prisoners by their number. No names were allowed to be used.

4 All participants (the prisoners and prison guards) were then placed in the mock prison and their actions were observed.

Results

What actually happened during the experiment? Zimbardo didn't give many clear instructions or directions to any of the participants because he was interested in observing the social interactions that occurred. Zimbardo observed that the participants assigned to prison guards started to adopt an authoritative persona and the prisoners started off obedient but then started to rebel. The environment of the mock prison became increasingly intense over the duration of the study. Some of the occurrences included:

- The prison guards enforced daily counts, in which the prison guards made the prisoners shout their assigned number. For the first couple of days, this started as a non-violent activity. During this time, both the prisoners and prison guards were carrying out their roles and there was little distress or tension among the participants.

- Each day, the prison guards became increasingly strict and aggressive during these daily counts and other interactions. In turn, the prisoners became increasingly passive each day and began accepting increasingly cruel orders.

- After a couple of days, prisoners were ordered by the guards to complete push ups and other behaviours.

- On *day 2*, one prisoner was displaying severe distress and wanted to leave the study. Zimbardo spoke to him and encouraged him not to leave.

- By *day 3*, the prison guards were extremely restrictive over the prisoners. They started controlling when the prisoners could eat and when they could sleep. This involved continuously waking up the prisoners overnight leading to the prisoners being severely sleep deprived.

- After the prisoners were forced into other humiliating activities such as cleaning toilets with their hands by the prison guards and suffering from severe sleep deprivation, many prisoners were experiencing severe distress. This led to four of the nine prisoners being released from the study on *day 4*.

- Some prisoners started to rebel. This included prisoner 819 refusing to eat on *day 5*. He was put in solitary confinement by the prison guards. The prison guards then ordered the rest of the prisoners to chant 'prisoner 819 did a bad thing' and bang on the door to the solitary confinement room. The other prisoners said that prisoner 819 made their life more difficult due to this rebellion leading to them all being punished.

- At this point, many of the participants displayed severe distress. The study ended at the end of *day 6*, less than half of the way through the planned two week experiment.

At the end of the study, Zimbardo and his team were shocked with the results. In just a few days, the prison guards severely degraded the prisoners, with many of them experiencing extreme distress. After completing debriefing with all participants, many of the prison guards were distressed due to being in disbelief of how cruel they were towards the prisoners. The prison guards said that because the mock prison seemed so real, they took their role very seriously. Among the group of guards, some instigated the humiliating acts themselves, while other guards simply followed their lead. In such a way, it was clear how some prison guards had a greater status among the group, with the other guards willingly carrying out their ideas, even if they were extremely cruel and humiliating for the prisoners.

🧩 Lesson link

During the Stanford prison experiment, the prison guards and prisoners were given uniforms. This involved the prison guards wearing military-like uniforms. These uniforms included many symbols of power and authority, including batons. In the next lesson *8B: Experiments on obedience*, you will learn about how symbols of authority, such as the military uniforms of the guards, can assert their power and authority and make others more likely to obey their commands. In contrast, the prisoners wore plain uniforms with their assigned numbers. These uniforms intended to strip them of their identity, potentially contributing to them obeying the demands of the prison guards more readily.

Image: whale_monorail/Shutterstock.com

Figure 3 The uniforms of the prison guards demonstrated their authority status during the experiment

Many of these prison guards were shocked that they willingly acted in ways that greatly conflicted with their values.

It was also surprising to see how the prisoners were turned against each other. It was expected that due to their shared cruel and humiliating experiences that they would form a strong group. However, due to the distress that the prisoners experienced, it was likely easy for them to turn against each other, such as shouting 'prisoner 819 did a bad thing', as it ensured their survival and placed them in a safer position with the guards who had the power.

ACTIVITY 2 – CLASS DISCUSSION

Watch original footage from the Stanford prison experiment

To watch the video, search *'This is a piece of footage from Stanford experiment'* on YouTube and watch the entire 19 minutes (Lacey, 2016). In this video, you will watch footage from the original 1971 experiment, and hear some explanations of the study from Philip Zimbardo.

Warning: the footage in this video can be distressing for some students.

After watching the video, discuss the following questions with a partner:

- Do you think it was ethical for the participants assigned the role of a prisoner to be arrested without warning?
- Which ethical principles do you think may have been violated in the study after watching the footage?
- Do you think the participants who were interviewed at the end of the video had undergone appropriate debriefing at the study's conclusion? Why or why not?
- Do you believe that the potential benefits of the research findings outweigh the potential risks experienced by the participants (beneficence)? Why or why not?

Ethics of the Stanford prison experiment 2.2.4.3

OVERVIEW

Zimbardo's Stanford prison experiment is known for being unethical and has received many criticisms.

THEORY DETAILS

The Stanford prison experiment has been widely criticised due to its negative impacts on the participants. Some of these major criticisms include Zimbardo's violation of the no-harm principle and withdrawal rights. It has also been questioned whether the debriefing at the end of the study was adequate. There has also been discussion as to whether the ethical value of beneficence was met. Zimbardo (1973) justified the study due to it being approved by the ethics committee at Stanford University.

No-harm principle

The no-harm principle involves protecting the physical and psychological wellbeing of participants and ensuring that they do not experience any physical or psychological harm during the experiment as well as following the experiment. There were many instances in the Stanford prison experiment where this principle was breached. This includes:

> **Lesson link**
>
> If you need to revise your knowledge on ethics and ethical guidelines, return to lesson *1E: Ethical considerations.*

- The prisoners experienced physical harm and psychological distress for six days during the study (Zimbardo, 1973). This includes some participants being in solitary confinement, being forced to strip off their clothes, being taunted and humiliated, and being forced into physical acts such as push-ups (Zimbardo, 1973). Many researchers have criticised the length of suffering, suggesting that the experiment should have ended days earlier as soon as signs of distress and suffering among the participants was evident.

- The prisoners were unexpectedly arrested by real police officers (Zimbardo, 1973). This has been heavily criticised due to participants potentially experiencing distress, fear and confusion when experiencing their mock arrest. Additionally, they were often arrested in front of family, friends, classmates or neighbours who were unaware that the arrest was part of an experiment. This may have damaged the reputation of the participants, as well as led to distress for their friends and family members.

- The prison guards also experienced psychological pain, with many of them experiencing severe distress upon reflection of their actions at the end of the experiment (Zimbardo, 1973). In response, Zimbardo (1973) asserted that after debriefing, many of the prison guards believed that their participation in the study was a valuable experience where they learnt a lot about themselves and human nature more broadly.

In response to all of these criticisms, Zimbardo (1973) argued that there were no alternatives on how to conduct the study, and asserted that all participants experienced extensive debriefing and had no experienced distress in real life due to the study.

Although participants experienced severe distress for a prolonged period of time, the study fortunately ended a week earlier than it was meant to.

Withdrawal rights

Prior to the study, Zimbardo stated that he would encourage participants not to quit the study (Le Texier, 2019). This occurred during the experiment, with Zimbardo convincing a participant to stay when they requested to leave the study. This directly violates modern withdrawal rights, in which participants of a study can leave at any time. Additionally, due to the nature of the study in which many participants felt as if they had lost their identity and had no power, many of them felt as if they could not leave (Zimbardo, 1973).

Debriefing

At the conclusion of the study, all participants underwent debriefing. This involved many of the participants being offered counselling and other support services due to their distress, with debriefing lasting a full day for some participants (Zimbardo, 1973). However, in an interview more than two months later, some participants still expressed distress when referring to the experiment. This led to researchers questioning whether the debriefing practices were adequate and appropriately managed the distress experienced by the participants.

Beneficence

In the years after the Stanford prison experiment was conducted, there has been ongoing discussion about whether the study met the ethical value of beneficence, which involves the potential benefit of the research findings outweighing any potential risks for the participants. Many psychologists and researchers said that the results of the study were not surprising and were expected, particularly due to Zimbardo's expectations and bias interfering in the study by providing the guards with ideas (Le Texier, 2019). Due to many researchers expecting these results, it has been suggested that the harm and suffering of the participants was not justified.

Zimbardo disputes this due to the impact of the study's findings on real life. This included Zimbardo (1973) being a witness during an investigation into American prison reform at the end of 1971, among other benefits.

> **🌐 Psychology applied**
>
> As can be seen in the Stanford prison experiment, groups assigned with status and power over others can sometimes enforce their power on others in cruel ways. This abuse of power has been seen in Australian detention centres, where it has been discovered that prison guards have used excessive force on detainees (Davidson, 2019). For example, it has been reported that excessive force was used unnecessarily, with one example involving excessive force being used on a detainee who asked kitchen staff for more garlic with their food (Davidson, 2019).

> **⊕ Want to know more?**
>
> Zimbardo has also faced further criticism over claims that he interfered in the study and fabricated some of the study's results. In replication studies different results were found, with researchers believing that this was due to the experimenters not providing the prison guards with information and encouragement to mistreat the prisoners by making them feel helpless (LeTexier, 2019). The combination of Zimbardo's interference in the study and alleged fabrication of results threatens the validity of the study. You may be wondering how Zimbardo's study was actually published after being so heavily flawed. Instead of publishing the study through the proper channels of academic literature in which a study is peer reviewed and then published in a scientific journal, Zimbardo instead published his results in The New York Times (Blum, 2018).

Theory summary

In this lesson, you learnt about the concept of groups and how status and power exist within groups. This involved learning about the different types of social power. You also learnt about the Stanford prison experiment, in which university students were assigned to either prisoners or prison guards in a mock prison. After learning about the experiment, you evaluated the ethics of the study. This specifically focused on:

- Debriefing
- Withdrawal rights
- The no-harm principle
- Beneficence

8A QUESTIONS

Theory-review questions

Question 1

Fill in the blanks with two of the following terms.

- Purpose
- Environment
- Three
- Two

A group involves _____ or more people who interact and influence each other and share a common _____.

Question 2

Each group member has a status within that group. Status involves *(Select one)*

A   the perception of an individual's position within a group.

B   an individual's self-labelled position within a group.

Question 3

Social power is related to the concept of status. How are they related? *(Select one)*

A   Group members with higher status have less social power.

B   Group members with higher status have more social power.

Question 4

Zimbardo conducted the Stanford prison experiment to investigate the impact of status and power on group behaviour. The study involved *(Select all that apply)*

I   The use of male and female students.

II   Participants being assigned to the role of a prisoner or a prison guard.

III   A mock prison set up in the basement of a hospital.

IV   A mock prison set up in the basement of a university.

Question 5

Zimbardo's study has been heavily criticised for being unethical. This criticism includes *(Select one)*

A   the fact that participants were never debriefed at the end of the study.

B   the fact that participants felt as if they could not leave the study.

Skills

Understanding research

Use the following to answer Questions 6-8.

Read the following excerpts from a journal article named *'Debunking the Stanford prison experiment'*. This article evaluates Zimbardo's use of pre-tests to select participants, and Zimbardo's interference in the study.

Pre-testing

Erich Fromm (1973) pointed out… the fact that the personality pretests administered to the volunteers might not have detected a predisposition among some of the subjects for sadistic or masochistic behaviour.

Zimbardo's interference in the experiment

…The archival materials reveal that this narrative of guards becoming spontaneously violent is inaccurate… [for example,] the guards were given clear instructions for how to create the environment. For example, Zimbardo explained to them during the guard orientation day, '…We can create fear in them, to some degree. We can create a notion of the arbitrariness that governs their lives, which are totally controlled by us… We're going to take away their individuality in various ways. They're going to be wearing uniforms, and at no time will anybody call them by name; they will have numbers and be called only by their numbers. In general, what all this should create in them is a sense of powerlessness. We have total power in the situation. They have none.'

cont'd

> **Zimbardo's interference in the experiment** Continued
>
> ...[Zimbardo] determined the number of visits to the toilet and the maximum time prisoners could spend there ('Tape 2,' 1971, p. 16 of the transcript). ...[Zimbardo] also suggested to the guards to be sarcastic or ironic, and to humiliate the prisoners by depriving them of their privileges...
>
> ...So we can assume that the guards were not 'role playing' according to social stereotypes of how guards act in a real prison but rather according to the 'cues pointing to the experimental hypothesis, the experimenters' expectations, and possibly, the experimenters' ideological commitment...'
>
> (Le Texier, 2019).

Question 6

The fact that the pre-tests may not have detected predispositions of 'sadistic and masochistic behaviour' may have impacted the study's *(Select one)*

A   validity.

B   sampling.

C   aim.

Question 7

The fact that the participants assigned the role of 'prison guards' were partially instructed by Zimbardo on how to treat the 'prisoners' is a source of error. This source of error is *(Select one)*

A   participant-related variables.

B   experimenter effects.

C   standardised instructions and procedures.

Question 8

Part of Zimbardo's explanation to the guards included 'we can create fear in them' and 'we have total power in the situation'. Which ethical value do these statements most closely violate? *(Select one)*

A   withdrawal rights

B   respect for human beings

C   debriefing

Exam-style questions

Multiple-choice questions

Question 9   (1 MARK)

The difference between status and power is that

A   status is the extent to which an individual can influence or control others, whereas power is a position perceived by other group members.

B   status is a position perceived by other group members, whereas power is the extent to which an individual can influence or control others.

C   status is how well liked an individual is by group members, whereas power is the extent to which an individual can influence or control others.

D   there are multiple forms of social status, but only one type of social power.

Use the following to answer Questions 10 and 11.

Carmel is the CEO of a solar panel company. To contribute to a great workplace culture at the company, she decided to have monthly company-wide celebration nights. At these nights, Carmel congratulates any employee who does great work, with these employees receiving a bonus at the end of the year. Due to her efforts to create a great workplace, she is admired and respected by all employees, with many of them buying her Christmas and birthday gifts.

Question 10   (1 MARK)

Which form of social power is Carmel using when providing her employees with company wide recognition and bonuses for their hard work?

A   referent power

B   expert power

C   reward power

D   coercive power

Question 11   (1 MARK)

Which other forms of social power does Carmel have that are evident in the scenario?

A   referent and legitimate power

B   legitimate and coercive power

C   expert and coercive power

D   referent and coercive power

Question 12   (1 MARK)

Zimbardo's Stanford prison experiment has been criticised for violating withdrawal rights. How was this evident in the study?

A   The participants' physical and psychological safety was not protected.

B   Some participants still displayed distress after debriefing at the conclusion of the study.

C   Participants should have been able to choose whether to be a prisoner or prison guard.

D   Participants who asked to leave the study were convinced to stay.

Short-answer questions

Question 13   (1 MARK)

Define power.

Question 14   (2 MARKS)

Using an example, describe the concept of a group.

Question 15   (5 MARKS)

Zimbardo's Stanford prison experiment involved assigning university students as either prisoners or prison guards.

a   Identify the aim of the experiment. (1 MARK)

b   During the study, the prison guards punished the prisoners with humiliating and cruel acts, such as forcing the prisoners to strip naked or to do push ups. Outline and explain which type of social power this involves. Refer to the experiment to justify your response. (3 MARKS)

c   During the study the participants displayed severe levels of distress. Which participant right does this violate? (1 MARK)

Questions from multiple lessons

Question 16   (1 MARK)

An individual's status is perceived by members of a group, with those with a greater status having more power over individuals in the group. The process of group members perceiving the status of others most clearly involves

A   prejudice, which involves the different mental processes used to form impressions of others.

B   discrimination, which is a widely held belief and generalisation about a group of people.

C   person perception, which involves the different mental processes used to understand and form impressions of others.

D   external attributions, which involves a judgement of behaviour resulting from forces from outside the individual performing the behaviour.

8B EXPERIMENTS ON OBEDIENCE

Why do you listen to the commands of some individuals but not others? Would you follow the instructions of the police? How about the instructions of your teacher? What about your siblings? In this lesson, you will learn why you are more likely to comply with the commands of authority figures or authoritative systems. You will also learn about Milgram's obedience experiment.

8A Experiments on status and power	8B Experiments on obedience	8C Experiments on conformity	8D Prosocial behaviour	8E Bullying	8F Media and behaviour

Study design dot point

- the influence of status and social power within groups, and obedience and conformity on individual behaviour, with reference to theorists including Asch, Milgram and Zimbardo

Key knowledge units

Obedience	2.2.4.4
Milgram's obedience experiment	2.2.4.5
Ethics of Milgram's experiment	2.2.4.6

Experiments on obedience

- Obedience 2.2.4.4
  - Factors affecting obedience
- Milgram's obedience experiment 2.2.4.5
  - Milgram's experiment (Milgram, 1963)
  - Factors affecting obedience during the experiment
- Ethics of Milgram's study 2.2.4.6
  - No-harm principle
  - Withdrawal rights
  - Deception and debriefing
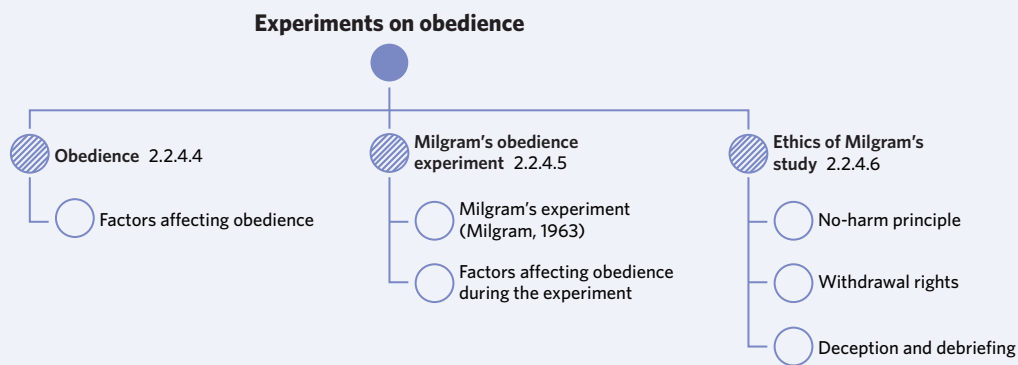
Obedience 2.2.4.4

OVERVIEW

Obedience involves following instructions or rules, particularly those set by people in power. There are multiple factors which influence whether an individual is or is not likely to obey instructions.

THEORY DETAILS

Do you listen to your teacher when they tell you to be quiet? What about if a police officer asks to see your license when you get pulled over? Do you show them your licence? What about if your sibling asked to see your license? Most individuals would listen to their teachers, and definitely police officers, but less likely to respond in the same way to their siblings; why is this?

Typically, we listen to individuals we perceive to have authority. In such a way, **obedience** is demonstrated, which involves complying with the instructions of an authority figure or following laws and rules. There are multiple factors which affect the likelihood of an individual obeying an authority figure. These include proximity, the status of an authority figure, and group pressure.

Obedience adhering to the instructions of authority figures or the rules or laws of society

Factors affecting obedience

Status of authority figure

As mentioned, obedience usually refers to an individual complying with the demands of an individual with authority. When the authority figure is perceived to have a high status, or have legitimate power, individuals are more likely to obey their commands.

Image: Yindee/Shutterstock.com

Figure 1 Police officers display many symbols of authority, including a navy blue uniform, wearing badges, and holding observable objects such as guns and handcuffs

The status of an authority figure is often identified through the use of symbols and uniforms. These include:

- Military leaders wearing badges
- Police officers wearing a navy blue police uniform
- Bosses displaying their degrees and other certificates in an office

Can you think of what symbols are in place to displace the authority of teachers in a school setting?

Proximity

Proximity refers to the closeness between an individual and an authority figure. This exists in two ways: physical proximity and relationship proximity.

- *Physical proximity* refers to the physical distance between individuals. Less distance between an individual and an authority figure leads to a greater likelihood of obedience. This may be difficult to believe, but think about instances when your teacher has asked something of you. Are you more likely to respond if they are standing right next to you or if they were on the other side of the room?

- *Relationship proximity* refers to the closeness between two individuals, with stronger or closer relationships usually having stronger emotional bonds. If you have a closer friendship or relationship of any form with an authority figure, you are more likely to obey them.

Group pressure

Group pressure involves an individual acting in a certain way, or feeling like they should act in a certain way, which aligns with the behaviours of others. In relation to obedience, this involves individuals being more likely to obey authority figures when they observe others obeying the commands of the authority figure, as well as being less likely to obey the authority figure if they observe others not obeying.

Overall, in functioning societies, obedience is believed to be productive (Milgram, 1963). Imagine if everyone chose to disobey the law and ignore traffic lights. Safety on the road would be compromised, and many people would potentially be injured.

In such a way, we can see that obedience is not inherently bad and can help to ensure a functioning society. However, what happens when people obey authority figures or systems which have ill intentions? We will now look at Milgram's obedience experiment which examines this.
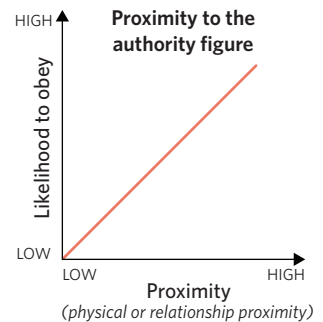
Figure 2 The higher the proximity (physical or relationship) to the authority figure, the greater the likelihood that someone will obey
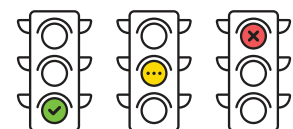
Image: Sudowoodo/Shutterstock.com

Figure 3 Within our society, most individuals obey road rules, which includes adhering to traffic lights to ensure road safety

Milgram's obedience experiment 2.2.4.5

OVERVIEW

Milgram's obedience experiment was conducted in the early 1960s. It intended to measure the extent to which individuals would obey others who are perceived to hold authority. The findings and implications of this study have greatly affected the field of social psychology and modern understanding of authority and obedience.

THEORY DETAILS

Milgram's experiment (Milgram, 1963)

Milgram's (1963) obedience experiment is an extremely famous and influential study about obedience. The study sought to see if people would obey the demands of a person who was perceived to have authority. This involved the participants believing that they were causing harm by giving another individual electric shocks (which were actually fake) when instructed by an authority figure. The results of the experiment surprised many researchers, with many participants shocking the other person to extremely intense and dangerous levels, with many participants believing that they were administering shocks that would result in death.

Aim

The study aimed to measure the extent to which individuals obeyed the commands of an authority figure, even when those commands required inflicting pain and suffering on another individual. The level of obedience of each participant was measured by the level of voltage (electric shock) they believed they were administering to another person.

Participants and materials

In the study, there were 40 male participants. These participants had a range of different jobs and ranged from around 20 to 50 years of age. The 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. Each participant believed that they were to play the role of a 'teacher' in the study. During the study, the participants had to administer shocks from an electric shock machine, illustrated in figure 5, 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 the real participant is unaware of this). This confederate student was strapped to an electric chair, and pretended to be in pain when the real participant in a teacher role administered what they believed to be real (but were fake) electric shocks.

Procedure

1   The participant enters the room and has been told that they are partaking in a study investigating memory and learning. The participant meets the experimenter, who is in a grey lab coat, and the other participant in the study, who is actually a confederate in their mid-40s and is perceived as 'likeable'.

2   The participant and the confederate draw their names from a hat to determine their role for 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   After drawing names from a hat, the student is taken into a separate room and placed in an electric chair. They are not actually connected to the electric chair but are trained to give specific fake responses of pain at certain times, which is unknown to the real teacher participant. The student is therefore separated by a wall from the participant (teacher) and the experimenter, meaning that the participant (teacher) can only hear the student but not see them. The participant (teacher) is told by the experimenter that the shocks from the electric chair are painful but not dangerous. The setup of the experiment is represented in figure 4.

4   Before starting the experiment, the experimenter demonstrates that the shocks are real by administering the participant (teacher) with a small electric shock (45 volts). Receiving this shock is to ensure that the participant believes that the shocks the student is receiving are legitimate.
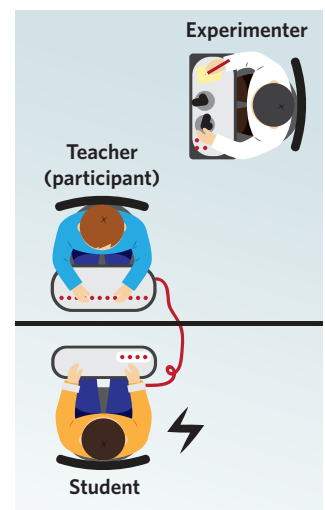
Image: ploy2907/Shutterstock.com

Figure 4 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

5 The learning test then begins, with the student providing responses to the questions asked by the participant (teacher) by pressing one of the four options. When the student answers the questions incorrectly, the participant (teacher) is asked by the experimenter to administer electric shocks to the student. A representation of the electric shock machine is outlined in figure 5, with the higher voltages labelled with 'Danger' and 'XXX' to emphasise that these shocks were unsafe. The electric shocks become incrementally more intense (increasing in voltage) with each incorrect answer from the student. The experimenter instructs the participant (teacher) to announce the voltage of each shock before administering it to the student.

VOLTS								
15	75	135	195	255	315	375	435	450
Slight shock	Moderate shock	Strong shock	Very strong shock	Intense shock	Extreme Intensity shock	DANGER: Severe shock	XXX	
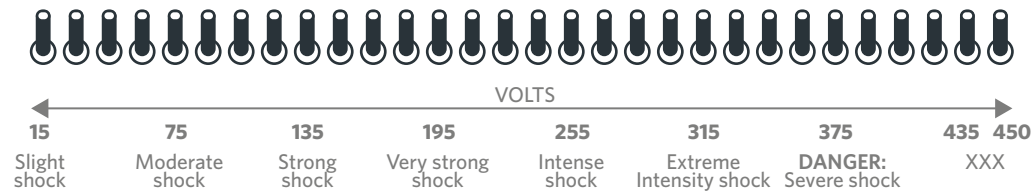
Figure 5 The labels on the electric shock machine used in Milgram's experiment

6 The student has set fake responses and protests when they receive certain voltages, yelling at each of the shocks the teachers administered. Specific responses include (Burger, 2009):

– The student pleads to be released from the chair at **150 volts**. This leads to most participants (teachers) turning to face the experimenter in uncertainty. The experimenter tells the participant (teacher) 'the experiment requires you continue' (Burger, 2009).

– The student loudly bangs 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 informs 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 returns to the room. The student and experimenter inform the participant (teacher) that the student did not actually get shocked and that the screams were fake. The participant (teacher) is invited to shake hands with the student to further assure them that they did not inflict any harm on them.

8 The participant (teacher) is interviewed and receives further information about the nature of the study (debriefing).

During the study, many of the participants had similar responses. After 300 volts, which is 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. The participants disobeyed the experimenter at different times, with some continuing all the way to the maximum shock of 450 volts. This will be further outlined in the results section.

Results

As we know, the study measured the maximum shock each participant would administer. This maximum shock represented the obedience of each participant, with those participants who administered the maximum voltage electric shock of 450 volts to the student acting obediently throughout the entire study. Any participants who refused to continue at a voltage lower than 450 volts displayed a level of disobedience to the authority figure (the experimenter).

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 till the end of the experiment. On average, these students predicted that around 1.2% of participants would continue to administer the full 450 volts of electric shock to the student.

The results that were found from this study were shocking. The percentage of participants and the voltages they stopped at is outlined in figure 6.

The voltage participants stopped at during Milgram's experiment
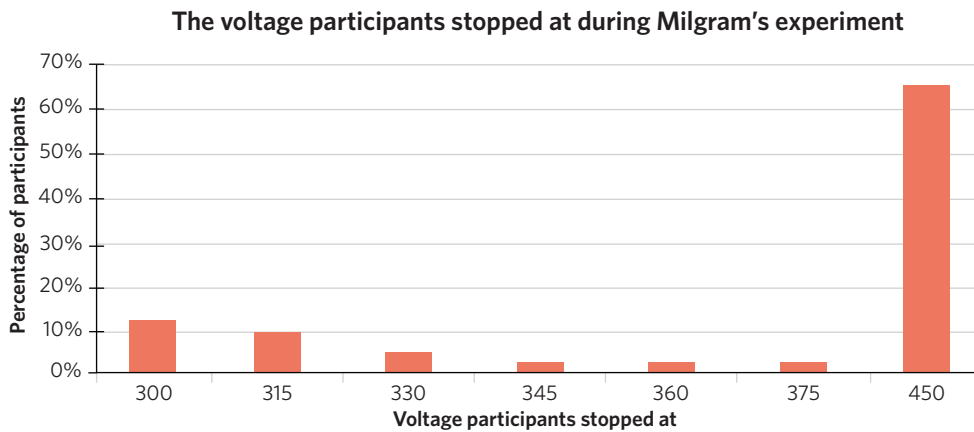
Figure 6   The percentage of participants who stopped administering electric shocks at particular voltages

Only five of the 40 participants stopped administering electric shocks at 300 volts, which is 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, with 35% of the participants in the study therefore disobeying the commands of the experimenter.

Shockingly, although many participants made it clear that they were extremely distressed when administering shocks, 26 of the 40 participants (65%) continued administering shocks up until the maximum 450 volts (Burger, 2009). This is particularly surprising as the participants (teachers) believed that this voltage was extremely dangerous with the potential to kill the student at this voltage.

Conclusion

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.

ACTIVITY 1 – CLASS DISCUSSION

Watch original footage from Milgram's experiment

In this video you will see footage of one participant's experience during Milgram's experiment. To watch the video, search *'Milgram Experiment'* on Youtube and watch the entire 11 minutes and 45 seconds (Burak, 2013). After watching the video, discuss the following questions with a partner:

- Deception was involved in the study due to the experimenter misleading the participant about the aim of the study. How may this have negatively impacted the participants?
- Do you think it was ethical to allow the experiment to continue while the participant showed signs of distress? Why or why not?
- Using your knowledge on factors that affect obedience, why do you think that the participants obeyed the commands of the experimenter?
- Do you think that you would follow the commands of the experimenter? Why or why not?

⊕ *Want to know more?*

Milgram 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. To learn about some of these variation studies, look at Milgram's 1965 article *'Some conditions of Obedience and Disobedience to Authority'*.

Factors affecting obedience during the experiment

The results of Milgram's experiment were extremely unexpected as they showed that ordinary individuals had the capacity to commit atrocious acts. The participants in the study merely followed the instructions of the authority figure (the experimenter) in the room. They were not coerced in any way to continue administering the shocks; when questioned, the experimenter would reply that 'the experiment requires you to continue'. It is important then to break down and understand the different factors that affected participants' obedience, or disobedience, in order to understand what other factors affected their behaviour.

Status of authority figure

We know that when authority figures have a high status and are perceived as legitimate, people are more likely to obey their requests or demands. In Milgram's study, the experimenter presented multiple symbols of authority, which may have led to the participants being more obedient.

The experimenter wore a grey lab coat. Grey or white lab coats typically symbolise authority due to representing expertise in scientific knowledge. This may have led to participants believing that the experimenter knew best due to their knowledge in the field, leading them to obey their commands. This belief was likely compounded by the fact that the experiment took place in a Yale University laboratory. Yale is widely recognised as one of the leading universities worldwide, further enhancing the perceived status and authority of not only the experimenter, but the experiment itself.

Proximity

As previously mentioned in this lesson, closer proximity, both in the form of physical closeness or the closeness of the relationship, influences the likelihood of obedience. Later replications of Milgram's (1963) study implemented variations in physical proximity between the participant (teacher) and experimenter, as well as between the participant (teacher) and student.

In a replication study, it was found that participants were less likely to obey the commands of the experimenter when instructions were given over the phone, rather than when they were delivered face to face. In this way, the closer the physical proximity to the experimenter, the more likely the participant was to be obedient.

In another replication study, the physical distance between the participant (teacher) and the student was also manipulated. It was found that the participant was *less* likely to be obedient when the participant was physically closer to the student. This is due to the participants hearing the protests from the student with increased volume and intensity, therefore more clearly seeing the distress of the student. These effects of proximity can be visualised in figure 8. In this way, although physical proximity to an authority figure increases obedience, obedience decreases when a person is physically closer to the person they have been instructed to harm.

Image: Ellegant/Shutterstock.com

Figure 7 A grey lab coat usually signifies expertise and knowledge in a field, providing those who wear white lab coats authority in scientific research

> 🧩 *Lesson link*
>
> In lesson *8A: Experiments on status and power*, you learnt about expert power. Expert power involves individuals having greater status or authority due to appearing knowledgeable in a chosen field. In such a way, the experimenter wearing a white lab coat symbolises expert power, portraying to the participant that they are knowledgeable in their field. Additionally, it is commonly perceived within society that scientists specifically should be admired due to being perceived as extremely knowledgeable and valuable to society, contributing to their level of expert power.
>
> In lesson *7B: Judging and perceiving others*, you also learnt about person perception. Symbols of authority such as the experimenter's grey coat, can aid in person perception, often allowing first impressions to be formed more easily.

Figure 8 The greater the proximity to the student in Milgram's study, the lower the likelihood of the participant to be obedient

As well as this physical proximity to the person being harmed, relationship proximity to the person being harmed (the student) may also decrease obedience of a participant (the teacher) to the experimenter. In such a way, these learnings about the relationship proximity of the participant and student can be applied to other aspects of life. Would you be less likely to obey an authority figure's demands if you would be inflicting harm on your best friend or a family member?

Group pressure

The behaviour of others can pressure individuals to obey or not obey authority figures. In Milgram's 1963 study, the participants were not exposed to the behaviour of others. However, replications of Milgram's study involved the participant (teacher) being exposed to others in the same teacher role disobeying the commands of the experiment. This exposure to disobedience from others led to a drop in complete obedience across the study, with only 10% of participants administering the maximum 450 volt electric shock. This is significantly lower than the 65% of participants who administered the maximum 450 electric shock in Milgram's original (1963) study.

Ethics of Milgram's study 2.2.4.6

OVERVIEW

Although the findings of Milgram's study greatly contributed to understandings of obedience, the study has been greatly criticised and often labelled as unethical.

THEORY DETAILS

There are multiple ethical principles and values which researchers have asserted that Milgram violated as part of his study. Some of these major criticisms include Milgram's violation of the no-harm principle and withdrawal rights. Milgram's use of deception and debriefing has also been heavily focused on.

No-harm principle

The no-harm principle involves ensuring that participants do not experience physical or psychological harm. Milgram's study has been criticised due to inflicting pain on participants, including:

- Psychological pain due to making participants 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 (1963) did not stop the experiment.

- Physical pain, due to shocking each participant 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).

In response to these criticisms, Milgram argued that the short-term psychological and physical discomfort was justified. Milgram stated that after debriefing, many participants said that they had gained valuable knowledge from the experiment and saw the benefits in them participating (Burger, 2009).

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, they 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). This explicitly violates withdrawal rights, in which participants can leave a study at any time.

Deception and debriefing

Deception was used during Milgram's (1963) study due to participants being told that they were participating in a study examining learning and memory, not a study about obedience. In psychological research, we have learnt that debriefing needs to occur, which is particularly important when deception is used. Milgram (1963) outlines that participants were not displaying signs of distress when they left, and that participants met with and spoke with 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.

Lesson link

In lesson **8D: Prosocial behaviour**, you will learn about the concept of *diffusion of responsibility*. This involves individuals not feeling as if they are responsible for their actions due to assuming that someone else will or should take responsibility. During Milgram's study, the experimenter informed each participant (teacher) that he himself was responsible for any harm to the student (Burger, 2009). Due to this, participants were likely to obey the experimenters and inflict harm due to not feeling responsible.

Lesson link

If you need to revise your knowledge on ethics and ethical guidelines, return to lesson **1E: Ethical considerations**.

Lesson link

In lesson **1E: Ethical considerations**, you learnt about the ethical value of beneficence. Beneficence involves the potential benefits of research findings outweighing the potential risks for the participants. Do you believe that Milgram's (1963) study met this ethical value of beneficence?

Theory summary

In this lesson, you learnt about the concept of obedience, which involves adhering to the instructions of authority figures or the rules and laws of society. You learnt about multiple factors which affect obedience. Specifically, these factors include proximity, status of an authority figure, and group pressure. You applied these factors to Milgram's obedience experiment, which aimed to measure the extent to which individuals obey the commands of an authority figure when inflicting pain on another individual. After learning about the aim, participants, procedure, results and conclusion of this study, you also evaluated the ethics of Milgram's study. This involved reviewing the study in relation to the ethical principles of:

- The no-harm principle
- Withdrawal rights
- Deception and debriefing

8B QUESTIONS

Theory-review questions

Question 1

Fill in the blanks with two of the following terms/phrases.

- Conforming to
- Complying with
- Authority figure
- Group

Obedience refers to _____ the demands of a/an _____.

Question 2

There are multiple factors that affect whether individuals are likely to obey demands.
Some of these factors include *(Select all that apply)*

I   Proximity, with individuals who are physically closer to an authority figure being more likely to obey than when they are physically further away.

II   The shyness of each individual, with individuals who are more shy being less likely to obey demands than those who are less shy.

III The status of the authority figure, with authority figures with a legitimate status being more likely to be obeyed by individuals.

Question 3

Another factor which affects obedience is group pressure. Group pressure affects obedience due to *(Select one)*

A   individuals being more likely to obey demands if they observe others doing so.

B   individuals being less likely to obey demands if they see others obey commands as they want to stand out.

Question 4

Milgram's obedience experiment aimed to investigate the degree to which an individual would obey commands to administer electric shocks. During the experiment, the participant carried out the role of the *(Select one)*

A experimenter, giving directions to another individual to administer electric shocks.

B student, receiving shocks for every wrong answer on the learning and memory test.

C teacher, administering shocks to the student for every wrong answer.

Question 5

Milgram's experiment has received many criticisms due to violating ethical standards.
It has been stated that Milgram violated *(Select one)*

A the no-harm principle, with participants shrieking in pain after receiving electric shocks for their wrong answers.

B withdrawal rights, with participants never being told that they could leave and many being told to continue when they said that they did not want to administer any more shocks.

Skills

Perfect your phrasing

Question 6

Which of the following sentences is most correct?

A Obedience involves following the commands of an individual who is perceived to have a lower level of authority.

B Obedience involves following the commands of an authority figure.

Question 7

Which of the following sentences is most correct?

A Proximity refers to how physically or emotionally close two individuals are, with individuals being more likely to obey those authority figures who they are emotionally or socially closer with.

B Proximity refers to how emotionally close two individuals are, with individuals being more likely to obey those authority figures who they are emotionally closer with.

Exam-style questions

Multiple-choice questions

Question 8   (1 MARK)

Which of the following scenarios does **not** demonstrate obedience?

A A student listening to her teacher who asks her to be quiet in class.

B A child doing his chores that his mother asked him to do.

C A learner driver braking at a red light.

D A friend choosing to braid their hair in a similar style to that of a friend.

Question 9   (1 MARK)

Milgram's 1963 obedience experiment measured the level of obedience of each participant through

A observing if they ever verbally refused to continue administering shocks, with this counting as a display of disobedience.

B measuring the highest voltage they administered, with participants who did not administer the maximum electric shock displaying disobedience.

C observing whether they appeared distressed or nervous when administering the shocks, with reactions such as sweating counting as a display of disobedience.

D observing whether the participants left the room to check on the student, with this counting as a display of disobedience.

Question 10   (1 MARK)

How did the status of the authority figure affect obedience in Milgram's 1963 experiment?

A   The experimenter was a legitimate authority figure for the participants due to being older than the participants.

B   The student was a legitimate authority figure for the participants due to appearing stern and wearing a white lab coat.

C   The teacher was a legitimate authority figure for the participants due to wearing a grey lab coat and being associated with Yale University.

D   The experimenter was a legitimate authority figure for the participants due to wearing a grey lab coat and being associated with Yale University.

Question 11   (1 MARK)

Deception occurred in Milgram's obedience experiment. This was most clearly seen through

A   participants being told to continue with the experiment even when they verbally stated that they did not want to continue anymore.

B   participants being physically harmed due to receiving a sample shock at the start of the experiment.

C   participants not being fully informed of the aims and nature of the study, being misinformed that the study was examining processes of learning and memory.

D   participants not being fully informed of the aims and nature of the study, with the participants being misinformed about the risks of participating in the study.

Short-answer questions

Question 12   (2 MARKS)

With the use of an example, explain how Milgram's obedience experiment violated the no-harm principle.

Question 13   (5 MARKS)

The procedure for Milgram's experiment involved three individuals. The participant who played the role of the teacher, and the student and experimenter.

a   Identify who the authority figure was in Milgram's obedience experiment. (1 MARK)

b   Predict whether you think the obedience of the participant would change if the participant and student sat next to each other rather than being separated by a wall. Justify your response. (2 MARKS)

c   At the end of the study, the participant and the student interact. Outline which ethical principle this interaction is a part of. Justify your response. (2 MARKS)

Questions from multiple lessons

Question 14   (1 MARK)

In Milgram's obedience experiment the experimenter is perceived to have status and legitimate authority over the participants. Specifically, due to being perceived as a researcher at Yale University which is widely recognised as a prestigious university, the experimenter is perceived by participants to have authority due to being knowledgeable in their field. This perception allows the experimenter to have which form of power?

A   coercive power

B   reference power

C   expert power

D   reward power

8C EXPERIMENTS ON CONFORMITY

Do you ever feel pressured to act the same as others? How about to dress the same? Or to like similar music? You have most likely felt pressure to act or think like others in the past due to the concept of conformity. In this lesson, you will learn about conformity. You will also learn about Asch's conformity experiment and the factors which affect conformity.

8A Experiments on status and power	8B Experiments on obedience	8C Experiments on conformity	8D Prosocial behaviour	8E Bullying	8F Media and behaviour

Study design dot point

- the influence of status and social power within groups, and obedience and conformity on individual behaviour, with reference to theorists including Asch, Milgram and Zimbardo

Key knowledge units

Conformity	2.2.4.7
Asch's conformity experiment	2.2.4.8
Factors that affect conformity in Asch's experiment	2.2.4.9

Experiments on conformity

- Conformity 2.2.4.7
- Asch's conformity experiment 2.2.4.8
  - Asch's experiment (Asch, 1952)
- Factors that affect conformity in Asch's experiment 2.2.4.9
  - Group size
  - Unanimity
  - Normative influence
  - Social loafing
  - Informational influence
  - Culture
  - Deindividuation
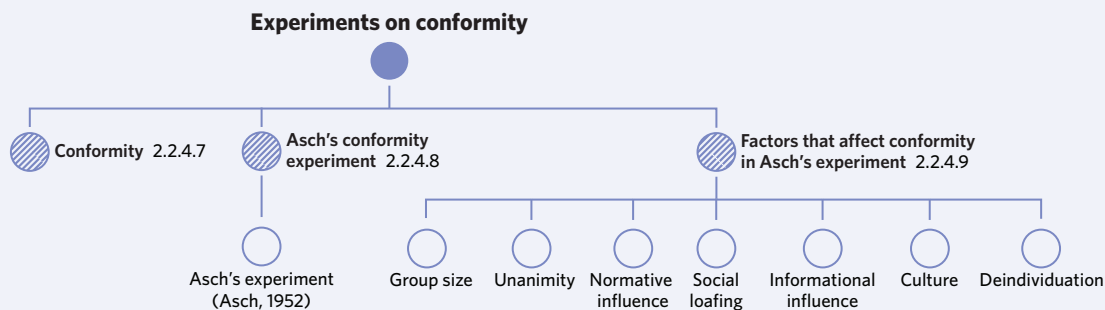
ACTIVITY 1 – CLASS EXPERIMENT

Conformity in action

Step 1. Get one student in your class to step outside.

Step 2. Decide on an action that the rest of the class will perform when your teacher says a specific word. For example, this could include the whole class standing up when your teacher says 'SAC', or the whole class clapping three times when your teacher calls out a specific student's name.

Step 3. Invite the student back into the classroom without telling them what is going on. Continue with the class and see if this student joins in on the action that the rest of the class is performing.

Did the student join in with the rest of their class members? Why did they do this? By the end of this lesson, you should be able to explain why the student may have performed the same action as their classmates.

Conformity 2.2.4.7

OVERVIEW

You have likely aligned your thoughts, feelings, or behaviours to fit in with others. This process is called conformity.

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 aligning your thoughts, feelings or behaviours in order to be consistent with the thoughts, feelings, or behaviours of others.

The act of conforming can be due to an *overt* (open and observable) pressure to fit in, such as being told that your clothes are weird leading to you buying new clothes.

Conformity the alignment of one's thoughts, feelings, or behaviour to match those of others or societal expectations

In these situations when an individual has been clearly singled out and made to feel different from others, the individual is likely to feel uncomfortable and may feel embarrassed or distressed. Due to wanting to alleviate (relieve or resolve) these negative feelings, people often choose to conform.

Image: Andy Dune/Shutterstock.com

Figure 1 No one likes to feel as if they don't fit in with others. This uncomfortable feeling can lead to individuals aligning their behaviour, thoughts, or feelings to conform with others

Individuals can also conform by aligning their thoughts, feelings, or behaviour with what they believe is expected of them. This often refers to the pressures of **social norms**, which are the expectations and beliefs perpetuated within society about what is and is not acceptable behaviour. Although these social norms are often widely known, they are often not explicitly spoken about, or are only rarely spoken about. These social norms can provide a more subtle and more *covert* (hidden, unobservable) pressure for individuals to conform to society's expectations. An example of a social norm could include shaking hands when first meeting someone new in Western cultures and particularly in formal settings. If people didn't conform to this norm and greeted a stranger with a high five during an interview for example, this could be seen as abnormal. Can you think of any other social norms that affect behaviour?

Social norms society's unofficial rules and expectations regarding how we ought to act that most people follow without thinking

⊙ *Analogy*

What would happen if we all conformed to social norms, or the thoughts, feelings, and behaviours of others? People often refer to the act of conforming as applying a cookie-cutter mould. If we all conformed and mirrored the image of a cookie-cut human, we would all be the same and have no uniqueness between us. Is this a world you would like to see?

Image: dreadek/Shutterstock.com

Figure 2 If we all conformed, we would represent cookie-cut people who all think, feel, and behave in the same way

ACTIVITY 2 – CLASS EXPERIMENT

Conformity in action: Results

If the student in your class did join in and perform the action with the rest of their classmate, you will now know that this is due to conformity. To see another example of conformity in action, search *'Brain Games – Conformity Waiting Room'* on YouTube and watch the entire five minutes and thirty-five seconds (Freeform Nation, 2018). After watching the video, discuss the similarities between the class experiment and the YouTube video as a class or in partners.

Asch's conformity experiment 2.2.4.8

OVERVIEW

Asch's conformity experiment is a very well-known study which was originally conducted in 1951 and published in 1952. The study involved a line judgement task, with the results of the study helping to inform researchers on the nature of conformity, and the factors that influence conformity which you will learn about later in this lesson.

THEORY DETAILS

Asch's experiment (Asch, 1952)

Solomon Asch's experiment on conformity was first conducted in 1951, with many further variation studies also being conducted. The study 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 which were most similar in length. The experiment was conducted in a group setting, so each participant could hear the responses of one another. The other group members were all confederates of the experiment who purposefully gave unanimous, but clearly wrong responses to the experimenter's questions. Many of the participants succumbed to the group pressure by conforming to their answers, with many of the participants conforming to the group at least once in the study.

Aim

The aim of the study was to measure the extent to which individuals would conform to a majority group. The level of conformity was measured by the extent to which participants aligned their responses with the incorrect responses of the confederates.

Participants and materials

The participants of the study involved 50 male first-year university students. These participants 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). The experimenter was also in the room during the study.

Procedure

Before the experiment began, Asch informed the confederates to give unanimous responses which were clearly incorrect for 12 of the 18 trials. After this, the procedure was as follows:

1 The participant enters the room. They are told to sit behind a long table, with seven other people (the confederates) sitting alongside them in a row. The participant is always seated at the second last seat of the table. The experimenter stands in front of the table with a stack of presentation cards.

2 The experimenter tells 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) which best matches it in length. These lines were presented on two separate presentation cards. This setup is displayed in figure 3. To answer, each member of the group 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'. Each trial involved the experimenter presenting two presentation cards (one with line X, the other with three lines labelled A, B or C). There were 18 trials.

Figure 3   A representation of the presentation cards used in Asch's experiment

3 The seven confederates purposefully give unanimous (all the same) incorrect responses for 12 of the 18 trials.

During the experiment, the participant was continuously exposed to the rest of the group giving unanimous responses which were clearly incorrect before it was their turn to answer. Many of these participants displayed signs of confusion. 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.

Results

What were the results of the experiment? Did the participants conform and give incorrect responses to fit in with the group?

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; i.e., at least once in the 12 trials where a unanimous incorrect response was given by the group, the participant also provided this same incorrect answer.
- 24% of 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.

> ⓘ **Useful tip**
>
> The percentage of participants who conformed at least once during the study varies across different resources, with some rounding up and stating that 'around 75% of participants conformed at least once'. As long as you refer to the results being around 74-75% your answer will be considered correct.

ACTIVITY 3 – CLASS DISCUSSION

Watch footage from Asch's conformity experiment

To watch the video, search '*Asch conformity experiment*' on Youtube and watch the entire five minutes and 46 seconds (HeroicImaginationTV, 2012). In this video, you will watch a reenactment of from the original 1951 experiment. You will also see footage of two variations of the original study. After watching the video, discuss the following questions with a partner:

- Did you find it surprising that the participant in the original study went along with the rest of the group and gave a response that was clearly incorrect? Why or why not?
- Do you think the presence of a partner made the participant more or less likely to conform to the group?
- Do you think that you would conform to the group? Why or why not?

Factors that affect conformity in Asch's experiment 2.2.4.9

OVERVIEW

There are multiple factors which can make individuals more or less likely to conform.
You will learn about these factors and how they influenced conformity in Asch's experiment.

THEORY DETAILS

After Asch (1952) conducted his original experiment, he conducted follow up studies which implemented variations. A meta-analysis of replication studies of Asch's conformity experiment was also conducted in 1996 by Bond and Smith. Through the research conducted by Asch (1952), as well as the research conducted by Bond and Smith (1996), factors which affect conformity within the study were suggested. These factors include:

- group size
- unanimity
- normative influence
- social loafing
- informational influence
- culture
- deindividuation.

The factors that affect conformity discovered through this research can also be applied to other experiences in life and can help to explain conformity in real life.

> 🧩 **Lesson link**
>
> On top of the factors already outlined that impact conformity, Bond and Smith (1996) also suggested that there were other factors that affect conformity. This included suggesting that individuals were more likely to conform to a group or to other individuals if those individuals were their friends than if they were strangers. This links to the concept of relationship proximity which was outlined in lesson *8B: Experiments on obedience*.

Group size

Would you feel greater pressure to conform to a large group of people? Asch conducted variations on his experiment with groups ranging from one to 15 confederates. Asch discovered that the likelihood to conform to the group increased with every additional confederate up to three confederates, after which the likelihood to conform stayed around the same regardless of how many confederates were added. That is, participants were equally as likely to conform if there were four or 15 confederates. This was also found in Bond and Smith's (1996) meta-analysis.

Unanimity

If an entire group agreed on an answer would you find it hard to voice your different opinion? This relates to the concept of **unanimity**, which involves complete agreement within a group.

Unanimity complete agreement among two or more individuals

In Asch's original study (1952), the group of confederates were unanimous with their answer. In such a way, if the participant gave an answer that differed from the rest of the group due to not conforming, they were the only group member not agreeing with the unanimous majority (Asch, 1952; Bond & Smith, 1996). Due to human beings desiring to fit in with others, many of the participants conformed to the unanimous group answers at least once during the study.

Asch also conducted further studies which varied the level of unanimity within the group. Through these variations, it was found that having even just one of the confederates not act unanimously within the group significantly decreased the participant's conformity within the experiment. This led to the participant's likelihood of conforming to the group at least once during the study dropping from 74% to around 10% due to the presence of one other group member who did not answer in line with the group. This difference can be seen in figure 4.

Effect of unanimity on conformity
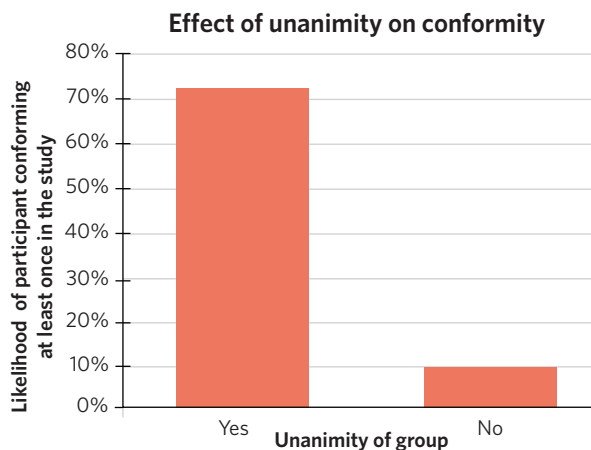
Figure 4 When a group is not unanimous (where one of the seven group members provides an alternate answer) the likelihood of the participant conforming significantly decreases

Normative influence

Another factor which affects conformity is normative influence. **Normative influence** refers to the effect of social *norms* (normative comes from norms) and expectations on your own thoughts, feelings, and behaviours. When individuals conform to the expectations or rules of society, they are increasing their likelihood of fitting in with others and therefore are more likely to be accepted by society. There are many social norms which exist in everyday life. These include saying thank you to staff who serve you your food at a restaurant and arriving to a class on time.

Normative influence the influence of social norms on an individual, influencing a person to act in certain ways which align with social norms

People change their thoughts, feelings or behaviour to meet social expectations to avoid negative social consequences, such as being made an outcast for not meeting society's expectations.

How did normative influence affect conformity in Asch's experiment? Participants may have conformed to the unanimous answer of the group as they did not want to experience negative consequences which may have arisen if they disagreed. For example, the participant may have believed that the other group members may have laughed at them or judged them in some way. On the other hand, by conforming to the group, the participants met the social expectation of fitting in with others and being a 'team player'.

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? This is due to social loafing.

Social loafing involves individuals putting in less effort when in a group than they would when alone, due to the belief that others in the group will put in the effort. This applies to all forms of group work, such as when working in a team or playing a team sport. We can also apply the concept of social loafing to Asch's study. Researchers have suggested that this may have involved participants conforming with the answers of the group to reduce their own effort as they could avoid independent decision making. For this reason, it is clear how social loafing has the ability to facilitate conformity.

Social loafing the tendency to put in less effort when in a group than a person would when alone

Informational influence

What happens when you enter a new situation or environment? How do you figure out how to behave?

In new situations, you are likely to be uncertain about how to behave which leads you to rely on observing the actions of others to inform your own behaviour.
For example, it might be your first day at a new school. Your old school may have been a really relaxed school where students could wear lots of jewellery. When you enter the school gate in the morning, you notice that no other students are wearing any jewellery so you decide to take yours off. You then go to your first class and sit down at a table. When the teacher walks in, all the students stand to greet them; you look around confused before quickly standing up to join the other students. In this situation, it is clear how individuals seek guidance from others when in new situations and environments.

Image: Katrine Glazkova/Shutterstock.com

Figure 5 Observing others to inform our own actions in new or unfamiliar situations is due to informational influence

This is due to informational influence. **Informational influence** is the influence of the observable information or behaviours of others in new situations and environments on an individual's own behaviour. Due to being unsure and uncertain of how to act in new situations, we often observe the behaviour of others to make sure that we fit in. We do this to make sure that we are making the right choices and acting in a way which is acceptable in the environment as we don't want to appear foolish.

Informational influence the influence of observable behaviours and information on an individual, influencing their behaviour in certain situations or environments

Informational influence is likely to have occurred in Asch's study as it was a novel (new) environment for the participants. Due to being in an unfamiliar environment and having never completed a line judgment task before, the participants may have used the information of the other members of the group to inform their own answer. This was made particularly apparent in the study when the participants were uncertain due to multiple lines (e.g. Line A and C) seeming to be similar, with each line therefore having the ability to match line X. As such, when lines were similar in length the rate of conformity was greater.

Culture

What does culture actually refer to? *Culture* is a broad term which includes the social norms, expectations, rituals, practices and beliefs of certain societies or groups. In such a way, different cultures express their practices, knowledge, and beliefs in different forms, such as through artwork, song, dance and dress.

In 7C: Explaining behaviour through attribution, you learnt about the difference between collectivist and individualistic cultures. Individualistic cultures prioritise the needs and goals of individuals and value independence. By contrast, collectivist cultures prioritise the needs and goals of groups, and place less importance on uniqueness.

Individualistic and collectivist cultures have been shown to have significantly different levels of conformity. Overall, individuals from collectivist cultures have been shown to be much more likely to conform than individuals from individualistic cultures (Bond & Smith, 1996). This is due to many reasons, such as people within individualistic cultures being encouraged to be independent, while collectivist cultures are encouraged to prioritise the needs of a team.

Replications of Asch's conformity experiments have been conducted across different cultures. These replication studies supported the effect of culture on conformity, with collectivist cultures such as China having much greater levels of conformity than individualistic cultures such as America and Germany (Bond & Smith, 1996).

> ### 🔍 *Research spotlight*
>
> Replications of Asch's conformity experiment were also conducted across multiple decades in America. The results of these studies displayed a shift in levels of conformity across time, with lower levels of conformity when the experiment was conducted in decades such as the 1980s when compared to the original decade of the 1950s (Bond & Smith, 1996). This was attributed to the changes in society over this period, with America placing a greater value on protest and individuality in the 1980s when compared to the 1950s.

Deindividuation

Another factor which affects conformity is deindividuation. **Deindividuation** refers to the tendency for individuals to lose their sense of identity and individuality within a group. This involves an individual believing 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.

How was deindividuation evident in Asch's study? One of the variation studies Asch conducted involved the participants having to write down their answer rather than announce it to the group (Asch, 1952). These participants were told that the experimenter would be the only one to see their answers. The results from this variation found that participants were less likely to conform to the unanimous group answers and give their own independent answers to the experimenter when they didn't have to announce it to the group (Bond & Smith, 1996). This is likely due to multiple reasons, including that there was less pressure to conform to the group, as the group was unaware of the participants' answers. Therefore, the participant could keep their individuality without the possibility of facing negative social consequences from the other team members.

> ### 🔍 *Research spotlight*
>
> Does it matter if participants conformed to the majority group one time if they chose to give their own, independent answer for the other 11 trials (remember that out of 18 trials, the confederates gave a unanimous incorrect response for 12 trials). Does this highlight the ability of individuals to stay independent despite self doubt and confusion? Or does it show that they are susceptible to conformity?
>
> One criticism from some researchers is that the results of the study have been misrepresented as they overestimate the role of conformity and ignore the level of independence participants displayed (Friend et al., 1990). Overall, results from the study included that around two-thirds of the responses from participants were correct, regardless of the majority response (Friend et al., 1990). In such a way, it may be seen that the influence of conformity was overestimated due to the statistic that 74% of participants conforming at least once was focused on (Friend et al., 1990). This highlights the importance of selecting and interpreting statistics in an accurate way to effectively represent the true results of a study.

Deindividuation the tendency for individuals to lose their sense of identity and individuality within a group

> ### 🧩 *Lesson link*
>
> In the next lesson, ***8D: Prosocial behaviour***, you will learn about the concept of *diffusion of responsibility*. This concept refers to individuals being less likely to help someone when other people are present than when they are the only person available to help someone in need. This is due to participants feeling like someone else will take responsibility and help the individuality. In such a way, it is clear how individuals often feel less accountable when there are other individuals around.

Theory summary

In this lesson, you learnt about the concept of conformity, which involves aligning your thoughts, feelings or behaviours to match social norms or the thoughts, feelings or behaviour of others. You also learnt about Asch's conformity experiment, which aimed to measure the extent to which individuals would conform to a majority group. You then learnt of the factors that affect conformity in Asch's experiment. These factors include:

- group size
- unanimity
- normative influence
- social loafing
- informational influence
- culture
- deindividuation.

8C QUESTIONS

Theory-review questions

Question 1

Fill in the blanks with two of the following terms.

- Maintaining
- Aligning
- Consistent
- Inconsistent

Conformity involves an individual _____ their thoughts, feelings or behaviours to be _____ with the thoughts, feelings, or behaviours of an individual, group or societal expectations.

Question 2

Asch's original 1952 experiment on conformity aimed to measure the extent to which individuals would conform to a group. To examine this, he *(Select one)*

A   observed whether participants felt different levels of pressure to conform to a group depending on the number of experimenters at the front of the room.

B   observed whether participants conformed to a group when other group members gave unanimous responses.

Question 3

Multiple factors that affect conformity in Asch's experiment were identified. Some of these factors include *(Select all that apply)*

I   Group size, with the likelihood for conformity increasing up to a group size with three other group members.

II   Social loafing, in which the likelihood for conformity increases due to individuals wanting to avoid decision making effort when in a group.

III Individuation, with those individuals with a greater level of independence and uniqueness being more likely to conform to the group.

Question 4

Which of the following correctly describes the impact of unanimity on conformity in Asch's experiment? *(Select one)*

A   Unanimity involves complete agreement among individuals, with conformity *more* likely to occur when the rest of the group members are unanimous in their answer.

B   Unanimity involves complete disagreement among individuals, with conformity *less* likely to occur when the rest of the group members are unanimous in their answer.

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 individuals, groups or social norms.

Question 6

Which of the following sentences is most correct?

A   Unanimity involves some members of a group agreeing or holding the same opinion.

B   Unanimity involves all members of a group agreeing or holding the same opinion.

Exam-style questions

Multiple-choice questions

Question 7   (1 MARK)

Which of the following correctly describes the procedure of Asch's original 1952 conformity experiment?

A   The participants had to work with a partner to decide which of the three lines were the most similar in length to line X.

B   The participants had a discussion as a group and provided the experimenter with one answer as to which of the three lines was the most similar in length to line X.

C   All members of the group (the participant and the confederates) had to announce to the group which of the three lines they believed was most similar in length to line X.

D   The participant had to write down their answer as to which of the three lines was the most similar in length to line X.

Question 8   (1 MARK)

Conformity

A   always involves individuals being pressured by an authority figure to act in a certain way.

B   sometimes involves individuals feeling pressured by societal expectations to behave in a certain way.

C   never involves individuals changing their thoughts or feelings to be the same as the thoughts or feelings of others.

D   never involves individuals changing their behaviour to fit in with others more.

Question 9   (1 MARK)

Which of the following correctly describe social loafing and its impact on conformity?

	Social loafing description	Impact on conformity
A	Involves individuals putting in less effort when in a group than they would when alone	Makes individuals more likely to conform to the opinion of a group
B	Involves individuals putting in less effort when in a group than they would when alone	Makes individuals less likely to conform to the opinion of a group
C	Involves individuals putting in more effort when in a group than they would when alone	Makes individuals more likely to conform to the opinion of a group
D	Involves individuals putting in an equal amount of effort when in a group than they would when alone	Does not impact the likelihood of conformity when in a group

Question 10   (1 MARK)

The difference between informational and normative influence is that

A   informational influence involves relying on social expectations to guide behaviour, whereas normative influence involves seeking guidance when uncertain.

B   informational influence involves the influence of the behaviour of others when in an uncertain situation, whereas normative influence involves relying on social expectations to guide behaviour.

C   informational influence is more about meeting expectations, whereas normative influence is more about making sure that you do the right thing.

D   informational influence and normative influence have no differences.

Short-answer questions

Question 11   (1 MARK)

Define deindividuation.

Question 12   (2 MARKS)

The results of Asch's conformity experiment found that 74% of participants conformed to the group's unanimous but incorrect answer at least once.

Describe informational influence and explain how it may have influenced participants to conform during the study.

Question 13   (4 MARKS)

Ella and Bruno are cousins who live in different countries. In Ella's country, she has always been encouraged to work hard to achieve her goals and to stand up for herself and her own opinions. Bruno has been brought up very differently. He has been taught to always look after the individuals around him and to prioritise the needs of his family and his work colleagues above his own needs.

a   Name the factor that affects conformity which is most evident in the scenario. (1 MARK)

b   Predict whether Ella or Bruno is more likely to conform. Refer to the factor identified in part a and to the scenario to justify your answer. (3 MARKS)

Questions from multiple lessons

Question 14   (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.

8D PROSOCIAL BEHAVIOUR

There's a fight in your schoolyard at lunch. Some people stand, almost amidst the fight themselves, yelling at the brawlers to 'Fight! Fight! Fight! Fight!'. Other, less vocal onlookers stand further back; they're more timid, but can't look away. Some even begin to record the event on their phones. Then, some 'hero' steps in and tries to break it up. How can we explain such an array of reactions to one simple event?

Image: GraphicsRF.com/Shutterstock.com

8A Experiments on status and power	8B Experiments on obedience	8C Experiments on conformity	8D Prosocial behaviour	8E Bullying	8F Media and behaviour

Study design dot point

- the influences on helping behaviour (or reluctance to help) including personal, situational and social factors

Key knowledge units

Prosocial behaviour	2.2.5.1
Situational factors	2.2.5.2
Personal factors	2.2.5.3
Social factors	2.2.5.4
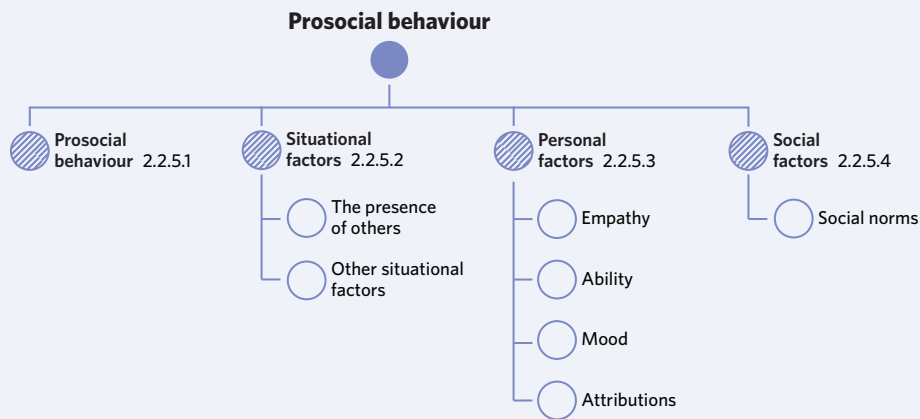
Prosocial behaviour 2.2.5.1

OVERVIEW

Prosocial behaviour is any behaviour that is performed intentionally and voluntarily to help other people or society. Whether or not we choose to help in different situations is dependent on a range of factors.

THEORY DETAILS

Why do we help others when we don't have to? In lesson 4A, you learnt about the roles of nature and nurture in development. **Prosocial behaviour** is influenced by a very wide range of factors. Broadly speaking, there are both environmental (nurture) and evolutionary (nature) explanations as to why humans choose to help. From an environmental perspective, there are a range of social rewards for helping another: a good reputation, personal satisfaction, friendships and so on. On the other hand, there are also biological explanations for prosocial behaviour that highlight the importance of helping those in one's family and community as a means of evolutionary group survival.

Prosocial behaviour behaviour that is intentionally and voluntarily performed in order to help another person or society

> **Memory device**
>
> You can remember that **pro**social behaviour means helping behaviour because the beginning of the word 'pro' here means *'in favour of'*. In other words, prosocial behaviour is in favour of social conventions and ideals. In contrast, the 'anti' in **anti**social means 'against' social, i.e. *against* social rules.

In 1964, a woman called Kitty Genovese was brutally assaulted and stabbed to death outside her apartment building in New York. News stories at the time claimed that 37 neighbours heard her cries for help over the half-hour period and that none of these 37 called the police or came to her aid. Later investigations suggest that the media greatly exaggerated the response of Kitty's neighbours, with fewer bystanders than 37 and some of them actually calling the police (Solomon, 2015).

Regardless of this since-revealed truth, the story at the time led psychologists to further research prosocial behaviour and the factors that influence someone to help or not help others. Instances in which people don't help others in need still occur today. In 2011, two-year-old toddler Wang Yue was run over by two cars in Foshan, China. Over 15 people walked by and saw her but did nothing to help.
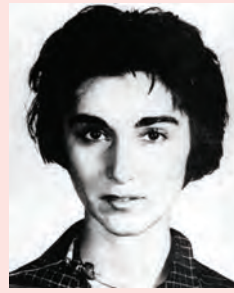
Figure 1 Kitty Genovese

In cases like Kitty Genovese's and Wang Yue's, what influences a person such that they do not provide help? Social psychology attempts to answer such questions by looking at a range of factors that influence how likely a person is to help another. These include:

- Situational factors
- Personal factors
- Social factors

Situational factors 2.2.5.2

OVERVIEW

Situational factors are environmental and contextual circumstances external to the individual.

THEORY DETAILS

There are a range of **situational factors** that can either increase or decrease the likelihood of helping behaviour occurring, including:

- The presence of others
- Physical proximity
- Risk
- Timing
- Sensory environmental cues

Situational factors elements of the environment or context a person is in that influences whether they help

The presence of others

One of the most extensively studied situational factors is the presence of other people in the environment at a time when helping is needed. Thinking back to Wang Yue, why did it take over 15 people to see and walk by her before someone eventually stepped in to help? Other people being present in an emergency situation like this can psychologically influence people in a range of ways.
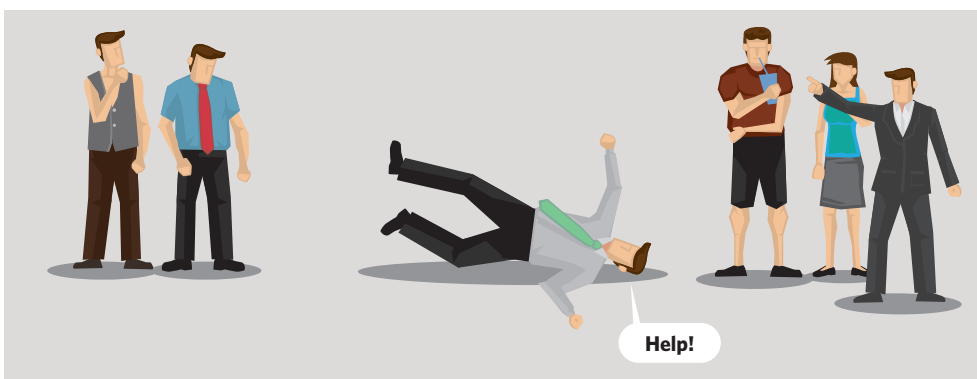
Help!

Image: UncleFredDesign/Shutterstock.com

Figure 2 Bystanders observing a man in need of help

The bystander effect

The bystander effect refers to the social psychological phenomenon in which when there are other people present, someone is less likely to help. In fact, the more people ('bystanders') present in a situation (or believed to be present), the less likely people are to help a victim in need. There are a range of psychological reasons this occurs, including:

- *Diffusion of responsibility*, which refers to the assumption that someone else present in the situation will take responsibility for helping
- *Ambiguity*, which refers to a situation being unclear in terms of who is responsible for helping. If many people are present, it might be ambiguous as to who should step in and help
- *Audience inhibition*, which occurs when people do not act out of fear of embarrassment. If many people are present, it could feel rather humiliating for the helper if they failed

The bystander effect the social psychological phenomenon which suggests that the presence (or imagined presence) of other people in an emergency situation reduces the likelihood that someone will provide help

*You can see the concept of the **bystander effect** and then **prosocial behaviour** depicted in the flip cartoon in the corners of this book

● RECORDING

Image: UncleFredDesign/Shutterstock.com

Figure 3 The bystander effect can also occur because people's desire to help is often overridden by the desire to record and share an emergency event via social media. Filming and sharing others' accidents, fights and emergencies is a very common occurrence, adding a digital motivation to the classic bystander phenomenon

When does a bystander intervene?

Two psychologists, Latané and Darley, were instrumental in prosocial behaviour research and the factors that influence bystander intervention (Latané and Darley, 1970). They devised a model of decision making for bystander intervention. Each step in the model must be fulfilled in order for a bystander to intervene. As you can see, the first three steps in particular consider the influence of situational factors on helping. This particular model also highlights that there are many opportunities and reasons for people to decide not to help as a bystander.

EMERGENCY

Notice the event	**Is help needed?**	NO
	YES	
Assess it as an emergency	**Is it an emergency?**	NO
	YES	
Take responsibility	**Does the helper assume responsibility for helping?**	NO
	YES	
Know how to help	**Does the helper decide on a course of action?**	NO
	YES	
Provide help	**Does the helper take action?**	NO
	YES	

✓ **Provide help**   ✗ **No help is given**
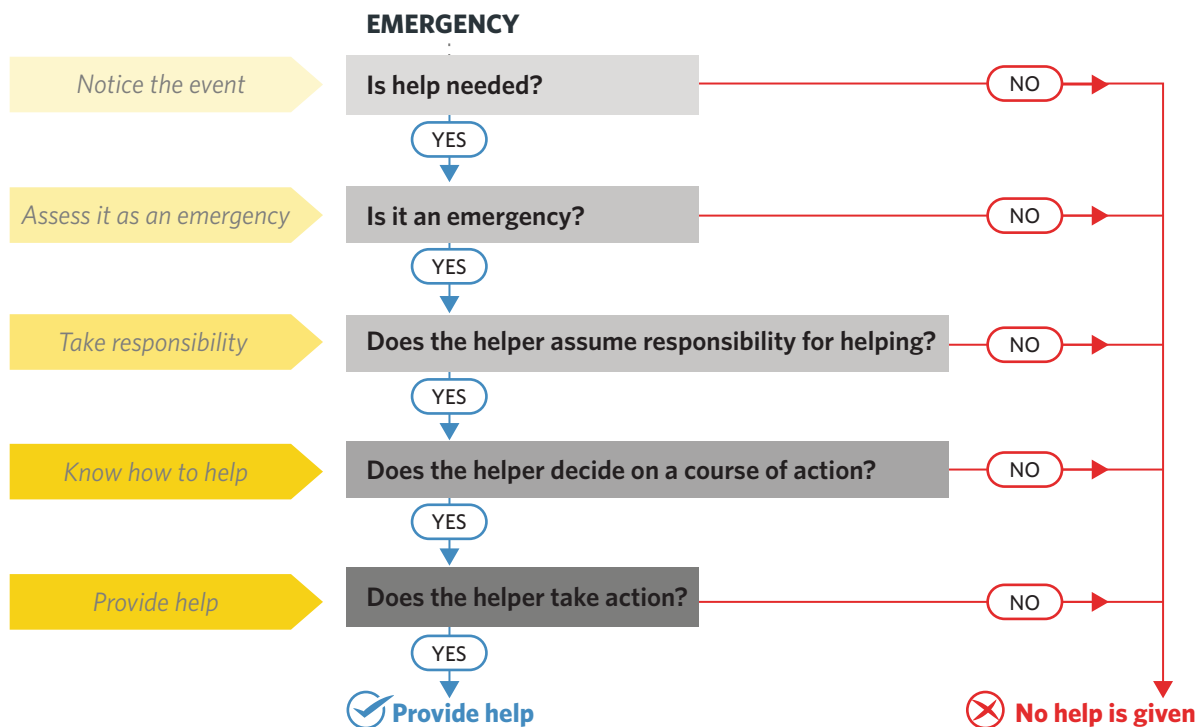
Figure 4 Latané and Darley's decision model of helping

Other situational factors

The presence of others is one of the strongest situational factors affecting people's behaviour, but there are also other situational factors too. These are summarised in table 1.

Table 1 Situational factors that influence helping outside the presence of others

Situational factor	Explanation
Physical proximity	Is there a psychological difference between ignoring a child like Wang Yue who is injured right in front of you, and ignoring children we cannot see starving in another country? Psychologically, most of us feel more compelled to help a child we can see in plain sight directly in front of us, than a child whose name we do not know in a distant country. Whether morally justifiable or not, physical distance (or proximity) to a victim has a major psychological influence on our willingness to help. Being confronted directly by a victim can elicit a greater desire to help.
Risk	The risk of a situation to the helper is also something that affects the decision to help. Generally, a helper will conduct *a cost–benefit analysis* of the risks involved in helping. If the risk of helping is too high and potentially endangers a helper, they may be less likely to help.
Timing	A potential helper has to perceive that they have enough time in order to help.
Sensory environmental cues	While the situational factors already outlined may seem obvious, research has been conducted on the effect of sensory environmental cues and how they influence the likelihood of helping behaviour. One interesting factor is that the presence of a pleasant smell can increase the likelihood of a person helping (Baron, 1997).

Personal factors 2.2.5.3

OVERVIEW

Aside from those things external to the individual, there are also a range of factors within the individual person that determines whether or not they will help. These are referred to as personal factors.

THEORY DETAILS

Inevitably, whether prosocial acts are performed is also dependent on the potential helper. **Personal factors** include aspects of the individual helper such as their ability, mood, desire and so on. These factors are of great interest to psychologists and have triggered many debates within moral psychology and philosophy about human nature. In this lesson, we will be exploring the following personal factors:

- Empathy
- Ability
- Mood
- Attributions

Personal factors influences on helping that stem from within the individual who is or is not going to help

Empathy

One of the most hotly debated factors surrounding prosocial behaviour is empathy as a driving force for helping others. *Empathy* refers to our ability to understand others' feelings as our own, or in other words, 'put ourselves in someone else's shoes'. Some psychologists suggest that the more we empathise with someone who needs help, the more likely we are to help them. Some even suggest that empathy is an essential criterion for helping others. This would suggest that we have to first understand another's need for help before deciding to provide it.

Empathy and the true altruism debate

The idea of empathy as a precursor to helping raises questions as to whether *altruism* can really exist. Some argue that *true altruism* requires only the person being helped to benefit and not the helper at all.

However, others suggest that this is not possible: every act of helping in some way satisfies the helper too, whether by providing a sense of achievement, or alleviating the pain they felt via empathy or distress. For example, donating to charity makes a person feel a 'warm glow' inside.

This alternative view supports the principle of *psychological egoism,* which contends that every human act is motivated by self–interest at least to some degree.
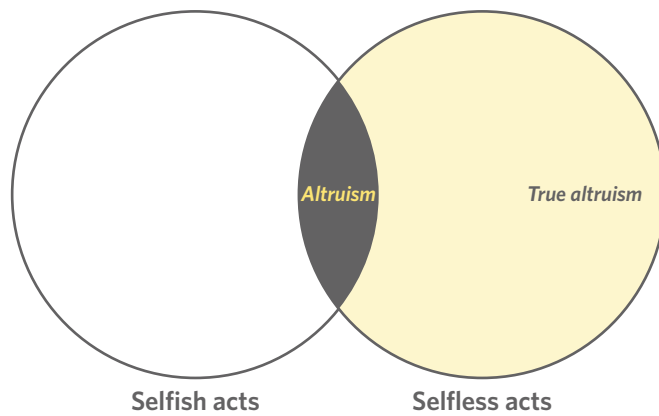
Figure 5 Those who believe in true altruism would argue that the right circle is totally possible for some acts. However, some people argue that true altruism does not exist, and that even the most selfless acts benefit the actor in some way by providing feelings of pride, achievement or relief. This is depicted by the overlap between the two circles

While requiring empathy to help might make some acts seem inherently selfish, others suggest that this is actually evidence of true altruism. Daniel C. Batson's *empathy–altruism hypothesis* suggests that if someone feels empathy for someone that needs help, they will perform prosocial behaviour regardless of whether they get something out of it or not (Batson, 1991). Regardless of the view you take, empathy can be a strong personal motivator for helping behaviour.

ACTIVITY 1 – CLASS DISCUSSION

Have you ever been truly altruistic?

Can you think of any instances of helping behaviour that in no way benefit the helper or make them feel good?

Can you think of a time where you have helped someone without first empathising with them?

Ability

Inevitably, the potential helper's actual or believed ability to help determines whether help is given too. If you do not believe you have the physical or mental capacity to catch a baby being thrown from a roof, you might pass the task off to somebody else.

Mood

Are you more likely to ask your family for a lift when they are in a good mood or a bad mood?

The emotions a potential helper is experiencing also affects the likelihood that they will give help. Although it of course depends on the individual, research suggests people help out of a desire to create or maintain a positive mood (Isen, Clark & Schwartz, 1976). Most clearly, people are more likely to help when they are already in a good mood, as positive affect can lead to feelings of generosity, a desire to cooperate and assist, and a greater warmth toward other people.

However, this does not mean that all bad moods necessarily decrease helping behaviour. For example, if you have ever donated to charity, was it because you were already in a good mood or was it out of guilt? Some negative moods, most notably guilt, can also promote prosocial behaviour.

Attributions

Thinking back to lesson 7C: Explaining behaviour through attribution, the attributions a potential helper makes also affects the likelihood of prosocial behaviour occurring.

This is specifically in regard to the attributions made about the person in need of help and the causes behind their situation. For example, when seeing a homeless person on the street, some people might be more likely to assist them if they make an external attribution about their situation; i.e. that the person is homeless because they were unfairly fired, or suffered some significant trauma. On the other hand, some people don't give to homeless people due to making internal attributions that it is the homeless person's own fault for their situation because, for example, they became addicted to drugs.

Psychology in practice

Moral psychology is a broad field of psychology which studies how we come to develop our own sense of morality, as well as the psychological processes that occur when we make moral decisions. The relationship between psychological perspective taking and decision making is of great interest to moral psychologists.

Social factors 2.2.5.4

OVERVIEW

There are also societal expectations about when it is morally expected that an individual should step in and help, and these can also influence whether or not help is given.

THEORY DETAILS

Social factors are those influences on behaviour that come from the expectation of how we should act with other people and in society. These behavioural standards or **'social norms'** stem from our biological needs, culture, communities, and wider society. Social norms can be thought of as those unofficial rules regarding how we ought to act held by society that most people follow without thinking.

Social norms

One of the most historically significant and universal social norms is known as the 'Golden Rule'. This dictates that you should treat others how you yourself would like to be treated. On a crowded train, you would cover your mouth if you needed to cough so as to avoid the imposition of infecting someone else, just as you would hope others would too.

Social norms also importantly have a significant influence on prosocial behaviour. There are certain societal expectations about when we should help others. Three important social norms that directly influence whether or not we should help someone include:

Social factors influences on helping that stem from other people and society

Social norms the unofficial rules regarding how we ought to act held by society that *most* people follow without thinking

Table 2 Social norms that affect helping behaviour

Norm	Description	Summary in regard to prosocial behaviour
Social responsibility norm	The social responsibility norm describes the societal expectation that we ought to help others who are in need. If we see a child alone on the road and we are able to, we should go and pick them up and protect them from danger. This norm emphasises the asymmetrical relationship between a helper and the person in need: if you are in a position where you can help because of ability or authority over another, you should. This particularly applies to people who can't help themselves such as the young, elderly and those with a disability.	Assist those in need of our help.
Reciprocity norm	The reciprocity norm dictates that we ought to help someone who has helped us. If we are able, we should return favours.	Help those who have helped us.
Social justice norm	The social justice norm suggests that we should only help those who deserve it. For example, a criminal in need of assistance to dispose of a body would likely not be eligible for help according to this norm.	Only help people that deserve it.

Image: kengphotostockShutterstock.com

Figure 6 The reciprocity norm is also seen in the animal kingdom and is often translated as the expression, 'You scratch my back, I'll scratch yours'

ACTIVITY 2

To help or not to help? – Summarise your knowledge on prosocial behaviour

Looking at the study design dot point, you will see that the study design requires you to be familiar with situational, personal and social factors that influence helping (or reluctance to helping) behaviour. Using the flowchart, provide a definition of each type of factor and an example under each category of a factor that would increase helping behaviour and a factor that would decrease helping behaviour.

Help needed: A man has dropped his wallet on the train in front of you

Situational factor
Define:

Personal factor
Define:

Social factor
Define:

Increases helping: *Decreases helping:*   *Increases helping:*   *Decreases helping:*   *Increases helping:*   *Decreases helping:*
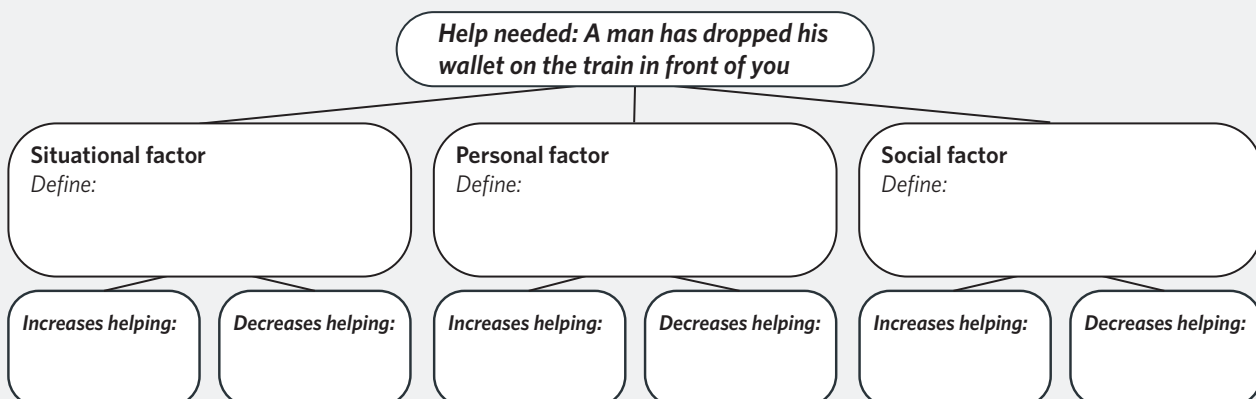
Theory summary

Table 3 Summary table of prosocial behaviour

	Increase helping	Increase reluctance to help
Situational factors	• Physical or geographic proximity • There are more benefits than costs for the helper • There is adequate time to help • There is certain sensory stimuli, such as a pleasant smell	• The bystander effect, resulting from things like diffusion of responsibility, ambiguity and audience inhibition • The risk is too high for the potential helper • There is not enough time • Physical or geographic distance
Personal factors	• The helper empathises with the person in need of help • The helper wants to maintain a positive mood or alleviate a negative mood • The helper is competent in the skills required to help • The helper attributes the victim's need for help as external or involuntary	• The helper does not empathise with the person in need • The helper is not in a mood which they wish to maintain or alleviate • The helper is not able to help • The helper attributes the victim's need for help as internal and blameworthy
Social factors	• The helper acknowledges and respects social norms like the social responsibility norm, reciprocity and the social justice norm	• On account of the social justice norm, the helper does not perceive the helpee as worthy of assistance • The helper does not perceive the helpee to be in a reciprocal relationship

8D QUESTIONS

Theory-review questions

Question 1

Which of these options is the best example of prosocial behaviour?

A   Waiting in the car at a zebra crossing to let an elderly woman cross the road.

B   Picking up rubbish you find on the beach.

Question 2

Personal factors that influence prosocial behaviour are *(Select one)*

A   things within the individual helper such as their mood and ability to understand someone they're going to help.

B   anything within the individual who is going to be helped.

Question 3

A personal factor that would increase helping would be *(Select one)*

A   having the ability to help.

B   not empathising with the person in need too much.

Question 4

Social factors are different to personal factors in relation to helping because *(Select one)*

A   social factors concern the way people feel about helping whereas personal factors don't.

B   social factors include what society feels and thinks whereas personal factors include what the individual helper feels and thinks.

Question 5

A social factor that decreases the likelihood of helping is *(Select one)*

A   wanting to return a favour to someone.

B   not believing the person deserves help because they have done something bad.

Question 6

The bystander effect decreases the likelihood of helping and is an example of *(Select one)*

A   a personal factor based on the presence of other people.

B   a situational factor based on the presence of other people.

Question 7

A situational factor is *(Select one)*

A   something within the environment or context that affects helping.

B   something that causes help to be needed.

Skills

Understanding research

Use the following information to answer Questions 8–11.

Read the following abstract reproduced from Williams' et al.'s study, 'The influence of empathic concern on prosocial behaviour in children'. This study tested the effect of the **personal factor** of emotional state in children on the prosocial behaviour of sharing stickers.

Abstract

This research explored the influence of empathic distress on prosocial behaviour in a…task with children. Children were randomly assigned to one of two conditions before engaging in a sticker sharing task; watching either a video of a girl upset that her dog had gone missing (emotion induction condition), or a video of the same girl preparing for a yard sale (control condition). In study one, 5–6 year old children in the emotion induction condition rated the emotional state of both the protagonist and the self more negatively, and also exhibited more prosocial behaviour; sharing more…and less often withholding a benefit… than the control group. Prosocial behaviour was significantly correlated with ratings of the emotional state of the protagonist but not with own emotional state, suggesting that empathic concern rather than personal distress was the primary influence on prosocial behaviour. In study two, 3–year–olds were tested … and like the 5 and 6–year–olds, showed more prosocial behaviour in the emotion induction condition than the control. (Williams et al., 2014).

Question 8

Which of the following statements from the excerpt correctly identifies the independent variable? *(Select one)*

A   'A sticker sharing task'

B   'Prosocial behaviour'

C   'The influence of empathic distress'

Question 9

Which of the following statements from the excerpt correctly identifies how the independent variable was operationalised? *(Select one)*

A   'Watching either a video of a girl upset that her dog had gone missing (emotion induction condition), or a video of the same girl preparing for a yard sale (control condition)'

B   'Engaging in a sticker sharing task'

Question 10

The statement that 'children were randomly assigned to one of two conditions before engaging in a sticker sharing task' refers to what? *(Select one)*

A   the sampling method

B   the allocation procedure

Question 11

Who was the population in this study? *(Select one)*

A children

B five and six year olds

C three year olds

D five, six and three year olds

Exam–style questions

Multiple-choice questions

Question 12 (1 MARK)

The smell of a room, the temperature of the air and the time of day are all

A social factors that influence helping behaviour.

B personal factors that influence helping behaviour.

C situational factors that influence helping behaviour.

D internal factors that influence helping behaviour.

Question 13 (1 MARK)

Social factors that always increase the likelihood of helping behaviour include

A the social responsibility norm and reciprocity norm.

B social norms.

C the potential helper's empathy for the person in need.

D whether the potential helper has enough time to help.

Question 14 (1 MARK)

Ayodele was in the school library and saw her friend struggling with a mathematics problem. Ayodele had been struggling with the same problem last week, and remembered how difficult she found it. Because of this, Ayodele helped her friend and gave her advice on approaching the problem.

Which of the following personal factors most likely influenced Ayodele to help her friend?

A mood

B empathy

C the reciprocity norm

D a cost–benefit analysis

Question 15 (1 MARK)

The bystander effect phenomenon says that

A as the number of victims increases, the likelihood of bystander helping increases.

B as the number of victims decreases, the likelihood of bystander helping decreases.

C as the number of bystanders increases, the likelihood of bystander helping increases.

D as the number of bystanders increases, the likelihood of bystander helping decreases.

Short-answer questions

Question 16 (2 MARKS)

Using an example, explain how the situational factor of risk may increase a potential helper's reluctance to help.

Question 17 (2 MARKS)

Hideki is mad at his little brother because he is not giving him a lift to the airport. Hideki pleaded with his brother, saying that Hideki used to give his brother lifts all the time. Now his brother is old enough to drive, but won't help Hideki with lifts.

In terms of helping behaviour, identify the social norm Hideki's brother is **not** adhering to and explain why.

Question 18   (5 MARKS)

Emir was walking down the corridor and saw a girl he liked, Ella, drop her books. Although Emir wanted to help Ella, he didn't because he was worried what others would think if they saw him.

a   Describe how the bystander effect is occurring in this situation and explain why it occurred. (3 MARKS)

b   Identify and explain how one personal factor may have instead led Emir to help. (2 MARKS)

Questions from multiple lessons

Question 19   (6 MARKS)

Donna never gives her change to homeless people on the street as she thinks they will spend it on drugs and alcohol. She also thinks that this is the reason all people become homeless in the first place.

a   Outline the relationship between stereotypes, discrimination and prosocial behaviour for Donna. (3 MARKS)

b   Identify and explain the type of attribution Donna makes about homeless people's situation and how it likely influences her prosocial behaviour. (3 MARKS)

8E BULLYING

Bullying as a social phenomenon contributes greatly to our understanding of individual and group behaviour. It demonstrates the more sinister psychological effects of an individual exercising their perceived power over others. This lesson will examine the meaning of bullying, the factors that influence bullying behaviour, and the psychological impact that it has on its victims.

8A Experiments on status and power	8B Experiments on obedience	8C Experiments on conformity	8D Prosocial behaviour	8E Bullying	8F Media and behaviour

Study design dot point

- factors that influence bullying (including cyberbullying) behaviour and the effects of bullying behaviour on an individual's psychological functioning

Key knowledge units

Types of bullying	2.2.6.1
Factors that influence bullying	2.2.6.2
Effects of bullying	2.2.6.3

Bullying

- Types of bullying 2.2.6.1
- Factors that influence bullying 2.2.6.2
  - Situational factors
  - Environmental factors
  - Factors that influence cyberbullying
- Effects of bullying 2.2.6.3
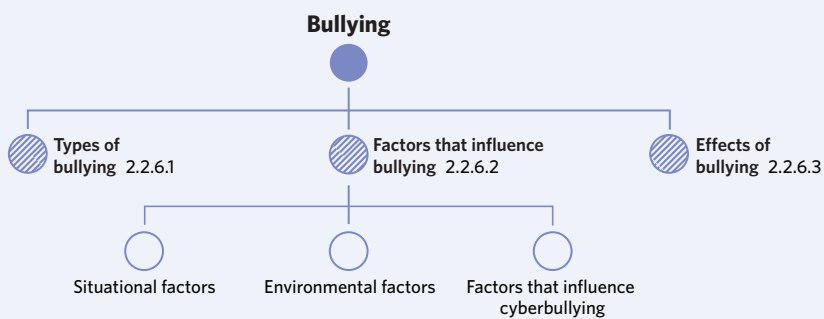
⊕ *Want to know more?*

If you have been bullied or have witnessed others being bullied, it is important that you reach out to get the support that you need. Support can be achieved through the following sources:

- **Kids Help Line** at 1800 55 1800 or *kidshelp.com.au*
- **Lifeline** at 13 11 14 or *lifeline.org.au*
- **The Australian Human Rights Commission** at 1300 656 419 or *humanrights.gov.au/complaints_information/index.html*

Types of bullying 2.2.6.1

OVERVIEW

Bullying, broadly speaking, refers to deliberately making an individual or group feel distressed. To gain a deeper understanding of bullying, however, it is important to break it down more specifically into its different types.

THEORY DETAILS

Bullying involves actively and repeatedly causing an individual or group to experience psychological distress by physical, verbal, or social means, causing a power imbalance between the bully and victim. A common understanding of bullying considers only the physical component of bullying; that is, that bullying involves hurting somebody else physically to make them feel hurt and upset. These activities are referred to as **overt bullying** given that they are visible and explicit. Bullying includes, but is not limited to, these kinds of overt physical actions.

Bullying intentionally and repeatedly causing an individual or group to feel distressed through verbal, social or physical behaviours

Overt bullying visible forms of bullying, such as causing physical harm or name calling

Covert bullying, by contrast, refers to actions that still cause significant levels of distress, but without being explicitly visible. **Cyberbullying**, being bullying that occurs in online spaces, often falls into the category of covert bullying. Online spaces, such as social media, often afford users less visible forms of communication to others, such as texting somebody. This enables people to send harmful messages that cause psychological harm. Cyberbullying can also be overt: other features of social media, such as public posts or group chats, enable people to target people in front of an online audience. This could involve someone publicly posting something harmful to an individual or group that causes them, but not their other followers, significant levels of distress. Bullying is a broad concept and different types of bullying, such as cyberbullying, show themselves in both overt and covert ways.

Covert bullying indirect forms of bullying, such as excluding people from group events or talking about them behind their backs

Cyberbullying bullying that involves intentionally harmful behaviour that occurs repeatedly in online spaces, such as on social media

Table 1 Summary of the types of bullying

Cyber bullying	Overt bullying	Covert bullying
Image: Djent/Shutterstock.com	Image: AVIcon/Shutterstock.com	Image: Adapted from Michael D Brown/Shutterstock.com
Figure 1 Cyberbullying is displayed online, such as by sending harmful messages on the phone	**Figure 2** Overt bullying can be observed directly, such as physical forms of bullying	**Figure 3** Covert bullying cannot be observed directly, such as when someone is continuously excluded from social events behind their back
Bullying that occurs in online spaces, such as on social media	Visible or obvious forms of bullying	Indirect forms of bullying
Eg, When an individual regularly sends hurtful messages to someone with the intention of causing them significant distress	Eg, When an individual intentionally pushes someone over on several occasions	Eg, When an individual intentionally invites everyone from a friendship group to catch ups except for one person

Factors that influence bullying 2.2.6.2

OVERVIEW

Bullying behaviour is not random, but rather influenced by many different factors. The influences on bullying behaviour can include situational (due to the specific conditions that precede bullying behaviour) and environmental (due to an individual's conditions during their upbringing) factors.

THEORY DETAILS

Situational factors

Situational factors are circumstances in an individual's context when bullying behaviour occurs that influence them to perform this behaviour, such as the number of bystanders present in a situation. For example, observational studies on students aged between 5 and 12 in a school setting have shown that four peers are present on average in most bullying incidents, ranging from 2 to 14 (O'Connell, Pepler, & Craig 1999). For the person demonstrating the bullying behaviour, this sense of performance and recognition acts as a reward and incentive. If someone is affiliated with aggressive peer groups and has a dominant social status, then this can also increase the likelihood of bullying.

Environmental factors

There are also a number of factors relating to an individual's family or home environment that can increase the likelihood of bullying behaviour. These are called *environmental factors*. If someone has poor parental supervision and a negative home environment, then bullying behaviour may increase due to violent or contradictory behaviour being likely to be modelled in their school or work environments. For example, research on 10-15 year-old participants suggests that poor parenting and participation in aggressive behaviour with siblings is a factor that influences bullying behaviour at school (Tippett & Wolke, 2014).

Lesson link

In *Units 3 & 4 Psychology*, you will learn about operant conditioning which outlines that if a behaviour is reinforced, the person is more likely to perform the behaviour again. In the context of bullying, the reception of bystanders and the personal satisfaction someone gains from bullying behaviour can act as positive reinforcement for the bully and increase the likelihood that it will endure. For example, if at lunchtime, someone verbally abuses another student and everyone around them starts laughing and clapping, this would be positive reinforcement for the bully and increase the likelihood of them continuing to display bullying behaviour. This reflects a problematic way in which bullying can be perpetuated.

Lesson link

In lesson **8D: Prosocial behaviour**, you learnt about the concept of the bystander effect. This also acts as a factor that influences bullying. Given that most bullying occurs in the presence of bystanders, who are unlikely to challenge bullying behaviour because of the bystander effect, this bullying endures.

Furthermore, environmental factors can also result in bullying when a person experiences a lack of safety or security at home, with these individuals taking their negative emotions out on other people. Other environmental factors include a person's:

- Financial security
- Past trauma
- Level of emotional support from friends or family

Factors that influence cyberbullying

Researchers have also identified distinct factors that influence cyberbullying behaviour for the bully. For example, cyberbullying can allow for anonymous bullying behaviour and the potential to reach a larger audience than more traditional environments. A post on social media targeting someone, for example, could reach hundreds or even thousands of people, whereas a comment during class may only reach around 10 to 20 other students. Further, cyberbullying behaviour is not limited to school or work environments, making it more accessible to many people as a way to cause psychological torment. While there are authority figures at school or work who can prevent bullying from occurring, it is much more difficult to moderate cyberbullying. This can influence the continuation of cyberbullying behaviour as it is less likely to be addressed or punished. Cyberbullying reflects the disruption of power dynamics that occurs online, with its anonymity giving people the confidence to publish particularly hurtful posts or messages that they would ordinarily not feel comfortable doing. For example, research on participants aged between 10 and 19 suggests that people can adopt another identity online and afront people in online spaces such as chat rooms (Vandebosch & Van Cleemput, 2008). All of these factors encourage cyberbullying behaviour and thus point to what makes it such a sinister recent development.

Effects of bullying 2.2.6.3

OVERVIEW

Bullying has serious psychological and physical consequences for those involved, including weakening immune system functioning due to stress and impacting mental health.

THEORY DETAILS

The victims of bullying can experience severe physical and psychological effects. As discussed, bullying, by definition, involves intentionally making someone experience significant distress. When someone experiences prolonged stress, *cortisol* (a stress hormone) is released to energise the body. However, the prolonged release of cortisol also weakens the immune system, increasing the likelihood of becoming sick. The prolonged stress involved in the repeated or ongoing nature of bullying therefore can lead to illness.

Bullying can also affect mental health. Being bullied can significantly compromise wellbeing, self-esteem, and can compromise functioning when it interferes with the ability to work at school or in the workplace. *Functioning* refers to our ability to effectively meet everyday demands and is one of the marks of a mentally healthy person. If someone experiences persistent bullying in the workplace, for example, then it can act as an incentive for not working, or even quitting the job. This undermines the ability to earn an income and live independently and therefore may contribute to mental health problems and disorders.

Theory summary

In this lesson, you learnt about what constitutes bullying, the different factors that influence bullying behaviour, and the effects of bullying behaviour on an individual's psychological functioning. You should now have an understanding of the different factors that increase the likelihood of bullying occurring and the psychological impact of bullying on mental health and its flow on effect on physical functioning.

Lesson link

In **Units 3 & 4 Psychology**, you will learn more about the effects of stress on biological functioning.

Lesson link

For a refresher on the concept of mental health and mental health disorders, head to lesson **5B: Factors influencing mental health and coping**.

In **Units 3 & 4 Psychology**, you will also learn about the mental health continuum, including its impact on functioning and the typical characteristics of a mentally healthy person, which includes high levels of functioning, social and emotional wellbeing, and resilience to life stressors. All of these characteristics can be undermined when someone is bullied.

8E QUESTIONS

Theory-review questions

Question 1

Fill in the blanks with the following terms.

- Bystanders
- Physical
- Home
- Cyberbullying

Bullying can be either overt or covert and includes _____. It can be influenced by environmental factors such as the number of _____ present and family factors such as _____ environments. Bullying has both psychological and _____ effects on those who endure it.

Question 2

The weakening of the immune system and a resulting illness can be a/an *(Select one)*

A   factor that influences bullying.

B   effect of bullying.

Question 3

Which of the following options is an example of cyberbullying? *(Select all that apply)*

I   Throwing a phone repeatedly at somebody

II   Repeatedly posting hurtful messages and images of somebody on social media

III   Personally messaging someone online repeatedly with the intention to cause them distress

Question 4

Having an unstable home life and being diagnosed with a mental health disorder are most commonly examples, respectively, of *(Select one)*

A   an effect of bullying and a factor that influenced bullying.

B   a factor that influenced bullying and an effect of bullying.

Skills

Unpacking the scenario

Use the following information to answer Questions 5–7.

Alejandro has been regularly receiving hurtful private text messages from somebody at his workplace. When he then goes to work, they often push him as he walks to the kitchen and call him names in front of his other coworkers. Having been treated like this at work for months, Alejandro starts to feel sick and decides that he needs to visit his doctor.

Question 5

Who was bullying in this scenario? *(Select one)*

A   Alejandro

B   Alejandro's coworkers

Question 6

Alejandro experienced overt bullying in this scenario when he *(Select one)*

A   was pushed by his coworkers and called names.

B   starts to feel sick and decides that he needs to visit his doctor.

Question 7

The effects of bullying in this scenario are clear from the statement that *(Select one)*

A   'Alejandro starts to feel sick'

B   'they often push him as he walks to the kitchen and call him names'

Exam-style questions

Multiple-choice questions

Use the following information to answer Questions 8–10.

Fazlur has recently been bullied at school. The bullying behaviour began when he was excluded from social events and from being able to participate in lunchtime activities like playing soccer on the oval. While Fazlur couldn't see this behaviour because it was happening behind his back, he certainly felt its effects and began to avoid going to school because it would cause such distress. The bullying behaviour ultimately increased to the extent that Falzur would be called names when he did come to school and pushed around in the hallway.

Question 8   (1 MARK)

Fazlur being excluded from social events and not being to participate in lunchtime activities reflects

A   overt bullying.

B   covert bullying.

C   cyberbullying.

D   impaired functioning.

Question 9   (1 MARK)

What concept relates to Fazlur missing school because of being bullied?

A   improved mental health

B   impaired functioning

C   factors that influence bullying

D   cyberbullying

Question 10   (1 MARK)

Falzur being called names and pushed around in the hallway reflects

A   overt bullying.

B   covert bullying.

C   cyberbullying.

D   impaired functioning.

Short-answer questions

Question 11   (1 MARK)

Define cyberbullying.

Question 12   (2 MARKS)

Identify an effect of bullying and explain how it can impact those being bullied.

Question 13   (4 MARKS)

Identify and describe two factors that influence bullying.

Questions from multiple lessons
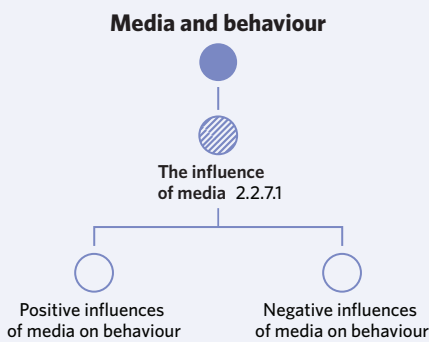
Question 14   (1 MARK)

In terms of mental health, a friend sending hurtful messages on social media would be which kind of influence on one's own mental health?

A   a biological factor

B   a psychological factor

C   a social factor

D   an internal factor

8F MEDIA AND BEHAVIOUR

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 your laptop or phone open as you are reading this. With media dominating our conscious experiences, it is impossible to ignore its potential to impact our behaviour. This lesson will explore both the positive and negative influences of different types of media, including advertising, television, video games, and social media on individual and group behaviour.

8A Experiments on status and power	8B Experiments on obedience	8C Experiments on conformity	8D Prosocial behaviour	8E Bullying	8F Media and behaviour

Study design dot point

- positive and negative influences of media on individual and group behaviour, illustrated by advertising, television, video games and social media

Key knowledge units

The influence of media   2.2.7.1

Media and behaviour

The influence of media 2.2.7.1

Positive influences of media on behaviour   Negative influences of media on behaviour

The influence of media 2.2.7.1

OVERVIEW

To understand how media influences behaviour, it is necessary to understand what constitutes media and to identify how much it pervades our everyday life.

THEORY DETAILS

Media refers to the ways in which information is spread throughout society. There are many forms of media with which you might be familiar; these include **advertising**, television, video games, and **social media**. We cannot escape media in our lives even if we try. On your daily commute to school, you will notice advertisements in shopfronts and streets, and even if you choose not to have a television in your house, you are likely to still be exposed to this media in environments such as waiting rooms. 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.

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 or your family may time events like dinner around certain shows. It is impossible to ignore how individual and group behaviours have changed to account for the emergence of prominent media forms, such as the television.

Media the form in which information is spread throughout society

Advertising the process of using media to persuade people to purchase commercial products

Social media types of media that allow people to interact with others

Figure 1 Media is diverse and does not only include social media

ACTIVITY 1

How much time do you spend on your phone?

Many phones have a screentime feature that reports how long you spend on your phone and on what applications. Have a look at this report to understand how much time you spend on your phone and therefore how long you are susceptible to media's influence each day.

Image: Can Yesil/Shutterstock.com

Figure 2 An example of a common screen time report on a smartphone

Positive influences of media on behaviour

Media is not intrinsically positive or negative, but rather can have varying influences on individual and group behaviour depending on the nature of the media that is being engaged with and the way in which it is being engaged. For example, there are aspects of video games that research suggests have significant cognitive benefits. Exposure to action video games that require complex problem-solving skills can develop perceptual, attentional, and cognitive abilities (Eichenbaum et al., 2014).

> 🔍 *Research spotlight*
>
> The cognitive benefits of video games can be used to reduce an age-related cognitive decline. As described by Eichenbaum et al. (2014):
>
> In the cognitive domain, video games have become an effective means of fighting off the cognitive decline seen with normal aging and potentially even of reducing the probability of Alzheimer's and similar disorders by ensuring that players stay mentally active. Many studies demonstrate the positive effect that video game play can have on the aging population.

Social media also gives rise to positive influences on behaviour, including fast and accessible communication which provides a sense of connectedness, as well as the spread of social justice activism. In the past, communication was limited to interactions between people in real life and more limited modes of communication such as the mail. With social media, people can now spread a message to people they may never have even met. This ease of communication can make people feel less lonely because they feel more connected to others.

This condition of social media has had many positive influences on group behaviour. There are many examples of social activism that have been organised through social media platforms. On the 20th of September 2019 around 300,000 Australians gathered together to make a social statement about climate change (ABC, 2019). This climate strike was largely organised using social media platforms like Facebook and Twitter. The ability to make a social statement about an issue that is important to you marks a positive influence of media on group behaviour.

ACTIVITY 2

How does social media encourage social activism?

Choose a contemporary example of social activism that you believe has had a positive influence on group behaviour. How did it have a positive influence on group behaviour? What was the role of social media in its organisation?
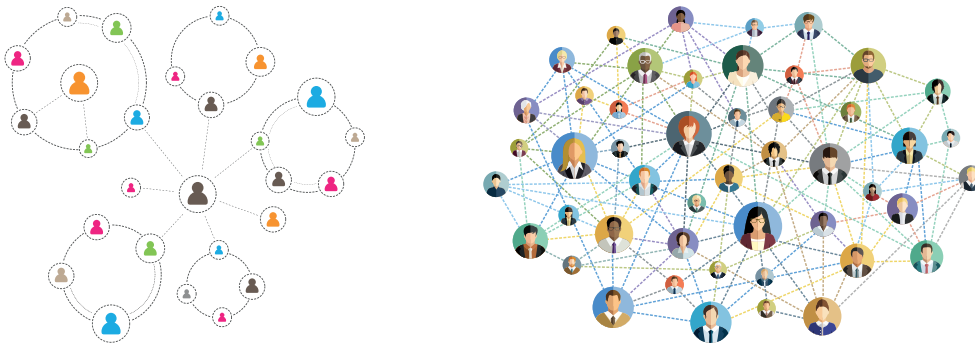
Images: (left to right): Mert Toker, aelitta/Shutterstock.com

Figure 3 Prior to social media, each person had fewer people that they were in direct connection with. With social media platforms like Twitter, Facebook, and Instagram, people are now much more connected and are therefore more easily able to mobilise large groups of people for social change

Advertising can also have similarly positive influences on behaviour. Global companies have huge budgets dedicated to their advertising in order to increase the reach of their marketing campaigns and increase their sales. When these systems of advertising are then used to promote a particular social issue, they can therefore be incredibly effective and reach a large number of people, which can also positively influence individual and group behaviour. The format of advertisements, such as television advertisements and billboards, are often particularly digestible and the most visible way to raise awareness for a particular issue. This helps to explain why governments often use these forms of advertisements for anti-smoking or anti-drink driving campaigns. The same can be said of television programs, which often use their popularity to promote a positive social message. With these forms of media dominating our everyday lives, they can significantly influence group behaviour to achieve a particular social goal when used for this purpose.

ACTIVITY 3

How does the Government have a positive influence on group behaviour?

The Australian government has launched many advertisements that aim to improve group behaviour in regard to a specific social issue. How does this print advertisement published by the Australian government use emotions to persuade you to change your behaviour?

Image: © Commonwealth of Australia

Negative influences of media on behaviour

We spoke before about how certain media forms, such as the television, can positively influence patterns of behaviour. Media may also have negative influences on behaviour. It is commonly identified that a negative influence of television on group behaviour is that it prevents people from interacting with one another. When we are watching television, often our awareness and attention become fixated on the stimuli of the television instead of those around us. As a result, communication and interaction can be inhibited by such media, marking a negative influence of media on behaviour.

ACTIVITY 4 – CLASS DISCUSSION

Does television have a positive or negative influence on family behaviour?

With people in your class, discuss how television influences the behaviour of your family. Does your family watch television together? Does this bring you all together? Or does this stop you from interacting with each other?

Media such as the television and video games have other impacts on attention. Television and video games are often excessively visually and audibly stimulating so as to capture our attention and ensure that we do not get bored. However, if one becomes used to this kind of stimulating material, it then becomes difficult to maintain focus on tasks that are not of this nature. As a result, this can have negative impacts on behaviour, such as making it difficult to concentrate on other stimuli such as school work and assignments due to being easily distracted (Firth et al., 2019). However, these findings have been contested by other researchers, with some saying adverse cognitive effects only occur for children who are excessively exposed to media (Firth et al., 2019).

Advertising and social media can also adversely impact mental health. Social media is based on the principle of staying connected to others. However, many social media platforms allow us to curate our profiles so as to present the best possible version of ourselves and not necessarily the most realistic. When constantly exposed to these curated identities, a person may experience significant distress when comparing themselves to others. This can also occur when comparing ourselves to the representations of models in advertisements, which project unrealistic standards of beauty that are often fabricated through visual manipulation with programs such as photoshop. In extreme circumstances, such comparisons can be so distressing that they can significantly impact our functioning as they discourage us from wanting to be around other people. For example, while studies on women have found that the variations in representation of body size in advertisements does not adversely impact an advertisement's efficacy (i.e. how much it increases willingness to buy the advertised product), the portrayal of particularly thin models does cause body-image related anxiety, particularly in groups of susceptible women (Dittmar & Howard, 2004). Therefore another negative influence of media is that it can impact our mental health and consequently our behaviour.

> **Lesson link**
>
> For a refresher on the concept of mental health, including the internal and external factors which assist individuals to cope with change and challenge, head to lesson *5B: Mental health*.

> **Lesson link**
>
> In *Units 3 & 4 Psychology*, you will learn about *observational learning*. This psychological concept can be used to account for the negative influences of media, such as video games, on behaviour. Observational learning suggests that people can learn through modeling their behaviour on what they have watched in their environment. For someone to learn through observation, they have to fulfil the following stages:
>
> - **Attention:** Learners must actively focus on the model in order to learn
> - **Retention:** The learner must create a mental representation and remember (retain) the behaviour the model has demonstrated
> - **Reproduction:** The learner must have the physical and mental capabilities to reproduce the observed behaviour
> - **Motivation:** The learner must want to reproduce the behaviour in order for learning to occur
> - **Reinforcement:** If the learner receives a desirable consequence for their behaviour, they are more likely to reproduce the behaviour again in the future. Alternatively, if the model performing the behaviour is rewarded, the behaviour is more likely to be copied by the observer
>
> If someone is observing particularly violent behaviour on television or through a violent video game, then it is possible that they may learn to model this behaviour themselves. The following is an example of how this may occur for a child playing violent video games:
>
> - **Attention:** The child actively focuses on their character in the violent video game that they are playing
> - **Retention:** The child creates a mental representation and remembers the violent behaviour that their character in the violent video game has demonstrated
> - **Reproduction:** The child has the physical (muscle strength, coordination, etc.) and mental (capacity to process and comprehend the steps involved in violent behaviour) capabilities to reproduce the violent behaviour that their character in the violent video game has demonstrated
> - **Motivation:** The child must want to reproduce the violent behaviour that their character in the violent video game has demonstrated
> - **Reinforcement:** If the child receives a desirable consequence for their violent behaviour as a character in a video game, they might be more likely to reproduce this behaviour in real life. For example, if the game rewards violent behaviour with levelling up or an in-game reward, the child may believe this reward applies in real life

Theory summary

In this lesson, you learnt about the positive and negative influences of media on individual and group behaviour. You should now have an understanding of how media pervades our everyday lives and therefore how it has an inevitable influence on our behaviour. However, it is important to maintain a dynamic approach to analysing these influences given that media is neither positive or negative in itself. You should now reflect on how advertising, television, video games, and social media impact your behaviour both individually and in group contexts using the psychological concepts that you have learnt about.

8F QUESTIONS

Theory-review questions

Question 1

Fill in the blanks with the following terms.

- Positive
- Negative

Media's presence in our everyday lives inevitably causes us to change our behaviour. While organising a protest to raise awareness for an important social issue could reflect a _____ effect of media on group behaviour, feeling self-conscious about our appearance when comparing ourselves to others online represents a _____ effect.

Question 2

Which of the following options exemplify how the media can negatively influence group behaviour? *(Select all that apply)*

I Families selectively attending to television instead of each other

II Increased difficulty concentrating on stimuli that are less stimulating than the television and video games

III Charity organisations using their advertising reach to raise awareness for a prominent social justice issue

Question 3

Posters and billboards can be issued by governments to persuade us to moderate our behaviour in regards to important social issues faced by our society. This reflects a *(Select one)*

A positive influence of advertising on group behaviour.

B positive influence of social media on group behaviour.

Question 4

Social media can lead to self-consciousness and impair mental health and therefore levels of functioning.
This reflects a *(Select one)*

A negative influence of social media on individual behaviour.

B positive influence of social media on individual behaviour.

Question 5

Fill in the blanks with the following terms.

- develop
- raise awareness

A positive influence of advertising on group behaviour is that large companies can use their reach to _____ for a prominent social issue impacting society, whereas a positive influence of video games is that they can _____ our cognitive abilities.

Skills

Unpacking the scenario

Granit is worried about the influence of media on his behaviour. Granit feels that he interacts less with his family directly because when they do spend time together everybody is selectively attending to the stimulus of the television screen. When speaking about this to his friend, they pointed out that media also can have positive influences on behaviour. His friend used the example of recent climate strikes being organised largely using social media platforms such as Facebook and Twitter and how these climate strikes and posts raising awareness about the impact of climate change have influenced people all around Australia to practice more sustainable behaviour.

Question 6

A negative influence of media was demonstrated through the statement that *(Select one)*

A   'everybody is selectively attending to the stimulus of the television screen'

B   'recent climate strikes being organised largely using social media platforms'

Question 7

A positive influence of media was demonstrated through the statement that *(Select one)*

A   'everybody is selectively attending to the stimulus of the television screen'

B   'recent climate strikes being organised largely using social media platforms'

Question 8

The examples of the television limiting time with family and climate strikes being organised on social media demonstrate how media is *(Select one)*

A   inherently positive or negative.

B   positive or negative depending on the context.

Exam-style questions

Multiple-choice questions

Question 9   (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 or negative influences on individual and group behaviour.

Question 10   (1 MARK)

Social media has the capacity to

A   increase the reach of a social message and raise awareness for an important issue, marking a positive influence of media on group behaviour.

B   decrease the reach of a social message, marking a positive influence of media on group behaviour.

C   increase the reach of a social message and raise awareness for an important issue, marking a negative influence of media on group behaviour

D   decrease the reach of a social message, marking a negative influence of media on group behaviour.

Question 11   (1 MARK)

Television and video games are

A   not stimulating stimuli and have negative influences on our levels of attention on other tasks.

B   stimulating stimuli and always have positive influences on our levels of attention on other tasks.

C   not stimulating stimuli and have positive influences on our levels of attention.

D   stimulating stimuli and can have negative influences on our levels of attention on other tasks.

Question 12   (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 and impact their functioning.

D   positive influence of media on behaviour because it can make people feel self-conscious and impact their functioning.

Question 13   (1 MARK)

Which of the following statements about advertising is correct?

A   It only has positive influences on behaviour.

B   It only has negative influences on behaviour.

C   It has neither positive nor negative influences on behaviour.

D   It can have either positive or negative consequences, depending on the context.

Short-answer questions

Question 14   (2 MARKS)

Using an example, explain how television has had a negative effect on group behaviour.

Question 15   (2 MARKS)

Identify a potential impact of video games on attention. Explain how this may negatively influence an individual's behaviour.

Question 16   (3 MARKS)

Using an example of an advertising campaign, describe how advertising can have a positive influence on individual behaviour.

Question 17   (3 MARKS)

Does social media have a positive or negative influence on group behaviour? Use an example to justify your response.

Question 18   (4 MARKS)

Describe how video games could have both a positive and negative influence on individual behaviour and functioning.

Questions from multiple lessons

Question 19   (1 MARK)

The unrealistic standards of beauty in advertisements can, for mental health, be

A   an internal factor.

B   an external factor.

C   a biological factor.

D   a psychological factor.

CHAPTER 8 REVIEW

CHAPTER SUMMARY

This chapter focused on social influences on behaviour. As you now know, there are multiple concepts which help to explain how our social environment can lead to us behaving in certain ways.

In **8A**, we learnt about the concepts of status and social power and how they can influence group behaviour. We also applied these concepts to Zimbardo's famous Stanford prison experiment, which investigated the impact of assigning individuals with different levels of status and power within a group. We also evaluated the ethics of this study.

In **8B**, we learnt about the concept of obedience, and the factors which affect obedience. These factors include:

- Status of authority figure
- Proximity
- Group pressure

We then applied the concept of obedience and its factors to Milgram's obedience experiment, which measured the extent to which individuals obeyed the commands of authority figures to inflict pain on others. We also learnt about the ethical implications of this study.

In **8C**, we learnt about the concept of conformity and how it influences behaviour. We applied this knowledge to Asch's conformity experiment, which measured the extent to which individuals would conform to a majority group. We also learnt about the factors that affect conformity. These factors include:

- Group size
- Unanimity
- Normative influence
- Social loafing
- Informational influence
- Culture
- Deindividuation

In **8D**, we learnt about prosocial behaviour. Specifically, we learnt about the situational, personal and social factors that influence the likelihood of prosocial behaviour.

Situational factors	Personal factors	Social factors

• The presence of others (including the bystander effect)
• Physical proximity
• Risk
• Timing
• Sensory environmental cues
	• Empathy
	• Ability
	• Mood
	• Attributions
		• Social norms, including the:
		  – Social responsibility norm
		  – Reciprocity norm
		  – Social justice norm

In **8E**, we learnt about the concept of bullying and the different types of bullying, including overt, covert, and cyberbullying. We also learnt about the factors that influence bullying, including situational and environmental factors. Finally, we learnt about the effects of bullying, particularly focusing on the negative impacts on psychological and physical functioning.

In **8F**, we learnt about the influence of different forms of media on behaviour. This included specifically learning about the effects of advertising, social media, television, and video games. We also learnt about the positive and negative influences of media on behaviour.

Social influences on behaviour
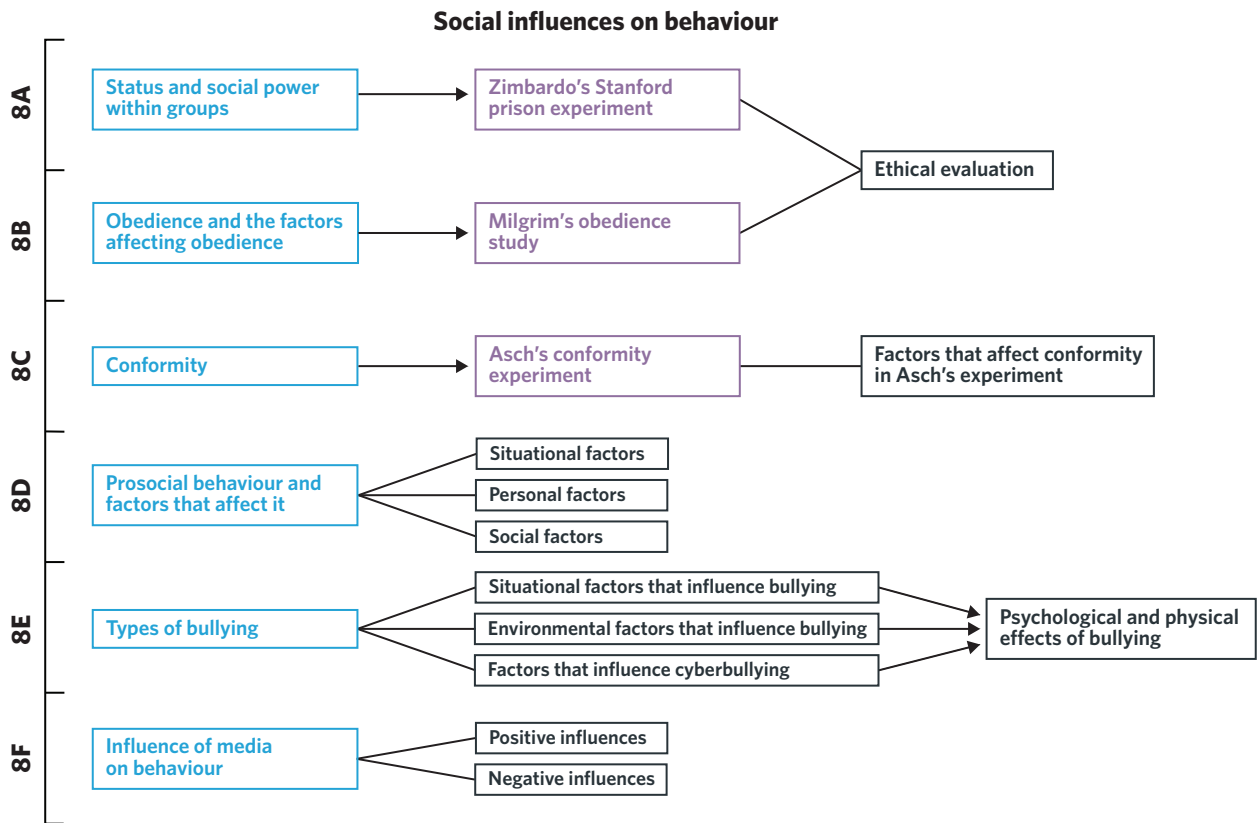
CHAPTER REVIEW ACTIVITIES

Review activity 1: Summary notes

On YouTube, search *'Social Influence: Crash Course Psychology #38'* (CrashCourse, 2014). Watch the entire 10 minute video.

Take notes on what is said about the following concepts from across chapter 8:

- Milgram's experiment
- Obedience
  - Factors affecting obedience
- Conformity
- Asch's experiment
  - Factors affecting conformity in Asch's experiment
- Groups
- Media
  - Social media
  - Influences of media on behaviour

Review activity 2: Label the scenario

For each of the scenarios listed, identify whether situational, personal or social factors influenced helping behaviour. If you can, further identify the specific factor that influenced whether the person helped or not.

Scenario 1: Jorja is a really strong swimmer who has represented her nation and won many medals. When at the beach one day, she jumped in to help a young boy who was struggling to stay above water because of large waves.

Scenario 2: Daphne and Timothy are lab partners in their chemistry class. Last week, Daphne really struggled trying to use her bunsen burner so Timothy gave her a hand. In class today, Timothy was finding it hard to find the meniscus in his beaker so Daphne invited him over to look at hers.

Scenario 3: Tyke has always been trying to fit in with the popular group at his school. At lunch he was hanging out with the popular group when he saw a grade two student start crying after they fell off the swings. He was about to go help her when the rest of the group started laughing at her and so he quickly ignored her.

CHAPTER 8 TEST

Multiple-choice questions

Question 1   (1 MARK)

Prosocial behaviour refers to

A   behaviour which intends to form strong social connections with others.

B   behaviour which is intended to help individuals fit in with others.

C   behaviour which is intentionally and voluntarily performed to help someone or society.

D   behaviour which is unknowingly influenced by the desires of the group.

Question 2   (1 MARK)

One factor which was found to affect the likelihood of conformity in Asch's 1952 study was social loafing. Social loafing involves

A   putting in minimal effort when around others.

B   putting in less effort when in a group compared to the effort you would put in alone.

C   putting in additional effort around others.

D   putting in more effort when in a group compared to the effort you would put in alone.

Question 3   (1 MARK)

The difference between overt and covert bullying is that

A   overt bullying is direct and observable, while covert is often indirect and unable to be observed.

B   overt bullying is indirect and not observable, while covert is often direct and observable.

C   overt bullying is intentional, while covert is not.

D   overt bullying occurs online, while covert bullying occurs in person.

Question 4   (1 MARK)

Which of the following is **not** a condition which needs to be met for multiple individuals to be considered a group?

A   There are two or more individuals.

B   The individuals need to influence each other's thoughts, feelings and/or behaviours.

C   The individuals need to interact with each other at least once a week.

D   The individuals need to interact with each other in some way.

Question 5   (1 MARK)

Which of the following is **not** a positive influence of media?

A   Media can have cognitive benefits and enhance problem-solving abilities.

B   Media can facilitate accessible communication among geographically distanced individuals.

C   Media can allow for the organisation and communication of social activism events and messages.

D   Media has increased the amount and depth of face-to-face interactions in the past few decades.

Question 6 (1 MARK)

Ms Pearce is a new teacher at a local primary school. At her old school, all the teachers, including Ms Pearce, wore heels and jewellery every day. On her first day to school she wore heels, jewellery and a nice dress but felt like she stood out when compared to the other teachers who wore more casual clothes, including flat shoes. Once her first day was finished she immediately rushed to the closest shopping centre to get some new, more casual clothes.

Which of the following social processes occurred in the scenario?

A Reward power, as Ms Pearce felt that she would gain more respect from her colleagues if she dressed similarly.

B Obedience, as Ms Pearce complied with the instructions of an authority figure.

C Conformity, as Ms Pearce complied with the instructions of an authority figure.

D Conformity, as Ms Pearce aligned her clothing to fit in with her colleagues.

Question 7 (1 MARK)

In the original 1973 Stanford prison experiment, many of the participants experienced severe distress. At the conclusion of the study, Zimbardo conducted debriefing sessions for participants. Why was his use of debriefing criticised?

A Zimbardo didn't need to use debriefing as no forms of deception were used in the study.

B Zimbardo's use of debriefing may not have been adequate as some participants still experienced distress months on at a follow-up interview.

C Zimbardo only debriefed the prisoners but not the prison guards.

D Debriefing did not include an offer for counselling for those participants in distress.

Question 8 (1 MARK)

Which of the following is an example of a situational factor that affects helping behaviour?

A empathy

B mood

C the presence of other people

D the helper's competence

Short-answer questions

Question 9 (1 MARK)

Define the concept of obedience.

Question 10 (1 MARK)

Outline a positive effect of media on group behaviour.

Question 11 (1 MARK)

Outline the aim of Asch's conformity experiment.

Question 12 (2 MARKS)

Providing an example, explain what personal factors are in relation to prosocial behaviour.

Question 13 (2 MARKS)

Describe the concept of withdrawal rights, and outline how this was violated in Milgram's obedience experiment.

Question 14   (4 MARKS)

Mr Spanti is a high school teacher. The students in his class always listen to his instructions, such as being quiet and doing their work when he instructs them to do so.

a   Referring to the scenario, outline a type of power Mr Spanti demonstrates in the scenario. (2 MARKS)

b   Identify and explain a factor affecting obedience which may contribute to Mr Spanti's students following his instructions. (2 MARKS)

Question 15   (5 MARKS)

Sienna was leaving to go to work when she saw her next door neighbour fall over while cutting the grass. She doesn't like this neighbour because she has heard that he consistently bullies all the kids in the neighbourhood by shouting at them when they walk past the house and even throwing food at them on occasion.

a   Name the social norm most clear in the scenario which may have influenced Sienna's likelihood of engaging in helping behaviour. (1 MARK)

b   Identify and describe which type of bullying Sienna's next door neighbour has been using. Justify your response by referring to the scenario. (3 MARKS)

c   Provide an example of a possible environmental factor which may have made Sienna's neighbour more likely to engage in bullying behaviour. (1 MARK)

Question 16   (5 MARKS)

Baxter has just joined a local choir group which has around 30 members. He has been taking independent singing lessons for the past five years but has never sung with others. On Baxter's first choir class, he observed that the choir members had a special clap they did when anyone met a big accomplishment in class. He asked one of the choir members to teach him the clap during the lesson and was joining in with the others by the end of the lesson.

a   Identify one condition the choir will have to meet for it to be considered a group. (1 MARK)

b   Due to being in a new environment, which factor would have increased Baxter's likelihood of conforming to the choir's clap? Identify and explain this factor, and describe how it was evident in the scenario. (3 MARKS)

c   Suggest how group size may have increased Baxter's likelihood to conform to the choir's clap. (1 MARK)

Key science skills questions

Question 17   (1 MARK)

During Milgram's study, the experimenter had certain responses for when the participant voiced reluctance to continue administering the electric shocks. These responses started with 'please continue' and then 'the experiment requires that you continue' (Milgram, 1963). These responses are an example of

A   a placebo.

B   counterbalancing.

C   a double-blind procedure.

D   standardised instructions and procedures.

Question 18   (3 MARKS)

The sample of participants in Zimbardo's Stanford prison experiment and Asch's conformity experiment were similar in demographic and were sourced in a similar way. This involved the participants being all male who responded to newspaper advertisements or being easily accessible due to being students of the researcher.

a   Name the sampling method used by both studies. (1 MARK)

b   Explain the concept of external validity, and explain how the sample only containing male participants may affect the external validity of both studies. (2 MARKS)

Questions from multiple chapters

Question 19   (1 MARK)

Bullying can lead to negative consequences, such as an individual experiencing distress and negative emotions such as fear, anger, and embarrassment. If bullying occurs for a prolonged period of time, this can negatively impact emotional development across the lifespan.

Which of the following identifies a way in which emotional development may be impacted as a result of bullying in adulthood?

A   heightened ability to trust others

B   craving or avoiding affection from others

C   having strong memory abilities

D   having high levels of motor coordination

Question 20   (3 MARKS)

One of the negative effects of media on behaviour is that it can negatively impact mental health. Social media especially has the ability to impact mental health due to individuals comparing themselves to images which may be photoshopped and unrealistic.

a   Define the concept of mental health and use an example to explain how social media may negatively impact mental health. (2 MARKS)

b   State whether social media is an internal or external factor on mental health. (1 MARK)

UNIT 2

AOS3

Student-directed practical investigation

In this area of study students design and conduct a practical investigation related to external influences on behaviour.

The investigation requires the student to develop a question, plan a course of action to answer the question, undertake an investigation to collect the appropriate primary qualitative and/or quantitative data, organise and interpret the data and reach a conclusion in response to the question. The investigation relates to knowledge and skills developed in Areas of Study 1 and/or 2 and is undertaken by the student using either quantitative or qualitative methods, including experiments, surveys, questionnaires, observational studies and/or rating scales.

Outcome 3

On completion of this unit the student should be able to design and undertake a practical investigation related to external influences on behaviour, and draw conclusions based on evidence from collected data.

STUDENT–DIRECTED PRACTICAL INVESTIGATION GUIDE

During Unit 2 you will conduct your own practical investigation 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.

To conduct this practical investigation, you will need to refer to the skills you have learnt about in **Chapter 1: Science skills and research methods**. *You will also learn some new skills you will need to conduct your own practical investigation, as well as revisit some skills you learnt for your research investigation in Unit 1.*

Image: LineTale/Shutterstock.com

Study design dot points

- development of an investigable question and formulation of a research hypothesis
- the psychological concepts specific to the investigation and their significance, including definitions of key terms, and psychological representations
- the characteristics of scientific research methodologies, including techniques for primary qualitative and quantitative data collection relevant to the investigation: experiments, surveys, questionnaires, observational studies and/or use of rating scales; reliability and validity of data; and minimisation of experimental bias
- ethics and issues of research including identification and application of relevant health, safety and bioethical guidelines, and use of human subjects
- methods of organising, analysing and evaluating primary data to identify patterns and relationships including sources of error and limitations of data and methodologies
- observations and experiments that are consistent with, or challenge, current psychological models, theories or frameworks
- the nature of evidence that supports or refutes a hypothesis, model or theory
- the key findings of the selected investigation and their relationship to psychological concepts and theories associated with perception and/or social cognition and influences
- the conventions of scientific report writing including psychological terminology and representations and standard abbreviations

A step-by-step guide on practical investigations

This assessment task will involve a range of steps that need to be carried out in a practical investigation. To help you approach this task, this guide will break down each of the steps you will need to accurately design, conduct and present your investigation, as well as include examples to help support your understanding of the task.

The steps you will need to take to carry out your investigation will involve:

> Developing a research question related to the impact of internal and/or external influences on behaviour. This will involve looking at contemporary research available to your topic to decide what you want to study and how you should conduct the study.

> 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 the type of data you will collect.

> After conducting your practical investigation, you will need to organise the data you have collected.

> You will then use the data you collected in combination with the contemporary psychological research studies you investigated to form a conclusion in response to the research question.

> You may also need to complete a logbook through the course of this assessment.

> Once you have conducted your practical investigation, you will also have to decide on how to present your investigation. This may include a digital presentation, an oral presentation, a scientific poster of a written report.

(VCAA, 2020)

During this practical investigation you will

- Plan your investigation
- Conduct your investigation
- Write up your investigation

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, including validity and reliability, accuracy, the use of data and errors to name a few. You have also learnt some skills and concepts when carrying out your Unit 1 AOS3 investigation, including effective science communication, the nature of evidence and the influence of factors on research. There are additional key knowledge points outlined below that you will need to learn before carrying out your practical investigation.

Health, safety and bioethical 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, bioethical guidelines, as well as 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).
- Ensuring that the environment/s in which you conduct the practical investigation is safe.
- Ensuring that 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 1E: Ethical considerations.

What exactly are bioethical guidelines? *Bioethical guidelines* involve the application of ethical principles to scientific research (Faunce, 2014). These guidelines have been implemented to protect human participants from harm and ensure their safety. There are four main bioethical guidelines: respect for autonomy, justice, beneficence, and non-maleficence. Some ethical questions you should ask yourself before conducting your practical investigation are outlined in table 1.

Table 1 The four main bioethical guidelines

Bioethical guideline	Description	Questions to ask before conducting your study
Respect for autonomy	The provision of as much information as possible to participants to ensure that they are able to make their own decisions to participate without any coercion (McCormick, n.d.).	• 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?
Justice	The implementation of fair treatment and procedures during a research study.	• Am I treating all participants in a fair and equal way? • Am I putting any pressure on any of my participants to participate?
Beneficence	The potential benefits of the research findings outweigh potential risks for the participants.	• 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	Ensuring that there is no intention to harm the participants or others in society, and to minimise harm when unavoidable (McCormick, n.d.).	• 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?

Some of these bioethical guidelines are similar or the same as the ethical values outlined in lesson 1E: Ethical considerations. Although the values of research merit and integrity and respect for human beings are not included as the main bioethical guidelines, it is still important to take these ethical values into account when designing and conducting your study. Some questions you may need to ask yourself in relation to these values include:

- 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 your practical investigation?
- Respect for human beings
  - 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?

Using all of these bioethical guidelines and ethical values, you need to consider whether any adjustments or considerations need to be made to how you conduct your practical investigation.

Want to know more?

Bioethics arose in the 1970s in response to debates among the research community on which studies were and were not ethical to conduct. At the time, there was much debate about contentious issues such as the manipulation of genes and reproduction, such as the use of people's reproductive eggs for research (Faunce, 2014). This led to the creation of bioethical guidelines, as well as the creation of ethics committees to approve research proposals. Many countries also have state or national ethics boards which oversee the implementation of bioethical guidelines in research studies, such as the National Health and Medical Research Council (NHRMC) in Australia.

Image: Visual Generation /Shutterstock.com

Figure 1 Debate about the manipulation of genes was one of the driving forces which led to the development of bioethical guidelines

Planning your investigation

Useful tip

Although there are steps outlining how to design your study, a lot of these steps 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 3), you need to know your research population (step 4).

Step 1 – 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 behaviour, such as the impact of an authority figure on obedient behaviour, or another topic your teacher has given you.

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 most interests you. As you learnt in the Unit 1 research investigation, researchers analyse the existing psychological literature to formulate their own question. 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 investigate correctly.

> ⓘ **Example**
>
> The research question we will investigate as an example is *'How does relationship strength influence the likelihood of prosocial behaviour?'*. This question has been formulated from content in Unit 2, Area of Study 2 which you learnt about in lesson **8D: Prosocial behaviour**.

Step 2 – 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 (such as a test to measure if individuals have been a bystander to bullying), which you can include or revise for your own study.

This research will aid you in the following steps in which you formulate a hypothesis, decide on a research design, design your method, and consider any ethics.

> ⓘ **Useful tip**
>
> You should take note of any useful psychological studies or research that you come across during this step as you will have to refer to previous theory and research in the discussion and introduction sections when you write up the findings from your study.

Step 3 – Formulate a hypothesis

In lesson 1A: Aims, hypotheses and variables, you learnt that hypotheses are testable predictions about the outcome of an experiment. In such a way, they need to be written in a clear and testable statement, which can either be supported or rejected by the outcomes of the study. A hypothesis also needs to include the independent and dependent variables 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 necessary.
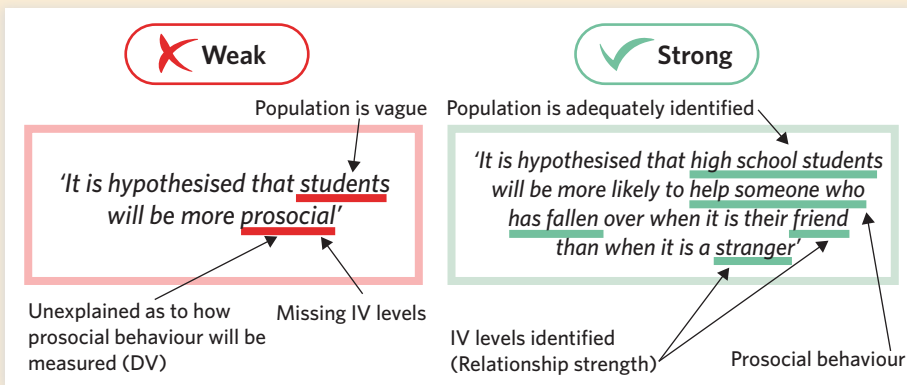
> ⓘ **Example**
>
>
>
> **Figure 2** A weak hypothesis compared to a strong hypothesis
>
> As can be seen in figure 2, the strong hypothesis is much clearer and more specific when compared to the weak hypothesis, making it easier to measure due to the dependent variable (DV) clearly outlined, the population specified and both levels of the IV identified. Due to this clearer hypothesis, it will be easier for other researchers to replicate the study. Importantly, the hypothesis also starts with 'It was hypothesised… ' and clearly outlines the direction of the hypothesis.

Step 4 – Decide on the research design

Now that you have formulated a hypothesis, you have multiple decisions you need to make about the research design. If you need a refresher on any of these concepts, return to chapter 1. The decisions you have to make include:

- The *type of investigation* you will use. The different types of investigations include, but are not limited to, an experiment, a self-report questionnaire or rating scale, interview, observational study, case study, longitudinal study, and cross-sectional study.
It is important to consider what is feasible for you to do. For example, you would not be able to conduct a longitudinal study over multiple years for the purpose of this assessment task.

- The *experimental research design* you will select (if you choose to conduct an experiment). This will involve evaluating whether it is the most appropriate to use an independent groups design, a repeated measures design, or a matched participants design.

- The *size of your sample*. It is important to again consider what is feasible here. For example, it would be near impossible for you to interview 100 participants due to time constraints.

- The *sampling procedure* you will use. Are you able to use random or stratified sampling, or is it best to use convenience sampling?

- The *allocation method* you will use. Are you able to randomly allocate your participants into the conditions?

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 5 – Design the methodology

In lesson 1D: Sources of error and prevention, 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.

- Materials you need to consider:
  - 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

- The procedure is best outlined as a step-by-step guide on what you will instruct your participants to do. You need to consider the following points when designing your procedure:
  - Are the instructions standardised? The more standardised it is, 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 4. 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). In such a way, you may include instructions at the start of your method to collect this information from the participants.

Step 6 – Decide on a data collection method

There are multiple decisions you need to make about how you will collect your data from the investigation. If you need a refresher on these methods, return to lesson 1F: Collection of data. Some of the questions you will have to consider include:

- Should I collect quantitative or qualitative data? Which is most appropriate to answer my research question?
- Will the data collected be subjective or objective?
- How will I record this data? Will I write these down during the investigation, or after? If recording afterwards, how do I ensure the accuracy of the data I capture?
- Will I be able to easily present and interpret this data in my report or presentation?

Step 7 – Consider ethical guidelines and any potential errors or biases

Before conducting your investigation, you need to consider any ethical considerations 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 1E: Ethical considerations, as well as the bioethical guidelines you learnt earlier in this guide. If you need a refresher on these, make sure to return to these sections before considering your own investigation. Some of the questions you need to ask yourself before conducting your study include:

- Does my investigation meet the bioethical guidelines? If not, what can I implement into my study to ensure that these guidelines are met?
- 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 considerations you may need to make some adjustments to your investigation.
    - Voluntary participation
    - Informed consent
    - Withdrawal rights
    - Confidentiality
    - Deception
    - Debriefing

Even when you do consider the ethics of your study, some things can occur during a study which 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.

> **(!) 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.
>
>
>
> Image: hvostik / Shutterstock.com
>
> **Figure 3** It is important that you gain informed consent from participants before conducting the study

It is also important to consider any errors or biases which may occur and to prevent these when possible. In lesson 1D: Sources of error and prevention, we learnt that extraneous variables (EVs) are any variables other than the independent variable which may produce unwanted results in an experiment. 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 repeated-measures design, have I considered the use of counterbalancing to minimise 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 resources, as well as potential extraneous variables arising while conducting your investigation. If this is the case, make sure to note this down so you can include it in your report, poster, or presentation.

Now that you have deliberated the ethical considerations 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 on step 5 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.

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, something which 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.

Image: Multigon/Shutterstock.com

Figure 4 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

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 digital presentation, oral presentation, scientific poster, and written report as possible format options. 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 5. It is likely that you will be expected to write around 1000 to 1500 words for this assessment, depending on what your teacher has outlined. Refer to figure 5 as a 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.
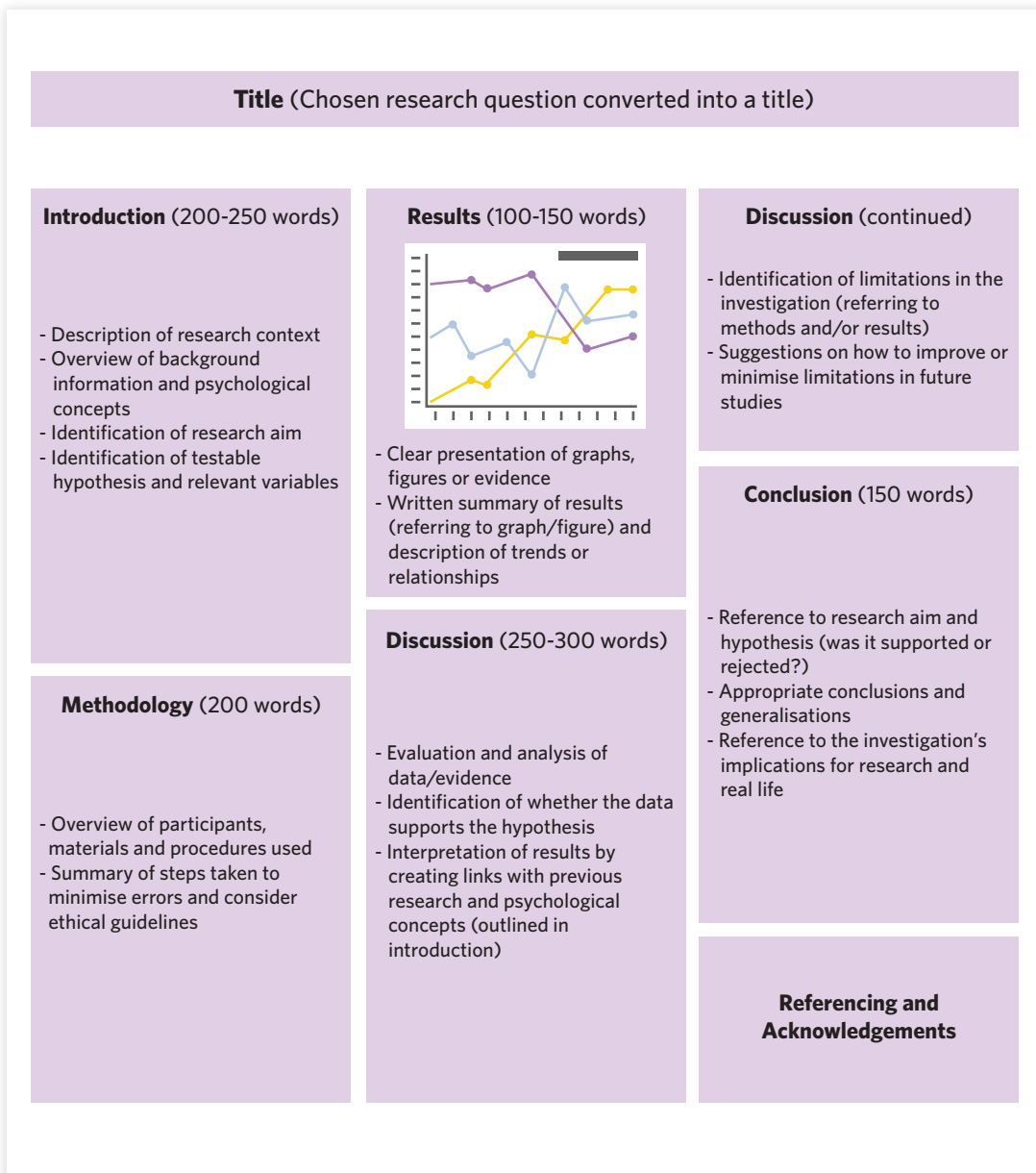

Title (Chosen research question converted into a title)

Introduction (200-250 words)

- Description of research context
- Overview of background information and psychological concepts
- Identification of research aim
- Identification of testable hypothesis and relevant variables

Methodology (200 words)

- Overview of participants, materials and procedures used
- Summary of steps taken to minimise errors and consider ethical guidelines

Results (100-150 words)

- Clear presentation of graphs, figures or evidence
- Written summary of results (referring to graph/figure) and description of trends or relationships

Discussion (250-300 words)

- Evaluation and analysis of data/evidence
- Identification of whether the data supports the hypothesis
- Interpretation of results by creating links with previous research and psychological concepts (outlined in introduction)

Discussion (continued)

- Identification of limitations in the investigation (referring to methods and/or results)
- Suggestions on how to improve or minimise limitations in future studies

Conclusion (150 words)

- Reference to research aim and hypothesis (was it supported or rejected?)
- Appropriate conclusions and generalisations
- Reference to the investigation's implications for research and real life

Referencing and Acknowledgements

Figure 5 A guide on the content to include in each section of your investigation write up (in scientific poster format)
Adapted from VCAA, 2020

> **⊙ Useful tip**
>
> Apart from the introduction section, every other section of your scientific poster should be written in past tense as you are referring to a study which has already been conducted. For example, it should be stated that *'20 female students participated in the study'* rather than *'20 female students are taking part in the study'*.

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 10 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 the following:

- Description of research context
- Overview of background information and psychological concepts
- Identification of research aim
- Identification of a testable hypothesis and relevant variables

The introduction should be the only section of your write up which is stated in future tense. In such a way, the aim and hypothesis in this section should be written in future tense as they have not been examined or tested yet. In the other sections, such as in the discussion and conclusion sections, these will be stated in past tense.

> **⊙ Useful tip**
>
> In chapter 1, you learnt that a hypothesis should always start with 'It was hypothesised...'. This is due to hypotheses which refer to a study which has already been conducted needing to be phrased in past tense. However, when identifying your hypothesis in your introduction, your hypothesis should be phrased in future tense. In such a way, your hypothesis should, therefore, start with 'It is hypothesised...'.

Description of research context

Firstly, you need to start off with relevant background information to contextualise your investigation. By contextualising your area of research, you should be indirectly justifying why the investigation is important to conduct. This contextualisation should be no more than a few sentences.

Overview of background information and 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. It is important to note the findings of these 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

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...'.

Identification of a testable hypothesis and relevant variables

It is then important to outline your research hypothesis. Remember that this should be stated in future tense and clearly outline a direction and relevant variables.
Your hypothesis should then be followed by the identification of the operationalised independent and dependent variables in your study.

Methodology

In your methodology you will need to include overviews of the following:

- Participants
- Materials
- Procedure (Usually best to include in a step-by-step format)
- The steps taken to minimise errors and biases
- The steps taken to consider ethical guidelines

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, 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'.

> **Memory device**
>
> To make sure that you include all relevant components when outlining the participants used in your investigation, you can remember the acronym SNAG.
>
> **S** – Sampling method
> **N** – Number of participants
> **A** – Age of participants
> **G** – Gender 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 relevant document.
>
> **Figure 6** 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 4 to 7 when planning your investigation. This should include the sampling and allocation 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.

Steps taken to minimise errors and consider ethical guidelines

The inclusion of steps taken to minimise errors and biases as well as to consider ethical guidelines will most likely be 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 display and summarise the findings from your study. To do so, you will need to use the skills you learnt in lesson 1G: Data organisation and interpretation. This includes the skill of visually presenting data in formats such as a bar chart or line graph. Once this data has been meaningfully and clearly presented, it is important to write a short summary of the results and refer to any trends or relationships clear in the data. This summary should involve simply stating 'what you see' in the data, but should not involve you making any interpretations of the data or linking the data to your hypothesis as this occurs in the discussion section.

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.
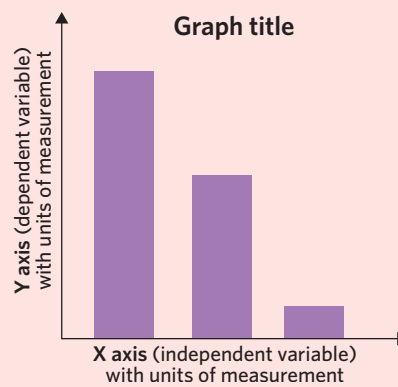
Figure 7 It is important to correctly label and title the method you use to visually present your data

Discussion

The discussion is one of the most important components of your write up. You will need to include the following:

- Evaluation and analysis of data/evidence presented in results
- Identification of whether the data supports the hypothesis
- Interpretation of results by creating links with previous research and psychological concepts that were outlined in your introduction
- Identification of limitations in the investigation (referring to methods and/or results)
- Suggestions on how to improve or minimise limitations in future studies

Analysis of results and identification of whether the hypothesis was or was not supported

To start this section, it is a good idea to analyse the data you presented in your results section and state whether this supports or rejects your hypothesis. When evaluating your results, it is important to refer to the overall trend, pattern or relationship between variables. For example, you could state *'High school students had a greater likelihood to act prosocially when they had a greater relationship strength with the individual who had fallen over (their friend) rather than when it was a stranger'*.

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', in fact, both outcomes are valuable in developing your understanding of the psychological concepts you researched.

📖 **Research spotlight**

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 which is supported. This practice led to social psychologist Norbert Kerr (1998) coining the term HARKing, which is an acronym which represents 'Hypothesising After the Results are Known'.

The practice of HARKing is an extremely dishonest practice which 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.

Linking previous research and psychological concepts to the investigation

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 for the discussion of your investigation. Did your study have similar findings or completely different findings? Why may this be?

Identification of research limitations

In this section it is important to identify any limitations of your investigation. These limitations may involve errors or biases which occurred when conducting your study and may have led to extraneous or confounding variables. It is important to explain these limitations, and to explain whether these may have influenced the results.

You may also identify some limitations of your methodology, such as the use of a small sample size or the use of convenience sampling. It is important to explain how these limitations may have affected your results.

Possible improvements for your study

Using the limitations you have identified, what suggestions do you have on 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.

> **⚠ Useful tip**
>
> One helpful way to integrate the limitations of your study and suggest improvements is by using the following structure. This may vary depending on the limitation you are evaluating. The structure includes:
>
> 1 Identifying (by name) a potential extraneous variable or other limitation
> 2 Briefly explain how this may have negatively impacted the results and/or conclusion of your study
> 3 In a sentence of two explain how this could be amended in future studies
>
> This process may need to be repeated a few times in your discussion to ensure a thorough examination of your study.

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.

You should start by restating the aim of your investigation, remember to present this in past tense. 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. This should be followed by a statement as to whether these results can be generalised to the population. Finally, you should identify any implications that your research has in real life, or in the realm of research. For example, if your results suggest a future area of the topic that needs to be researched or a method in which the study can be improved, it is important to note that here.

> **⚠ Useful tip**
>
> It is important to not use 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 over-state 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.

> **🧩 Lesson link**
>
> In lesson **1H: Evaluation of research** you learnt about drawing conclusions as well as the *generalisability* of an investigation, which refers to the extent to which the results of an investigation can be applied to a wider research population. You learnt that to be able to generalise your research findings you need to ensure that your sample is representative of the research population and that the results are valid and reliable. It is therefore important that you consider these factors affecting generalisability to inform whether you can generalise your findings or not.

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 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.

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.

> (!) **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.

HOW DOES RELATIONSHIP STRENGTH INFLUENCE THE LIKELIHOOD OF PROSOCIAL BEHAVIOUR?

INTRODUCTION

There is a need for social cohesion within society due the inherent social nature of humans. In such a way, it is vital for a functioning society for those to help others in need, also known as acting prosocially (Mesurado & Richaud, 2017). It is important to examine prosocial behaviour among adolescents as much of the previous research has focused on children and older adults.

Prosocial behaviour involves intentional and voluntary actions taken to help another person (Goold et al., 2021). Previous studies on prosocial behaviour of children and adults have asserted that individuals have a greater tendency to act prosocially towards their friends, than to strangers (Mesurado & Richaud, 2017; Padilla-Walker et al., 2013). In such a way, it has been asserted that the strength of a relationship between two individuals mediates the likelihood of prosocial behaviour (Padilla-Walker et al., 2013).

This study aims to determine whether the relationship strength between individuals affects the likelihood of prosocial behaviour. It is hypothesised that high school students will be more likely to help a friend who has fallen over than to help a stranger who has fallen over.

The operationalised independent variable is the strength of the relationship between the participant and individual in need, with the individual in need either being a friend or stranger to the participant. The operationalised dependent variable is the likelihood of prosocial behaviour measured by the average percentage of participants who helped the individual in need.

METHOD

PARTICIPANTS: 14 students (8 Female and 6 Male) aged between 16 and 17 from Edrolo Secondary College who were selected by convenience sampling and randomly allocated to the research conditions.

MATERIALS: Informed consent form, School Relationships Questionnaire, and a clipboard with paper and pen to write down responses to follow up questions.

PROCEDURE:

1 14 students from Edrolo Secondary College were sampled using convenience sampling.

2 Participants were randomly allocated into two conditions, either the condition with a strong relationship (in which a friend needs help) or weak relationship (in which a stranger needs help). Random allocation occurred by pulling names out of a hat.

3 Prior to the study commencing, participants filled in a short School Relationships Questionnaire. Part of this questionnaire involves listing three close friends the participant has at Edrolo Secondary College.

4 The research assistant deceives the participant by asking them follow up questions about their questionnaire responses during lunch time. During this questioning, the participant is positioned in a way where they can clearly view someone (a confederate of the study) fall down, seemingly injure themselves, and ask

for help. This individual is either a friend or a stranger to the participant.

5 Without knowing which condition the participant is in, the research assistant observes and records whether the participant helps the person in need. These results are given to the experimenter who analyses and organises the data according to the condition the participant was in.

6 The participants are debriefed regarding the use of deception.

ETHICS AND MINIMISATION OF EXTRANEOUS VARIABLES: Before the study commenced, participants read and signed an informed consent sheet outlining the aim, nature and risks of the study, with those under the age of 18 having a legal guardian or parent signing it on their behalf. Signing the informed consent sheet indicated voluntary participation, with participants being informed of their right to withdraw from the study at any point without consequence. Due to the use of deception, thorough debriefing occurred at the conclusion of the study to ensure participants did not experience ongoing distress and were fully informed of the nature of the study. All participant information was kept confidential. A double-blind procedure was used to minimise experimenter bias and participant expectations.

RESULTS

Investigating the effect of relationship strength on prosocial behaviour
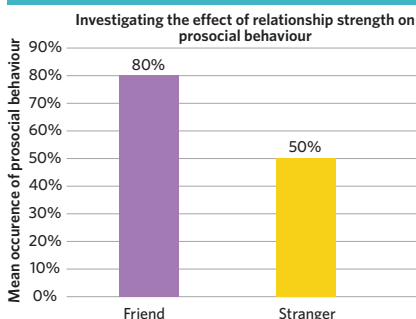
The results display that participants were more likely to act prosocially in response to a friend than a stranger in need. This was established by 80% of participants in the condition with a friend in need acting prosocially, while only 50% of participants in the condition with a stranger acted prosocially.

DISCUSSION

It was hypothesised that high school students would be more likely to help a friend who had fallen over than helping a stranger who had fallen over. The results of the study supported this hypothesis, with high school students being more likely to help those who they had a greater relationship strength with (a friend) than who they had a weaker relationship strength with (a stranger).

The results from the study are congruent with previous studies in which it was suggested that a greater relationship strength increased the likelihood of prosocial behaviour (Mesurado & Richaud, 2017; Padilla-Walker et al., 2013). It has been suggested that this is due to individuals attributing whether the individual in need of help is worthy of help, possibly explaining why participants were more likely to act prosocially towards friends than strangers (Mesurado & Richaud, 2017).

However, there are multiple flaws of the study. Firstly, the small sample size and use of convenience sampling reduces the external validity of the study. Additionally, although a double-blind procedure was implemented to minimise participant and experimenter expectations, the possible presence of extraneous variables limits the internal validity of the study. This includes the individual participant differences, namely the differences in empathy levels between participants which has been shown to influence the likelihood of prosocial behaviour (Mesurado & Richaud, 2017). In such a way, a potential improvement may involve analysing the empathy levels of participants through an empathy questionnaire before conducting the study, and then matching participants across conditions based on levels of empathy. Therefore, the use of a matched participants design may be more beneficial for this study than the independent groups design which was used. This will ensure that the likelihood of prosocial behaviour in this study is due to the different conditions, rather than participant differences in empathy. Furthermore, the study's validity is further threatened due to the 'strangers' potentially not being strangers to the participant as they are peers at the same school, so whilst they may not be a friend, they are also not a true stranger. In such a way, future studies may benefit from conducting this study in a public setting with legitimate strangers.

CONCLUSION

This study aimed to investigate whether the relationship strength between individuals affects the likelihood of prosocial behaviour. The hypothesis that high school students would be more likely to help a friend who had fallen over than a stranger was supported by the results of the study. However, due to limitations, including a small sample that was sourced through convenience sampling, and the potential presence of confounding variables, these results are unable to be generalised to the wider research population of high school students.

This study suggests that the pattern of greater prosocial behaviour towards friends than strangers that has been discovered amongst children and adults may also occur among adolescents. Future research should implement a matched participants design in which participants are matched on empathy levels to minimise the extraneous variable of individual participant differences. Additionally, a more accurate understanding of prosocial behaviour and relationship strength will be achieved if conducted in a public setting with the use of a legitimate stranger.

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1A Aims, hypotheses and variables

Theory-review questions

1 B. *The aim of an experiment outlines the purpose of the study, whereas the hypothesis is the prediction that will be tested in the study.*

2 A. *The hypothesis of a study is a testable prediction about the cause and effect relationship of the variables within a study.*

3 II; III & V. *Remember, a hypothesis includes the independent and dependent variables, as well as stating the direction of the relationship between these variables. It is important that it is written in a way that is testable in order for a study to be conducted using the scientific method.*

4 In an experiment, researchers **manipulate** the independent variable in order to **measure** the effect it has on the dependent variable. *Researchers change the independent variable between experimental groups to see the effect that it has on the dependent variable.*

5 B. *When conducting a study, researchers must specify in detail how they are going to manipulate the IV and measure the DV; this is known as operationalising variables.*

Skills

Understanding research

6 **Aim:** The aim of this study is to explore whether the susceptibility of contagious yawning is an indicator of an individual's baseline empathy level
Hypothesis: It was hypothesised that people higher in empathy were more likely to show contagious yawning than those lower in empathy
Experimental research design: Independent groups

Exam–style questions

Multiple-choice questions

7 B   8 C   9 D

Short-answer questions

10 [It was hypothesised that[1]][people who spend more time on social media find it more difficult to speak to other people in person.[2]]

✓ ✗ I have started my hypothesis with 'It was hypothesised that'.[1]

✓ ✗ I have included the independent and dependent variables.[2]

✓ ✗ I have stated the direction of my hypothesis.

11 a [The aim of this study was[1]][to explore whether smell had an effect on a person's mood.[2]]

✓ ✗ I have started my aim with 'The aim of this study was'.[1]

✓ ✗ I have stated a relevant aim for this study.[2]

b [Independent variable: whether the participant was in the room with the rose-scented candle, or in in the room with no added scent.[1]]
[Dependent variable: what mood participants reported experiencing after the quiz.[2]]

✓ ✗ I have identified a relevant IV for this study.[1]

✓ ✗ I have identified a relevant DV for this study.[2]

c [It was hypothesised that[1]][participants who were exposed to the rose-scent during the study were more likely to report a positive mood than those who were not.[2]]

✓ ✗ I have started my hypothesis with 'It was hypothesised that'.[1]

✓ ✗ I have included the independent and dependent variables.[2]

✓ ✗ I have stated the direction of my hypothesis.

1B Scientific research methodologies

Theory-review questions

1 D. *Scientific research differs from non-scientific research in that it follows the scientific method where empirical evidence is collected for a study.*

2 When considering which methodology to use, researchers must consider which method best suits their research question, as well as the **benefits and limitations** of each method. For example, conducting a/n **experiment** allows the researcher to collect data under carefully controlled settings, however if the researcher wants to study people in their natural settings a/n **observational study** might better suit the purposes. *Remember, regardless of the methodology used, the type of data and benefits and limitations should be considered.*

3 A. *Option A is correct here, as option B describes a case study research method.*

4 A. *This is true. 'Self-reports' is a broad term that describes a method through which data is collected. The specific methods to collect this data includes questionnaires, interviews, and participants filling out rating scales.*

Skills

Unpacking the scenario

5 A   6 B

Exam-style questions

Multiple-choice questions

7 B   8 D   9 A

Short-answer questions

10 [A control group in an experiment is the group of participants who are not exposed to the IV.[1]][The purpose of the control group is to act as a 'baseline' to compare the effects that the IV has on the results of the experimental group.[2]]

✓ ✗ I have outlined that a control group is not exposed to the IV.[1]

✓ ✗ I have explained the purpose of the control group as a comparison to see the effects of the IV.[2]

11 [One advantage of using a self-report method is that the researcher can better understand the perspective of the participant/s.[1]][One disadvantage of using a self-report method is that the data that is collected is subjective, and therefore difficult to validate.[2]]

✓ ✗ I have outlined an advantage of self-report methodology.[1]

✓ ✗ I have outlined a disadvantage of self-report methodology.[2]

12 [Margot is conducting an observational study.[1]][A benefit of this type of observational study is that the social interactions between the students is occurring naturally, without researcher intervention which can produce biased results.[2]]

✓ ✗ I have identified that the type of study being conducted is an observational study.[1]

✓ ✗ I have outlined one relevant benefit of using this research method.[2]

✓ ✗ I have referred to the character's name in my response (Margot), and to the scenario.

1C Population, sample and sampling

Theory-review questions

1 B. *Often the research population is too large for the researcher to conduct the research using all members of the population.*

2 B. *The research population is the wider group of interest, however, the smaller subset of participants is known as the sample.*

3 I; II & III. *All of these need to be considered when creating an ideal sample.*

4 B. *Stratified sampling is most likely to be representative of the population because the key characteristics of the population have been considered, and the sample is selected from these strata.*

5 B. *Remember, both allocation and sampling involve doing things with participants: while sampling involves getting participants from a population, allocation involves putting participants from a sample into experimental groups.*

Skills

Perfect your phrasing

6 B

Exam-style questions

Multiple-choice questions

7 C **8** D **9** A **10** B

Short-answer questions

11 [Random sampling means that every member of the population has an equal chance of being selected for the sample.[1]][Signe could select her sample through random sampling by putting all of her students' names into a random generator and then pulling out 10 names to participate in the study.[2]]

✓ ✗ I have outlined random sampling.[1]

✓ ✗ I have described an appropriate method of random sampling.[2]

✓ ✗ I have referred to the character's name in my response (Signe), and to the scenario.

Other acceptable responses could include:

- Other appropriate methods of random sampling, as long as all members of the population have an equal chance of being selected.

12 [Convenience sampling is when the researcher selects a sample from the population in the most time and cost-effective manner.[1]] [For example, if the researcher was a university professor studying

a population of university students, she might just use her first-year students as the sample.[2]][In contrast, stratified sampling involves dividing the population into strata based on relevant characteristics, and then selecting the sample from each stratum in a proportion that represents the research population.[3]][In the same example with the university professor, she might divide up the university population into genders, and select the sample to reflect the gender split in the population.[4]]

✓ ✗ I have outlined convenience sampling.[1]

✓ ✗ I have provided an example of convenience sampling.[2]

✓ ✗ I have outlined stratified sampling.[3]

✓ ✗ I have provided an example of stratified sampling.[4]

✓ ✗ I have used an appropriate distinguishing word, such as 'in contrast'.

1D Sources of error and prevention

Theory-review questions

1 In experiments, researchers must try to identify and control variables, other than the independent variable, that might affect the dependent variable. These variables are known as **extraneous** variables. Unfortunately, not all variables can be controlled. When these other variables have had an effect on the dependent variable, they are known as **confounding** variables. *Remember, extraneous and confounding variables can refer to the same variables. If they have systematically affected the dependent variable, they are referred to as confounding variables*

2 I; III & IV *The use of a placebo and counterbalancing are ways of preventing the potential sources of error.*

3 III & IV *Choosing an appropriate experimental design minimises participant-related variables and order effects, but cannot control for participant or experimenter expectations, as these can occur in any experimental design.*

4 A. *Experimenter effects refer to the expectations of the experimenter, not those of the participant.*

Skills

Perfect your phrasing

5 A **6** A

Exam-style questions

Multiple-choice questions

7 D **8** C **9** A

Short-answer questions

10 [In a repeated measures experimental design, counterbalancing involves half of the participants participating in the control condition first and then the experimental condition, and the other half of the participants participating in the experimental condition first and then the control condition.[1]][This balances out possible order effects that can occur due to all participants being in both conditions.[2]]

✓ ✗ I have described counterbalancing.[1]

✓ ✗ I have described how counterbalancing controls for order effects.[2]

11 a [One possible confounding variable in Ms Banks' study is participant-related variables.[1]][Participant-related variables refer to the individual differences between participants, such as whether they had breakfast before the test of mood. This may mean that their mood (the DV) was affected by something other than the intended independent variable of sleep.[2]]

✓ ✗   I have identified one possible confounding variable.[1]

✓ ✗   I have explained this confounding variable could have systematically affected the DV of this study.[2]

✓ ✗   I have referred to the character's name in my response (Ms Banks), and to the scenario.

b [Ms Banks could have controlled for participant variables by using standardised testing instructions and procedures to minimise these differences between individual participants.[1]]

✓ ✗   I have described a relevant method Ms Banks could have used to control for the source of error.[1]

✓ ✗   I have referred to the character's name in my response (Ms Banks), and to the scenario.

Other acceptable responses could include:

- Sampling procedures, such as using a stratified sample.
- Choosing an experimental design, such as the use of a matched participants design in which participants are matched on relevant variables such as baseline mood levels.

1E   Ethical considerations

Theory-review questions

1 I & II. *People don't always agree on what is 'right' and 'wrong' in research, which is why, historically, there have been psychological studies conducted that would breach today's ethical guidelines.*

2 B. *The no-harm principle is in relation to the participants in a study. It is the role of the researcher to ensure that there is no psychological or physical harm caused to the participants.*

3 II & IV are true. I & III are false. *When a participant is under 18, their guardian must also give consent. Animals can be used in research if the research proposal meets ethical standards.*

4 B. *Deception can be used if approved by the ethics committee, but debriefing must occur afterwards in which participants are told about the true nature of the study.*

Skills

Unpacking the scenario

5 A   **6** B

Exam-style questions

Multiple-choice questions

7 C   **8** B   **9** D

Short-answer questions

10 [One advantage of using animals in psychological research is that it is more cost and time-efficient to test animals than humans when a large sample size is needed.[1]]

✓ ✗   I have outlined one advantage of using animals in psychological research.[1]

Other acceptable responses could include:

- Other advantages of using animals in research.

11 [When Dr Krishna anonymised participant data, he was upholding the ethical consideration of confidentiality.[1]][This means that all participant data, such as their name, age and their individual results in the study, are kept private.[2]]

✓ ✗   I have identified the ethical consideration as confidentiality.[1]

✓ ✗   I have described what confidentiality means in terms of ethical considerations.[2]

✓ ✗   I have referred to the character's name in my response (Dr Krishna), and to the scenario.

1F   Collection of data

Theory-review questions

1 A. *Primary data involves the researcher directly collecting data themselves, whereas secondary data involves researchers using data collected from other studies.*

2 **Quantitative** data is measurable and is expressed numerically, whereas **qualitative** data is expressed using descriptions. *One way to remember the difference between qualitative and quantitative is that qualitative data concerns the 'qualities' of something, which is often expressed using descriptions, and quantitative data concerns the 'quantities of something', which is expressed using numbers.*

3 A. *Subjective data concerns individual or personal experiences; this type of data allows researchers to gain a deeper insight into the perspectives of participants.*

4 B. *Objective data is collected and measured (or observed) directly by the researcher. One way of remembering this is that objective data and observed both start with 'ob'.*

Skills

Understanding research

5 A   **6** B

Exam-style questions

Multiple-choice questions

7 A   **8** D   **9** A

Short-answer questions

10 [One strength of objective data is that it does not rely on the interpretation of researchers, and so it is often more valid than subjective data because it is not subject to bias.[1]]

✓ ✗   I have described one benefit of objective data.[1]

11 a [In the first stage of his experiment, Arthur collected quantitative, objective data.[1]][This is because he was collecting numerical data such as the number of views, number of likes and dislikes etc., which are expressed numerically and are not subject to the interpretation of the researcher.[2]]

✓ ✗ I have identified that the type of data collected in the first stage of the experiment is quantitative and objective.[1]

✓ ✗ I have explained why this data is quantitative and objective.[2]

✓ ✗ I have referred to the character's name in my response (Arthur), and to the scenario.

b [In the second stage of his experiment, Arthur collected qualitative and subjective data.[1]] [This is because the data he collected was in the form of his own notes, which are dependent on his own interpretation and are expressed using words.[2]]

✓ ✗ I have identified that the type of data collected in the second stage of the experiment was qualitative and subjective.[1]

✓ ✗ I have explained why this data is qualitative and subjective.[2]

✓ ✗ I have referred to the character's name in my response (Arthur), and to the scenario.

1G   Data organisation and interpretation

Theory-review questions

1 I & III. *It is important to remember that descriptive statistics only apply to the data set that is being analysed. They cannot be used to decide whether the results can be generalised; this is a different type of statistic called inferential statistics.*

2 A. *When the data is unevenly distributed, the mean is not a reliable indicator of the 'average' of a data set because it does not accurately represent the centre.*

3 B. *Standard deviation is another measure of central tendency that describes the spread of data around the central point of the data set.*

4 A. *Tables, bar charts and line graphs are different ways of organising and presenting data to make interpretation of data easier.*

Skills

Understanding research

5

	Number of participants who chose happy music	Number of participants who chose neutral music	Number of participants who chose sad music
Group 1: Depressed	2	2	4
Group 2: Not depressed	3	3	2

6

Music choices of clinically depressed compared to those of mentally healthy individuals
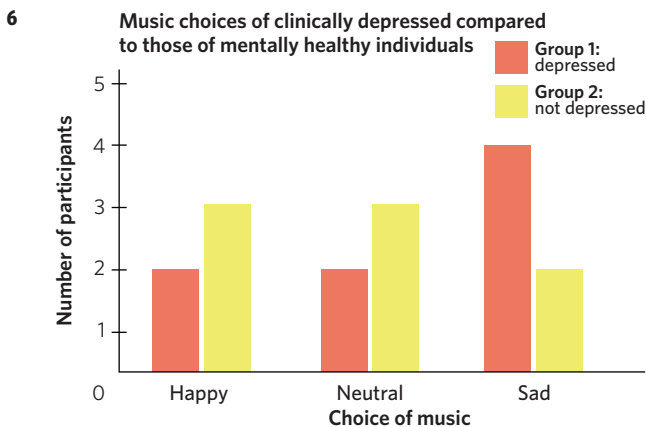
Exam-style questions

Multiple-choice questions

7 C   **8** D   **9** B

Short-answer questions

10 [Standard deviation is a number which indicates how much a data set is spread around the central score (mean) in a data set.[1]]

✓ ✗ I have described standard deviation as a measure of central tendency.[1]

11 [Outliers are data points that differ or lie far away from the other data points.[1]] [If they are not removed from a data set, they can skew the data because the numerical average of the results might not reflect the true or most commonly occurring result.[2]]

✓ ✗ I have explained what outliers are.[1]

✓ ✗ I have explained how they can affect the measures of central tendencies.[2]

1H   Evaluation of research

Theory-review questions

1 I; II; III & IV. *All of these factors affect generalisability. For the results of an investigation to be generalised to the wider population, the sample should be large, unbiased and representative of the population and the results need to be both valid and reliable.*

2 A. *Remember, reliability refers to how 'reliable' (consistent) the results are under different conditions. If results are consistent when replicated, then they are reliable.*

3 B. *Validity refers to whether the investigation is 'valid' (accurate) in measuring what it aims to measure.*

4 There are two types of validity that a researcher must evaluate. **Internal validity** refers to the extent that the independent variable has caused the change in the dependent variable. **External validity** refers to the extent that the results of an experiment can be generalised to other settings, people and over time. *Remember, internal validity refers to factors that are within an investigation and external validity refers to factors that are outside of the investigation.*

Skills

Perfect your phrasing

5 B   **6** A

Exam-style questions

Multiple-choice questions

7 A   **8** B   **9** D

Short-answer questions

10 [Amir only had one participant in her investigation and this small sample size means that her participant is not reflective of the wider population, therefore meaning that she is unable to generalise her findings beyond her investigation.[1]]

✓ ✗ I have explained why the results cannot be generalised.[1]

✓ ✗ I have referred to the character's name in my response (Amir), and to the scenario.

Chapter 1 test

Multiple-choice questions

1	B	**2**	A	**3**	B	**4**	C
5	A	**6**	D	**7**	C	**8**	C
9	B	**10**	D				

Short-answer questions

11 [One benefit of using convenience sampling is that it is cost and time-effective.[1]][One limitation is that it could produce a biased sample which is not representative of the research population.[2]]

✓ ✗ I have described one benefit of convenience sampling.[1]

✓ ✗ I have described one limitation of convenience sampling.[2]

12 [Order effects (or practice effects) can occur in repeated measures experimental designs, where the order in which participants partake in conditions could affect results.[1]][This can be controlled for by using counterbalancing in a repeated measures design whereby half of the participants participate in the control condition and then the experimental condition and the other half participate in the reverse order as to cancel out any order effects that may affect the results.[2]]

✓ ✗ I have explained what order effects are and referred to them occurring in repeated measures experimental designs.[1]

✓ ✗ I have explained how they can be controlled for using counterbalancing.[2]

13 [Due to case studies often investigating rare phenomena, a small sample size is used which makes it more difficult to generalise the findings to a wider population.[1]]

✓ ✗ I have outlined a limitation of using a case study methodology.[1]

14

Emotional intelligence in males and females
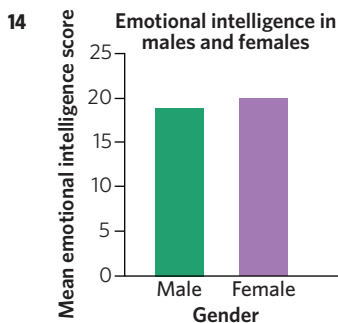
✓ ✗ I have labelled the x axis with the IV (gender).

✓ ✗ I have labelled the y axis with the DV (mean emotional intelligence score).

✓ ✗ I have correctly graphed the mean results for both groups.

✓ ✗ I have included an appropriate heading.

15 [Janet is collecting subjective[1]][and quantitative data.[2]]

✓ ✗ I have identified the data as subjective.[1]

✓ ✗ I have identified the data as qualitative.[2]

✓ ✗ I have referred to the character's name in my response (Janet), and to the scenario.

16 [Using a placebo in an experiment is a form of deception, as the participant believes they are taking an active treatment when they are not.[1]][When there is deception in an experiment, debriefing must occur afterwards to explain to participants the true nature of the study and that they had received a placebo treatment in order to meet ethical standards.[2]]

✓ ✗ I have explained that using a placebo is a form of deception.[1]

✓ ✗ I have explained why debriefing needs to occur when deception is used.[2]

17 a [A strength of using a longitudinal study for Oanh's research is that she can follow the same participants and track their changes over time. This is particularly useful because she is studying children and their development in this study.[1]][However, a limitation of using a longitudinal design is that it is costly and time-consuming.[2]]

✓ ✗ I have explained a strength of using longitudinal design.[1]

✓ ✗ I have explained a limitation of using longitudinal design.[2]

✓ ✗ I have referred to the character's name in my response (Oanh), and to the scenario.

Other acceptable responses could include:

- Other possible strengths and limitations, e.g. the limitation of a high drop-out rate of participants.

b [Instead of a longitudinal study, Oanh could use a cross-sectional study.[1]][This would involve having participants of different age groups, such as ten groups of children each aged 1-10, and studying them all at once rather than conducting the longitudinal study over 10 years.[2]]

✓ ✗ I have suggested the use of a cross-sectional study.[1]

✓ ✗ I have described what a cross-sectional study would involve.[2]

✓ ✗ I have referred to the character's name in my response (Oanh), and to the scenario.

18 [One reason why researchers may use animals instead of human participants in a study is because animal behaviours can generally be more easily controlled than human behaviour which may make it easier to run the experiment.[1]]

✓ ✗ I have outlined one advantage of using animals in a study.[1]

Other acceptable responses could include:

- For large sample sizes, using animals rather than human participants could be more time and cost-efficient.
- Animals have shorter gestation periods than humans, allowing for more efficient studies on genetics.
- Animals generally have shorter life spans than humans, allowing for more effective studies on the effects of ageing.

19 [Experimenter's expectations of a study could affect how they interact with participants, whether they do this consciously or not, and this could affect the results.[1]] [For example, in a study for a trial medication, if the experimenter knew who was receiving the active and inactive treatments, they might spend more time giving information to the participants taking the active treatment. This extra information could affect the participants' behaviour when taking the medication which could confound the results.[2]] [One way to control for experimenter expectation is to use a double-blind procedure, in which the person administering the treatment is unaware of which condition the participant is assigned to.[3]]

✓ ✕   I have explained what experimenter effects are and how they could affected results.[1]

✓ ✕   I have provided an example.[2]

✓ ✕   I have described double-blind procedures as a way to control for experimenter effects.[3]

20 a [The independent variable in Dr Olive's study was participants' stress levels,[1]] [and the dependent variable was how distressing their dreams were.[2]]

✓ ✕   I have correctly identified the independent variable.[1]

✓ ✕   I have correctly identified the dependent variable.[2]

✓ ✕   I have referred to the character's name in my response (Dr Olive), and to the scenario.

b [It was hypothesised that[1]] [people who experienced more stress reported higher levels of distressing dreams.[2]]

✓ ✕   I have started my hypothesis with 'It was hypothesised that...'.[1]

✓ ✕   I have included the IV and DV in my hypothesis.[2]

✓ ✕   I have stated a direction for my hypothesis.

c [One limitation of the study is the use of self-report data which is subjective and not reliable.[1]] [This may have impacted the results because participants may have classified what a distressing dream is differently.[2]]

✓ ✕   I have explained one limitation of using self-report data.[1]

✓ ✕   I have described how this limitation could affect the results.[2]

✓ ✕   I have referred to the character's name in my response (Dr Olive), and to the scenario.

2A   Historical approaches to understanding the brain

Theory-review questions

1   B.   *This is false. In Ancient civilisations such as Egypt and Greece, there was debate as to whether the heart or the brain was the centre for these functions.*

2   B.   *This is false. Although many methods to study the brain have attempted to be scientific in their methodology (e.g. phrenology), strong counter evidence is one way to deem an outdated method as a 'pseudoscience'.*

3   B.   *This is false. The mind-body problem didn't consider whether thought was in the brain or body, but rather considered whether thought was in the body (and therefore brain) or whether it was an intangible non-physical phenomenon.*

4   II & III.   *Although phrenology was largely mistaken about much of the brain, these two general notions of the brain are still considered true today.*

5   Pioneering brain research of the 19th and 20th century used a range of methods to understand how different areas of the brain work to perform different functions. **Electrical brain stimulation** involves stimulating the brain with a current in order to observe the responses of an organism. This was similar in nature to **ablation**, which involved cutting or destroying parts of the brain to observe how it would affect functioning. Other studies had to rely on **autopsies**, examining a patient's brain after death to see if any damage could explain their disorder. *Ablation and electrical brain stimulation both involved an active process of stimulating or cutting an organism's brain and observing the effects, whereas autopsies occurred post-mortem (after death).*

6   Neuroimaging techniques allow images of the brain to be captured using various scanning technologies. **Structural** techniques capture images of the brain and its regions, whereas **functional** techniques also capture which areas of the brain are active when performing certain tasks. *Remember that functional techniques can also capture structural images, but have the added advantage of showing levels of brain activity.*

Skills

Understanding research

7   B   **8**   B   **9**   A

Exam-style questions

Multiple-choice questions

10   C   **11**   A   **12**   C   **13**   B

Short-answer questions

14   [While the heart hypothesis argued that the heart was responsible for mental functions such as reasoning and/or emotion,[1]][the brain hypothesis instead argued that it was the brain that was responsible for these functions.[2]]

   ✓   ✗   I have outlined what the heart hypothesis proposed.[1]

   ✓   ✗   I have outlined what the brain hypothesis proposed.[2]

   ✓   ✗   I have used a distinguishing word, such as 'while'.

15   [The left hemisphere specialises in language expression.[1]][Because split brain patients have had their hemispheres split,[2]][when words are processed in the right hemisphere, they cannot be sent across to the left hemisphere. This means the language processing that enables information to be verbalised cannot occur.[3]]

   ✓   ✗   I have explained that the left hemisphere specialises in language expression.[1]

   ✓   ✗   I have explained that split brain patients have no connection between their hemispheres (i.e. their corpus callosum has been severed).[2]

   ✓   ✗   I have explained that words processed by the right hemisphere cannot be verbalised because information cannot be sent to the left hemisphere which is responsible for this task.[3]

16   [One structural neuroimaging technique is computerised tomography (CT).[1]][CT involves a person entering a chamber and then a machine taking many continuous x-ray images around their brain.[2]][This provides both two and three-dimensional images of the person's brain structure which can be examined for research or disease detection.[3]]

   ✓   ✗   I have correctly identified one structural neuroimaging technique.[1]

   ✓   ✗   I have described how this technique is conducted.[2]

   ✓   ✗   I have described how this technique is then used to understand the brain.[3]

Other acceptable responses could include:

- You may have identified and described magnetic resonance imaging (MRI).

17   **a**   [Localisation of function refers to idea that specific parts of the brain are responsible or specialised in certain functions.[1]]

   ✓   ✗   I have outlined what is meant by localisation of function.[1]

   b   [To determine where in the brain controlled a rat's leg movement, researchers may first have tried electrically stimulating a specific part of the brain.[1]][They would then observe the rat's behaviour to see if their leg moved in response to the electrical current.[2]] [The researcher would then make an inference as to whether the part of the brain stimulated was responsible for leg movement on the basis of this observed response and repeat if necessary.[3]]

   ✓   ✗   I have explained that researchers would first electrically stimulate a specific part of the rat's brain.[1]

   ✓   ✗   I have explained that researchers would then observe the rat's response.[2]

   ✓   ✗   I have explained that researchers would then make an inference on the basis of this response.[3]

2B   The nervous system

1 I & II. *The nervous system, which includes the brain, spinal cord, and all nerves outside them, is responsible for everything we think, feel, and do, which includes highly specific functions.*
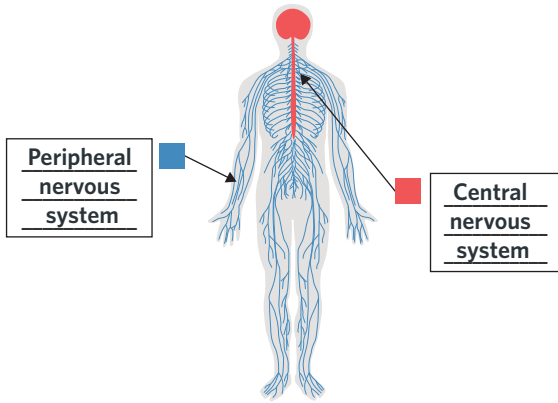
2

Image: Systemoff/Shutterstock.com

Remember, the CNS is the brain and spinal cord and the PNS is everything outside it.

3 A. *This is true because the CNS does control these central functions.*

4 B. *This is false because both the CNS and PNS work together to communicate about information both from within and outside the body.*

5 The peripheral nervous system is divided into the somatic and autonomic nervous system. The **somatic** system controls the skeletal muscles and voluntary movement, whereas the **autonomic** system controls visceral muscles, organs and glands which are largely self-regulating. *You can remember that the somatic nervous system controls movement of the skeletal muscles, because somatic and skeletal muscles both start with 'S'.*

6
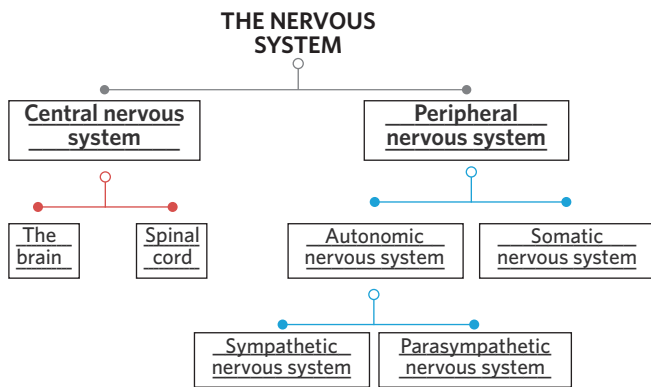
It helps to visualise the structure of the nervous system using a diagram like this to see what is under each subdivision.

Skills

Unpacking the scenario

7 Alyssa's actions at the beach involved the communication between various divisions of her nervous system. The division of Alyssa's nervous system that felt the cold on her legs would have been the **somatic** nervous system which sent a message to her brain about the external world. The **central** nervous system would be responsible for sending a message to Alyssa's somatic nervous system, telling her to move her legs, dive and any other intentional actions she took.

On the other hand, Alyssa's involuntary shivering and heart heart racing would be caused by the activation of her **sympathetic** division of the autonomic nervous system.

Multiple-choice questions

8 A   **9** B   **10** C   **11** C

Short-answer questions

12 [The sympathetic and parasympathetic nervous system are both part of the autonomic nervous system.[1]] [However, while the parasympathetic nervous system maintains the body's balance at rest or calms it down after arousal, the sympathetic nervous system activates and increases arousal.[2]]

  ✓ ✗   I have outlined one similarity between the sympathetic and parasympathetic nervous system.[1]

  ✓ ✗   I have outlined one difference between the sympathetic and parasympathetic nervous system.[2]

  ✓ ✗   I have used a distinguishing word, such as 'while'.

Other acceptable responses could include:

- You may have outlined alternative similarities and differences.

13 [The somatic nervous system functions to send information about the body's sensations and activities to the central nervous system[1]] [and also to send information from the central nervous system to the skeletal muscles about how to move or respond.[2]]

  ✓ ✗   I have described one function of the somatic nervous system.[1]

  ✓ ✗   I have described another function of the somatic nervous system.[2]

Other acceptable responses could include:

- You may have outlined slightly different functions, such as 'voluntary movement'.

14 a [Erfan may be experiencing a racing heart,[1]] [and dilation of his pupils.[2]]

  ✓ ✗   I have identified one sympathetic nervous system response.[1]

  ✓ ✗   I have identified another sympathetic nervous system response.[2]

  ✓ ✗   I have referred to the character's name in my response (Erfan), and to the scenario.

Other acceptable responses could include:

- Other physiological responses in line with activation of the sympathetic nervous system.

b [Erfan's body as part of the somatic nervous system would register the aggressive dog's bite and send sensory messages about it to the central nervous system.[1]] [The central nervous system system would process this pain/touch information and coordinate a response,[2]] [telling the leg skeletal muscles in the somatic nervous system to walk away via motor messages.[3]]

✓ ✗ I have explained that the somatic nervous system would communicate via sensory messages to the central nervous system what was occurring as registered by the body.[1]

✓ ✗ I have explained that the central nervous system would process this information and register a response.[2]

✓ ✗ I have explained that a motor message would be sent to the skeletal muscles in the somatic nervous system to move.[3]

✓ ✗ I have used terms such as transmit, process, and coordinate to describe the activities of the nervous system.

✓ ✗ I have referred to the character's name in my response (Erfan), and to the scenario.

Questions from multiple lessons

15 A   **16** C

2C The neuron

Theory-review questions

1 Specialised nerve cells that communicate information via electrochemical messages around the nervous system are **neurons**, whereas **glial cells** help to protect and support them to perform their function. *Think of neurons as responsible for executing the job, with glial cells being their very important assistants.*

2 I; II & III. *Neurons are responsible for transmitting, receiving and processing neuronal messages, which serve as the building blocks for everything we think, feel, and do.*

3 The synaptic gap is the space between two adjacent neurons. A neuron that sends a message into the synaptic gap is called the **presynaptic** neuron, and a neuron that receives a message is called the **postsynaptic** neuron. *It's important to remember that all neurons serve as both a presynaptic and postsynaptic neuron depending on the stage of neuronal messaging, but the neuron that is currently sending a message into the synapse is the presynaptic neuron and the neuron currently receiving one is the postsynaptic neuron.*

4
Dendrites   **Axon**   Myelin   **Axon terminals**

direction of impulse
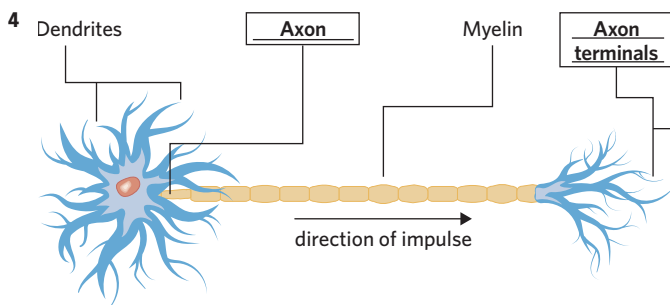
When labelling a neuron it helps to notice a few things first. Firstly, is the direction of the impulse labelled? If so, you know the starting point for the impulse is the end of the neuron with dendrites. Secondly, if it is a motor neuron like this, you may wish to look for the bigger end containing the cell body to know which end has the dendrites.

5 When a neuronal message first reaches a neuron, the dendrites **receive** the message. After being processed by the cell body, the axon **transmits** electrical energy away from the cell body down the neuron. When this electrical impulse reaches the axon terminal, the synaptic buttons on their ends **release** chemicals called neurotransmitters into the synaptic

gap. *To remember the different roles of each part of a neuron, it can help to pair them with important verbs (action words) like to transmit, process, release, receive and so on because each part of the neuron performs a different action.*

Skills

Perfect your phrasing

6 A

Exam-style questions

Multiple-choice questions

7 C   **8** C   **9** B   **10** A

Short-answer questions

11 [Myelin functions to insulate and protect the axon of a neuron,[1]] [which in turn also helps to speed up electrical transmission within a neuron.[2]]

✓ ✗ I have outlined one role of the myelin.[1]

✓ ✗ I have outlined another role of the myelin.[2]

12 [Neurons primarily function to communicate information around the nervous system,[1]] [whereas glial cells primarily function to protect and support neurons in this role.[2]]

✓ ✗ I have described the primary function of neurons.[1]

✓ ✗ I have compared this to the primary function of glial cells.[2]

✓ ✗ I have used a distinguishing word, such as 'whereas'.

Questions from multiple lessons

13 C

14 [Glial cells in the central nervous system would be found in the brain and the spinal cord.[1]]

✓ ✗ I have correctly identified that these central nervous system glial cells would be found in both the brain and spinal cord.[1]

2D Structure and function of the brain

Theory-review questions

1

Forebrain

Midbrain

Hindbrain
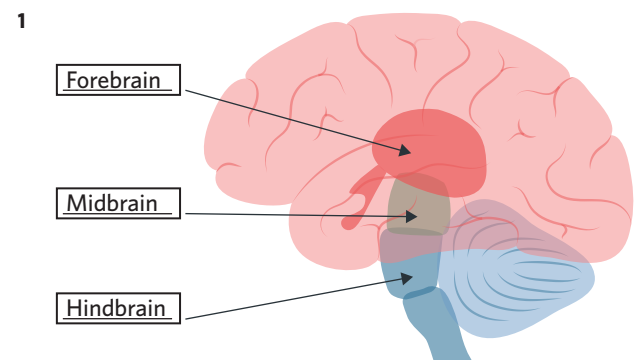
2 B. *This is false because, although different areas of the brain have differing specialisations, all areas of the brain work together to integrate information and coordinate functions.*

3 C. *Although all brain areas perform some pretty important functions, the forebrain is responsible for our most sophisticated functions like language, reasoning and so on.*

4 I; III & V. *These three areas make up the hindbrain, and importantly, the spinal cord is not part of the brain.*

5 B. *The reticular formation extends along the brain stem across the hindbrain and midbrain, with pathways also extending to the forebrain.*

6 A. *This is true as different components of each region of the brain contribute to motor movement in some way.*

Skills

Perfect your phrasing

7 B

Exam-style questions

Multiple-choice questions

8 C   **9** D   **10** B   **11** A

Short-answer questions

12 [The reticular formation is involved in regulating physiological arousal,[1]] [and adjusting muscle tension.[2]]

✓ ✗ I have identified one function of the reticular formation.[1]

✓ ✗ I have identified another function of the reticular formation.[2]

Other acceptable responses could include:

- filter inputs of information to the brain, passing on important information to different areas of the brain.
- regulating the sleep-wake cycle and consciousness.

13 [Dasha's thalamus[1]] [would have been involved in relaying and filtering the visual information of the sunflowers appearance or the auditory information of the birds' singing, sending this on to her cerebral cortex.[2]] [Further, Dasha's hypothalamus[3]] [would have been involved in her motivated, pleasure-seeking behaviour of picking a flower and feeling overjoyed.[4]]

✓ ✗ I have identified one structure of the forebrain involved in Dasha's actions.[1]

✓ ✗ I have explained how this structure may have been involved in one of Dasha's actions.[2]

✓ ✗ I have identified one other structure of the forebrain involved in Dasha's actions.[3]

✓ ✗ I have explained how this structure may have been involved in one of Dasha's actions.[4]

✓ ✗ I have referred to the character's name in my response (Dasha), and to the scenario.

Other acceptable responses could include:

- You may have identified other areas of the forebrain and other corresponding actions they may have been involved in, so long as those actions were clear in the scenario.

Questions from multiple lessons

14 B   **15** A

2E   The cerebral cortex

Theory-review questions

1 The **cerebral cortex** is the thin outer layer of the cerebrum. It can be divided into two hemispheres, which demonstrates the concept of **hemispheric specialisation** with each hemisphere having unique functions for different thoughts, feelings, and behaviors. It can also be divided into four lobes, including the **frontal lobe**, parietal lobe, occipital lobe, and temporal lobe. *The cerebral cortex can be divided into two hemispheres as well as into four lobes, with hemispheric specialisation referring to the idea that each hemisphere is dominant for different functions.*

2 A. *This is true. The left hemisphere specialises in verbal and analytical functions, whereas the right hemisphere has a distinct function for non-verbal tasks.*

3 II & III. *The premotor cortex and Broca's area are two brain structures of the frontal lobe, as well as the prefrontal cortex and primary motor cortex.*

4 B. *The primary somatosensory cortex is an area of the parietal lobe that is most directly responsible for spatial awareness.*

5 C. *The primary visual cortex is the area of the occipital lobe involved most directly in receiving visual information from the sensory receptors located on the retina of our eyes.*

6 A. *This is true. The Wernicke's area is an area of the temporal lobe which helps to make sense of speech, as opposed to the Broca's area which is involved in the production of speech.*

Skills

Perfect your phrasing

7 A

Exam-style questions

Multiple-choice questions

8 A   **9** B   **10** D   **11** C

12 D

Short-answer questions

13 [The Broca's area is primarily responsible for assisting the production and articulation of speech,[1]] [whereas the Wernicke's area is responsible for the comprehension of speech.[2]]

✓ ✗ I have explained that the Broca's area is responsible for producing speech.[1]

✓ ✗ I have explained that the Wernicke's area is responsible for comprehending speech.[2]

✓ ✗ I have used an appropriate distinguishing word, such as 'whereas'.

14 [The primary visual cortex is an area of the occipital lobe.[1]] [It has the function of receiving and processing visual information from the sensory receptors located on the retina of our eyes.[2]] [Visual information from the two different visual hemispheres is sent to and processed contralaterally in the primary visual cortex of the opposite cerebral hemisphere, therefore demonstrating the principle of localisation of function.[3]]

✓ ✗ I have identified the primary visual cortex as an area of the occipital lobe.[1]

✓ ✗ I have described how the primary visual cortex is involved in processing visual information.[2]

✓ ✗ I have described how the primary visual cortex's function of processing visual information demonstrates localisation of function.[3]

Questions from multiple lessons

15 C

16 [The pons regulates the respiratory system,[1]][whereas the frontal lobe initiates voluntary movements.[2]]

✓ ✗ I have described a function of the pons.[1]

✓ ✗ I have described a function of the frontal lobe.[2]

✓ ✗ I have used an appropriate distinguishing word, such as 'whereas'.

Other acceptable responses could include:

- Other functions of the pons could have been used, such as how it relays information between the cerebral cortex and the cerebellum, as well as between the medulla and the midbrain, is involved in sleep and some research suggests dreaming and waking from sleep, and is involved in some involuntary movements.

Chapter 2 test

Multiple-choice questions

1	C	**2**	C	**3**	B	**4**	D
5	A	**6**	C	**7**	B	**8**	D

Short-answer questions

9 [The hypothalamus (in conjunction with other brain areas) regulates our hormones[1]][and is located in forebrain beneath the thalamus.[2]]

✓ ✗ I have correctly identified the part of the brain that regulates hormone levels.[1]

✓ ✗ I have correctly described its location.[2]

10 a [Peripheral nervous system.[1]]

✓ ✗ I have correctly identified the peripheral nervous system.[1]

Other acceptable responses could include:

- Somatic nervous system.

b [Central nervous system.[1]]

✓ ✗ I have correctly identified the central nervous system.[1]

11 [Point 1 labels the pons,[1]][point 2 labels the cerebellum,[2]][and point 3 labels the medulla.[3]]

✓ ✗ I have correctly named pons at point 1.[1]

✓ ✗ I have correctly named cerebellum at point 2.[2]

✓ ✗ I correctly named medulla at point 3.[3]

12 a [Occipital lobe.[1]]

✓ ✗ I have correctly identified the occipital lobe as the area most likely affected by the accident.[1]

b [Localisation of function refers to certain areas of the brain being more specialised in certain functions.[1]][If Perri's visual impairments are due to damage to areas of the brain responsible for vision (such as the primary visual cortex), then this reflects a localisation of the visual function.[2]]

✓ ✗ I have demonstrated an understanding of the concept of localisation of function.[1]

✓ ✗ I have described how Perri's impairments could potentially reflect this concept.[2]

✓ ✗ I have referred to the character's name in my response (Perri), and to the scenario.

13 [Glial cells function to rid neurons of waste/debris,[1]][and also to provide neurons with nutrients.[2]]

✓ ✗ I have identified one function of glial cells.[1]

✓ ✗ I have identified another function of glial cells.[2]

Other acceptable responses could include:

- Other functions of glial cells, such as the production of myelin.

14 [Structural neuroimaging allows images to be gathered of the different structures/areas of the brain only,[1]][such as CT scans,[2]][whereas functional techniques allow levels of activity in the brain to also be captured,[3]][such as fMRI.[4]]

✓ ✗ I have outlined structural neuroimaging techniques.[1]

✓ ✗ I have provided one example of a structural neuroimaging technique.[2]

✓ ✗ I have compared structural techniques to functional techniques.[3]

✓ ✗ I have provided one example of a functional neuroimaging technique.[4]

✓ ✗ I have used a distinguishing word, such as 'whereas'.

Other acceptable responses could include:

- You may have identified MRI as another structural technique, or PET as another functional.

15 a [A researcher might observe a patient moving a limb[1]][or they might observe a patient experiencing difficulty or confusion when making a decision.[2]]

✓ ✗ I have identified one potential reponse a patient might exhibit when their frontal lobe is electrically stimulated.[1]

✓ ✗ I have identified a second potential reponse a patient might exhibit when their frontal lobe is electrically stimulated.[2]

Other acceptable responses could include:

- Other responses, so long as they were linked to the functions of the frontal lobe. For example, you may have identified confusion when performing other executive functions (planning, judging, symbolic thinking etc.), vocalisations or difficulty vocalising (language), changes in memory recall etc.

b [By stimulating areas of the frontal lobe using an electrical current,[1]] [and carefully and directly observing patients' responses through repeated trials,[2]] [a researcher might be able to infer a function of the frontal lobe if electrical stimulation repeatedly brings about a certain response e.g. leg movement.[3]]

✓ ✗ I have explained that to infer functions of the frontal lobe, areas of the frontal lobe would first need to be electrically stimulated.[1]

✓ ✗ I have explained that inferences would depend on careful observation patients' responses to the electrical stimulation.[2]

✓ ✗ I have explained that an inference about frontal lobe function could be made if a specific response kept happening when a specific area was electrically stimulated.[3]

16 [The reticular activating system is a network of neurons located in the reticular formation, with projections extending into the upper and lower parts of the brain.[1]] [It functions to regulate levels of arousal in response to environmental conditions.[2]]

✓ ✗ I have described the structure of the reticular activating system.[1]

✓ ✗ I have described the function of the reticular activating system.[2]

Key science skills questions

17 B　　　　**18** D

19 a [The patient would likely be unable to name the chicken accurately[1]] [because information presented to the left visual field is processed by the non-verbal right hemisphere [2]] [and therefore cannot be transferred to the left hemisphere which enables verbalisation, due to the severing of the corpus callosum.[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 inability to verbalise is due to information from the right hemisphere not being able to be transferred to the left hemisphere, which is responsible for verbalisation.[3]

b [Sperry and Gazzaniga used case studies[1]] [and a limitation of this type of investigation is that findings can't be generalised to a wider population.[2]]

✓ ✗ I have correctly identified case studies as the type of investigation.[1]

✓ ✗ I have outlined one relevant limitation of this investigation type.[2]

✓ ✗ I have referred to the characters' names in my response (Sperry and Gazzaniga), and to the scenario.

20 a [fMRI could be an appropriate technique for Doctor Rosen's study,[1]] [because it is a functional technique and can therefore be used to track activity which is necessary for this study.[2]]

✓ ✗ I have identified a functional neuroimaging technique (fMRI or PET).[1]

✓ ✗ I have justified my response.[2]

✓ ✗ I have referred to the character's name in my response (Doctor Rosen), and to the scenario.

b [Doctor Rosen used an independent groups design,[1]] [and random allocation may occur by putting participants into a random number generator and assigning them to the control or experimental groups.[2]]

✓ ✗ I have identified independent groups as the experimental design used.[1]

✓ ✗ I have outlined an appropriate allocation procedure.[2]

✓ ✗ I have referred to the character's name in my response (Doctor Rosen), and to the scenario.

c [Doctor Rosen asked trained PhD students to administer the concentration tasks without telling them the study's purpose in order to create a double-blind procedure,[1]] [which means that she is able to prevent experimenter bias in the procedures and testing that could potentially confound results.[2]]

✓ ✗ I have correctly explained that Doctor Rosen used PhD students to create a double-blind procedure.[1]

✓ ✗ I have explained that this is done in order to prevent experimenter bias.[2]

✓ ✗ I have referred to the character's name in my response (Doctor Rosen), and to the scenario.

3A   Developmental plasticity

Theory-review questions

1   A. *Remember that developmental plasticity only involves changes to the brain that reflect learning until we reach maturity.*

2   In infancy, developmental plasticity functions mostly to **build the foundations for understanding the world,** whereas in adolescence, it functions more to **refine and build on the understanding of the world**. *In infancy, we need lots of connections to learn important skills like language and motor coordination for the first time. In adolescence, we need to refine and cut connections.*

3   **Developmental plasticity** can involve changes to the neurons and their connections. **Myelination** ensures communication between neurons is successful and efficient by protecting neurons. **Synaptic pruning** removes connections that are underused. *Remember that developmental plasticity is the umbrella term for all processes that underlie learning as we age, including myelination and synaptic pruning.*

4   B. *Because this learning is occuring after maturation and the development of the brain, it involves another type of plasticity (adaptive).*

5   I; III; IV & V. *The development of the frontal lobe involves any process that occur as it reaches maturity.*

6   A. *Our earliest and most foundational skills are learnt when we have the greatest number of synapses.*

Skills

Perfect your phrasing

7   B   **8**   A

Exam-style questions

Multiple-choice questions

9   A   **10**   B   **11**   C   **12**   C

Short-answer questions

13   [During development, myelination involves the formation of a protective coating around axons which helps to protect and insulate developing neurons, allowing them to communicate.[1]][Because it occurs at key stages of development, notably during infancy and adolescence, 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 responses could 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   [Frontal lobe development[1]][and synaptic pruning both occur during developmental plasticity.[2]]

✓ ✗ I have identified one change that occurs as part of developmental plasticity.[1]

✓ ✗ I have identified another change that occurs as part of developmental plasticity.[2]

Other acceptable responses could include:

- Myelination.

15   **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

16   [The frontal lobe is responsible for executive functions and higher-order thinking.[1]][It is also the last lobe of the brain to fully develop in developmental plasticity.[2]][As such, this explains why teenagers may still exhibit impulsive or irrational behaviour because this area of their brain hasn't developed yet.[3]]

✓ ✗ I have identified the functions of the frontal lobe.[1]

✓ ✗ I have explained that it is the last lobe to develop fully.[2]

✓ ✗ I have linked this to adolescents' impulsive or irrational behaviour.[3]

3A

3B   Brain injury and adaptive plasticity

Theory-review questions

1   C. *Given the frontal lobe's role in initiating voluntary movement, the impact of injury to this area of the cerebral cortex can include difficulty initiating motor movement.*

2   A. *The cerebral cortex stores the memories of events and information from the past. When injured, an impact to psychological functioning therefore includes difficulty retrieving long-term memories.*

3   Due to the frontal lobe's role in determining aspects of our personality, an impact of injury to the cerebral cortex on **social functioning** includes difficulty maintaining positive relationships with family and friends due to changes in **mood**. *The frontal lobe is responsible for moderating aspects of our personality. When this part of the cerebral cortex is injured, then, it can result in mood changes and a difficulty maintaining relationships with family members and friends.*

4   A. *Adaptive plasticity is the ability for the brain to change as a result of experiences like brain injuries, where often the brain has the capacity to restore neural activity in damaged areas to ensure rehabilitation can be possible.*

5   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 injury, and occurs naturally without help from a psychologist.*

6   **Rerouting** involves a neuron seeking a new connection with another undamaged neuron to ensure the formation of strong neural pathways, whereas **sprouting** involves a neuron growing branches on the axon and dendrite to enhance the neuron's ability to communicate and connect with other neurons effectively. *Rerouting is related to undamaged neurons and their ability to form new effective neural connections with other undamaged neurons, whereas sprouting is related to a neuron's ability to grow branches on the axon and dendrite, often after having sustained damage, to enhance communication.*

Skills

Perfect your phrasing

7   A   **8**   B

Exam-style questions

Multiple-choice questions

9   D   **10**   C   **11**   C

Short-answer questions

12   [Adaptive plasticity refers to the brain's ability to restore and enhance neural functioning over time due to experience.[1]][After injury to the cerebral cortex, where the neurons in a particular region are damaged, adaptive plasticity enables these neurons to be restored and to recover neural pathways that enable rehabilitation to occur.[2]]

   ✓ ✗   I have explained the concept of adaptive plasticity.[1]

   ✓ ✗   I have described the role of adaptive plasticity in restoring functioning after brain injury to the cerebral cortex.[2]

13   [One process 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 neuron pathways.[2]][Another process 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 process of adaptive plasticity.[1]

   ✓ ✗   I have described this process of adaptive plasticity.[2]

   ✓ ✗   I have identified rerouting as a process of adaptive plasticity.[3]

   ✓ ✗   I have described this process of adaptive plasticity.[4]

Questions from multiple lessons

14   A

15   [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.[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]

3C   Neurological disorders and Parkinson's disease

Theory-review questions

1   Broadly speaking, a **neurological disorder** refers to any damage or malfunctioning of the nervous system. A **neurodegenerative disorder** specifically refers to the progressive breaking down of neurons in the brain over time, which includes **Parkinson's disease**. *Neurological disorder is the umbrella term that is used to describe any nervous system damage, which includes a neurodegenerative disorder that more specifically involves the degeneration of neurons in the brain over time. Parkinson's disease is therefore categorised as a neurodegenerative disorder because it involves the progressive degeneration of neurons in the substantia nigra, resulting in a lack of production of the neurotransmitter dopamine.*

2   I & II. *Only muscle rigidity and tremors constitute motor (i.e. relating to movement) symptoms, while fatigue and constipation are non-motor symptoms.*

3   A. *This is true. On the basis of the ethical principle of beneficence, the findings achieved through testing the often similar mental processes of animals means that the benefits of ensuring the safety of a medication that could improve the lives of millions outweighs the initial harm caused to the animals.*

4   A. *Deep brain stimulation is a possible treatment for neurodegenerative disorders. It involves inserting electrodes into an area in the brain and producing electrical activity where neural functioning has been impaired, such as in the substantia nigra to treat the symptoms of Parkison's disease.*

Skills

Perfect your phrasing

5   B   **6**   B

Exam-style questions

Multiple-choice questions

| **7** | C | **8** | D | **9** | A | **10** | C |

11   A

Short-answer questions

12 ⌈A neurodegenerative disorder is a disease characterised by the progressive loss or damage to neurons in the nervous system.[1]⌉ ⌈An example of a neurodegenerative disorder is Parkinson's disease, which results in the degeneration of dopamine-producing neurons in the substantia nigra in the brain.[2]⌉

✓ ✗   I have defined neurodegenerative disorders.[1]

✓ ✗   I have identified an example of a neurodegenerative disorder, such as Parkinson's disease.[2]

13 ⌈Levodopa is a medication that treats the symptoms of Parkinson's disease; when taken it is converted to dopamine and helps to restore motor functions.[1]⌉⌈By contrast, deep brain stimulation is a procedure which involves stimulating electrical activity in the substantia nigra where neural degeneration has occurred in order to increase neural transmission of dopamine and restore motor functions.[2]⌉

✓ ✗   I have described how Levelopa is used as treatment for Parkinson's disease.[1]

✓ ✗   I have described how deep brain stimulation is used as a treatment for Parkinson's disease.[2]

✓ ✗   I have used an appropriate distinguishing phrase, such as 'by contrast'.

14 ⌈Dopamine is a neurotransmitter involved in motor function.[1]⌉ ⌈In Parkinson's disease, the neurons that produce dopamine are damaged and therefore there are inadequate levels of dopamine,[2]⌉⌈which affects motor function and results in symptoms such as rigidity[3]⌉⌈and tremors.[4]⌉

✓ ✗   I have described that dopamine is involved in motor function.[1]

✓ ✗   I have described that Parkinson's disease involves inadequate production of dopamine.[2]

✓ ✗   I have identified one example of a motor symptom.[3]

✓ ✗   I have identified a second example of a motor symptom.[4]

Questions from multiple lessons

15   A

16 ⌈The somatic nervous system is responsible for the coordination of voluntary movement in conjunction with the central nervous system.[1]⌉ ⌈Motor symptoms such as tremors and muscle rigidity therefore demonstrate that the somatic nervous system has been impaired due to inadequate levels of dopamine, resulting in insufficient or inadequate motor neural messages being sent from the central nervous to the somatic nervous system.[2]⌉

✓ ✗   I have described the role of the somatic nervous system as coordinating voluntary movement.[1]

✓ ✗   I have described how the motor symptoms of Parkison's disease result from insufficient motor messages being able to be sent via the somatic nervous system, due to inadequate levels of dopamine.[2]

Chapter 3 test

Multiple-choice questions

| **1** | B | **2** | D | **3** | C | **4** | C |
| **5** | B | **6** | C | **7** | D | **8** | A |

Short-answer questions

9 ⌈One biological impact of injury to the frontal lobe could be loss of motor movement/paralysis.[1]⌉

✓ ✗   I have identified one biological impact of injury to the frontal lobe (loss of motor movement/paralysis).[1]

10 ⌈Developmental plasticity lays the foundations for learning and experience as our brain reaches maturity,[1]⌉⌈and it occurs rapidly during infancy and adolescence.[2]⌉⌈On the other hand, adaptive plasticity occurs to enhance or recover brain functioning in response to things like injury or experiences beyond development,[3]⌉⌈and can occur all throughout the lifespan.[4]⌉

✓ ✗   I have explained what developmental plasticity is.[1]

✓ ✗   I have explained when developmental plasticity occurs.[2]

✓ ✗   I have explained what adaptive plasticity is.[3]

✓ ✗   I have explained when adaptive plasticity occurs.[4]

✓ ✗   I have used a distinguishing phrase, such as 'on the other hand'.

11 ⌈The substantia nigra (of the basal ganglia within the midbrain) would be impacted by Parkinson's disease.[1]⌉⌈Fernando might find therapeutic relief if during deep brain stimulation, electrodes are implanted into his substantia nigra[2]⌉⌈producing enhanced neuronal functioning in this area and overcoming the inadequate neural activity caused by degenerating dopamine-producing neurons and thereby relieving his symptoms, e.g. muscle rigidity.[3]⌉

✓ ✗   I have correctly identified the substantia nigra as the area of Fernando's brain that has been impacted.[1]

✓ ✗   I have explained that deep brain stimulation would involve electrodes being implanted into the substantia nigra.[2]

✓ ✗   I have explained the therapeutic relief (increased neural activity) that this technique would provide, providing an example of a symptom that might be relieved.[3]

✓ ✗   I have referred to the character's name in my response (Fernando), and to the scenario.

12 ⌈A structural technique such as CT[1]⌉⌈may be used to see the loss of brain mass associated with the degeneration of neurons in relevant structures of the brain of a person with Parkinson's disease.[2]⌉ ⌈A functional technique such as fMRI[3]⌉⌈may be used to demonstrate the impaired neural activity levels associated with the degeneration or impairment of neurons in relevant areas of the brain of a person with Parkinson's disease.[4]⌉

✓ ✗   I have identified one structural neuroimaging technique (CT or MRI).[1]

✓ ✗ I have explained how this technique may be used to track the progression of Parkinson's disease, with reference to showing loss of brain mass at the structural level.[2]

✓ ✗ I have identified one functional neuroimaging technique (PET or fMRI).[3]

✓ ✗ I have explained how this technique may be used to track the progression of Parkinson's disease, with reference to showing decreased neural activity at the functional level.[4]

13 [One change that occurs is synaptic pruning[1]][which involves the elimination of connections between neurons that are not used[2]][in order to have only necessary connections for efficient functioning.[3]]

✓ ✗ I have identified one process of developmental plasticity.[1]

✓ ✗ I have described what this process involves.[2]

✓ ✗ I have described the function of this process.[3]

Other acceptable responses could include:

- Other processes of developmental plasticity (myelination, frontal lobe development, synaptogenesis), so long as you have adequately described what they involve and their function.

14 [A neurodegenerative disorder is a neurological condition characterised by the progressive loss of neurons in the brain.[1]][Parkinson's is an example of a neurodegenerative disorder.[2]]

✓ ✗ I have outlined what a neurodegenerative disease is.[1]

✓ ✗ I have provided an example of a neurodegenerative disorder (Parkinson's disease).[2]

15 a [Nikole's injury has impacted her psychological functioning by impairing her ability to concentrate and make decisions.[1]]

✓ ✗ I have identified how Nikole's injury has impacted her psychological functioning.[1]

✓ ✗ I have referred to the character's name in my response (Nikole), and to the scenario.

b [Sprouting[1]][involves the growth of new axonal or dendritic branches on neurons.[2]][This allows for new neural connections to be made when damage occurs, which could help Nikole to regain lost functions.[3]]

✓ ✗ I have identified one process of adaptive plasticity.[1]

✓ ✗ I have described this process of adaptive plasticity.[2]

✓ ✗ I have described how this could aid Nikole's recovery.[3]

✓ ✗ I have referred to the character's name in my response (Nikole), and to the scenario.

Other acceptable responses could include:

- You may have explained how rerouting could aid Nikole's recovery.

16 [Adolescents experience a maturation of their frontal lobe[1]][and synaptic pruning.[2]]

✓ ✗ I have identified one developmental plasticity change in the adolescent brain.[1]

✓ ✗ I have identified another developmental plasticity change in the adolescent brain.[2]

Other acceptable responses could include:

- Further myelination of neurons.

Key science skills questions

17 C

18 a [The researchers are investigating adaptive plasticity,[1]][because the changes to the brain would be due to the impact of increased exercise on a brain suffering neurodegeneration, rather than the normal processes of a developing brain.[2]]

✓ ✗ I have identified adaptive plasticity as the type of plasticity the researchers are investigating.[1]

✓ ✗ I have justified my response.[2]

b [A limitation is that because the study is conducted on rats, the results cannot be generalised to a human population.[1]]

✓ ✗ I have outlined a limitation of this study, referring to generalisability.[1]

Questions from multiple chapters

19 D

20 [Oligodendrocytes are involved in both developmental[1]][and adaptive plasticity.[2]]

✓ ✗ I have named developmental plasticity.[1]

✓ ✗ I have named adaptive plasticity.[2]

4A   Nature versus nurture

Theory-review questions

1   Psychological development refers to continual changes and growth in domains including **emotional**, social and **cognitive** development. *It is important to remember that the aspects of psychological development are emotional, social and cognitive. Physical development is not included as a part of psychological development.*

2   A. *Believing that only the genetic makeup of an individual determines the characteristics they will develop is consistent with the nature perspective of the debate.*

3   I; III & IV. *Inheriting traits from parents is part of the nature perspective of the nature versus nurture debate, emphasising the genetic component of development rather than the impact of the environment.*

4   A. *In the interaction of nature and nurture, nature provides a foundation in which nurture builds on to determine the traits an individual will develop.*

5   B. *Due to identical twins being from the same fertilised egg (zygote), they inherit the exact same genes. These twins are known as monozygotic twins.*

Skills

Understanding research

6 B   **7** D   **8** A

Exam-style questions

Multiple-choice questions

9 D   **10** C   **11** B   **12** D

13 A   **14** B

Short-answer questions

15   [Monozygotic twins are identical due to sharing the exact same genes,[1]] [whereas dizygotic twins are not identical as the genes of each twin is slightly different.[2]]

✓ ✗   I have explained that monozygotic twins share the exact same genes.[1]

✓ ✗   I have explained that dizygotic twins do not share the exact same genes.[2]

✓ ✗   I have used an appropriate distinguishing word, such as 'whereas'.

16   [One aspect of psychological development is emotional development, which involves the life-long development of skills that allow individuals to control, express, and recognise emotions in an appropriate and effective way.[1]] [An example of emotional development is learning how to recognise your own emotions and subsequently learning how to appropriately display them.[2]]

✓ ✗   I have defined one aspect of psychological development.[1]

✓ ✗   I have provided an example of this aspect of psychological development.[2]

Other acceptable responses could include:

- Social or cognitive development, so long as you correctly defined them and provided an appropriate example.

17   [In the interaction of nature and nurture, the genes each individual inherits provide a potential foundation for development in which certain traits can develop in the right environmental conditions.[1]] [For example, an individual may inherit the personality trait of extroversion as both biological parents are strong extroverts.[2]] [Nurture can fulfil this potential by providing exposure to circumstances which increase the likelihood of the trait inherited developing.[3]] [For example, the individual may be involved in performing arts from a young age, increasing their likelihood of becoming an extrovert.[4]]

✓ ✗   I have described the role of nature in the interaction of nature and nurture.[1]

✓ ✗   I have provided a relevant example of the role of nature.[2]

✓ ✗   I have described the role of nurture in the interaction of nature and nurture.[3]

✓ ✗   I have provided a relevant example of the role of nurture.[4]

18   [Khaled and Steven have the same nurture due to inheriting the exact same genes, [1]] [with them being monozygotic twins potentially explaining why they are both extremely organised in their day to day life.[2]] [However, they experienced different nurture[3]] [due to them being adopted into different families, potentially explaining why Steven is quiet while Khaled is loud.[4]]

✓ ✗   I have identified that Khaled and Steven had the same nature.[1]

✓ ✗   I have referred to Khaled and Steven being identical/ monozygotic twins and both being organised to explain how nature was evident.[2]

✓ ✗   I have identified that Khaled and Steven experienced different nurture.[3]

✓ ✗   I have referred to Khaled and Steven growing up in different environments and having different temperaments to explain how nurture was evident.[4]

✓ ✗   I have referred to the characters' names in my response (Khaled and Steven), and to the scenario.

Questions from multiple lessons

19 A

4B   Periods of psychological development

Theory-review questions

1   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 to be learnt at all.*

2   A. *Critical periods are more prescriptive than sensitive periods, with a shorter and less flexible time period in which specific skills and functions have to be learnt.*

3   A. *Maturation involves a structure being predetermined and laid out so that exposure to certain experiences and stimuli can contribute to the growth of relevant neural processes and skills.*

4   B. *Due to Genie still being able to expand her vocabulary at this age and the process taking longer, it was inferred to have a sensitive period.*

Skills

Perfect your phrasing

5 B

Exam-style questions

Multiple-choice questions

6 C	**7** B	**8** D	**9** A
10 B	**11** C		

Short-answer questions

12 ⌈One major difference is that sensitive periods have more flexible time periods in which a skill can be developed whereas critical periods are more rigid periods.[1]⌉

✓ ✗   I have identified a difference between critical and sensitive periods.[1]

✓ ✗   I have used an appropriate distinguishing word, such as 'whereas'.

Other acceptable responses could include:

- Skills with critical periods have to be learnt in the period, whereas skills with sensitive periods can be learnt after the sensitive period.
- Humans have more sensitive than critical periods.
- Critical periods start and end more abruptly than sensitive periods.

13 ⌈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 in my response (Genie), and to the scenario.

14 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 in my response (Kairo and Logan), and to the scenario.

Questions from multiple lessons

15 A

4C   Attachment and emotional development

Theory-review questions

1 **Attachment** describes the emotional bond between two individuals. **Attachment theory** specifically addresses the bond between an infant and primary caregiver. *Attachment refers to the emotional bond between two individuals, such as between two friends or cousins, however, in the context of emotional development, attachment theory outlines the specific type of attachment developed between a child and caregiver.*

2 C. *When an infant's needs are inconsistently met, insecure attachment is more likely to develop as they may be unable to trust and rely on others for support.*

3 B. *'Healthy' emotional development involves individuals being able to experience, appropriately express, and recognise a range of emotions. It is not limited to positive emotions only.*

4 II & III. *When infants experience insecure attachment due to not consistently having their needs met by their primary caregivers, they are likely to find it hard to trust others, or even crave attention from others.*

5 III. *Temperament is a stable disposition and genetics impact attachment due to the biological parents contributing to the characteristics the infant holds, however this is not physical as infants are unable to recognise themselves at such a young age, therefore being unable to visually recognise individuals who look similar to them.*

Skills

Perfect your phrasing

6 B	**7** A

Exam-style questions

Multiple-choice questions

8 B	**9** A	**10** C	**11** D
12 A			

Short-answer questions

13 ⌈Emotional development involves the advancement of skills which allow individuals to appropriately understand, express and recognise the emotions of themselves and others.[1]⌉⌈Emotional development is impacted by attachment styles, with a secure attachment style leading to an increased likelihood of the individual to be able to develop trusting relationships with others.[2]⌉

✓ ✗   I have defined emotional development.[1]

✓ ✗   I have used a relevant example to explain how secure attachment can impact emotional development.[2]

14 ⌈Early life experiences refer to the relationships and events which occur before birth up until the age of around five.[1]⌉⌈Attachment theory suggests that infants who experience family support and comfort from their primary caregivers are more likely to develop healthy attachment,[2]⌉⌈with skin-to-skin contact having the ability to reassure the newborn that they are cared for and loved, therefore encouraging the development of secure attachment.[3]⌉

✓ ✗   I have explained the concept of early life experiences.[1]

✓ ✗   I have outlined family support as an experience contributing to healthy attachment.[2]

✓ ✗ I have suggested how skin-to-skin contact can encourage secure attachment by ensuring the newborn that they are protected and cared for.[3]

15 a [Temperament refers to the stable disposition of each individual, with Henry having an easy temperament due to always smiling and having predictable sleeping patterns.[1]] [Henry's easy temperament encourages secure attachment as his caregivers are able to anticipate and actively respond to his needs.[2]]

✓ ✗ I have explained Henry's temperament.[1]

✓ ✗ I have stated which attachment style Henry is likely to have by referring to the impact of temperament.[2]

✓ ✗ I have referred to the character's name in my response (Henry), and to the scenario.

✓ ✗ I have referred to relevant terminology, including 'easy temperament' and 'secure attachment'.

b [Due to Henry being likely to develop secure attachment, he is more likely to experience healthy emotional development.[1]] [This may lead to Henry having greater self-esteem as an adult,[2]] [as well as being able to develop trusting relationships with others.[3]]

✓ ✗ I have explained how secure attachment is likely to lead to healthy emotional development.[1]

✓ ✗ I have identified an example of emotional development Henry may display as an adult.[2]

✓ ✗ I have identified a second example of emotional development Henry may display as an adult.[3]

✓ ✗ I have referred to the character's name in my response (Henry), and to the scenario.

Questions from multiple lessons

16 C

4D Studies of attachment

Theory-review questions

1 A. *Harlow's study was an experiment as he manipulated the independent variable by some monkeys being fed by the cloth surrogate and other monkeys being fed by the wire surrogate mother, whereas Ainsworth did not manipulate the variables and instead observed and recorded infant behaviour.*

2 A. *Harlow's study did not look at food providing the infants with comfort, instead it tried to distinguish whether meeting biological needs or providing physical comfort led to attachment.*

3 The results of Harlow's study demonstrated that attachment is created on an **emotional** basis, with infants seeking **comfort** from their mothers. *The results of Harlow's study demonstrated that attachment is not created on a biological basis as it can be formed between an infant and a surrogate inanimate 'mother' as long as they provide comfort, as seen by providing emotional support for the infant when distressed.*

4 Ainsworth investigated secure and insecure **attachment** of infants through the *Strange **Situation*** study. *There are two main, overarching forms of attachment: secure and insecure attachment.*

5 A. *The bond an infant forms with their primary caregiver/s leads to their attachment style. This attachment style impacts emotional development and can lead to certain behaviours and tendencies in future adult relationships, but it is not related to scores on an emotional intelligence test.*

Skills

Understanding research

6 B   **7** B   **8** C

Exam–style questions

Multiple-choice questions

9 B   **10** A   **11** A

Short-answer questions

12 [An infant who experiences the same level of comfort from their mother and their stranger is likely to have an insecure-avoidant attachment style,[1]] [due to their needs being inconsistently met as a child.[2]] [This may lead to problems in future adult relationships as the infant is unlikely to be able to rely on others and therefore not be able to form strong bonds with others due to their needs being inconsistently met as a child.[3]]

✓ ✗ I have identified that the infant is likely to have an insecure-avoidant attachment style.[1]

✓ ✗ I have identified that insecure-attachment style most likely arose due to needs being inconsistently met as a child.[2]

✓ ✗ I have explained why the insecure-avoidant attachment style may be problematic in future relationships.[3]

13 a [Franklin is likely to have a secure attachment style.[1]]

✓ ✗ I have identified that Franklin is likely to have a secure attachment style.[1]

✓ ✗ I have referred to the character's name in my response (Franklin), and to the scenario.

b [Franklin's attachment style of secure attachment is likely to lead to him having healthy emotional development as an adult.[1]] [This may lead to him displaying characteristics such as resilience and trust in others.[2]]

✓ ✗ I have outlined how Franklin's attachment style of secure attachment is likely to lead to healthy emotional development as an adult.[1]

✓ ✗ I have outlined healthy emotional characteristics Franklin is likely to display as an adult.[2]

✓ ✗ I have referred to the character's name in my response (Franklin), and to the scenario.

c [One behaviour which is likely to have contributed to Franklin's secure attachment style is his mother Alicia consistently meeting his needs, allowing for a strong bond to form between them.[1]]

✓ ✗ I have outlined behaviours which are likely to have contributed to Franklin's secure attachment style.[1]

✓ ✗ I have referred to the characters' names in my response (Franklin and Alicia), and to the scenario.

Questions from multiple lessons

14 B   **15** D

4E   Cognitive development

Theory-review questions

1 A. *Although the process of perception can involve understanding information and imagination can involve producing independent thought, cognition involves both of these processes, as well as organising information from the environment.*

2 B. *Humans are born with some cognitive abilities which are strengthened over time due to experiences. This allows our experiences to have an impact on how we think, understand new information, and organise concepts.*

3 A schema mentally represents concepts that have been created through our experiences. Our schemas influence how we interact with our environment. *In this way, we can think of schemas as 'mental models' which contain our past learnings, helping to guide our future actions.*

4 **I. Assimilation**, in which new information is added to a pre-existing schema.

II. Accommodation, in which new information leads to a restructuring of a pre-existing schema. *Remember that assimilation increases schema depth whereas accommodation restructures the shape of a schema altogether.*

Skills

Unpacking the scenario

5 Saxton's original schema, or mental representation of **cars**, was learnt through experience. This schema was challenged when **Marom/his dad** told him that a bus was a larger vehicle which can transport more people. The person experiencing accommodation in the scenario was **Saxton**, because he had to alter his original schema when it was challenged by new information.

Exam-style questions

Multiple-choice questions

6 C   **7** D   **8** B   **9** B

10 C

Short-answer questions

11 [Assimilation involves incorporating new information into an existing schema,[1]] [whereas accommodation involves restructuring a pre-existing schema in order to fit new information.[2]]

⟋ ✕   I have outlined the process of assimilation.[1]

⟋ ✕   I have outlined the process of accommodation.[2]

⟋ ✕   I have used an appropriate distinguishing word, such as 'whereas'.

12 [A schema is a mental representation of a concept developed through experience.[1]] [Schemas function as a cognitive tool by providing guidance on how to interact with the internal and external environment by providing information acquired from previous experiences.[2]] [An example of a schema is an individual's understanding of the concept of kettles, with the mental model containing information acquired from experience such as 'kettles which have been boiled are too hot to touch', leading to the individual being careful around boiled kettles.[3]]

⟋ ✕   I have explained what a schema is.[1]

⟋ ✕   I have explained how schemas function as a cognitive process, explicitly referring to how it helps guide interactions within the internal and external environment.[2]

⟋ ✕   I have included an example which accurately represents a schema.[3]

13 **a** [The cognitive process which occurred when Tamika recognised the soccer goals at school is assimilation.[1]] [Assimilation involves incorporating new information into an existing schema.[2]] [This process is clear in the scenario due to the novel information of the goals at school with poles and a net aligning with the information Tamika already knew about soccer due to using rubbish bins at home as a goal. The goals at school have therefore deepened Tamika's understanding of her schema about soccer as she now knows what real soccer goals look like.[3]]

⟋ ✕   I have identified the cognitive process which occurred as assimilation.[1]

⟋ ✕   I have explained the process of assimilation, referring to the incorporation of new information into an existing schema.[2]

⟋ ✕   I have referred to relevant information from the scenario to support my response.[3]

⟋ ✕   I have referred to the character's name in my response (Tamika), and to the scenario.

b [The cognitive process which occurred when Charlie learnt soccer was being played instead of Australian football was accommodation.[1]] [Accommodation involves restructuring a pre-existing schema in order to fit in new information.[2]] [This process is clear in the scenario due to Charlie learning that picking up and throwing the ball is wrong, with her friend Tamika then telling the rules of soccer. This therefore demonstrates Charlie's schema of Australian football restructuring to integrate the new information that round balls are not used for Australian football.[3]]

⟋ ✕   I have identified the cognitive process which occurred as accommodation.[1]

⟋ ✕   I have explained the process of accommodation, referring to the change of a pre-existing schema to fit in new information.[2]

⟋ ✕   I have referred to relevant information from the scenario to support my response.[3]

⟋ ✕   I have referred to the characters' names in my response (Charlie and Tamika), and to the scenario.

Questions from multiple lessons

14 [The type of plasticity which facilitates the creation of schemas, as well as the processes of assimilation and accommodation, is developmental plasticity.[1]] [Developmental plasticity involves changes in the brain in response to ageing and maturation, which are involved in the learning which impacts new and existing schemas.[2]]

⟋ ✕   I have named the type of plasticity as developmental plasticity.[1]

⟋ ✕   I have described the process of developmental plasticity.[2]

Other acceptable responses could include:

- Adaptive plasticity due to the modification and creation of schemas that occur across the lifespan in response to learning from experiences.

4F   Piaget's theory of cognitive development

Theory-review questions

1 A. *Piaget developed specific stages of cognitive development that he believed occurred in children.*

2 A. *In each stage there is a set of accomplishments children are said to achieve. However, research has shown that these achievements aren't dependent on critical periods, with many individuals developing these cognitive abilities at ages different to Piaget's theory.*

3

Concrete thinking   **Symbolic thinking**
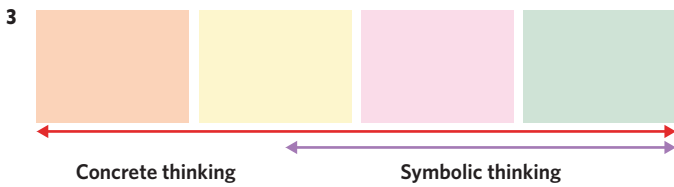
Concrete thought, which involves the comprehension of tangible objects, is developed earlier, with symbolic thought starting to develop during the preoperational stage.

4 Concrete thoughts are more **literal**, whereas symbolic thoughts can be **hypothetical**. *Concrete thought is limited to the comprehension of more tangible concepts, in which concepts and objects are solely interpreted literally. In contrast, symbolic thought allows the production and comprehension of hypothetical and abstract thinking.*

5 C. *Piaget's underestimation of children's cognitive abilities is heavily criticised. It was found that Piaget relied too much on the tasks he developed to identify children's cognitive abilities when these tests may not have accurately represented the cognitive abilities of children.*

Skills

Understanding research

6 B   **7** A   **8** A

Exam-style questions

Multiple-choice questions

9 B   **10** C   **11** D   **12** A

13 B

Short-answer questions

14 [An example of a symbolic thought is pretend play, such as using gumnuts as a form of currency in the playground at school.[1]]

✓ ✗   I have provided a relevant example of symbolic thought.[1]

15 **a** [According to Piaget, the children in Mr Jenson's study would be in the concrete operational stage.[1]]

✓ ✗   I have identified that the children would be in the concrete operational stage.[1]

✓ ✗   I have referred to the character's name in my response (Mr Jenson), and to the scenario.

b [The results of Mr Jenson's study do not align with Piaget's theory as Piaget's theory outline that the ability to use logic is developed in the formal operational stage in which children are aged 12 or above.[1]] [This does not match the results of Mr Jenson's study in which children begin to use logic at the age of eight.[2]] [This occurrence relates to the criticism of Piaget's work that he underestimated the cognitive ability of children.[3]]

✓ ✗   I have explained why the results of the study do not align with Piaget's theory of development.[1]

✓ ✗   I have referred to information from the scenario to support my explanation.[2]

✓ ✗   I have referred to the relevant criticism of Piaget's theory of cognitive development.[3]

✓ ✗   I have referred to the character's name in my response (Mr Jenson), and to the scenario.

16 [The concrete operational stage involves the ability to represent concepts with symbols and words,[1]] [whereas the formal operational stage involves being able to produce hypothetical thoughts and understand abstract concepts.[2]] [An accomplishment achieved by the end of the concrete operational stage is classification,[3]] [and an accomplishment of the formal operational stage is the ability to use logic and reasoning.[4]]

✓ ✗   I have explained the concrete operational stage.[1]

✓ ✗   I have explained the formal operational stage.[2]

✓ ✗   I have provided an example of an accomplishment of the concrete operational stage.[3]

✓ ✗   I have provided an example of an accomplishment of the formal operational stage.[4]

✓ ✗   I have used an appropriate distinguishing word, such as 'whereas'.

Questions from multiple lessons

17 C

4G   Erikson's theory of psychosocial development

Theory-review questions

1 A. *Remember, the word 'psychosocial' is made up of two components: psychological (cognitive processes) and social processes, and so this development involves an interaction of the two processes.*

2 B. *All individuals are born with unique qualities and traits due to genetic influences, which can then be influenced by experience.*

3 B. *Erikson's theory differs from other models of development due to the belief that development is a continual process over the lifespan, with events at all stages of life having the potential to change behaviours, cognition and personality.*

4 A. *Erikson's theory outlines that the successful resolution of the crisis of each stage helps individuals move on to and meet the requirements of the next stage. Erikson does not specify that these are traumatic.*

5 I & III are false. II is true. *It is important to remember that Erikson's theory has been widely criticised, particularly for not having a perspective which applies to all cultures.*

4G

6 Some psychologists argue that individuals **don't** have to experience all of the crises outlined in the model to experience healthy **psychosocial** development. *This is a common criticism of Erikson's theory, with many researchers questioning whether this notion of 'crises' is correct.*

Skills

Understanding research

7 B   **8** A

Exam-style questions

Multiple-choice questions

9 A   **10** C   **11** B   **12** C

Short-answer questions

13 [Psychosocial development involves the interactions between cognitive and social processes throughout the lifespan.[1]]

✓ ✗   I have correctly outlined the process of psychosocial development.[1]

14 [Erikson's theory of psychosocial development is a theory of development in which personality is shaped by the desire to meet social and cultural expectations.[1]] [Each stage of this theory involves a psychosocial crisis, with the crisis of each stage needing to be resolved to successfully resolve the future crises of each stage.[2]]

✓ ✗   I have explained Erikson's theory of psychosocial development, with reference to the development of personality.[1]

✓ ✗   I have referred to psychosocial crises to support my explanation of Erikson's theory of psychosocial development.[2]

15 a [Identity vs. role confusion.[1]]

✓ ✗   I have correctly identified the stage that Clodagh is experiencing as identity vs. role confusion.[1]

b [Clodagh is experiencing the crisis of the stage identity vs. role confusion by experiencing role confusion.[1]] [This is seen through Clodagh questioning her values and being unsure about where she fits in, demonstrating that she is uncertain about her identity and does not hold a strong sense of who she is.[2]]

✓ ✗   I have correctly identified that Clodagh is experiencing role confusion.[1]

✓ ✗   I have referred to the scenario to justify my response.[2]

✓ ✗   I have used the terminology of Erikson's model, using the phrase 'role confusion'.

✓ ✗   I have referred to the character's name in my response (Clodagh), and to the scenario.

Questions from multiple lessons

16 B

Chapter 4 test

Multiple-choice questions

1 C   **2** B   **3** B   **4** A
5 D   **6** C   **7** D   **8** B

Short-answer questions

9 [Psychological development involves the changes in an individual's emotional, cognitive and social growth across the lifespan.[1]]

✓ ✗   I have outlined what is meant by psychological development.[1]

10 [Insecure-avoidant attachment is a style of attachment in which the infant may be reluctant to or avoid contact from their primary caregiver, usually formed due to a lack of responsiveness to their needs.[1]]

✓ ✗   I have described insecure-avoidant attachment.[1]

11 [Maturation involves the biologically determined changes which facilitate development from conception through to adulthood.[1]]

✓ ✗   I have described the process of maturation.[1]

12 [Concrete thought is based on knowledge acquired from personal experience and involves literal interpretations of tangible objects.[1]] [For example, understanding numeracy due to using blocks to count.[2]]

✓ ✗   I have defined concrete thought, referring to literal interpretations.[1]

✓ ✗   I have provided a relevant example of concrete thought.[2]

13 [The ability to verbally produce single words is likely to have a sensitive period.[1]] [This is due to Genie still being able to learn how to verbally produce single words at an older age, suggesting that the set period is flexible, although it does take longer to learn the skill.[2]]

✓ ✗   I have explained that the ability to verbally produce single words is likely to have a sensitive period.[1]

✓ ✗   I have justified my response by referring to a characteristic of sensitive periods evident in the scenario.[2]

✓ ✗   I have referred to the character's name in my response (Genie), and to the scenario.

14 a [Harper is in the integrity versus despair stage.[1]]

✓ ✗   I have identified that Harper is in the integrity versus despair stage.[1]

✓ ✗   I have referred to the character's name in my response (Harper), and to the scenario.

b [Harper is not displaying healthy emotional development, which involves the continuous development of skills which allow individuals to control, express and recognise emotions in an appropriate way.[1]] [This can be seen as she has been unable to appropriately express her emotions, coming off as grumpy and irritable to her family for a prolonged period of time.[2]]

✓ ✗ I have identified that Harper is not displaying healthy emotional development.[1]

✓ ✗ I have used an appropriate example from the scenario to justify my response.[2]

✓ ✗ I have referred to the character's name in my response (Harper), and to the scenario.

Other acceptable responses could include:

- Harper is displaying healthy emotional development, as long as appropriately justified, e.g. is irritable due to experiencing a crisis, so her mood is in proportion with her experience.

15 a [Environmental factors arise from an individual's physical and social surroundings,[1]] [and significantly shape psychological development, for example, by shaping what knowledge individuals learn and when they learn it.[2]]

✓ ✗ I have described environmental factors.[1]

✓ ✗ I have briefly outlined how environmental factors shape psychological development.[2]

b [Piaget's 'universal' theory of cognitive development suggests that each child achieves certain cognitive accomplishments at set times. This may be inaccurate as the theory ignores the influence of environmental factors on cognitive development.[1]] [This is due to the theory ignoring how each individual's unique experiences, and the times in which they learn things impact on their cognitive development, with some individuals being more likely to reach cognitive achievements earlier than others due to their experiences in their environment.[2]]

✓ ✗ I have stated how Piaget's 'universal' theory ignores the influence of environmental factors on psychological development.[1]

✓ ✗ I have referred to the impact of environmental factors on psychological development to justify my response.[2]

16 a [The statement aligns with the nature perspective.[1]]

✓ ✗ I have named nature as the perspective of the debate that the statement aligns with.[1]

b [It is now widely accepted that there is an interaction between nature and nurture in psychological development, rather than one perspective dominating development.[1]] [For this reason, the statement is likely to be false, as genetics can contribute to the likelihood of developing a mental health disorder, but environmental factors, such as traumatic life experiences, do as well.[2]]

✓ ✗ I have referred to researchers now accepting that there is an interaction between nature and nurture.[1]

✓ ✗ I have explained that this statement is likely to be false due to ignoring the influence of environmental factors on the development of mental health disorders.[2]

c [If this statement was true, identical (monozygotic) twins would have the same likelihood of developing specific mental health disorders due to their genetics.[1]] [Additionally, adoption studies would demonstrate that if identical twins were adopted by different families and grew up in different environments, they would still

have the exact same likelihood of developing certain mental health disorders because they would have inherited them from their biological parents.[2]]

✓ ✗ I have explained that twin studies would demonstrate that identical twins have the same likelihood of developing specific mental health disorders if the statement was true.[1]

✓ ✗ I have explained that adoption studies would demonstrate that identical twins adopted into different families would have the same likelihood of developing specific mental health disorders if the statement was true.[2]

Key science skills questions

17 C

18 a [The population is four-year-old children,[1]] [whereas the sample is the 20 four year-old children from the local kindergarten.[2]]

✓ ✗ I have correctly outlined the population as four year-old children.[1]

✓ ✗ I have correctly outlined the sample as the 20 four year-old children from the local kindergarten.[2]

b [One ethical consideration Dr Farrell has violated is informed consent[1]] [which involves participants having a thorough understanding of the nature and risks of the experiment.[2]] [This has been violated in the scenario due to the four-year-old children being under the age of 18, and therefore requiring informed consent from their parents or legal guardians on their behalf which did not occur.[3]]

✓ ✗ I have correctly identified an ethical consideration Dr Farrell violated.[1]

✓ ✗ I have correctly explained an ethical consideration Dr Farrell violated.[2]

✓ ✗ I have justified my response by referring to relevant information from the scenario.[3]

✓ ✗ I have referred to the character's name in my response (Dr Farrell), and to the experiment scenario.

Other acceptable responses could include:

- Voluntary participation
- Withdrawal rights

Questions from multiple chapters

19 B

20 [The Wernicke's area is primarily involved in language comprehension,[1]] [while the Broca's area is primarily involved in speech production.[2]]

✓ ✗ I have identified the Wernicke's area as the area involved primarily in language comprehension.[1]

✓ ✗ I have identified the Broca's area as the area involved primarily in speech production.[2]

5A Understanding normality and mental health

Theory-review questions

1 **Normality** is a broad term that relates to common and accepted thoughts, feelings, and behaviours that can be understood from many different approaches. Normality emerges on an individual level through **typical behaviours** that match someone's regular activity and can be distinguished from **atypical behaviours** which are uncommon for the individual. Normality is further understood through **adaptive behaviours** that enable someone to change according to different demands. This can be distinguished from **maladaptive behaviours** that impair someone from coping with different challenges across time. *Normality can be more specifically investigated in terms of how an individual demonstrates typical and atypical behaviours, relating to how common behaviours are for that person, as well as adaptive and maladaptive behaviours, relating to if someone is able to change their behaviours according to different situations.*

2 B. *This is false. There are many different approaches to understanding normality, not one authoritative or universal definition.*

3 III & V. *Socio-cultural approaches to normality must consider what is considered as acceptable according to social codes set by different cultures.*

4 The current state of a person's psychological wellbeing and functioning at any given time is referred to as **mental health**, whereas a **mental health disorder** occurs when there is a severe disturbance and sense of distress which significantly impacts an individual's ability to function independently. *Mental health refers broadly to psychological wellbeing and functioning, which in the case of severe distress can be impaired and therefore become a mental health disorder.*

5 B. *This is false. The idea of mental health as a continuum is that a person's mental health state varies and placement on the continuum therefore changes over time.*

Skills

Unpacking the scenario

6 B   7 B

Exam–style questions

Multiple-choice questions

8 D   9 A   10 B   11 C

12 C   13 A

Short-answer questions

14 [The situational approach defines normality according to what is standard and accepted in specific contexts.[1]][For example, trying to pin someone to the ground would be considered normal during a boxing match, despite this behaviour be being abnormal in other contexts, like when in a public library.[2]]

✓ ✗ I have described the situational approach to normality.[1]

✓ ✗ I have provided an example of the situational approach to normality.[2]

15 [The historical approach to normality defines normality according to the standard and acceptable thoughts, feelings, and behaviours of a particular period of time,[1]][whereas the socio-cultural approach to normality to defines normality according to the standard social codes of a particular culture.[2]]

✓ ✗ I have described the historical approach to normality, with reference to how it relates to the standard thoughts, feeling, and behaviours of a historical era.[1]

✓ ✗ I have described the socio-cultural approach to normality, with reference to how it relates to the standard social codes of a particular culture.[2]

✓ ✗ I have used an appropriate distinguishing work, such as 'whereas'.

16 [A mental health disorder is a diagnosed psychological state characterised by the presence of a severe disturbance and sense of distress which significantly impacts an individual's ability to function independently.[1]][The mental health continuum is a tool used to track progression of mental health which consistently fluctuates over time, progressing from mentally healthy, to mental health problems, to mental health disorders.[2]][Mental health disorders therefore constitute a point on one end of the mental health continuum, which someone may reach at a particular time but not be assigned to indefinitely.[3]]

✓ ✗ I have defined a mental health disorder.[1]

✓ ✗ I have demonstrated an understanding of the concept of a mental health continuum.[2]

✓ ✗ I have explained how mental health disorders relate to the mental health continuum.[3]

Questions from multiple lessons

17 D   18 A

5B Factors influencing mental health and coping

Theory-review questions

1 There are different approaches to understanding mental health. The **biopsychosocial model** characterises the different factors that impact mental health as either biological, psychological or social, which informs what could have led to the development of a **mental health disorder** and therefore what needs to be addressed to improve the state of mental health. Biological and psychological factors can be considered **internal**, whereas social factors can be considered **external**. *There is no one universal way to conceptualise mental health. There are different approaches that can help characterise and track what impacts our levels of functioning, among which is the biopsychosocial model and internal and external factors. These approaches are related insofar as internal factors have biological and psychological components and external factors have social components.*

2 B. *The biopsychosocial model aims to characterise factors as either biological, psychological or social to distinguish how each influences mental health.*

3 I; II; III & IV. *Internal factors all stem from within the individual, such as exercising. External factors, by contrast, originate from an outside source, such as support from a family member.*

4 III & IV. *It is only these two options that are psychological because they specifically involve cognitive and affective processes, such as how a situation is conceptualised as being positive or negative and the thought processes involved.*

5 The loss of a significant relationship can be considered a social factor because it relates to an individual's **external** environment as opposed to their **internal** biological or psychological functioning. *The loss of a significant relationship is an external and social factor because it originates from an outside source for the individual experiencing it.*

6 A. *Biological factors relate to the functioning of the body, whereas psychological factors relate to our cognitive processes.*

Skills

Perfect your phrasing

7 A

Exam-style questions

Multiple-choice questions

8 C **9** B **10** B **11** D

Short-answer questions

12 ⌈The biopsychosocial model is a framework for approaching mental health that suggests that biological, psychological and social factors all interact and contribute to mental health.[1]⌉

 ✓ ✗ I have explained how the biopsychosocial approach to mental health includes biological, psychological and social factors.[1]

13 ⌈Support from family, friends and community is an external factor which can affect mental health.[1]⌉⌈If somebody has low levels of resilience, then having a support network that will provide help and support will enable them to cope with changes and challenges within their environment.[2]⌉

 ✓ ✗ I have identified an external factor.[1]

 ✓ ✗ I have explained how it can assist individuals to cope with change and challenge.[2]

14 ⌈An internal factor that assisted Orla to cope with the changes and challenges of breaking up with her long-term partner and arguing with friends is getting adequate sleep.[1]⌉⌈This ensures that Orla is equipped with the biological and psychological benefits of sleep that will help her to overcome her distress and begin to resume regular levels of functioning.[2]⌉

 ✓ ✗ I have identified getting adequate sleep as an internal factor.[1]

 ✓ ✗ I have explained how getting adequate sleep assisted Orla to cope with change and challenge.[2]

 ✓ ✗ I have referred to the character's name in my response (Orla), and to the scenario.

Questions from multiple lessons

15 D **16** A

5C Major categories of psychological disorder

Theory-review questions

1 A. *This is true. Only psychologists and psychiatrists can diagnose someone with a psychological disorder as they have relevant clinical training.*

2 B. *Diagnosis of psychological disorders according to their label and category must involve an assessment of whether someone meets the set diagnostic criteria for that disorder.*

3 B. *It is important to remember that these labels like 'anxiety disorders' are broader categories under which specific and diagnosable disorders fit.*

4 As categories of psychological disorder, **personality disorders** are defined by the presence of persistent socially abnormal traits and behaviours, whereas **psychotic disorders** are defined by a state in which there is a psychological misunderstanding of or break from reality. *Remember, it is important to be familiar with the defining characteristics of the five categories of psychological disorder in this lesson.*

Skills

Understanding research

5 B **6** I & III **7** B **8** A

Exam-style questions

Multiple-choice questions

9 C **10** A **11** B **12** C

13 D

Short-answer questions

14 ⌈Labelling someone with a psychological disorder can help a mental health professional to devise a targeted treatment for their symptoms.[1]⌉ ⌈However, labels can sometimes create social or self stigma, potentially alienating or making someone feel ashamed in society.[2]⌉

 ✓ ✗ I have outlined one benefit of labelling someone with a psychological disorder.[1]

 ✓ ✗ I have outlined one limitation of labelling someone with a psychological disorder.[2]

15 ⌈Both bipolar disorders and depressive disorders are a type of mood disorder.[1]⌉⌈However, while depressive disorders are characterised by persistent and extreme low mood, in contrast, bipolar disorders involve fluctuation between mania and hypomania (heightened mood) and lower moods.[2]⌉

 ✓ ✗ I have described one similarity between depressive disorders and bipolar disorders.[1]

 ✓ ✗ I have described one difference between depressive disorders and bipolar disorders.[2]

16 a ⌈Cultural acceptance of gambling behaviour may have been a social risk factor to the development of Hank's gambling addiction.[1]⌉

 ✓ ✗ I have identified one possible social risk factor to Hank's gambling addiction.[1]

 ✓ ✗ I have referred to the character's name in my response (Hank), and to the scenario.

b ⌈Hank may have demonstrated frequent and uncontrollable gambling behaviour, such as placing a lot of money on a sporting bet when he couldn't resist.[1]⌉⌈He may have also experienced cognitive distortions, such as believing that he is lucky and can 'beat the game'.[2]⌉

 ✓ ✗ I have identified one behaviour relevant to gambling addiction that Hank may have demonstrated.[1]

 ✓ ✗ I have identified one cognition relevant to gambling addiction that Hank may have demonstrated.[2]

 ✓ ✗ I have referred to the character's name in my response (Hank), and to the scenario.

5C

17 [No.[1]][Isobel is unlikely to be diagnosed with a personality disorder because although her peers may find her odd, there is not enough evidence that her behaviour is odd enough to be socially or culturally unacceptable,[2]][nor is there evidence that this behaviour causes Isobel or her peers any distress or harm.[3]]

✓	✗	I have correctly identified that based on this information, Isobel could not be diagnosed with a personality disorder.[1]
✓	✗	I have provided one justification for why there is not evidence in the scenario for a diagnosis, with reference to a characteristic of personality disorders.[2]
✓	✗	I have provided one other justification for why there is not evidence in the scenario for a diagnosis, with reference to another characteristic of personality disorders.[3]
✓	✗	I have referred to the character's name in my response (Isobel), and to the scenario.

Other acceptable responses could include:

- Other justifications, so long as they made reference to another consistent characteristic of personality disorder that Isobel did not clearly demonstrate.

18 [One characteristic of anxiety disorder is that Thi describes that she feels persistent worry and apprehension about something bad happening in the future.[1]][Another characteristic is that she also describes physical symptoms of anxiety like feeling nauseous.[2]][One intervention Thi's psychologist might suggest is the use of breathing regulation exercises in order to control her physiological arousal.[3]][Another possible intervention could be the prescription of anti-anxiety medication which could work to reduce any brain chemistry problems Thi has that might cause her to experience anxiety.[4]]

✓	✗	I have identified one characteristic of anxiety disorders that Thi described.[1]
✓	✗	I have identified another characteristic of anxiety disorders that Thi described.[2]
✓	✗	I have described one possible intervention Thi's psychologist might suggest.[3]
✓	✗	I have described one other possible intervention Thi's psychologist might suggest.[4]
✓	✗	I have referred to the character's name in my response (Thi), and to the scenario.

Other acceptable responses could include:

- Other characteristics of anxiety that Thi described and other possible interventions commonly recommended to treat anxiety disorders.

Questions from multiple lessons

19 C

5D Schizophrenia and the 'two-hit' hypothesis

Theory-review questions
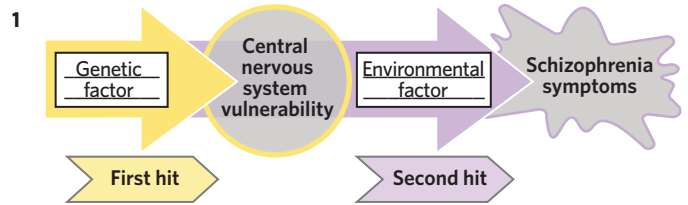
1

2 B. *This is false because the first 'hit' may also or alternatively involve genetic mutation developed before birth but one that is not necessarily inherited.*

3 B. *While the second hit must be environmental, it does not necessarily have to be social; for example, it may involve an individual using specific illicit drugs which can trigger the onset of symptoms.*

4 I; II; IV & VI. *These are all environmental factors and therefore may be potential second 'hits'.*

5 B. *The biopsychosocial model is the predominant model used for most disorders, and while the 'two-hit' hypothesis may be useful for some disorders, it does not explain all disorders.*

Skills

Perfect your phrasing

6 B

Exam-style questions

Multiple-choice questions

7 C   **8** B   **9** C

Short-answer questions

10 [The 'two-hit' model suggests schizophrenia must be developed by a genetic influence followed by an environmental influence (which may be biological, psychological or social),[1]][whereas the biopsychosocial model more generally looks at how various biological, psychological, and social factors may interact in any order to contribute to the development of schizophrenia; i.e., a genetic factor does not always have to be the first influence.[2]]

✓	✗	I have described that the 'two-hit' model explains the development of schizophrenia in terms of two factors: a genetic followed by an environmental factor.[1]
✓	✗	I have described how the biopsychosocial model looks at the influence of biological, psychological, and social factors on the development of schizophrenia in any order.[2]
✓	✗	I have used an appropriate distinguishing word, such as 'whereas'.

11 [The 'two-hit' hypothesis explains that schizophrenia results from a combination of genetic and environmental factors.[1]][The first hit must be a genetic factor, such as inheriting a predisposition for the disorder from a family member,[2]][while the second hit must be an environmental factor that causes significant distress, such as growing up in a hostile environment.[3]]

✓ ✗ I have explained that the 'two-hit' hypothesis explains schizophrenia as a result of genetic and environmental factors.[1]

✓ ✗ I have explained that the first hit must be genetic and provided an example.[2]

✓ ✗ I have explained that the second hit must be environmental and provided an example.[3]

Questions from multiple lessons

12 a [Julian's mother's death might be considered a 'second hit' according to the model,[1]] [because it is a very stressful environmental factor that occurred later in life that might be responsible for the onset of Julian's symptoms if it interacted with the vulnerability caused by a first hit.[2]]

✓ ✗ I have correctly explained how Julian's mother's death would be regarded as a second hit according to the model.[1]

✓ ✗ I have explained why this factor could be accounted for as a second hit, using the phrase 'environmental factor' and referring to its interaction with the first hit.[2]

✓ ✗ I have referred to the character's name in my response (Julian), and to the scenario.

b [Julian's belief that he is able to control the tides is an example of a delusion.[1]] [This is because it is a firm belief he holds that conflicts with strong counter evidence from reality.[2]]

✓ ✗ I have correctly identified this symptom as a delusion.[1]

✓ ✗ I have justified my response.[2]

✓ ✗ I have referred to the character's name in my response (Julian), and to the scenario.

Chapter 5 test

Multiple-choice questions

1	D	2	B	3	A	4	B
5	C	6	A	7	D	8	B

Short-answer questions

9 [The functional approach to normality defines what is 'normal' as the thoughts, feelings, and behaviours that enable the individual to meet the demands of everyday life.[1]]

✓ ✗ I have described the functional approach to normality.[1]

10 [Internal factors are factors which arise from within the individual and provide the biological or psychological support required in order to cope with the changes and challenges brought about by everyday life.[1]]

✓ ✗ I have explained what is meant by internal factors that assist an individual to cope with change and challenge.[1]

11 [Anxiety disorders are a group of psychological disorders characterised by extreme, ongoing worry and distress, usually for future events.[1]]

✓ ✗ I have explained what characterises the category of anxiety disorders.[1]

12 [Tracy's family history of schizophrenia might be considered a 'first hit' according to the two-hit hypothesis model of schizophrenia,[1]] [because it is a genetic factor that causes a central nervous system vulnerability to the disorder early in development and when interacting with a stressful environmental factor later in life (the second hit), this could contribute to the the onset of Tracy's schizophrenic symptoms.[2]]

✓ ✗ I have correctly explained how Tracy's family history of schizophrenia would be regarded as a first hit according to the 'two-hit' model.[1]

✓ ✗ I have correctly explained that this factor is a first hit because it could contribute to the onset of Tracy's schizophrenia symptoms by causing a central nervous system susceptibility to schizophrenia when interacting with a second environmental hit.[2]

✓ ✗ I have referred to the character's name in my response (Tracy), and to the scenario.

13 a [An internal factor in the scenario is Jessie exercising.[1]] [The using up of stress hormones as achieved through exercising biologically enhances Jessie's performance when studying.[2]]

✓ ✗ I have identified an internal factor in the scenario.[1]

✓ ✗ I have explained how it helped Jessie to cope with the challenge of her exams, with reference to how it biologically prepares her for study.[2]

✓ ✗ I have referred to the character's name in my response (Jessie), and to the scenario.

b [An external factor in the scenario is Jessie getting help from her friends and teachers.[1]] [Jessie has a greater capacity to work out questions she may not be able to work out herself when getting help from different people.[2]]

✓ ✗ I have identified an external factor in the scenario.[1]

✓ ✗ I have explained how it helped Jessie to cope with the challenge of her exams, with reference to how it enables her to reach different perspectives to resolve questions.[2]

✓ ✗ I have referred to the character's name in my response (Jessie), and to the scenario.

14 [One characteristic of psychotic disorders that Fiona describes is delusions.[1]] [Fiona maintains rigid and fixed beliefs about the world ending, even when counterevidence is provided that would suggest that it is unlikely that this will occur.[2]] [Another characteristic of psychotic disorders that Fiona describes is hallucinations.[3]] [Fiona describes experiencing visual stimuli as though they are a real perception, despite these objects not existing in reality.[4]]

✓ ✗ I have identified one characteristic of psychotic disorders that Fiona describes to her psychologist.[1]

✓ ✗ I have described the first characteristic of psychotic disorders that Fiona describes to her psychologist.[2]

✓ ✗ I have identified a second characteristic of psychotic disorders that Fiona describes to her psychologist.[3]

✓ ✗ I have described the second characteristic of psychotic disorders that Fiona describes to her psychologist.[4]

✓ ✗ I have referred to the character's name in my response (Fiona), and to the scenario.

15 [A social risk factor that Jasmine has experienced is the loss of a significant relationship.[1]][This has impacted Jasmine's functioning by making it more difficult for her to complete daily tasks like shopping that were usually shared between her and her partner.[2]][A psychological risk factor that Jasmine is experiencing is rumination.[3]][By thinking about the breakup over and over again, this makes it more challenging to Jasmine to concentrate on other tasks such as that which is required for work.[4]]

✓ ✗ I have identified the loss of a significant relationship as a social risk factor.[1]

✓ ✗ I have described how the loss of a significant relationship has impacted Jasmine's functioning.[2]

✓ ✗ I have identified rumination or thinking about the breakup repeatedly as a psychological risk factor.[3]

✓ ✗ I have described how rumination or thinking about the breakup repeatedly has impacted Jasmine's functioning.[4]

✓ ✗ I have referred to the character's name in my response (Jasmine), and to the scenario.

16 [The situational approach is one approach to understanding normality.[1]][According to this approach, singing and dancing expressively would be considered normal when at a concert given that this behaviour is common and acceptable in this environment.[2]]

✓ ✗ I have identified an approach to understanding normality.[1]

✓ ✗ I have provided an example of normal behaviour according to this approach.[2]

Other acceptable responses could include:

- Any of the socio-cultural, functional, historical, medical, or statistical approaches, as long as an appropriate example of normal behaviour according to the selected approach was provided.

Key science skills questions

17 B

18 [The potential for participants to already be taking depression medication would be an extraneous variable in Dr Lieberman's experiment.[1]][This is because it had the potential to cause an effect on the dependent variable (alleviation of depression symptoms) for a reason other than the independent variable (taking Dr Lieberman's depression medication).[2]]

✓ ✗ I have identified that the potential for participants to already be taking depression medication would be an extraneous variable.[1]

✓ ✗ I have justified my response, with reference to how it could cause a change on the dependent variable outside of the change caused by the independent variable.[2]

✓ ✗ I have referred to the character's name in my response (Dr Lieberman), and to the scenario.

Other acceptable responses could include:

- You may have specified the type of variable as 'participant differences' or 'participant-related extraneous variables'.

Questions from multiple chapters

19 A

20 [Lotte is describing insecure-avoidant attachment.[1]][This could act as a social factor that increases the likelihood of developing a mental health disorder later in life by making it less likely for Lotte to reach out for social support from friends and family when she requires it to maintain her levels of functioning.[2]]

✓ ✗ I have identified the type of attachment that Lotte is describing as insecure-avoidant attachment.[1]

✓ ✗ I have explained how it could act as a social factor that increases the likelihood of developing a mental health disorder later in life.[2]

✓ ✗ I have referred to the character's name in my response (Lotte), and to the scenario.

6A   Sensation and perception

Theory-review questions

1 C. *Sensation and perception both deal with sensory information but in different ways: sensation receives and sends it, while perception processes and understands it.*

2 When sensation occurs, we are **unconscious** of the sensory stimuli we are receiving. When perception occurs, we become **conscious** of it. *Remember, sensation is just the receiving and sending of sensory information before the brain even begins to interpret it.*

3 Sensation and perception involve detecting and responding to sensory data. During sensation, sensory data is **raw**. During perception, the data is **processed**. *Remember, the brain does the 'processing' of sensory information in perception; before this, the data is raw or unprocessed.*

4
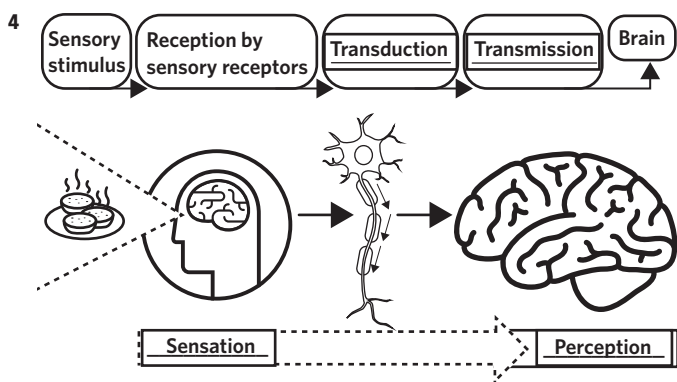
Image: Sudowoodo, Pikovit/Shutterstock.com

Sensation involves three substages that all involve dealing with the unprocessed sensory data in some way: it is received, converted and then sent.

5 B. *We can become aware of the information our senses have picked up once perception has occurred. Before that, we are not consciously aware of it.*

Skills

Perfect your phrasing

6 A

Exam-style questions

Multiple-choice questions

7 B   **8** B   **9** D   **10** D

11 C

Short-answer questions

12 [Reception is the first part of sensation and is when the sensory receptors of our sense organs first detect a sensory stimulus.[1]]

  ✓ ✗ I have outlined the process of reception.[1]

  ✓ ✗ I have referred to sensation and sensory receptors in my response.

13 [Receptive fields are the portion of space in which a sensory stimulus is detectable by sensory receptors.[1]][This limits sensation because it means that reception can only occur for stimuli within a receptor's receptive field.[2]]

  ✓ ✗ I have described what a receptive field is.[1]

  ✓ ✗ I have described how receptive fields influence sensation.[2]

  ✓ ✗ I have referred to sensory receptors and reception in my response.

14 [When someone has the sensation of the smell of a rotten egg,[1]] [transduction would work to convert the original raw data of the smell into an electrochemical signal which can be sent as a neural impulse.[2]] [Transmission would then work to send this neural signal to the brain.[3]]

  ✓ ✗ I have provided an example of a smell.[1]

  ✓ ✗ I have described how transduction would work in relation to my example.[2]

  ✓ ✗ I have described how transmission would work in relation to my example.[3]

15 **a** [For Nyjah, sensation would be functioning to detect the necessary sensory stimuli, such as the raw visual data (i.e. light energy), about his mouth and the feelings of pressure or touch when flossing and send this information to his brain.[1]][Perception would be functioning to make Nyjah aware of this stimuli and make sense of it so that he can floss his teeth with accuracy.[2]]

  ✓ ✗ I have explained the function of sensation for Nyjah when flossing his teeth.[1]

  ✓ ✗ I have explained the function of perception for Nyjah when flossing his teeth.[2]

  ✓ ✗ I have referred to the character's name in my response (Nyjah), and to the scenario.

b [Nyjah would first experience selection[1]][involving him attending to certain features such as the visual information about his mouth and floss to the exclusion of other sensory features.[2]][He would then experience organisation,[3]][involving his brain organising the various stimuli relevant to flossing into a meaningful whole.[4]] [Finally, Nyjah would experience interpretation,[5]][involving him assigning meaning to the images of him flossing using his contextual surroundings and memories.[6]]

  ✓ ✗ I have identified the stage of selection.[1]

  ✓ ✗ I have explained how selection would occur for Nyjah when flossing.[2]

  ✓ ✗ I have identified the stage of organisation.[3]

  ✓ ✗ I have explained how organisation would occur for Nyjah when flossing.[4]

  ✓ ✗ I have identified the stage of interpretation.[5]

  ✓ ✗ I have explained how interpretation would occur for Nyjah when flossing.[6]

  ✓ ✗ I have referred to the character's name in my response (Nyjah), and to the scenario.

Other acceptable responses could include:

- You may have explained selection slightly differently, saying that he attended to other features of stimuli such as the sensations of pressure and touch.

Questions from multiple lessons

16 D   **17** A

6A

6B Vision

Theory-review questions

1 A. *Sensation always occurs before perception.*

2 B. *Although a receptive field determines where visual stimuli can be received, they do not actually receive the visual information. This is first done by sensory receptors.*

3 A. *Every sensory receptor has its own receptive field, which is the area of space in which that receptor can detect sensory stimuli.*

4 A. *The process of selection also occurs in the optic nerve, and interpretation occurs not only in the primary visual cortex but in other areas of the cerebral cortex.*

5 B. *While sensation involves more unvaried, objective biological processes, perception is more varied and subject to individual differences such as their perceptual set and the rules they apply to visual stimuli.*

6 A. *A perceptual set is made up of a factor or factors which can influence the way someone perceives a visual image.*

7 B. *Depth cues depend on information from our eyes, such as the state of the eye muscles, whereas perceptual set is more composed of social and psychological factors, such as our mood, which can determine our perceptions.*

8 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.*

Skills

Understanding research

9 A   10 B   11 B

Exam-style questions

Multiple-choice questions

12 C   13 B   14 A   15 A

16 D

Short-answer questions

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 one monocular depth cue.[1]

✓ ✗ I have explained how this cue allows a person to judge depth.[2]

Other acceptable responses could include:

- Relative size
- Height in visual field
- Linear perspective
- Interposition
- Texture gradient

18 [Selection is the initial process of perception involving selecting the visual signals to pay attention to at the exclusion of others.[1]] [The filtering is done by feature detector cells in the optic nerve and primary visual cortex,[2]] [allowing us to process only the important information later in perception.[3]]

✓ ✗ I have described the process of selection in perception.[1]

✓ ✗ I have described the role of feature detectors in selection.[2]

✓ ✗ I have described the purpose of selection in perception.[3]

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 one 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 one other 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]

Other acceptable responses could include:

- You may have identified other Gestalt principles, so long as you were able to provide an explanation as to how they allowed someone to perceive or mentally complete the image on the road sign.

Questions from multiple lessons

20 A

6C Taste

Theory-review questions

1 A. *Perception for any sensory system (such as vision and taste) occurs after the message has already reached the brain.*

2 B. *Conscious awareness of any kind of sensory stimuli is only possible once perception has begun.*

3 The primary sensory organ for taste is the **tongue**. A sensory stimulus we sense during taste is called a **tastant**. During sensation, these are first received by a **gustatory receptor**. *Remember that in any sensory system (vision, taste, etc), we receive sensory stimuli with the sensory receptors on the relevant sensory organ.*

4 B. *This is false. A receptive field in taste is the area of space in which food must be in order for it to be received by a gustatory receptor. In this way, receptive fields never 'sense' flavour as they just refer to space, but gustatory receptors do 'receive' flavour information.*

5 B. *Remember that perception is influenced by more subjective factors unique to each individual, including their age, genetics, perceptual set, and culture. Age and genetics can also affect sensation, but this question asks what all of these factors may affect.*

6 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.*

Skills

Perfect your phrasing

7 A

Exam-style questions

Multiple-choice questions

8 C	9 A	10 C	11 C
12 B			

Short-answer questions

13 ⌈During transmission in taste, an action potential containing sensory data about the taste of something is sent from the tongue, via the cranial nerves[1]⌉⌈and the thalamus to the primary gustatory cortex in the cerebral cortex.[2]⌉

✓ ✗ I have described that transmission in taste involves an action potential being sent that contains sensory information about taste along the cranial nerves.[1]

✓ ✗ I have described that this information is transmitted to the primary gustatory cortex via the thalamus.[2]

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 end up perceiving.[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 which influences taste perception.[1]

✓ ✗ I have explained how age may specifically affect the way we perceive flavour.[2]

15 ⌈A person's culture can socially influence a person's 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.[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]

16 a ⌈During sensation, Hasan's gustatory receptors would receive the tastants of the apple and information about its flavour.[1]⌉ ⌈This chemical information about the flavour would then be transduced into an action potential[2]⌉⌈which would be transmitted, via cranial nerves and then the thalamus, to the primary gustatory cortex for processing.[3]⌉

✓ ✗ I have described the process of reception of the apple's flavour for Hasan.[1]

✓ ✗ I have described the process of transduction of information about the apple's flavour for Hasan.[2]

✓ ✗ I have described the process of transmission of the flavour information.[3]

✓ ✗ I have referred to the character's name in my response (Hasan), and to the scenario.

✓ ✗ I have used the terminology gustatory receptors, action potential (or electrochemical/neural message, cranial nerves, and gustatory cortex).

b ⌈Hasan's genetics may have influenced his perception of the funny taste.[1]⌉⌈For example, if he inherited the gene which gave him lots of taste buds and made him a supertaster, he may be very sensitive to odd flavours.[2]⌉

✓ ✗ I have identified one factor which may have influenced Hasan's taste perception of the funny flavour.[1]

✓ ✗ I have explained how this factor may have specifically influenced Hasan's perception of the funny flavour.[2]

✓ ✗ I have referred to the character's name in my response (Hasan), and to the scenario.

Other acceptable responses could include:

- You may have said any other relevant factor which influences perception (age, culture, perceptual set), so long as you explained it in relation to the scenario.

Questions from multiple lessons

17 ⌈Transmission in vision involves sending sensory information about images from the eye to the primary visual cortex in the brain,[1]⌉ ⌈whereas in taste, sensory information about flavour is sent from the tongue to the primary gustatory cortex in the brain.[2]⌉

✓ ✗ I have outlined how transmission occurs in visual sensation.[1]

✓ ✗ I have contrasted this with how transmission occurs in taste sensation.[2]

✓ ✗ I have referred to the type of sensory information sent, and to the primary visual cortex and primary gustatory cortex.

✓ ✗ I have used a distinguishing word, such as 'whereas'.

6D Perceptual distortions, fallibility and synaesthesia

Theory-review questions

1 B. *All of our senses are fallible and prone to making errors or experiencing perceptual distortions.*

2 A. *Visual illusions cause us to perceive images in a way that does not match physical reality, regardless of the sensations received of an image.*

3 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.*

4 B. *This is false. Depending on the texture of food, we can actually taste more or less the flavour because of how it is received in our mouth.*
These differences are real and not distortions; however, we can experience perceptual distortions that affect our flavour perception.

6D

5 Synaesthesia is a perceptual phenomenon. It occurs when a sensory stimulus first stimulates **sensation** within one sensory system, but then during **perception**, a secondary sensory system becomes involved and has unusual or abnormal experiences. *The unusual experiences of synaesthesia occur only in the perception stage and in a sense that has not undergone sensation.*

6 B. *Although some kinds of mental illness make people more likely to experience frequent perceptual distortions and errors of judgement, perceptual distortions and synaesthesia can all occur in healthy intact brains.*

Skills

Perfect your phrasing

7 B　　　　　**8** A

Exam-style questions

Multiple-choice questions

9 C　　　　**10** A　　　　**11** C　　　　**12** A

Short-answer questions

13 [The texture of food can influence how intense a flavour is because texture determines how much food is received by our taste receptors.[1]] [Texture can also influence how much we enjoy flavour, because if texture is unexpected we may not like the flavour experience of food.[2]]

✓ ✗ I have described one way the texture of flood influences our judgement of flavour.[1]

✓ ✗ I have described one other way the texture of flood influences our judgement of flavour.[2]

14 [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 Gestalt principle of closure to the two arrows, closing the shapes formed by the differing arrowheads. When completed or "closed", the shape of the inverted arrowhead is longer and bigger than the shape with the regular arrowhead, and so we perceive the former as being longer.[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 responses could include:

- Other visual illusions, as long as your explanation for why they occur is relevant and accurate.

15 [Synaesthesia occurs when sensation within one sensory system activates regular perception in that same sensory system but also activates another unstimulated sensory system which integrates unusual perceptions of that stimulus.[1]] [One characteristic of synaesthesia is that it is experienced 'one-way' in that if a person tastes a flavour when seeing a certain word, they won't then automatically see that word when tasting that flavour.[2]] [Another characteristic is that it is automatic and involuntary.[3]]

✓ ✗ I have explained synaesthesia as a perceptual phenomenon.[1]

✓ ✗ I have described one characteristic of synaesthesia.[2]

✓ ✗ I have described another characteristic of synaesthesia.[3]

Other acceptable responses could include:

- Another characteristic of synaesthesia that is experienced consistently.

Questions from multiple lessons

16 [Perceptual set refers to our tendency or predisposition to interpret sensory stimuli in certain ways due to our expectations, motivations, mood etc.[1]] [Perceptual set can lead to visual or flavour distortions when we interpret images or flavours incorrectly due to these factors that make up our perceptual set.[2]] [For example, visual distortions could occur if we 'see' a ghost when actually it is a sheet in the distance if we are feeling scared.[3]] [For flavour, we might incorrectly perceive something as tasting of high quality if it is wrapped in an expensive brand's packaging.[4]]

✓ ✗ I have correctly described the concept of perceptual set.[1]

✓ ✗ I have explained how perceptual set can lead to perceptual distortions of vision and taste.[2]

✓ ✗ I have provided an example of how perceptual set can distort visual perception.[3]

✓ ✗ I have provided an example of how perceptual set can distort taste perception.[4]

Chapter 6 test

Multiple-choice questions

1 D　　　**2** A　　　**3** A　　　**4** C

5 B　　　**6** A　　　**7** B　　　**8** C

Short-answer questions

9 [In taste reception, the chemical molecules of food (tastants) are received by the gustatory receptors.[1]]

✓ ✗ I have outlined the process of reception in taste sensation.[1]

✓ ✗ I have referred to the gustatory receptors (or sensory receptors) and tastants (or food molecules) in my response.

10 [Sensation occurs unconsciously, whereas perception can occur consciously or unconsciously.[1]]

✓ ✗ I have outlined one difference between sensation and perception.[1]

✓ ✗ I have used a distinguishing word, such as 'whereas'.

Other acceptable responses could include:

- Other differences, such as that sensation refers to the process of receiving data from the external world, whereas perception involves the process of making sensory data meaningful.

11 [Sensory (gustatory) receptors in taste receive the food molecules during reception.[1]] [The food molecules which can be received by these receptors are limited by their own receptive field.[2]] [A receptive field is an area of space in which a sensory stimulus (e.g. a tastant) must be present in order for it to be received.[3]]

I have explained what a sensory receptor is in the sensory system of taste.[1]

I have explained the relationship between a sensory receptor and its receptive field.[2]

I have explained what a receptive field is in the sensory system of taste.[3]

12 [Transduction involves converting raw sensory data into an electrochemical message (action potential) so it can be sent to the brain.[1]] [In vision, this involves converting light signals into an action potential,[2]] [whereas in taste, it involves converting food chemicals into an action potential.[3]]

I have explained the process of transduction.[1]

I have explained how transduction occurs in vision.[2]

I have compared this to how transduction occurs in taste.[3]

I have used a distinguishing word, such as 'whereas'.

I have referred to an action potential/electrochemical signal in my response.

13 [Linear perspective[1]] [allows someone to see distance in the image because the point at which the parallel lines of the road converge is perceived to be the furthest away.[2]] [Texture gradient[3]] [also allows someone to see depth because the more texture detail that can be seen, the closer elements of the image appear to be, such as the bushes and the road lines that can be viewed clearly at the bottom of the image, signalling that these points are closer to the viewer.[4]]

I have named one pictorial depth cue.[1]

I have explained how this pictorial depth cue allows a person to see depth, referring to elements of the image.[2]

I have named another pictorial depth cue.[3]

I have explained how this pictorial depth cue allows a person to see depth, referring to elements of the image.[4]

Other acceptable responses could include:

- Other pictorial depth cues, so long as they could be applied to the image.

14 [Rods are photoreceptors which receive visual signals in low-light conditions.[1]] [Because cats have better night vision than humans, they may have more rods than humans.[2]] [Cones, on the other hand, are responsible for seeing fine details and colour,[3]] [and because cats can't see fine details or colours as vibrantly, they may have less cones than humans.[4]]

I have explained the role of rods.[1]

I have used this to explain why cats may have better night vision than humans.[2]

I have explained the role of cones.[3]

I have used this to explain why cats may have worse vision for fine details and colour than humans.[4]

15 [Synaesthesia occurs when an unstimulated sensory system experiences unusual perceptions when another sensory system has undergone sensation of a certain stimulus.[1]] [For Joan, the normal sensation of hearing music occurs in her auditory sensory system,[2]] [which is then sent to and perceived in the brain.[3]] [However, during this perception, her visual system also integrates the sight of colours with each note, giving rise to her experience of synaesthesia.[4]]

I have explained how synaesthesia occurs in terms of sensation and perception.[1]

I have explained how the auditory sensation of music occurs for Joan.[2]

I have explained that the auditory perception of music occurs for Joan.[3]

I have explained how the sensory system of vision integrates unusual perceptions for Joan.[4]

I have referred to the character's name in my response (Joan), and to the scenario.

16 a [First, during reception, Alex would receive the image of Kurt's pose at the photoreceptors in her eyes.[1]] [Next, her eyes would convert this light energy into an action potential during transduction.[2]] [This action potential would then be transmitted via the optic nerve and the thalamus to the primary visual cortex in the brain in the process of transmission.[3]]

I have described the process of visual reception, referring to the sensory receptors.[1]

I have described the process of visual transduction, referring the conversion of light (or electromagnetic) energy into an action potential (or electrochemical energy).[2]

I have described the process of visual transmission, referred to the optic nerve and primary visual cortex.[3]

I have referred to the characters' names in my response (Kurt and Alex), and to the scenario.

b [Organisation occurs when we regroup fragmented visual signals so that we can then make sense of them during interpretation.[1]] [For Alex, this might occur if she groups visual signals such as the edges or lines of Kurt's body which she can separate from the background image.[2]]

I have explained the process of organisation in visual perception.[1]

I have explained how organisation might occur for Alex when perceiving Kurt's pose.[2]

I have referred to the characters' names in my response (Kurt and Alex), and to the scenario.

Key science skills questions

17 B

18 a [Independent groups design.[1]]

I have correctly identified independent groups as the relevant experimental research design.[1]

b [Doctor Kenickie may have used a research assistant to create a double-blind procedure in order to prevent experimenter bias.[1]] [By using someone else to collect the data, his own expectations and biases would not influence the results.[2]]

✓	✗	I have listed one reason why Doctor Kenickie may have used a research assistant.[1]
✓	✗	I have described how using a research assistant would help with this reason.[2]
✓	✗	I have referred to the character's name in my response (Doctor Kenickie), and to the scenario.

c [A perceptual set refers to a person's predisposition to perceive in a certain way that aligns with one's expectations.[1]] [By priming participants with the knowledge and expectation that the cube 'switches', Doctor Kenickie predisposed participants in condition 1 to see a switch which explains why they saw it quicker than participants who were just told to look for something unusual.[2]]

✓	✗	I have explained what is meant by the concept 'perceptual set'.[1]
✓	✗	I have explained how the concept of perceptual set might account for the difference in results between participants.[2]
✓	✗	I have referred to the character's name in my response (Doctor Kenickie), and to the scenario.

Questions from multiple chapters

19 D

20 [Stavros' peripheral nervous system (specifically the somatic) registered the pain during sensation.[1]] [His central nervous system processed this pain during perception.[2]]

✓	✗	I have correctly identified the somatic (peripheral) nervous system as being responsible for Stavros' sensation.[1]
✓	✗	I have correctly identified the central nervous system as being responsible for Stavros' perception.[2]
✓	✗	I have referred to the character's name in my response (Stavros), and to the scenario.

7A Attitudes

Theory-review questions

1 I & III. *Remember that attitudes are usually learnt and involve assessments of anything ranging from positive to negative.*

2 A. *The model suggests that affective, behavioural, and cognitive (ABC) components need to be expressed for attitudes to exist.*

3 II & III. *Remember that affect means emotion, and so statements only relating to feelings are correct.*

4 B. *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.*

5 B. *Outside the tri-component model of attitudes, many psychologists suggest that you don't need all three components to be consistent to hold an attitude. Therefore, in reality you can argue that you do not need all three components.*

6 Attitudes form a central component of our **social cognition.** We learn what our attitudes are from **experience** and apply them to **future action**. *Attitudes are just one core component of how we make sense of the social world around us.*

Skills

Understanding research

7 I; II & IV. **8** B

Exam-style questions

Multiple-choice questions

9 A **10** D **11** B

Short-answer questions

12 [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]

13 [Nikhil holds a negative attitude towards swimming, evident in his affect towards swimming comprising feelings of anxiety.[1]][His behaviour also reflects this attitude, as he avoids swimming.[2]][Finally, he holds negative cognitions towards swimming, such as believing that swimming is dangerous for him.[3]]

✓ ✗ I have correctly identified the affective component of Nikhil's attitude.[1]

✓ ✗ I have correctly identified the behavioural component of Nikhil's attitude.[2]

✓ ✗ I have correctly identified the cognitive component of Nikhil's attitude.[3]

✓ ✗ I have referred to the character's name in my response (Nikhil), and to the scenario.

Questions from multiple lessons

14 a [Achmad may have inherited a genetic predisposition to be highly sensitive to sour or bitter foods.[1]][This means biologically that he can't stand these foods, thereby creating a negative attitude towards them.[2]]

✓ ✗ 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 referred to the character's name in my response (Achmad), and to the scenario.

Other acceptable responses could include:

- How age may have biologically influenced Achmad's attitude.

b [The behavioural component of Achmad's attitude towards sour lollies is clear in that he refuses to eat them in a game with friends.[1]]

✓ ✗ I have explained how one component of Achmad's attitude was present in this scenario.[1]

✓ ✗ I have referred to the character's name in my response (Achmad), and to the scenario.

Other acceptable responses could include:

- How the affective or cognitive component was present in this scenario.

7B Judging and perceiving others

Theory-review questions

1 In terms of the tri-component model of attitudes, stereotypes are cognitive, prejudices are **affective** and discrimination is **behavioural**. *Prejudice describes feelings held against particular groups, whereas discrimination is when these feelings turn into behaviour that disadvantages the people within these groups.*

2 C. *Person perception is a very broad term referring to any process, direct or indirect, that we use to make impressions of people.*

3 A. *The ideas presented here are not emotions or actions but are cognitions and so they are part of a stereotype.*

4 B. *Discrimination is the behavioural component of stereotypes and prejudice in the tri-component model of attitudes.*

5 I & III. *Because Luka thinks Hispanic men are threatening, he is believing in a stereotype (cognitive component) that is often perpetuated by American media that portrays Hispanic people as violent criminals. Because Luka feels scared, he also holds prejudice and this is an affective component. However, these feelings and thoughts don't translate to behaviour (discrimination).*

Skills

Unpacking the scenario

6 The person forming an attitude through processes of person perception in this scenario is **the doctor**. The doctor holding a stereotype of homeless people is evidenced by his thoughts that Sara is **mentally ill**, **on drugs** and might be imagining her cough. This stereotype has probably led to feelings of prejudice against homeless people, and led to some discriminatory behaviour. The doctor discriminating against Sara is clear in his actions of **asking whether she takes drugs, feels mentally unstable straight away and not helping her with her cough.**

Other acceptable responses could include:

- You may have filled in the blanks with slightly different wording, so long as the general ideas were similar to this answer.

Exam-style questions

Multiple-choice questions

7 D   **8** B

Short-answer questions

9 [Prejudice is a negative feeling held towards a certain social category.[1]] [For example, feeling threatened by someone because of their ethnicity.[2]]

✓ ✗ I have outlined what prejudice means.[1]

✓ ✗ I have provided an example of prejudice.[2]

✓ ✗ I have used a word like 'feeling' or 'affective' in my response.

10 [Direct discrimination is when behaviour towards a social group overtly excludes or disadvantages them,[1]] [such as laughing at someone for having a speech impediment.[2]] [However, indirect discrimination occurs when having something the same for everyone 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 an appropriate distinguishing word such as 'however'.

11 a [The stereotype of men having to have interests that aren't sensitive or in the humanities[1]] [may have made Solomon worry that he'd be viewed as weak, as interest in poetry generally involves emotional sensitivity.[2]]

✓ ✗ I have provided some stereotypes of males that may have contributed to Solomon's worries.[1]

✓ ✗ I have explained how this stereotype might have made Solomon worry in relation to the scenario.[2]

✓ ✗ I have referred to the character's name in my response (Solomon), and to the scenario.

b [The stereotype of men needing to be strong and unemotional[1]] [may have led the boys who potentially subscribe to this belief to act on it and discriminate against Solomon[2]] [by making fun of him for going to poetry.[3]]

✓ ✗ I have described a potential stereotype of men underlying the discrimination present in this scenario.[1]

✓ ✗ I have described how this stereotype may have led to discrimination.[2]

✓ ✗ I have explained how discrimination as a result of this stereotype occurred in this scenario.[3]

✓ ✗ I have referred to the character's name in my response (Solomon), and to the scenario.

Questions from multiple lessons

12 [A prejudice is an affective component and describes negative feelings held against a particular social group[1]] [such as feeling disdain for transgender people.[2]] [However, a stereotype is a cognitive component 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 an affective component.[1]

✓ ✗ I have provided an example of a prejudice.[2]

✓ ✗ I have explained what a stereotype is and identified it as a cognitive component.[3]

✓ ✗ I have provided an example of a stereotype.[4]

✓ ✗ I have used an appropriate distinguishing word such as 'however'.

7C   Explaining behaviour through attribution

Theory-review questions

1 C. *Attribution refers to both the judgement and the process of making a judgement about the causes of behaviour.*

2 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.*

3 A. *If you can notice a repeated pattern in the types of attribution someone makes, they may have an attributional style, i.e. a tendency to attribute causes in a certain way.*

4 B. *The attributions we make are subject to a range of biases. One common error is the self-serving bias which refers to our tendency to attribute our shortcomings to factors beyond our control, and successes to factors we can control.*

5 C. *Different kinds of cognitive biases can lead us to make more internal or external attributions.*

6 A. *For example, some biases make us more likely to consider internal attributions, therefore swaying the conclusion we make.*

Skills

Unpacking the scenario

7 A   **8** A   **9** A   **10** B

Exam-style questions

Multiple-choice questions

11 D   **12** B   **13** B

Short-answer questions

14 a [William's behaviour is not doing well in English class[1]] [which he attributes to an internal cause of his inability due to having a more mathematical thinking style.[2]]

✓ ✗ I have correctly identified William's behaviour (as either not doing well or not paying attention in English class).[1]

✓ ✗ I have correctly identified William's attribution, referring to 'internal'.[2]

✓ ✗ I have referred to the character's name in my response (William), 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 attributions could alter William's future behaviour.[3]

✓ ✗ I have referred to the character's name in my response (William), and to the scenario.

15 [The fundamental attribution error is a cognitive bias which affects how we attribute behaviour. Specifically, it describes our tendency to overlook external causes for other people's behaviour.[1]] [For example, if someone bumped into us we might be more likely to attribute that to an internal carelessness rather than to an external reason such as them tripping on a rock.[2]]

✓ ✗ I have explained that the fundamental attribution error is a cognitive bias which involves overlooking external causes for other people's behaviours.[1]

✓ ✗ I have included an example of the fundamental attribution error.[2]

Questions from multiple lessons

16 a [Stereotyping.[1]]

✓ ✗ I have correctly identified 'stereotype' or 'stereotyping' as the relevant concept of person perception.[1]

b [Li first observed the murder behaviour by reading about it[1]] [and then identified the murder as the behaviour.[2]] [He then made an internal attribution by thinking that the wife murdered due to resentment she might feel towards her husband.[3]]

✓ ✗ I have explained how Li observed the behaviour through reading about the murder.[1]

✓ ✗ I have explained how Li identified the behaviour as murder.[2]

✓ ✗ I have explained that Li attributed the behaviour, specifying the type (internal).[3]

✓ ✗ I have referred to the character's name in my response (Li), and to the scenario.

c [The personal factor of Li's own experience as a married man may have influenced his attribution of the murder to feelings of resentment.[1]] [If he feels resentment in his own marriage, this explanation of the cause might have come to him more quickly or biased his reasoning.[2]]

✓ ✗ I have identified personal experience as a relevant factor that may have influenced Li's attribution.[1]

✓ ✗ I have explained how this factor could have applied in the given scenario.[2]

✓ ✗ I have referred to the character's name in my response (Li), and to the scenario.

d [Defensive attributions involve attributing the cause of another's misfortune to something internal and controllable to reduce the fear of that same thing happening to us.[1]] [In this scenario, Li is making a defensive attribution by attributing the murder to a resentment he believes would never be held against him.[2]]

✓ ✗ I have described what a defensive attribution is.[1]

✓ ✗ I have explained how Li made a defensive attribution in this scenario.[2]

✓ ✗ I have referred to the character's name in my response (Li), and to the scenario.

Chapter 7 test

Multiple-choice questions

1	A	**2**	C	**3**	B	**4**	B
5	D	**6**	B	**7**	C	**8**	A

Short-answer questions

9 [A stereotype is a widely held belief and generalisation about a certain group of people.[1]]

✓ ✗ I have correctly defined stereotype.[1]

10 [Disrimination 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 the term discrimination.[1]

✓ ✗ I have provided an example of discrimination.[2]

✓ ✗ I have mentioned the word 'behaviour' in my response.

11 [Defensive attribution is a cognitive bias which affects how we attribute behaviour.[1]][Specifically, it describes how when hearing of another's misfortune, we attribute that misfortune to an internal and controllable cause in order to ease our own worry that the same could occur for us.[2]][For example, if we heard that our friend broke their leg when hit by a car, we might attribute this behaviour to them being careless and not looking when crossing the road.[3]]

✓ ✗ I have explained that defensive attribution is a cognitive bias.[1]

✓ ✗ I have explained what defensive attribution involves.[2]

✓ ✗ I have included an example of a defensive attribution.[3]

12 [According to the model, a negative attitude toward non-fiction books would have three components. Firstly, the affective component might involve feeling bored when reading non-fiction.[1]][Secondly, the behavioural component might involve avoiding reading non-fiction books and criticising them.[2]][Finally, the cognitive component might involve the belief that non-fiction books are boring because they lack literary flare and interesting language.[3]]

✓ ✗ I have explained how the affective component of a negative attitude to non-fiction might present, providing an example.[1]

✓ ✗ I have explained how the behavioural component of a negative attitude to non-fiction might present, providing an example.[2]

✓ ✗ I have explained how the cognitive component of a negative attitude to non-fiction might present, providing an example.[3]

13 [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]

14 a [Leo behaves in a non-threatening way towards women, by skipping, smiling and crossing the road when he sees a woman alone at night.[1]][This behaviour might reflect a positive attitude he holds towards women, such as a respect for women and the belief that they should feel safe at night.[2]]

✓ ✗ I have correctly explained Leo's behaviour in this scenario.[1]

✓ ✗ I have explained an attitude towards women that Leo's behaviour might reflect.[2]

✓ ✗ I have referred to the character's name in my response (Leo), and to the scenario.

b [A stereotype of men as threatening, scary, and dangerous[1]][may have influenced Leo to behave in a way that shows he does not fit in with this stereotype.[2]]

✓ ✗ I have described a stereotype of men that may have influenced Leo's behaviour.[1]

✓ ✗ I have described how this stereotype may have directly influenced Leo's behaviour.[2]

✓ ✗ I have referred to the character's name in my response (Leo), and to the scenario.

15 [Cognitive dissonance refers to a feeling of stress we feel when different components of our attitude don't align.[1]][For example, we may feel uncomfortable if we believe smoking is bad for our health (cognitive component) but have a cigarette at a party (behavioural component).[2]]

✓ ✗ I have explained what is meant by cognitive dissonance, referring to components of attitudes not matching.[1]

✓ ✗ I have provided an example of cognitive dissonance.[2]

16 [Discrimination refers to behaviour performed on the basis of views held against a certain group of people in society, generally informed by stereotypes of that group.[1]][In this scenario, the researchers demonstrated discrimination when they felt annoyed towards Scarlett offering her opinion,[2]][possibly informed by a stereotype of young, pretty, women or bartenders not being intelligent.[3]]

✓ ✗ I have described what discrimination is, using a word like 'behaviour' or 'action'.[1]

✓ ✗ I have described when discrimination occurred in the scenario.[2]

✓ ✗ I have explained how this prejudice may have been informed by a stereotype.[3]

✓ ✗ I have referred to the character's name in my response (Scarlett), and to the scenario.

Key science skills questions

17 D

18 [It was hypothesised that[1]][greater levels of exposure to an ethnic group[2]][will reduce[3]][the prejudice held by outsiders.[4]]

✓ ✗ I have started my hypothesis with the phrase 'It was hypothesised that...'.[1]

✓ ✗ I have stated the independent variable (exposure to an ethnic group).[2]

✓ ✗ I have stated the direction of my hypothesis.[3]

✓ ✗ I have stated the dependent variable (prejudice levels).[4]

Questions from multiple chapters

19 C

20 a [Jun's classmates held the stereotype that Japanese people are quiet and reserved.[1]][This acted as a social factor because the societal expectation and stereotype of Japanese people led Jun's peers to find him funny and odd.[2]][This may have impacted Jun's mental health because his peers' beliefs caused him to experience distress at his new school, as seen in him no longer behaving as he would want to or participating in what he enjoys.[3]]

✓ ✗ I have explained how a stereotype was present in this scenario.[1]

✓ ✗ I have explained how the stereotype identified acted as a social factor.[2]

✓ ✗ I have explained how this factor may have negatively impacted Jun's mental health.[3]

✓ ✗ I have referred to the character's name in my response (Jun), and to the scenario.

b [Jun's affective component of his attitude was that he loved and felt positive towards acting.[1]][Initially, his behaviour was consistent with this component as he was willing to perform for his class.[2]] [However, after being laughed at, he became too uncomfortable to perform and no longer had behaviour consistent with his love of acting.[3]]

✓ ✗ I have identified that Jun's affective component of his attitude towards acting.[1]

✓ ✗ I have explained how Jun's behaviour was initially consistent with this component.[2]

✓ ✗ I have explained how his behaviour changed to be inconsistent with this component.[3]

✓ ✗ I have referred to the character's name in my response (Jun), and to the scenario.

8A   Experiments on status and power

Theory-review questions

1   A group involves **two** or more people who interact and influence each other and share a common **purpose**. *For a collection of people to be classified as a group, there are conditions that need to be met. This includes there being two or more people and sharing a common purpose or goal.*

2   A. *Status is not about the labels or position each individual believes that they have within a group. Rather, it is about the perception of their position within the group, as perceived by other group members.*

3   B. *Group members who are perceived to have a greater status have more power over the group members. By having power, this means that they have the ability to influence or control another individual's thoughts, feelings and behaviours.*

4   II & IV. *The Stanford prison experiment was conducted in a basement at Stanford University, with male participants being assigned to the role of either a prisoner, or a prison guard.*

5   B. *Participants were debriefed at the end of the study, however researchers questioned whether the debriefing was adequate. Withdrawal rights were breached as many of the participants felt as though they could not leave the study, with some even being convinced to stay when they requested to leave.*

Skills

Understanding research

6   A   **7**   B   **8**   B

Exam-style questions

Multiple-choice questions

9   B   **10**   C   **11**   A   **12**   D

Short-answer questions

13   [Power refers to the extent to which an individual can influence or control another individual's thoughts, feelings and behaviour.[1]]

    ✓   ✗   I have defined power.[1]

14   [A group involves two or more people who interact with and influence each other and share a common purpose.[1]] [An example of a group is a team of students who are working together to complete a group assignment and want to achieve a good mark.[2]]

    ✓   ✗   I have described the concept of a group.[1]

    ✓   ✗   I have provided an example of a group.[2]

15   **a**   [The aim of the experiment was to investigate the effect on behaviour of assigning individuals with roles in a prison environment.[1]]

      ✓   ✗   I have identified the aim of the experiment.[1]

    Other acceptable responses could include:

- The aim being to investigate the effects of assigning some individuals with a greater status and power or investigating the effects of status and power in a group.

    b   [This involved the use of coercive power.[1]] [This is due to coercive power involving providing individuals with punishments for behaviours,[2]] [such as the guards punishing the prisoners by making them do push ups or putting them in solitary confinement.[3]]

      ✓   ✗   I have outlined the type of power as coercive power.[1]

      ✓   ✗   I have explained coercive power.[2]

      ✓   ✗   I have referred to the experiment to justify my response.[3]

    c   [This violates the no-harm principle as participants experienced physical and psychological harm.[1]]

      ✓   ✗   I have identified the participant right as the no-harm principle.[1]

Questions from multiple lessons

16   C

8B   Experiments on obedience

Theory-review questions

1   Obedience refers to **complying with** the demands of a/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.*

2   I & III. *Status and proximity both increase the likelihood of someone obeying the demands of an authority figure. Shyness is not a factor affecting obedience.*

3   A. *Group pressure involves a greater likelihood to obey authority figures when observing others also obeying. This is due to these individuals justifying their actions as they see others acting in the same way, or feeling as if they don't want to be left out.*

4   C. *The participants carried out the role of the teacher, in which they quizzed the student and administered shocks to the student for any wrong answers.*

5   B. *Although Milgram's study has been criticised for violating the no-harm principle, this has been for other reasons as the participants played the role of the teacher and therefore did not shriek in pain after receiving shocks. Instead, they were told to continue with the experiment when they did not want to.*

Skills

Perfect your phrasing

6   B   **7**   A

Exam-style questions

Multiple-choice questions

8   D   **9**   B   **10**   D   **11**   C

Short-answer questions

12   [Milgram's obedience experiment violated the no-harm principle due to not safeguarding the physical and psychological safety of participants.[1]] [For example, many participants experienced psychological pain and distress while administering shocks, with many participants sweating, nervously shaking and stuttering.[2]]

    ✓   ✗   I have explained how Milgram's experiment violated the no-harm principle.[1]

    ✓   ✗   I have used an example from the study to justify my response.[2]

Other acceptable responses could include:

- Other examples of harm caused to participants, such as participants experiencing physical pain during the shock at the start of the experiment when they experienced a shock of 45 volts.

13 a ⎡The 'experimenter' was the authority figure in Milgram's obedience experiment.**[1]**⎤

> ✓ ✗ I have identified the 'experimenter' as the authority figure in Milgram's obedience experiment.**[1]**

b ⎡It is likely that the participant would be less likely to obey the demands of the authority figure (the experimenter) if there was no wall separating the participant (teacher) and student during the study.**[1]**⎤⎡This is due to the participant and student being in closer social (or physical) proximity. The participant would be able to visually see the painful reactions to the electric shocks, making them less likely to continue to administer increasingly intense shocks.**[2]**⎤

> ✓ ✗ I have predicted that the participant is less likely to obey.**[1]**

> ✓ ✗ I have referred to the factor of social or physical proximity to justify my prediction.**[2]**

c ⎡The participant and student interacting at the end of the experiment is part of the debriefing ethical principle.**[1]**⎤⎡This is due to the interaction intending to assure the participant that they did not inflict any pain on the student to ensure that they do not leave the study in distress, as well as debriefing the participant about the use of deception in the study.**[2]**⎤

> ✓ ✗ I have identified the ethical principle as debriefing.**[1]**

> ✓ ✗ I have justified my response by explaining that the interaction, referring to the components of debriefing it included.**[2]**

Questions from multiple lessons

14 C

8C Experiments on conformity

Theory-review questions

1 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. *Asch's original study focused on whether individuals conformed by giving clearly wrong answers just to fit in with the rest of the group.*

3 I & II. *Group size and social loafing are both factors that affected conformity in Asch's experiment, while another factor is deindividuation not individuation.*

4 A. *When all other group members give the same (a unanimous) answer, the participant is more likely to conform as they don't want to be the only individual left out with a different answer.*

Skills

Perfect your phrasing

5 B   **6** B

Exam-style questions

Multiple-choice questions

7 C   **8** B   **9** A   **10** B

Short-answer questions

11 ⎡Deindividuation involves individuals losing their sense of identity and individuality when in a group.**[1]**⎤

> ✓ ✗ I have defined deindividuation.**[1]**

12 ⎡Informational influence involves observing others to seek information or guidance on how to behave in a new and unfamiliar scenario or environment.**[1]**⎤⎡Due to the participants being uncertain when entering the room, they may have relied on the answers of the group to inform their own response in the novel environment leading to a greater likelihood to conform, particularly when multiple lines were similar in length to line X.**[2]**⎤

> ✓ ✗ I have described informational influence.**[1]**

> ✓ ✗ I have explained how informational influence may have increased the likelihood of participants to conform during the experiment.**[2]**

13 a ⎡Culture is the factor which is most evident in the scenario.**[1]**⎤

> ✓ ✗ I have identified culture as the face most evident in the scenario.**[1]**

b ⎡Bruno is more likely to conform than Ella due to their cultural differences.**[1]**⎤⎡This is due to Bruno likely growing up in a collectivist culture in which he has been taught to prioritise group needs over his own needs, making him less likely to question others and more likely to conform.**[2]**⎤⎡By contrast, Ella has likely grown up in an individualistic culture where she has been taught to stand up for her beliefs and opinions, making her less likely to conform as she has been taught to value her independence and uniqueness.**[3]**⎤

> ✓ ✗ I have predicted that Bruno is more likely to conform than Ella.**[1]**

> ✓ ✗ I have identified and explained that Bruno grew up in a collectivist culture and is therefore more likely to conform.**[2]**

> ✓ ✗ I have identified and explained that Ella grew up in an individualistic culture and is therefore less likely to conform.**[3]**

> ✓ ✗ I have referred to the characters' names in my response (Ella and Bruno), and to the scenario.

Questions from multiple lessons

14 B

8D Prosocial behaviour

Theory-review questions

1 B. *The first behaviour was not performed voluntarily as waiting at a zebra crossing is a legal requirement, and voluntarily helping is a criterion of prosocial behaviour.*

2 A. *Each type of factor (personal, situational, social) concerns how it influences the behaviour of a potential helper, not a person who would receive help.*

3 A. *Option B is incorrect because empathy increases the obviousness and relevance of helpee's needs to the helper, thereby increasing the likelihood the helper will perform prosocial behaviour.*

4 B. *Both social and personal factors concern how people think and feel, but social factors specifically concern how wider society thinks and feels in the form of social norms.*

5 B. *This factor describes the social justice norm, which can decrease helping behaviour if someone perceives a helpee as unjust in some way.*

6 B. *The bystander effect is situational because it doesn't concern how bystanders think and feel, but simply their presence in the environment of help being required.*

7 A. *All of the factors (social, situational, personal) concern the way they affect a potential helper's behaviour, not what causes help to be needed.*

Skills

Understanding research

8 C **9** A **10** B **11** A

Exam-style questions

Multiple-choice questions

12 C **13** A **14** B **15** D

Short-answer questions

16 [A potential helper usually assesses the risks of helping via a cost–benefit analysis. If the risk is higher than the potential benefits, this would likely increase reluctance to help.[1]] [For example, if someone is drowning but the potential helper cannot swim, they would likely not help due to the risk to their own life.[2]]

✓ ✗ I have explained that an assessment of high levels of risk for helping increases reluctance to help.[1]

✓ ✗ I have provided an example of when someone would likely not help due to the associated risks.[2]

17 [Hideki's brother is not adhering to the social norm of reciprocity[1]] [because he is not returning the favour of giving lifts that Hideki had given him in the past.[2]]

✓ ✗ I have correctly identified reciprocity as the relevant social norm.[1]

✓ ✗ I have explained how Hideki's brother is not adhering to this norm.[2]

✓ ✗ I have referred to the character's name in my response (Hideki), and to the scenario.

18 a [The bystander effect occurs when people do not help in a situation due to the presence of other people.[1]] [In this situation, Emir was a bystander who did not help Ella.[2]] [This was most likely due to audience inhibition, because Emir felt worried about what other bystanders might think of him.[3]]

✓ ✗ I have described what the bystander effect is.[1]

✓ ✗ I have explained how the bystander effect occurred in this scenario, acknowledging that Emir was a bystander of Ella's situation.[2]

✓ ✗ I have explained that this was due to Emir worrying what others would think, using the terminology 'audience inhibition'.[3]

✓ ✗ I have referred to the characters' names in my response (Emir and Ella), and to the scenario.

b [Emir's mood may have increased the likelihood of him helping.[1]] [If he had been less worried and in another mood such as confident or cheerful, he may have helped .[2]]

✓ ✗ I have identified one personal factor that may have prompted Emir to help.[1]

✓ ✗ I have explained how this factor would more likely lead Emir to help.[2]

✓ ✗ I have referred to the character's name in my response (Emir), and to the scenario.

Other acceptable responses could include:

- Other personal factors, so long as you explained them in line with the scenario, including:
  - Ability.
  - Attribution.
  - Empathy.

Questions from multiple lessons

19 a [Donna believes in a stereotype of homeless people, believing they all do drugs and drink alcohol.[1]] [This stereotype has led to discriminatory behaviour[2]] [of her not providing the prosocial help of charity.[3]]

✓ ✗ I have correctly outlined Donna's stereotype of homeless people.[1]

✓ ✗ I have outlined that this stereotype has led to Donna's discriminatory behaviour.[2]

✓ ✗ I have outlined the link between prosocial behaviour and Donna's stereotyping and discrimination.[3]

✓ ✗ I have referred to the character's name in my response (Donna), and to the scenario.

b [Donna makes an internal attribution[1]] [by blaming homeless people's situation on something they have chosen to do (consume drugs and alcohol).[2]] [This likely decreases her prosocial behaviour, as seen in her not helping them due to her believing they would spend it on drugs and alcohol.[3]]

✓ ✗ I have correctly identified Donna's attribution at internal.[1]

✓ ✗ I have explained Donna's attribution in relation to the scenario.[2]

✓ ✗ I have explained how this likely reduces her helping behaviour toward the homeless.[3]

✓ ✗ I have referred to the character's name in my response (Donna), and to the scenario.

8E   Bullying

Theory-review questions

1 Bullying can be either overt or covert and includes **cyberbullying**. It can be influenced by environmental factors such as the number of **bystanders** present and family factors such as **home** environments. Bullying has both psychological and **physical** effects on those who endure it. *The types of bullying included in this lesson are overt, covert and cyberbullying, which are influenced by factors such as the bystander effect and cause physical and psychological effects.*

2 B. *The weakening of the immune system does not influence someone to perform bullying behaviour, but rather occurs to the victim as a biological consequence to the stress that they endured.*

3 II & III. *While using a phone to physically harm someone uses technology to achieve bullying behaviour, this bullying itself does not occur in an online environment.*

4 B. *Having an unstable home life influences someone to perform bullying behaviour, whereas being diagnosed with a mental health disorder is a potential effect of enduring long-term bullying.*

Skills

Unpacking the scenario

5 B   **6** A   **7** A

Exam–style questions

Multiple-choice questions

8 B   **9** B   **10** A

Short-answer questions

11 ⌈Bullying that occurs in online spaces, such as on social media.[1]⌉

    ✓ ✗ I have provided an appropriate definition of cyberbullying.[1]

12 ⌈An effect of bullying is compromised levels of functioning.[1]⌉⌈Bullying can make people less likely to go to school or work, impacting their ability to independently complete important day-to-day tasks.[2]⌉

    ✓ ✗ I have identified an effect of bullying.[1]

    ✓ ✗ I have explained how it could impact those being bullied.[2]

Other acceptable responses could include:

- Illness, and impaired mental health, so long as how these effects could impact those being bullied was sufficiently explained.

13 ⌈The number of bystanders present.[1]⌉⌈Having around four bystanders present will act as a situational incentive for someone to attempt to get recognition for their bullying behaviour.[2]⌉⌈Affiliation with aggressive peer groups.[3]⌉⌈If someone is surrounded by aggressive peers, this is an environmental factors that can cause behaviour to be modelled in the form of bullying.[4]⌉

    ✓ ✗ I have identified one factor that influences bullying.[1]

    ✓ ✗ I have described how it influences bullying.[2]

    ✓ ✗ I have identified another factor that influences bullying.[3]

    ✓ ✗ I have described how that factor influences bullying.[4]

Other acceptable responses could include:

- Operant conditioning as a learning model.
- The bystander effect means bullying is not likely to be challenged.
- Poor parental supervision.
- Negative home environment.
- Other responses as long as they are described appropriately.

Questions from multiple lessons

14 C

8F   Media and behaviour

Theory-review questions

1 Media's presence in our everyday lives inevitably causes us to change our behaviour. While organising a protest to raise awareness for an important social issue could reflect 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.*

2 I & II. *A decreased connectedness to family and a difficulty concentrating on stimuli that is not excessively stimulating are negative influences of the media, whereas charities using their advertising reach to promote positive group behaviour is a positive influence of the media.*

3 A. *Government-issued posters and billboards use the same techniques as companies advertising a product, but to promote a social instead of commercial message, therefore reflecting a positive influence of advertising.*

4 A. *Impaired functioning involves being unable to individually meet the demands of everyday life, which is therefore a negative influence of social media.*

5 A positive influence of advertising on group behaviour is that large companies can use their reach to **raise awareness** for a prominent social issue impacting society, whereas a positive influence of video games is that they can **develop** our cognitive abilities. *Commercial companies often have invested large amounts of money into their advertising campaigns to ensure that they can sell their products to as many people as possible. These commercial companies are therefore often the most equipped to use their advertising reach to promote positive behaviours. Video games have different positive effects as the problem-solving skills that they require can improve cognitive functioning.*

Skills

Unpacking the scenario

6 A   **7** B   **8** B

Exam-style questions

Multiple-choice questions

9 C   **10** A   **11** D   **12** C

13 D

Short-answer questions

14 ⌈Television has created a new environment where we selectively attend to the stimuli of the television instead of the people around us.[1]⌉ ⌈This represents a negative influence of television on group behaviour because it inhibits our interaction and connection to others.[2]⌉

✓ ✗   I have provided an example of how television can have negative effects on group behaviour.[1]

✓ ✗   I have explained how this reflects a negative influence of media on group behaviour.[2]

15 [Video games are often highly stimulating in order to maintain our attention for as long as possible, and so impact our attention by drawing our focus to the game instead of other stimuli.[1]][This reflects a negative influence of media on individual behaviour because it makes it more challenging to attend to less stimulating stimuli such as school work or assigments.[2]]

✓ ✗   I have identified an impact of video games on attention.[1]

✓ ✗   I have explained how this impact on attention may negatively influence an individual's behaviour.[2]

16 [Advertising can have a positive influence on individual behaviour by providing information to help people overcome a health problem.[1]] [For example, the Australian Government's Quitline campaign advertised the importance of quitting smoking and provided guidelines for getting help,[2]][allowing viewers to gain awareness or seek help in order to overcome a smoking addiction.[3]]

✓ ✗   I have provided an example of a positive influence of advertising on individual behaviour.[1]

✓ ✗   I have provided an example of a relevant advertising campaign.[2]

✓ ✗   I have described how this particular campaign has a positive influence on individual behaviour.[3]

17 [Social media has a positive influence on group behaviour[1]][because its affordance of mass communication increases the reach of a social message.[2]][For example, social media played an important role in organising Australians to participate in a climate strike in order to raise awareness about climate change in 2019.[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 responses could include:

- You could also argue that social media has a negative influence on group behaviour, so long as you provided an appropriate example to justify your response. For example, that social media enhances feelings of insecurity and therefore impacts levels of functioning.

18 [A positive influence of video games is that they can enhance cognitive abilities.[1]][Exposure to action video games that require complex problem solving skills can develop cognitive abilities.[2]][A negative influence of video games is that regular exposure can make it difficult to concentrate on other tasks.[3]][Video games are perceptually stimulating which makes it more difficult to complete other less stimulating tasks that are important for our functioning, such as school and work.[4]]

✓ ✗   I have identified a positive influence of video games on individual behaviour.[1]

✓ ✗   I have described how this influence is positive.[2]

✓ ✗   I have identified a negative influence of video games of individual behaviour.[3]

✓ ✗   I have described how this influence is negative.[4]

Questions from multiple lessons

19 B

Chapter 8 test

1 C	**2** B	**3** A	**4** C
5 D	**6** D	**7** B	**8** C

Short-answer questions

9 [Obedience involves adhering to the instructions of authority figures or the rules or laws of society.[1]]

✓ ✗   I have defined obedience.[1]

10 [Social media provides a positive effect on group behaviour as it supports social justice activism by increasing the efficiency of communication needed to organise activism events such as strikes.[1]]

✓ ✗   I have outlined a positive effect of media on group behaviour.[1]

Other acceptable responses could include:

- Other positive effects of media on group behaviour.

11 [Asch's conformity experiment aimed to measure the extent to which individuals would conform to a majority group.[1]]

✓ ✗   I have outlined the aim of Asch's conformity experiment.[1]

Other acceptable responses could include:

- To investigate the extent to which individuals would conform by measuring the amount of trials (out of 12) in which participants would conform to the majority group.

12 [Personal factors stem from within an individual and influence whether they are or are not likely to help.[1]][An example of a personal factor is the potential helper's mood.[2]]

✓ ✗   I have explained the concept of personal factors.[1]

✓ ✗   I have provided an example of a personal factor.[2]

Other acceptable responses could include:

- Other personal factors such as empathy, ability, and attributions.

13 [Withdrawal rights involve the participant right to leave the study at any point without fear of punishment or consequence.[1]] [Withdrawal rights were violated in Milgram's obedience experiment as participants were told to continue with the study when they wished to leave and stop administering the electric shocks.[2]]

✓ ✗   I have described the concept of withdrawal rights.[1]

✓ ✗   I have outlined how Milgram's obedience experiment violated the ethical principle of withdrawal rights.[2]

✓ ✗   I have referred to the experiment scenario.

14 a [Mr Spanti has legitimate power,[1]] [as he has a higher status and position over his students which leads to them listening to his instructions.[2]]

✓ ✗   I have identified the type of power as legitimate power.[1]

✓ ✗   I have referred to the scenario to explain how Mr Spanti has legitimate power.[2]

✓ ✗   I have referred to the character's name in my response (Mr Spanti), and to the scenario.

b [Status of authority figure may have affected the obedience level of Mr Spanti's students,[1]] [as he has the legitimate authority as their teacher and may have symbols to display this authority such as a name badge.[2]]

✓ ✗   I have identified a factor which may have affected obedience.[1]

✓ ✗   I have explained how this factor may have contributed to the likelihood of Mr Spanti's students complying with his instructions.[2]

✓ ✗   I have referred to the character's name in my response (Mr Spanti), and to the scenario.

Other acceptable responses could include:

- Other factors affecting obedience including proximity and group pressure, so long as you have explained it correctly with reference to the scenario.

15 a [Social justice norm.[1]]

✓ ✗   I have named the social justice norm as the social factor in the scenario.[1]

b [Sienna's next door neighbour has been using overt bullying[1]] [which involves direct and observable forms of bullying.[2]] [This can be seen in the scenario as Sienna's neighbour has shouted at the kids in the neighbourhood and even thrown food at them.[3]]

✓ ✗   I have identified the type of bullying as overt bullying.[1]

✓ ✗   I have described overt bullying.[2]

✓ ✗   I have justified how overt bullying was shown in the scenario.[3]

✓ ✗   I have referred to the character's name in my response (Sienna), and to the scenario.

c [One possible environmental factor which may influence Sienna's neighbour's bullying may be that they lack a sense of safety and belongingness at home.[1]]

✓ ✗   I have provided an example of an environmental factor which may have influenced Sienna's neighbour to bully the kids in the neighbourhood.[1]

✓ ✗   I have referred to the character's name in my response (Sienna), and to the scenario.

Other acceptable responses could include:

- Other environmental factors such as past trauma and level of emotional support from family and friends, so long as it is relevant to the scenario.

16 a [To be considered a group, the choir members will have to influence each other.[1]]

✓ ✗   I have identified a condition that the choir will have to meet to be considered a group.[1]

b [The factor which increased Baxter's likelihood to conform to the choir's clap was informational influence.[1]] [Informational influence involves observing the behaviours of and information provided by others in a new situation to inform one's own behaviour.[2]] [Informational influence was evident in the scenario as Baxter observed the other choir members perform the special clap and then learnt it.[3]]

✓ ✗   I identified informational influence as the factor which increased conformity.[1]

✓ ✗   I explained informational influence.[2]

✓ ✗   I have described how informational influence was evident in the scenario.[3]

✓ ✗   I have referred to the character's name in my response (Baxter), and to the scenario.

c [Due to the choir having 30 members, the number of group members would have provided Baxter with pressure to conform. However, this pressure would have been equally influential if there were just three other choir members.[1]]

✓ ✗   I have suggested how group size may have increased Baxter's likelihood to conform.[1]

✓ ✗   I have referred to the character's name in my response (Baxter), and to the scenario.

Key science skills questions

17 D

18 a [Convenience sampling.[1]]

✓ ✗   I have named convenience sampling as the sampling method used in both studies.[1]

b ⌈External validity involves the extent to which the results of a study can be applied to other settings, people and time.[1]⌉⌈Due to both the Stanford prison experiment and Asch's conformity experiment only having male participants, the external validity may be limited as the results will be unable to be applied to the general population due to not including female participants in their samples.[2]⌉

✓ ✗ I have explained external validity.[1]

✓ ✗ I have explained how the external validity of the studies may be limited due to not including female participants in the samples.[2]

Questions from multiple chapters

19 B

20 a ⌈Mental health is the current state of an individual's psychological wellbeing and functioning.[1]⌉⌈Social media may negatively impact an individual's mental health by lowering a person's self-esteem.[2]⌉

✓ ✗ I have defined the concept of mental health.[1]

✓ ✗ I have used an example to explain how social media may negatively impact mental health.[2]

b ⌈Social media is an external factor on mental health.[1]⌉

✓ ✗ I have identified social media as an external factor on mental health.[1]

GLOSSARY

A

Ablation the surgical removal, destruction or cutting of tissue p. 77

Accommodation the cognitive process of restructuring an existing schema in order to fit in new information p. 206

Adaptive behaviours activity that enhances an individual's ability to match the changing demands of their everyday life p. 244

Adaptive plasticity the brain's ability to restore and enhance neural functioning over time due to experience p. 144

Addiction disorder a category of psychological disorder characterised by a dependence on a particular substance or behaviour despite negative consequences p. 259

Adolescence the developmental period beginning after the onset of puberty from approximately 10 to 19 years old p. 136

Advertising the process of using media to persuade people to purchase commercial products p. 419

Affective component our emotions and intuitive feelings towards something p. 346

Aim a statement outlining the purpose of the study p. 3

Allocation the process of assigning participants to conditions in the experiment for the research p. 23

Anxiety disorder a category of psychological disorder characterised by extreme, ongoing worry and distress p. 261

Assimilation the cognitive process of incorporating new information into an existing schema p. 206

Attachment a long-lasting emotional bond between two individuals p. 183

Attachment theory a theory that suggests that the bond formed between children and their primary caregivers determines the nature of the child's emotional development into adulthood p. 183

Attitude an evaluation of something, such as a person, object, event, or idea p. 345

Attribution an evaluation made about the causes of behaviour and the process of making this evaluation p. 359

Attributional style tendencies and repeated patterns in the way someone makes attributions. Also known as a person's explanatory style p. 361

Atypical behaviours activity that is unusual or unnatural according to how an individual usually behaves p. 243

Autonomic nervous system (ANS) the branch of the PNS responsible for connecting the CNS and the body's visceral (non-skeletal) organs, muscles and glands p. 92

Autopsy the examination of a body after death to determine the cause of death or the cause of a disease or disorder that a person suffered p. 76

Axon the long strand-like part of a neuron that conducts electrical impulses away from the cell body to the sending end of a neuron p. 101

Axon terminals the ends of a neuron that release a message into the synapse p. 101

B

Bar chart a graph that depicts the relationship between two variables using rectangular bars p. 49

Behavioural component our outward and observable actions that reflect our point of view of something p. 346

Biological factors factors relating to genetic makeup and physiological functioning of the body p. 251

Bipolar disorder a category of mood disorder characterised by disabling alternations between periods of low moods and periods of heightened moods (mania or hypomania) p. 263

Brain an organ contained in the skull that coordinates thought, behaviour and nervous system activity p. 71, 90

Brain stem a part of the brain which is an extension of the spinal cord, including the midbrain, medulla, and pons p. 107

Brain versus heart debate a historical debate surrounding whether the heart or the brain was responsible for central functions including thought, emotion, and behaviour p. 72

Broca's area the area of the frontal lobe responsible for the production of speech and some aspect of speech interpretation p. 119

Bullying intentionally and repeatedly causing an individual or group to feel distressed through verbal, social or physical behaviours p. 413

C

Case study an in-depth study of an individual or a very small group of individuals p. 12

Central nervous system (CNS) the brain and spinal cord p. 90

Centration the act of focusing only on one feature or characteristic of an object to the exclusion of all others p. 214

Cerebellum the ball-like structure at the lower back of the brain behind the brain stem, primarily involved in skeletal muscle movement and coordination p. 108

Cerebral cortex the thin outer layer of the cerebrum p. 116

Cerebrum the largest expanse of brain matter, including the outer cerebral cortex and inner tissue of the forebrain, responsible for a range of sophisticated functions p. 111

Choosing an experimental research design the process of choosing an appropriate experimental research design in order to reduce possible extraneous and confounding variables p. 29

Classification the ability to group objects or concepts into categories which are organised on the basis of common features p. 215

Cognition the ability to produce thought as well as comprehend and organise information from the internal and external environment p. 205

Cognitive bias an error in thought processes that impacts rational decision making and reasoning p. 362

Cognitive component our thoughts and beliefs towards something p. 346

Computerised tomography (CT) a neuroimaging technique that involves taking continuous two-dimensional x-ray images of a person's brain or body in order to provide both two and three-dimensional images p. 82, 151

Conclusion a statement regarding the results of an investigation as to whether the hypothesis was supported or not p. 55

Concrete thinking a type of thought based on knowledge acquired through personal experience which involves literal interpretations of tangible concepts p. 216

Cones photoreceptors that allow someone to see colour and fine details in well-lit conditions p. 308

Confidentiality the right of the participant for their personal details to remain private p. 36

Conformity the alignment of one's thoughts, feelings, or behaviour to match those of others or societal expectations p. 393

Confounding variables variables other than the independent variable that have directly and systematically had an effect on the dependent variable p. 28

Conservation the ability to understand that the properties of an object stay the same even when the object's appearance is altered p. 215

Contralateral functions the role of each cerebral hemisphere to receive sensory information from, and control the movement of, the opposite side of the body p. 117

Control group a group that is used as a basis for comparison; participants are not exposed to the experimental condition/s (the IV) p. 15

Convenience sampling when a sample is selected using the quickest and easiest means possible, selecting people who are readily available from the population p. 22

Coping the ability to meet and overcome the challenges and setbacks faced during everyday life p. 252

Counterbalancing a method used in repeated measures experimental designs to reduce order effects p. 30

Covert bullying indirect forms of bullying, such as excluding people from group events or talking about them behind their backs p. 414

Cranial nerves the nerves which extend from the tongue to the brain, along which gustatory information is transmitted p. 320

Critical periods the narrow, rigid developmental period in which a specific skill or function must be learnt p. 177

Cross-sectional study when data is collected from participants from different segments of the population (pre-existing cohorts) to represent a 'snapshot' in time p. 12

Cyberbullying bullying that involves intentionally harmful behaviour that occurs repeatedly in online spaces, such as on social media p. 414

D

Debriefing a process which occurs at the conclusion of a study and involves the researcher outlining the nature of the study to participants and includes ensuring that participants do not leave the study with lasting harm p. 36

Deception when the participant is unaware of the true nature of the study p. 36

Deep brain stimulation a treatment for neurological disorders that involves creating an electrical current through a pulse generator to stimulate a particular region of the brain with depleted neural activity due to degenerated and damaged levels of neurons p. 150

Deindivuation the tendency for individuals to lose their sense of identity and individuality within a group p. 399

Dendrites the bushy spines of a neuron that receive a message p. 101

Dependent variable (DV) the variable that is being measured in an experiment for changes it experiences due to the effect of something (i.e. the independent variable) p. 5

Depressive disorder a category of mood disorder characterised by a disabling low mood p. 263

Depth cues visual clues that allow someone to judge the distance or depth of stimuli in their environment p. 312

Descriptive statistics statistics that are used to organise and summarise data p. 47

Developmental plasticity changes in the brain that occur in response to ageing and maturation p. 135

Difficult temperament a relatively stable disposition in which infants are unhappy and have irregular sleeping and eating patterns p. 188

Discrimination the unjust treatment of people due to their membership within a certain social category p. 355

Disorganised attachment a style of attachment in which the infant displays problematic and unpredictable behaviours, usually due to extremely negative early life experiences p. 199

Dizygotic twins twins who are not identical due to variations in the genes they inherited p. 168

Dopamine a neurotransmitter responsible for the coordination of voluntary movement and experiences of pleasure and pain p. 148

Double-blind procedure a procedure in which both the participants and the person conducting the experiment are unaware of which condition participants have been allocated to in order to reduce experimenter bias and participant expectations p. 31

Dualism in the mind-body problem, the view that the mind and the body are separate and distinguishable things p. 73

E

Easy temperament a relatively stable disposition in which infants are warm and friendly and have established sleeping and eating patterns p. 188

Egocentrism the inability to understand the perspectives of others p. 214

Electrical brain stimulation (EBS) a research or therapeutic technique that involves electrically stimulating parts of the brain p. 78

Emotional development the continuous, life-long development of skills which allow individuals to control, express, and recognise emotions in an appropriate way p. 185

Empirical evidence data that is collected through direct observation or through experiments p. 2

Environmental factors factors which influence development that arise from an individual's physical and social surroundings p. 164

Erikson's psychosocial theory of development a theory of development proposed by Erikson in which the behaviour and personality of individuals is shaped by the desire to meet social and cultural expectations p. 225

Ethical guidelines a set of rules and considerations that researchers must abide by when conducting research p. 34

Ethics committee a group of people who review research proposals and consider the potential risks, benefits and implications in order to either approve or disapprove them for research p. 35

Experiment a study conducted in a carefully controlled environment to measure the cause and effect relationship between variables p. 11

Experimental group the group within an experiment that are exposed to experimental condition/s (the IV) p. 15

Experimenter effects when an experimenter's expectations about the study influence the results p. 31

External attribution a judgement of the causes of a behaviour as resulting from forces outside the individual performing the behaviour p. 360

External factors factors which arise from the environment of an individual and contribute to their mental health p. 251

External validity the extent to which the results of an investigation can be applied to other settings, people and time p. 57

Extraneous variables variables other than the independent variable that may produce unwanted results in an experiment p. 28

Eye the sensory organ for vision p. 308

Fallibility the quality of being prone to error or experiencing difficulties in judgement p. 327

F

Forebrain the largest area of the brain, located at the top and front of the brain p. 110

Frontal lobe the largest lobe of the cerebral cortex at the front of the cerebral hemispheres with the functions of high-order mental processes, regulation and expression of emotions, voluntary movement, and the production speech p. 118

Frontal lobe development the growth and neural maturation of the frontal lobe p. 137

Functional approach to normality defining normality in terms of thoughts, feelings, and behaviours that enable the individual to meet the demands of everyday life p. 241

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 its activity levels p. 84, 151

G

Gambling disorder an addiction disorder which involves an individual compulsively risking their own money or object of value in an attempt to win back more of it p. 259

Generalisability the extent to which the results of an investigation can be applied to the wider research population p. 56

Genetics the unique, cellular makeup of each individual which is inherited from biological parents p. 187

Gestalt principles guiding rules of perception that allow us to organise independent visual signals into meaningful wholes p. 310

Glial cells a specialised cell that protects and supports neurons and their functioning p. 101

Goal-directed behaviour the ability to behave in a way which meets the demands of a goal that has been purposefully set out p. 213

Group two or more people who interact and influence each other and share a common objective p. 374

Gustatory receptors the sensory receptors which detect chemical molecules in food p. 320

H

Hemispheric specialisation the idea that each of the brain's cerebral hemispheres has its own specialisations p. 116

Hereditary factors factors which influence development that are genetically passed down from biological parents to their offspring p. 164

Hindbrain an area at the base of the brain, including the medulla and pons (in the brain stem) and the cerebellum p. 107

Historical approach to normality defining normality in terms of the dominant customs of a specific period of time p. 241

Hypothalamus an almond-sized structure in the forebrain, primarily involved in homeostatic functioning as well as motivated and emotional behaviours p. 111

Hypothesis a testable prediction about the outcome of an experiment; it is written in the form of a statement and includes the variables that will be tested p. 3

I

Independent groups design an experimental design in which participants are split into two or more groups; typically a control group and an experimental group/s p. 16

Independent variable (IV) the variable that the experimenter manipulates in order to observe the effect it has on something (i.e. the dependent variable) p. 5

Infancy the developmental period from birth until one years old p. 136

Inferential statistics statistics that provide information on the statistical significance of the results and suggest how they might apply to a wider population p. 47

Informational influence the influence of observable behaviours and information on an individual, influencing their behaviour in certain situations or environments p. 398

Informed consent the right of the participant to have a thorough understanding of the nature of the study, before agreeing to participate p. 36

Insecure-anxious attachment a style of attachment in which the infant fluctuates between clinging to and rejecting their primary caregiver, usually due to the caregiver inconsistently meeting the infant's needs p. 198

Insecure-avoidant attachment a style of attachment in which the infant may be reluctant to or avoid contact from their primary caregiver, usually formed due to a lack of responsiveness to their needs p. 198

Internal attribution a judgement of the causes of a behaviour as resulting from features of the individual performing the behaviour p. 360

Internal factors factors which arise from within the individual and contribute to their mental health p. 251

Internal validity the extent to which the changes in the dependent variable are caused by the independent variable, and not other variables p. 57

Interpretation the process of understanding and assigning meaning to sensory information p. 303

Interview a type of questionnaire that is usually conducted verbally, involving the researcher asking participants questions and recording their responses p. 11

L

Levodopa a Parkison's disease medication that is converted to dopamine by neurons in the brain upon consumption to improve motor functioning outcomes p. 149

Line graph a graph that depicts the relationship between two variables using a line that connects each data point p. 49

Localisation of function the psychological principle that suggests that different areas of the brain are responsible for different behaviours and mental processes p. 117

Longitudinal study a type of investigation in which data is gathered from participants over an extended period of time, and the participants are followed up after specific time intervals p. 12

M

Magnetic resonance imaging (MRI) a neuroimaging technique that uses magnetic and radio fields to take two and three-dimensional images of the brain p. 82, 151

Maladaptive behaviours activity that impairs an individual's ability to match the changing demands of their everyday life p. 244

Matched participants design an experimental design in which participants are paired based upon relevant characteristics, where one member of the pair is tested in one condition, and the other member is tested in the other p. 16

Maturation the biologically programmed changes which facilitate development from conception through to adulthood p. 175

Mean a measure of central tendency, expressed numerically, that represents the average of a data set p. 47

Media the form in which information is spread throughout society p. 419

Medical approach to normality defining normality in terms of thoughts, feelings, and behaviours that do not fit the clearly outlined diagnostic criteria for a particular p. 242

Medulla a mass of neurons located at the bottom of the brain stem, just above the spinal cord, primarily involved in regulating autonomic functions p. 108

Mental health the current state of a person's psychological wellbeing and functioning p. 244, 250

Mental health continuum a tool used to track progression of mental health which consistently fluctuates over time, progressing from mentally healthy, to mental health problems, to mental health disorders p. 245

Mental health disorder a diagnosed psychological state characterised by the presence of a severe disturbance and sense of distress, involving thoughts, feelings, and/ or behaviours that are atypical of the person and that significantly impact their ability to function independently p. 244, 250, 256

Midbrain a part of the brain stem in the centre of the brain p. 109

Mind-body problem a debate that questions whether our mind and body are separate and distinguishable things or whether they are the same thing p. 73

Monism in the mind-body problem, the view that the mind and the body are one and the same thing p. 73

Monozygotic twins twins who are identical due to inheriting the exact same genes p. 168

Mood disorder a category of psychological disorder characterised by a disabling lowering or heightening of mood p. 262

Motor messages information about voluntary movement transmitted from the CNS to the skeletal muscles p. 91

Myelin the fat and protein substance that surrounds and insulates the axon of a neuron p. 101

Myelination the formation of myelin around the axons of neurons p. 136

N

Nature versus nurture debate a debate which questions whether development is dependent on hereditary (nature) or environmental (nurture) factors p. 163

Nervous system the complex network of specialised cells in the body that allows the communication of information around the body about the internal and external environment p. 88

Neurodegenerative disorder a disease characterised by the progressive loss of neurons in the brain p. 148

Neuroimaging a range of techniques used to capture images of the brain's structure, function and activities p. 81

Neurological disorder a disease characterised by any damage or malfunctioning of the nervous system p. 148

Neuron a nerve cell responsible for transmitting, receiving, and processing information p. 98

Neuronal reception the process in which a neuron accepts (receives) a message p. 99

Neurotransmission the process in which a neuron sends a message p. 99

No-harm principle the role of the researcher to ensure that all participants within an investigation do not experience mental or physical harm p. 35

Non-standardised testing procedures when instructions and procedures in an experiment are not consistent for all participants, therefore affecting the results obtained p. 31

Normality the state of having thoughts, feelings, and behaviours that are considered common and acceptable p. 240

Normative influence the influence of social norms on an individual, influencing a person to act in certain ways which align with social norms p. 397

O

Obedience adhering to the instructions of authority figures or the rules or laws of society p. 383

Object permanence the understanding that an object still exists when it is unable to be seen, heard, or touched p. 213

Objective data data that does not rely on personal opinion and is independent of the interpreter; it can be observed or measured by multiple people and obtain the same results p. 41

Observational study a type of study in which data is collected through careful monitoring of participants p. 12

Occipital lobe the rearmost lobe of the cerebral cortex behind the parietal lobe, with the primary function of processing visual stimuli p. 121

Operationalisation the process of defining variables in terms of how they will be manipulated or measured in the experiment p. 6

Optic nerve the two nerves which extend from the back of the eye to the brain, along which visual information is transmitted to the brain p. 308

Order effects a source of error in repeated measures designs due to the order the participants participate in the experimental and control conditions p. 30

Organisation the process of regrouping features of sensory stimuli together in order to form cohesive and meaningful information p. 302

Outlier a value that differs significantly from the other values in a data set p. 48

Overt bullying visible forms of bullying, such as causing physical harm or name calling p. 413

P

Parasympathetic nervous system a branch of the ANS responsible for returning and maintaining the body's visceral organs, muscles and glands at optimal and balanced functioning p. 92

Parietal lobe the lobe of the cerebral cortex behind the frontal lobe with the functions of receiving and processing sensory stimuli and spatial awareness p. 120

Parkinson's disease a progressive disease of the nervous system characterised by both motor and non-motor symptoms p. 148

Participant-related variables individual participant differences that can affect the results p. 29

Perception the process of selecting, organising, and interpreting sensory information to be able to understand it p. 302

Perceptual distortion an error in the judgement or interpretation of sensory stimuli p. 327

Perceptual set a predisposition to perceive stimuli in a certain way due to a range of factors including a perceiver's mood, motivations, context, and past experiences p. 314, 323

Peripheral nervous system (PNS) all nerves outside the CNS, responsible for carrying information to and from the CNS p. 90

Person perception the different mental processes used to understand and form impressions of other people p. 353

Personal factors influences on helping that stem from within the individual who is or is not going to help p. 406

Personality the unique qualities and characteristics that an individual possesses and expresses through their thoughts, feelings, and behaviours p. 224

Personality disorder a category of mental disorders that are characterised by a set of enduring personality traits and behaviours which diverge significantly from cultural and societal norms, causing marked distress or harm for an individual p. 264

Photoreceptors the sensory receptors of the eye which receive light and are responsible for the process of transduction p. 308

Phrenology the study of the shape and size of the human skull to determine personality and mental functioning p. 74

Placebo an inactive medication, procedure or treatment that is used to control for participant expectations p. 30

Placebo effect when an inactive treatment or procedure has an effect due to the participants' expectations p. 30

Plasticity the ability of the brain to physically change in response to experience and learning p. 134

Pons a small structure located directly above the medulla in the brain stem, primarily involved in relaying information between different brain areas and regulating the respiratory system p. 108

Population the group of people of interest to an experiment, to which the results of the experiment are generalised to p. 4, 20

Positron emission tomography (PET) a neuroimaging technique that uses a scanning device to take coloured images of the brain, showing its functional activity and structure by tracing the levels of a radioactive substance in the brain p. 83, 151

Postsynaptic neuron the neuron that receives a message from the synapse p. 100

Power the extent to which an individual can influence or control another individual's thoughts, feelings and behaviour p. 375

Prefrontal cortex an area of the frontal lobe responsible for higher-order cognitive processes p. 118

Prejudice a negative feeling held against people within a certain group or social category p. 355

Premotor cortex an area of the frontal lobe responsible for planning necessary sequences for motor movements p. 118

Presynaptic neuron the neuron that releases a message into the synapse p. 100

Primary auditory cortex the area of the temporal lobe that is responsible for the perception of sound p. 122

Primary data collection a method of data collection involving data being collected directly by the researcher p. 40

Primary motor cortex an area of the frontal lobe that initiates voluntary movements by sending motor neural messages to our skeletal muscles p. 118

Primary somatosensory cortex the area of the parietal lobe responsible for receiving and processing sensory information p. 120

Primary visual cortex the area of the occipital lobe involved in receiving visual information from the sensory receptors located on the retina of our eyes p. 121

Prosocial behaviour behaviour that is intentionally and voluntarily performed in order to help another person or society p. 403

Psychological development an individual's changes across multiple domains, including the life-long growth across emotional, cognitive and social domains p. 163

Psychological factors factors relating to cognitive and affective functioning p. 251

Psychology the scientific study of human mental states and beaviour p. 70

Psychosis a psychological state in which an individual's grasp of reality is impaired and inaccurate p. 266

Psychosocial crisis a point of tension between an individual's capabilities and the desire to meet the expectations of society p. 225

Psychosocial development the interactions between cognitive and social processes throughout the lifespan that affect development and growth p. 223

Psychotic disorder a category of psychological disorder characterised by the state of psychosis p. 266

Q

Qualitative data data of concepts that is measured or expressed non-numerically p. 41

Quantitative data data concerning numerical amounts and is expressed numerically p. 41

Questionnaire a list of questions that participants can respond to in a variety of formats p. 11

R

Random allocation when every member of the sample has an equal chance of being assigned to each condition in an experiment p. 23

Random sampling when every member of the population has an equal chance of being selected for the sample p. 22

Rating scale a form of questionnaire collecting numerical data from participants' responses p. 11

Reception when a sensory stimulus is first detected by a sensory organ p. 299

Receptive field the space in which a sensory stimulus can be detected by a sensory receptor p. 300

Reliability how likely it is that the results are consistent and that the same results could be obtained by another researcher p. 57

Repeated measures design an experimental design in which the same participants are in every condition of the experiment p. 16

Rerouting a neuron's ability to form a new connection with another undamaged neuron p. 144

Reticular formation a net-like structure of neurons extending along the brain stem, connecting various parts of the brain and spinal cord via pathways and projections p. 109

Reversibility the understanding that objects can experience change and then return to their original form p. 214

Risk factor a biological, psychological, or social factor which can increase a person's susceptibility to or contribute to the development of a psychological disorder p. 258

Rods photoreceptors that allow someone to see in low levels of light p. 308

S

Sample a subset of the population, commonly referred to as the research participants p. 21

Sampling the process through which the participants for a study are selected from the population of interest p. 21

Sampling procedures the different methods through which a sample can be drawn from a population p. 29

Schema a mental representation of a concept developed through experience p. 206

Schizophrenia a specific kind of psychotic disorder characterised by the presence of longer-term psychosis and impairment to functioning p. 266, 274

Secure attachment a style of attachment formed by a strong emotional bond between the infant and their primary caregiver due to the caregiver consistently meeting the needs of the infant p. 198

Selection the process of attending to certain features of sensory stimuli to the exclusion of others p. 302

Self-report a participant's subjective account of an experience; this type of investigation can be conducted through the use of a questionnaire, interview or rating scale p. 11

Sensation the process of receiving and detecting raw sensory information via our sensory organs and sending it to the brain p. 299

Sensitive periods the optimal developmental period for a specific function or skill to be learnt p. 177

Sensory messages information about the body's sensations transmitted from the PNS to the CNS p. 91

Sensory receptors the receptors on a neuron that specialise in receiving information about specific kinds of sensory stimuli p. 299

Single-blind procedure a procedure in which participants are unaware of which condition they have been allocated to in order to reduce participant expectations p. 31

Situational approach to normality defining normality according to what is standard and accepted in specific contexts p. 242

Situational factors elements of the environment or context a person is in that influences whether they help p. 404

Skeletal muscles muscles connected to the skeleton that are involved in conscious, voluntary movement p. 91

Social factors factors relating to an individual's interaction with their external environment and other people p. 251

Social factors (on helping) influences on helping that stem from other people and societal expectations p. 408

Social loafing the tendency to put in less effort when in a group than a person would when alone p. 398

Social media types of media that allow people to interact with others p. 419

Social norms society's unofficial rules and expectations regarding how we ought to act that most people follow without thinking p. 394, 408

Socio-cultural approach to normality defining normality according what is standard according to social and cultural beliefs and practices p. 241

Somatic nervous system (SNS) the branch of the PNS responsible for sending motor information from the CNS to the body's skeletal muscles, and bringing sensory information from the body to the CNS in order to formulate voluntary responses p. 91

Spinal cord a long cable of nerve tissue connecting the brain to the peripheral nervous system, responsible for carrying motor information from the brain, and sensory information from the body p. 90

Sprouting a neuron's ability to develop new branches on the dendrites or axons p. 144

Standard deviation a measure of central tendency, expressed numerically, that represents the spread of data around the mean p. 48

Standardised instructions and procedures the consistent use of instructions and procedures for all participants p. 31

Statistical approach to normality defining normality in terms of what has been measured as commonly occurring thoughts, feeling and behaviours p. 242

Status an individual's position within a group as perceived by other members of that group p. 375

Stereotype a widely held belief and generalisation about a group of people p. 354

Stratified sampling when the population is divided into groups based upon relevant characteristics, and participants are selected from each group in proportion to how they appear in the population p. 22

Subjective data data that relies on personal opinion or self-report p. 41

Symbolic thinking a more sophisticated type of thought based on the ability to represent concepts, draw conclusions, and understand hypothetical constructs p. 216

Sympathetic nervous system a branch of the ANS responsible for activating the body's visceral organs, muscles, and glands for increased activity or when under threat p. 92

Synaesthesia a perceptual phenomenon characterised by the experience of unusual perceptions in one sensory system after another sensory system has been activated p. 331

Synaesthete a person who experiences synaesthesia p. 331

Synapse the area in which neurotransmission occurs between two neurons, including the sending end of the presynaptic neuron, the gap between two neurons, and the receiving end of the postsynaptic neuron p. 100

Synaptic gap the space between two neurons into which a neuronal message is transmitted p. 100

Synaptic pruning the elimination of underused synapses p. 137

T

Table a method of presenting data using columns and rows p. 49

Taste the sensation and perception of flavour p. 319

Taste buds clusters of gustatory receptors on the tongue p. 320

Temperament the relatively stable disposition of an individual, including the typical behaviours and emotions they express p. 188

Temporal lobe the lower central lobe of the cerebral cortex, responsible for auditory perception, as well as being involved in memory, visual perception, and emotional responses p. 122

Thalamus a structure comprising two egg-shaped globes within the forebrain, primarily involved as a relay centre and filtering system for sensory and motor signals, as well as regulating arousal, attention and activity p. 110

The 'two-hit' hypothesis a framework which suggests that schizophrenia arises when a person experiences two different types of events: a genetic factor followed by an environmental factor p. 275

The biopsychosocial model a framework for approaching mental health that suggests that biological, psychological, and social factors all interact and contribute to mental health p. 250

The bystander effect the social psychological phenomenon which suggests that the presence (or imagined presence) of other people in an emergency situation reduces the likelihood that someone will provide help p. 405

Tongue the primary sensory organ involved in taste p. 320

Transduction the conversion of raw sensory information detected by sensory receptors into a form that can be sent to the brain p. 300

Transmission the process of sending sensory information as a neural impulse to the part of the brain responsible for processing sensory information p. 301

Tri-component model of attitudes a model which illustrates the relationship between the affective, behavioural and cognitive components of our attitudes p. 346

Typical behaviours activity that is consistent with how an individual usually behaves p. 243

U

Unanimity complete agreement among two or more individuals p. 397

V

Validity the extent to which the investigation measures what it intends to measure p. 57

Variable a factor or element of an experiment that may be manipulated or measured p. 4

Visceral muscles/organs/glands the body's non-skeletal muscles, organs and glands p. 92

Vision the sensory system which allows us to see our internal and external environment p. 307

Visual constancy our ability to perceive visual objects as staying the same even though the sensation of the objects may change p. 312

Visual illusion the perception of a visual stimulus in a way that conflicts with how it is in physical reality p. 327

Visual perception principles guiding rules that apply to visual signals and determine how they are organised and interpreted p. 310

Voluntary participation the right of the participant to willingly choose to participate p. 36

W

Wernicke's area the area of the temporal lobe responsible for the comprehension of speech p. 122

Withdrawal rights the right of the participant to leave the study at any point, without fear of consequence p. 36

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