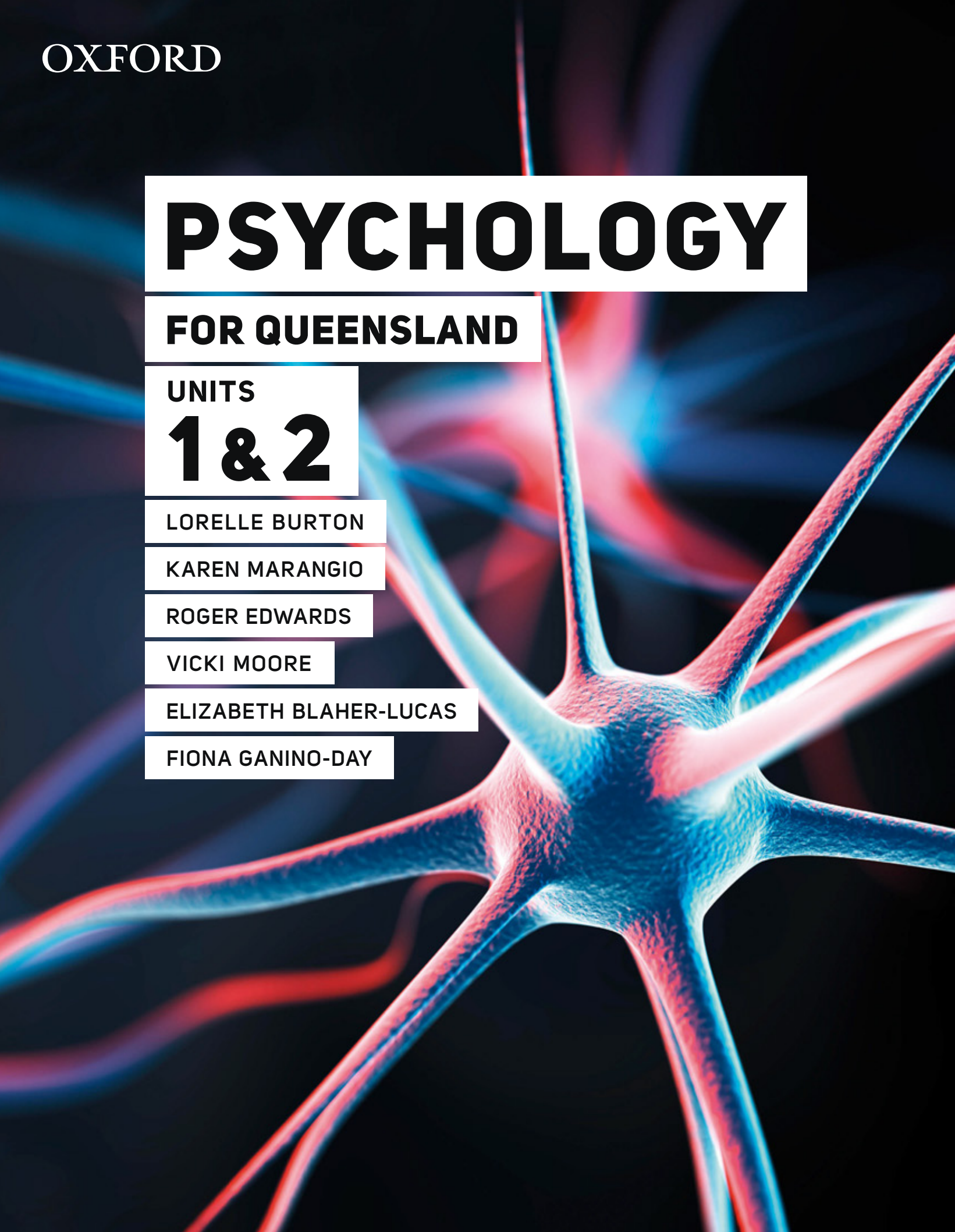

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FOR QUEENSLAND

UNITS 1 & 2

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Published in Australia by
Oxford University Press
Level 8, 737 Bourke Street, Docklands, Victoria 3008, Australia.

© Lorelle Burton, Roger Edwards, Karen Marangio, Vicki Moore, Elizabeth Blaher-Lucas and Fiona Ganino-Day 2019

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Typeset by Newgen KnowledgeWorks Pvt. Ltd., Chennai, India
Edited by Helen Koehne
Proofread by Laura Davies
Indexed by Max McMaster
Printed by Sheck Wah Tong Printing Press Ltd.

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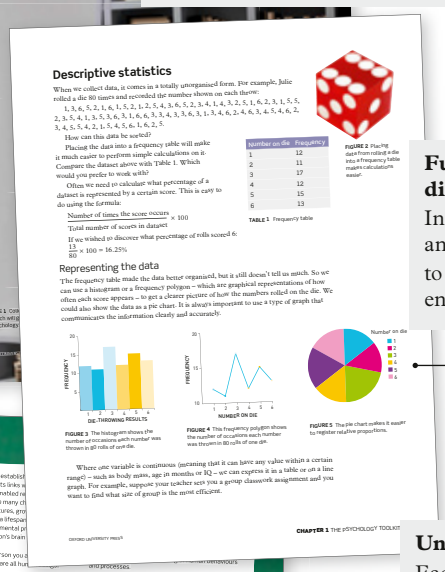
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Using *Psychology for Queensland Units 1 & 2*

The first of a two-volume series, *Psychology for Queensland* offers complete support for Units 1 & 2 teachers and their students, providing unparalleled depth and comprehensive syllabus coverage.

Key features of the Student book





Psychology toolkit
The Student book begins with a stand-alone reference chapter that includes:

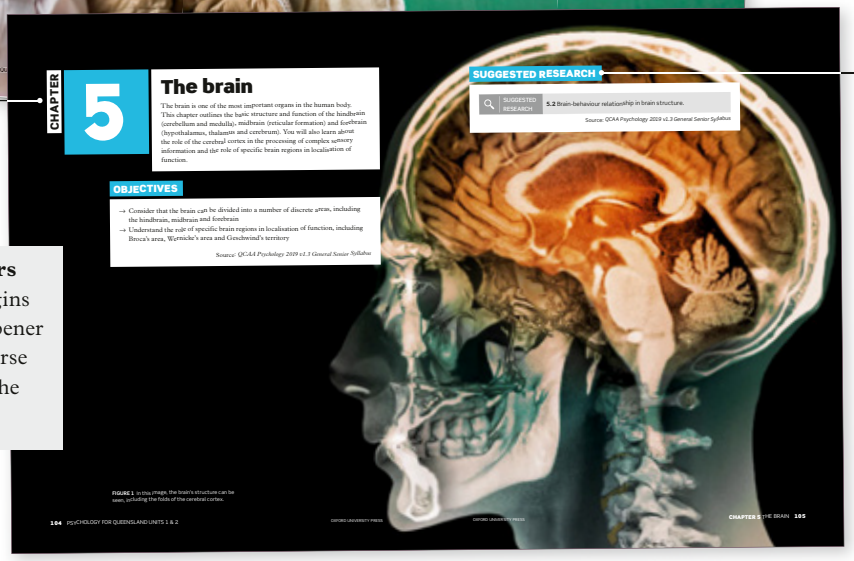
- assessment advice and structured examples
- a step-by-step guide to preparing for your exam
- methods for presenting and analysing psychological data.

Full-colour diagrams and photos
Instructive illustrations and diagrams help to clarify concepts and engage students.



Unit openers
Each unit begins with a unit opener that includes:

- an **overview of Topics** in the Unit
- **Unit objectives** from the syllabus.



Practicals
A list of mandatory and suggested practicals within the chapter that allow students to apply their knowledge to real-life activities.

Chapter openers
Each chapter begins with a chapter opener that includes course objectives from the syllabus.

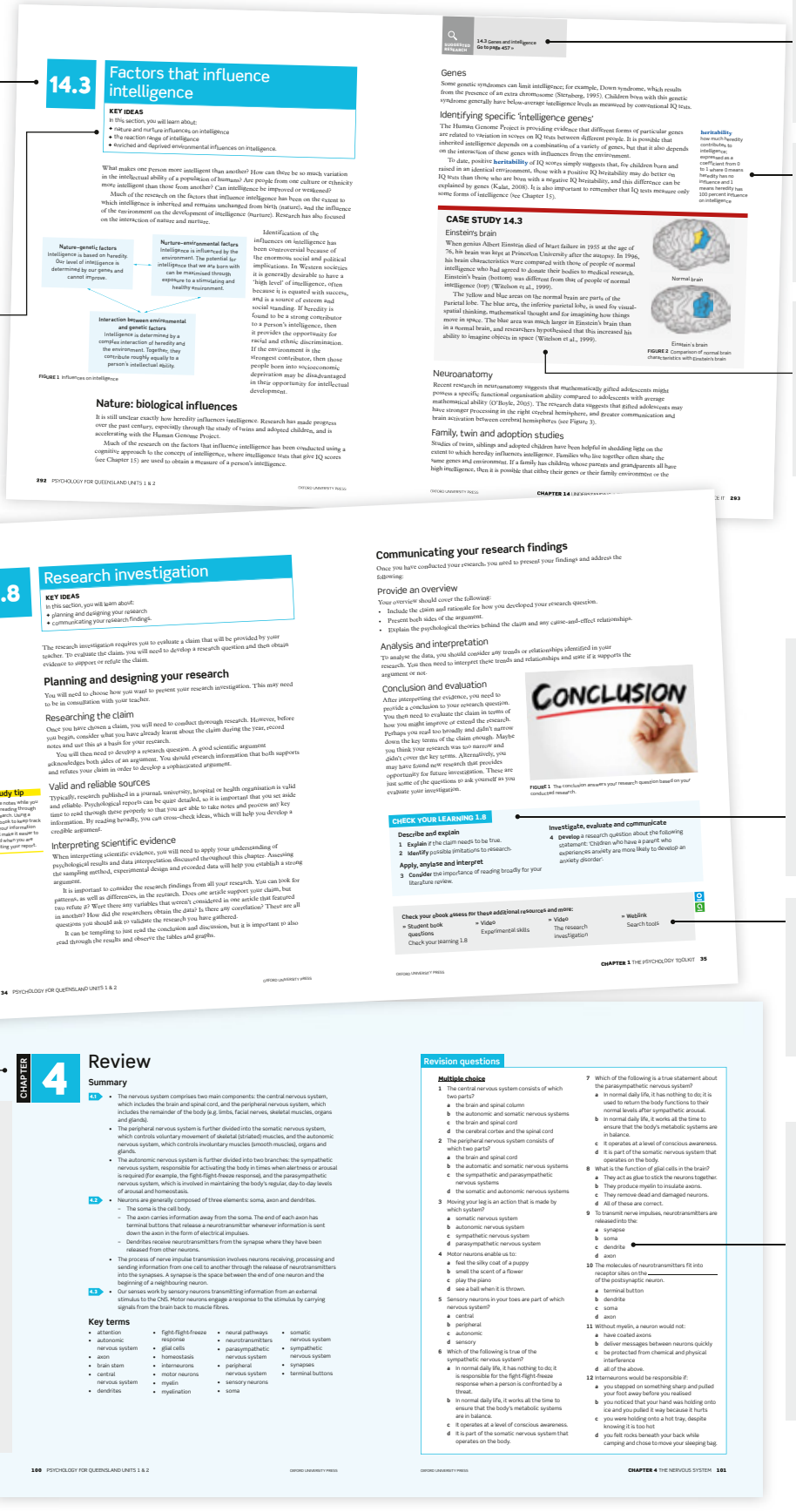
Section-based approach
Content is presented in clearly structured **sections**. Each section is clearly labelled and numbered to help navigation.

Key ideas
A set of clear learning objectives from the syllabus prepare students for what they will study in every section.

Study tip
Practical advice to help students improve their performance in assessment tasks.

Chapter reviews
Each chapter review includes:

- a summary of key learning in each chapter
- revision questions written to target assessment through multiple-choice and short-answer questions
- key terms introduced throughout the chapter.



Practical links
Direct links to mandatory and suggested practicals.

Margin glossary
Key terms to help students recall important information.

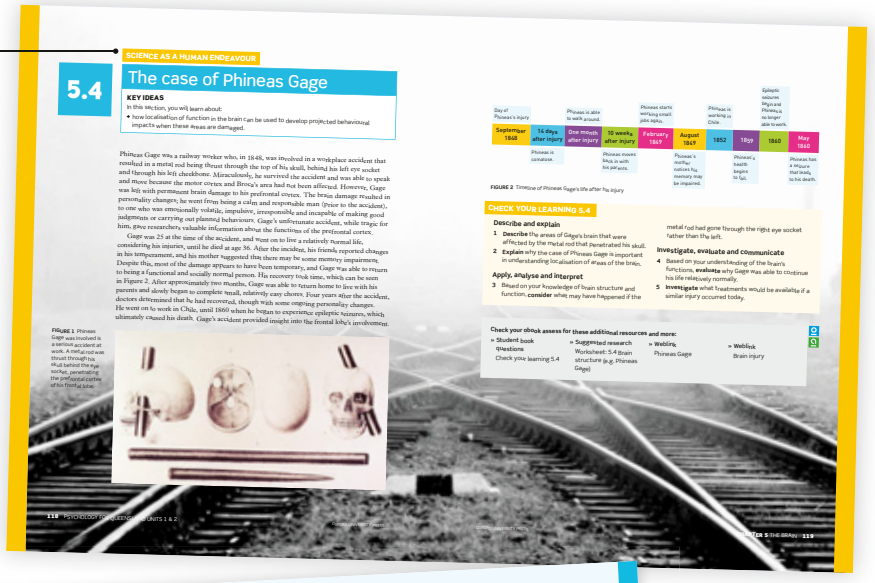
Case studies
Real-life examples to illustrate theoretical points being explained in the text.

Check your learning
Activity boxes with questions and tasks organised using cognitive verbs according to Marzano and Kendall's taxonomy.

Weblinks
Access to additional resources to help consolidate student learning via obook assess.

Multiple choice and short answer questions
Revision questions that help students consolidate content and prepare for exams, with helpful suggestions to guide students on how long they should spend on each question.

Science as a human endeavour
Promotes interest in topics for research investigations.


SCIENCE AS A HUMAN ENDEAVOUR

5.4 The case of Phineas Gage

KEY IDEAS

In this section, you will learn about:
- how localisation of function in the brain can be used to develop projected behavioural impacts when these areas are damaged.

Phineas Gage was a railway worker who, in 1848, was involved in a workplace accident that resulted in a metal rod being thrust through the top of his skull, behind his left eye socket and through his left cheekbone. Miraculously, he survived the accident and was able to speak and move because the motor cortex and Broca's area had not been affected. However, Gage was left with permanent brain damage to his prefrontal cortex. The brain damage resulted in personality changes; he went from being a calm and responsible man (prior to the accident), judicious or carrying out planned behaviours. Gage's unfortunate accident, while tragic for him, gave researchers valuable information about the functions of the prefrontal cortex.

Gage was 25 at the time of the accident, and went on to live a relatively normal life, considering his injuries, until he died at age 36. After the incident, his friends reported changes in his temperament, and his mother suggested that there may be some memory impairments. Despite this, most of the damage appears to have been temporary, and Gage was able to return to being a functional and socially normal person. His recovery took time, which can be seen in Figure 2. After approximately two months, Gage was able to return home to live with his parents and slowly began to complete small, relatively easy chores. Four years after the accident, doctors determined that he had recovered, though with some ongoing personality changes. He went on to work in Chile, until 1860 when he began to experience epileptic seizures, which ultimately caused his death. Gage's accident provided insight into the frontal lobe's involvement.

FIGURE 1 Phineas Gage was involved in a serious accident at work. A metal rod was thrust through his skull behind the eye socket, penetrating the prefrontal cortex of his frontal lobe.

FIGURE 2 Timeline of Phineas Gage's life after his injury

CHECK YOUR LEARNING 5.4

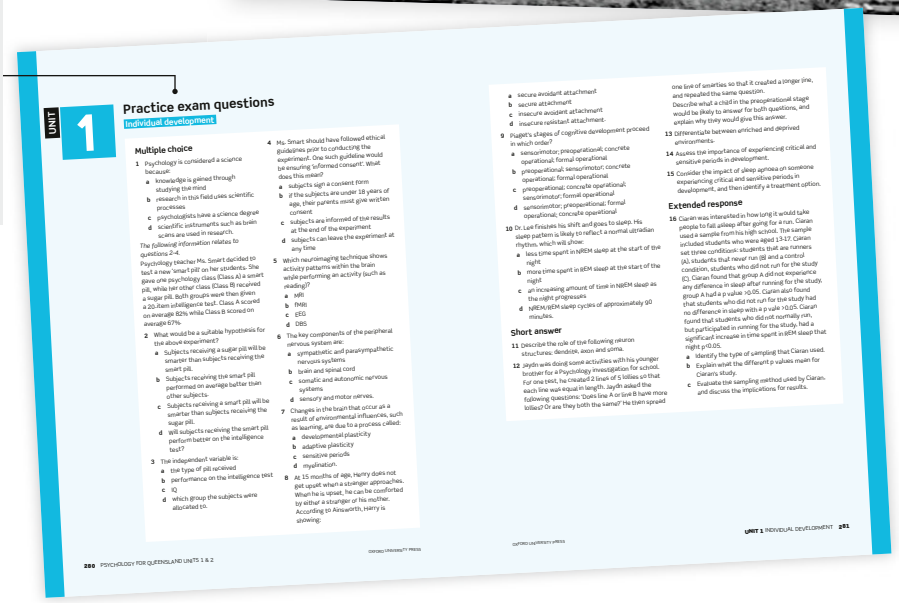
Describe and explain
1 Describe the areas of Gage's brain that were affected by the metal rod that penetrated his skull.
2 Explain why the case of Phineas Gage is important in understanding localisation of areas of the brain.

Apply, analyse and interpret
3 Based on your knowledge of brain structure and function, consider what may have happened if the metal rod had gone through the right eye socket rather than the left.

Investigate, evaluate and communicate
4 Based on your understanding of the brain's functions, evaluate why Gage was able to continue his life relatively normally.
5 Investigate what treatments would be available if a similar injury occurred today.

Check your obook assess for these additional resources and more:
» Student book questions — Check your learning 5.4
» Suggested research — Worksheet: 5.4 Brain structure (e.g. Phineas Gage)
» Weblink — Phineas Gage
» Weblink — Brain injury

Practice examination
Questions can be found at the end of each Unit to help prepare students for their end-of-year external examinations


UNIT 1 Practice exam questions

Individual development

Multiple choice

1 Psychology is considered a science because:
a knowledge is gained through studying the mind
b research in this field uses scientific processes
c psychologists have a science degree
d scientific instruments such as brain scans are used in research.

The following information relates to questions 2–4.
Psychology teacher Ms. Smart decided to test a new 'smart' pill on her students. She gave one psychology class (Class A) a smart pill, while her other class (Class B) received a sugar pill. Both groups were then given a 20-item intelligence test. Class A scored on average 82% while Class B scored on average 67%.

2 What would be a suitable hypothesis for the above experiment?
a Subjects receiving a sugar pill will be smarter than subjects receiving the smart pill.
b Subjects receiving the smart pill performed on average better than other subjects.
c Subjects receiving a smart pill will be smarter than subjects receiving the sugar pill.
d Will subjects receiving the smart pill perform better on the intelligence test?

3 The independent variable is:
a the type of pill received
b performance on the intelligence test
c IQ
d which group the subjects were allocated to.

4 Ms. Smart should have followed ethical guidelines prior to conducting the experiment. One such guideline would be ensuring 'informed consent'. What does this mean?
a subjects sign a consent form
b if the subjects are under 18 years of age, their parents must give written consent
c subjects are informed of the results at the end of the experiment
d subjects can leave the experiment at any time

5 Which neuroimaging technique shows activity patterns within the brain while performing an activity (such as reading)?
a MRI
b fMRI
c EEG
d DBS

6 The key components of the peripheral nervous system are:
a sympathetic and parasympathetic nervous systems
b brain and spinal cord
c somatic and autonomic nervous systems
d sensory and motor nerves.

7 Changes in the brain that occur as a result of environmental influences, such as learning, are due to a process called:
a developmental plasticity
b adaptive plasticity
c sensitive periods
d myelination.

8 At 15 months of age, Harry does not get upset when a stranger approaches. When he is upset, he can be comforted by either a stranger or his mother. According to Ainsworth, Harry is showing:
a secure avoidant attachment
b secure attachment
c insecure avoidant attachment
d insecure resistant attachment.

9 Piaget's stages of cognitive development proceed in which order?
a sensorimotor; preoperational; concrete operational; formal operational
b preoperational; sensorimotor; concrete operational; formal operational
c preoperational; concrete operational; sensorimotor; formal operational
d sensorimotor; preoperational; formal operational; concrete operational

10 Dr. Lee finishes his shift and goes to sleep. His sleep pattern is likely to reflect a normal ultradian rhythm. which will show:
a less time spent in NREM sleep at the start of the night
b more time spent in REM sleep at the start of the night
c an increasing amount of time in NREM sleep as the night progresses
d NREM/REM sleep cycles of approximately 90 minutes.

Short answer

11 Describe the role of the following neuron structures: dendrite, axon and soma.

12 Jaydn will do and some activities with his younger brother for a Psychology investigation for school. For one test, he created 2 lines of 5 lollies so that each line was equal in length. Jaydn asked the following questions: 'Does line A or line B have more lollies? Or are they both the same?' He then spread one line of sweeties so that it created a longer line, and repeated the same question. Describe what a child in the preoperational stage would be likely to answer for both questions, and explain why they would give this answer.

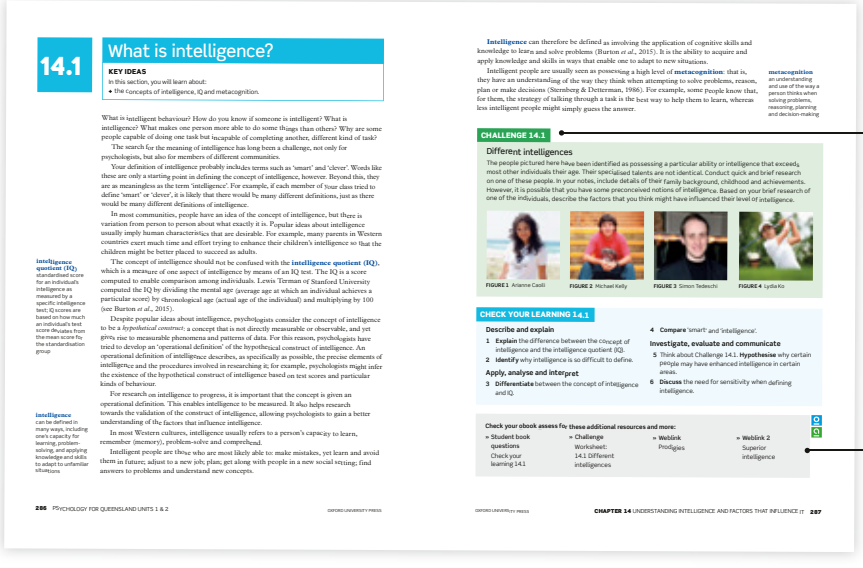
13 Differentiate between enriched and deprived environments.

14 Explain the importance of experiencing critical and sensitive periods in development.

15 Consider the impact of sleep apnoea on someone experiencing critical and sensitive periods in development, and then identify a treatment option.

Extended response

16 Ciaran was interested in how long it would take people to fall asleep after going for a run. Ciaran used a sample from his high school. The sample included students who were aged 13-17. Ciaran set three conditions: students that are runners (A), students that never run (B) and a control condition, students who did not run for the study (C). Ciaran found that group A did not experience any difference in sleep after running for the study. group A had a p value >0.05. Ciaran also found that students who did not run for the study had no difference in sleep with a p value >0.05. Ciaran found that students who did not normally run, but participated in running for the study, had a significant increase in time spent in REM sleep that night p<0.05.
a Identify the type of sampling that Ciaran used.
b Explain what the different p values mean for Ciaran's study.
c Evaluate the sampling method used by Ciaran, and discuss the implications for results.


14.1 What is intelligence?

KEY IDEAS

In this section, you will learn about:
- the concepts of intelligence, IQ and metacognition.

What is intelligent behaviour? How do you know if someone is intelligent? What is intelligence? What makes one person more able to do some things than others? Why are some people capable of doing one task but incapable of completing another, different kind of task?

The search for the meaning of intelligence has long been a challenge, not only for psychologists, but also for members of different communities.

Your definition of intelligence probably includes terms such as 'smart' and 'clever'. Words like these are only a starting point in defining the concept of intelligence, however. Beyond this, they are as meaningless as the term 'intelligence'. For example, if each member of your class tried to define 'smart' or 'clever', it is likely that there would be many different definitions, just as there would be many different definitions of intelligence.

In most communities, people have an idea of the concept of intelligence, but there is variation from person to person about what exactly it is. Popular ideas about intelligence usually imply human characteristics that are desirable. For example, many parents in Western countries exert much time and effort trying to enhance their children's intelligence so that the children might be better placed to succeed as adults.

intelligence quotient (IQ) standardised score for an individual's intelligence as measured by a specific intelligence test; IQ scores are based on how much an individual's test score deviates from the mean score by the standardisation group

The concept of intelligence should not be confused with the **intelligence quotient (IQ)**, which is a measure of one aspect of intelligence by means of an IQ test. The IQ is a score computed to enable comparison among individuals. Lewis Terman of Stanford University computed the IQ by dividing the mental age (average age at which an individual achieves a particular score) by chronological age (actual age of the individual) and multiplying by 100 (see Barton *et al.*, 2015).

Despite popular ideas about intelligence, psychologists consider the concept of intelligence to be a *hypothetical construct*; a concept that is not directly measurable or observable, and yet gives rise to measurable phenomena and patterns of data. For this reason, psychologists have tried to develop an 'operational definition' of the hypothetical construct of intelligence. An operational definition of intelligence describes, as specifically as possible, the precise elements of intelligence and the procedures involved in researching it; for example, psychologists might infer the existence of the hypothetical construct of intelligence based on test scores and particular kinds of behaviour.

For research on intelligence to progress, it is important that the concept is given an operational definition. This enables intelligence to be measured. It also helps research towards the validation of the construct of intelligence, allowing psychologists to gain a better understanding of the factors that influence intelligence.

intelligence can be defined in many ways, including one's capacity for learning, problem-solving, and applying knowledge and skills to adapt to unfamiliar situations

In most Western cultures, intelligence usually refers to a person's capacity to learn, remember (memory), problem-solve and comprehend.

Intelligent people are those who are most likely able to: make mistakes, yet learn and avoid them in future; adjust to a new job; plan; get along with people in a new social setting; find answers to problems and understand new concepts.

Intelligence can therefore be defined as involving the application of cognitive skills and knowledge to learn and solve problems (Burton *et al.*, 2015). It is the ability to acquire and apply knowledge and skills in ways that enable one to adapt to new situations.

Intelligent people are usually seen as possessing a high level of **metacognition**; that is, they have an understanding of the way they think when attempting to solve problems, reason, plan or make decisions (Sternberg & Detterman, 1986). For example, some people know that, for them, the strategy of talking through a task is the best way to help them to learn, whereas less intelligent people might simply guess the answer.

metacognition an understanding and use of the way a person thinks when solving problems, reasoning, planning and decision-making

CHALLENGE 14.1

Different intelligences

The people pictured here have been identified as possessing a particular ability or intelligence that exceeds most other individuals their age. Their specialised talents are not identical. Conduct quick and brief research on one of these people. In your notes, include details of their family background, childhood and achievements. However, it is possible that you have some preconceived notions of intelligence. Based on your brief research of one of the individuals, describe the factors that you think might have influenced their level of intelligence.

FIGURE 1 Arianne Cassiti
FIGURE 2 Michael Kelly
FIGURE 3 Simon Tedeschi
FIGURE 4 Lydia Ko

CHECK YOUR LEARNING 14.1

Describe and explain
1 Explain the difference between the concept of intelligence and the intelligence quotient (IQ).
2 Identify why intelligence is so difficult to define.

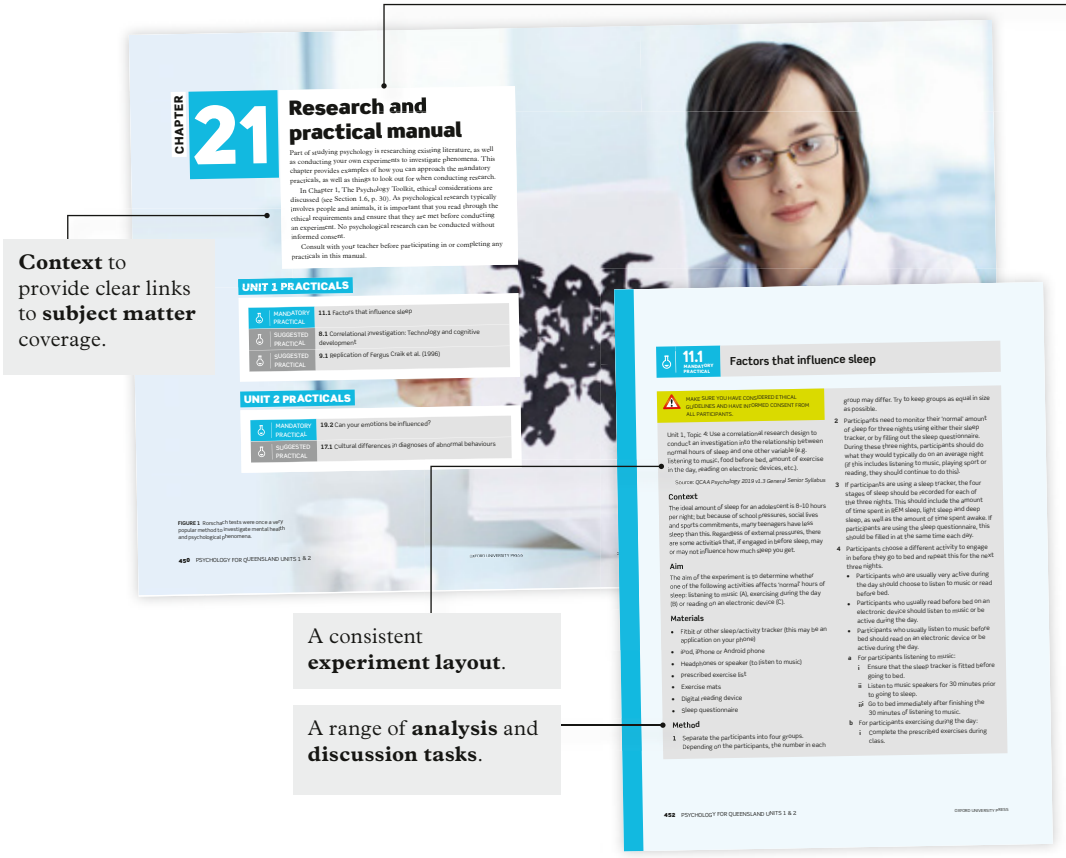
Apply, analyse and interpret
3 Differentiate between the concept of intelligence and IQ.
4 Compare 'smart' and 'intelligence'.

Investigate, evaluate and communicate
5 Think about Challenge 14.1. Hypothesise why certain people may have enhanced intelligence in certain areas.
6 Discuss the need for sensitivity when defining intelligence.

Check your obook assess for these additional resources and more:
» Student book questions — Check your learning 14.1
» Challenge — Worksheet: 14.1 Different intelligences
» Weblink — Prodigies
» Weblink 2 — Superior intelligence

Challenge
Contains scenarios and questions that encourage critical thinking.

obook assess
Links to a range of digital resources help to support student learning and assessment.



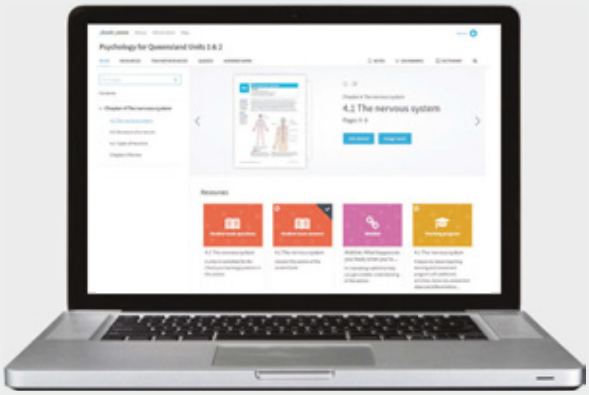
Context to provide clear links to **subject matter** coverage.

A consistent **experiment layout**.

A range of **analysis** and **discussion tasks**.

Practical manual
Each chapter contains a range of practical activities to reinforce theoretical aspects of the syllabus. Each mandatory practical and manipulative skill from the syllabus is included in the practical manual. Suggested practicals are included via the obook assess.

obook assess



Psychology for Queensland Units 1 & 2 is supported by a range of engaging and relevant digital resources via obook assess.

Students receive:

- a complete digital version of the Student book with notetaking and bookmarking functionality
- video tutorials demonstrating key skills
- write-in worksheets to accompany all mandatory and suggested practicals
- interactive auto-correcting multiple-choice quizzes
- a range of engaging weblinks to support understanding
- access to work assigned by their teacher: reading, homework, tests, assignments.

In addition to the student resources, teachers also receive:

- detailed planning resources
- Student book answers
- printable (and editable) sample assessments, including data tests and exams with answers
- the ability to set up classes, set assignments, monitor progress and graph results, and to view all available content and resources in one place.

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Oxford University Press would also like to offer a special thanks to Breanna Hall for reviewing the content in *Psychology for Queensland Units 1 & 2*.

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CHAPTER 1

The psychology toolkit

Psychology requires research skills to experiment and test theories in order to gain further knowledge. A true experiment always aims to discover natural laws of cause and effect – how do changes in one property cause changes in another?

This chapter will become a useful reference throughout Units 1 and 2 of Psychology. Psychology applies the most rigorous of scientific methods in order to collect information and test theories, so in some ways this chapter tells you many of the most important things in all of psychology. It *should* come first!

This chapter is set out in a way that makes each piece of information easy to access. It is not meant to be read from beginning to end. Rather, it's like a toolbox – you dip your hand into it, get the tool you need and then use it.

OBJECTIVES

→ Identify the research question
→ Formulate a null hypothesis and an alternative hypothesis
→ Design the method
→ Collect the data
→ Process the data, and analyse and evaluate evidence
→ Report the findings

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FIGURE 1 Collecting information and conducting research will greatly increase your understanding of psychology.

1.1 The scientific method

KEY IDEAS

In this section, you will learn about:

- the scientific method
- independent and dependent variables
- null hypothesis and alternative hypothesis.

Psychology is a science that uses research methods and experimental evidence to test theories and understand human nature. Psychologists, as scientists, use the scientific method to answer research questions.

The scientific method

scientific method a standardised way of making observations, gathering data, testing hypotheses and interpreting results to establish theories in order to describe and measure human behaviour

The **scientific method** is a logical process of problem-solving applied in all sciences. It involves eight steps.

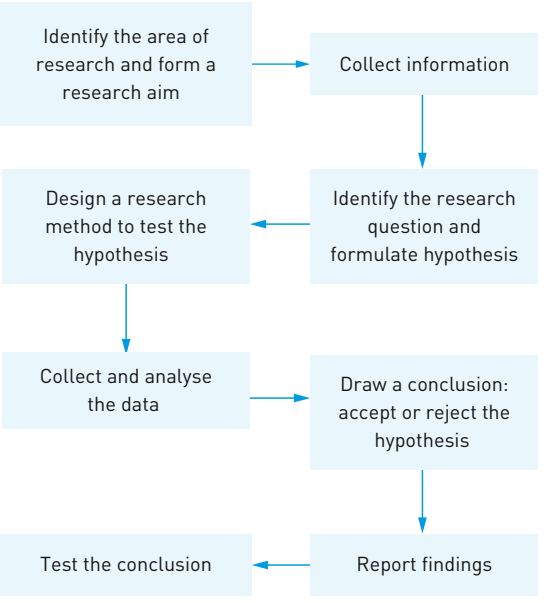


FIGURE 1 The scientific method

To see exactly how the scientific method works, consider the example of some interesting research by Judith Kearins (1981) in Western Australia.

1. *Identify the area of research and form a research aim*. Kearins wished to discover whether the skills of Indigenous people in visual tasks (especially visual memory) were better than those of non-Indigenous Australians.
2. *Collect information*. From previous research, it appeared that Indigenous Australians brought up in bush communities were superior in their observational skills and interpretation of spatial cues.
3. *Identify the research question and formulate a hypothesis*. Kearins asked the question: 'Is there a difference in visual memory between Indigenous Australians and other Australians?' She formed the hypothesis that the visual memory of Indigenous Australians would be superior to that of other Australians.

4 *Design a research method to test the hypothesis*. Participants were 44 Indigenous Australian adolescents and 44 non-Indigenous Australian adolescents. Kearins developed a test of visual memory in which 20 objects were placed on a board that was divided into 20 squares. After looking at the objects for 30 seconds, participants were asked to recall as many items as they could in the correct location. The experiment was repeated using different types of objects: natural, manufactured or a combination of both.

5 *Collect and analyse the data*. It was found that, on average, the Indigenous Australian participants recalled more than 16 items while the other participants recalled fewer than 12. This difference was found to be statistically significant.

6 *Draw a conclusion – accept or reject the hypothesis*. Kearins concluded that the culture and experience of Indigenous Australians caused them to have superior visual memory compared to other Australians.

7 *Report findings*. This study was published in a journal called *Cognitive Psychology*.

8 *Test the conclusion*. Using a similar method, Klich and Davidson (1983) performed research on school children and found similar results.



FIGURE 2 Tasks like this are used by psychologists to test cognitive functioning and ability.

Variables

Research is all about variables. But what is a variable?

A variable is a quantity or quality that can be different at different times or in different places. In psychology, we are mainly interested in properties that vary from person to person or within the same person at different times. These could include:

- age
- race
- gender
- IQ
- aggression
- position in family

- income
- eye colour
- quality of life
- feelings of wellbeing.

Every experiment has at least one independent and one dependent variable:

independent variable (IV) the variable that is manipulated by the experimenter who then measures resulting changes in the dependent variable

- An **independent variable (IV)** is deliberately manipulated or varied in some way by the experimenter. This is planned before the experiment begins. Simple experiments use one independent variable with two values (male/female; yes/no) – in Kearins' research, it was Indigenous Australians/non-Indigenous Australians. In a more complex experiment, the IV could be continuous – that is, it could have a range of values on a scale; for example, age, body mass IQ or optimism.

dependent variable (DV) the property that is measured in psychological research, to look for effects of the independent variable

- The **dependent variable (DV)** is the property that is measured in the research. Its value depends on the IV and that is why it is called 'dependent'. The DV is therefore the property that the researcher believes will change as a result of changes in the value of the IV. The DV is usually continuous (that is, it has any value within a certain range) and should be stated as an operational definition.

operationalisation quantification of a variable

Operationalisation of a variable means that the variable is stated in terms that show how it is measured. Ask yourself: How can I present this variable as a number? This might include:

- age: operationalised as age in total months
- IQ: operationalised as a score on an intelligence test (e.g. WAIS-5).
- aggression: operationalised as the number of aggressive responses in an observed 30-minute period.

Extraneous and confounding variables

extraneous variable a variable other than the independent variable that could cause changes in the value of the dependent variable

An **extraneous variable** is a variable other than ('extraneous to') the IV that could cause changes in the value of the DV. Extraneous variables are undesirable. When the potential effects of an extraneous variable have been removed from the experiment (usually by the experimental design), the variable is said to be a controlled variable.

confounding variable a variable other than the independent variable that has a systematic effect on the value of the dependent variable. If a confounding variable exists, no valid conclusions about the research can be drawn

A **confounding variable** is a variable other than the IV that has a systematic effect on the value of the DV. If a confounding variable exists, the research is usually a waste of time and no valid conclusions can be drawn, so very stringent procedures are used to prevent this happening.

Hypothesis

hypothesis a prediction of the outcome of research stated in terms of the influence of changes in the value of the independent variable on the value of the dependent variable

A **hypothesis** in psychological research is a clear statement predicting how changes in the independent variable(s) will affect the value of the dependent variable(s). A hypothesis should also clearly state the population about which the researcher intends to draw conclusions.

The variables are not operationalised in the statement of the hypothesis, but they need to be clearly stated in operational terms in the introductory part of the research report. These are some examples of appropriate hypotheses:

- It was hypothesised that for adult drivers in Brisbane, an increase in blood alcohol level will cause a decrease in reaction speed.
- It was hypothesised that for patients recovering from heart surgery, regular exercise will lead to improved cardiovascular health.
- It was hypothesised that for students showing examination anxiety in Psychology, rest periods taken during examinations will lead to decreased anxiety.

- It was hypothesised that Psychology students who have regular study schedules throughout the academic year will achieve better academic results than those who cram in the last two weeks before the exams.

Experimental research may also forecast a **null hypothesis**. The null hypothesis states that the independent variable will have no effect on the dependent variable, or that any change on the dependent variable will be unrelated to the independent variable.

null hypothesis hypothesis that there will be no significant difference between groups; any difference observed is caused by error

For example, it was hypothesised that there would be no statistically significant gender difference evident on the spatial ability test.

The **alternative hypothesis** is one that states that there will be a relationship between the independent variable and the dependent variable.

alternative hypothesis hypothesis that there will be a relationship between the independent and dependent variables

For example, it was hypothesised that there would be a statistically significant age difference evident on the spatial ability test, with older students expected to outperform younger students.

CHECK YOUR LEARNING 1.1

Describe and explain

1 **Identify** the steps of the scientific method.
2 **Describe** the following:
   - **a** independent variable
   - **b** dependent variable
   - **c** extraneous variable
   - **d** confounding variable
3 **Explain** the null hypothesis.
4 **Summarise** the scientific method.

Apply, analyse and interpret

5 For each of the situations below, **determine** what the variables are:
   - **a** Primary school children who watch violent cartoons on television have more nightmares than those who watch humorous cartoons.
   - **b** By the age of six, children who were in day care before the age of six months are socially better adjusted than those who stayed with a sole caregiver.
   - **c** Children who sleep more than nine hours each night have better concentration in school than those who sleep less than nine hours.

Investigate, evaluate and communicate

6 A researcher theorises that students who eat cereal in the morning will have lowered exam performance. **Propose** a research question and hypothesis for this.
7 A researcher had a theory that an increased intake of sugar improves people's problem-solving ability. We need to know how to define 'increased sugar intake' so that it is measurable. This could be operationalised as a 10 per cent increase in sugar intake per day. We also have to decide how we would measure 'problem-solving' ability.

Hypothesise 'problem-solving ability' (this could be how many problems solved in a certain time or length of time taken to solve a particular problem. You could also consider different types of problems, such as anagrams, jigsaws, Sudoku or crosswords).

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  Hypotheses
- » Weblink
  The scientific method
- » Weblink
  Variables

1.2 Sampling methods and experimental designs

KEY IDEAS

In this section, you will learn about:

- participant selection
- random sampling and stratified random sampling
- experimental and control groups
- experimental designs.

After deciding what variables to investigate, psychologists need to decide how to select participants for their study and how best to design their research.

population
the group of people about which we wish to draw conclusions

sample
the members of the population who have been chosen to take part in the research

convenience sampling
using whoever is available at the time of research

random sampling
a sampling procedure in which every member of the population has an equal chance of being selected

Participant selection

In research, we are always interested in drawing conclusions that are valid for a particular group or groups of people. The group about which we wish to draw conclusions is referred to as the **population**.

It is rarely possible to perform an experiment on every member of a population. As a result of this, psychologists select a smaller number of individuals from the population to be participants in their research and to represent the population. This group is referred to as the **sample** and the selection of participants for research is called 'sampling'. Sampling procedures must ensure that the sample is representative of the population from which it is drawn. This means that personal characteristics of the sample should be distributed in the same proportions as in the population.

Convenience sampling is when researchers use the people who are easily available to them. This may be people in their local café. These people are probably not representative of the greater population, but are readily accessible to the researcher.

Two procedures used to make sure that the sample is representative are random sampling and stratified sampling (or stratified random sampling).

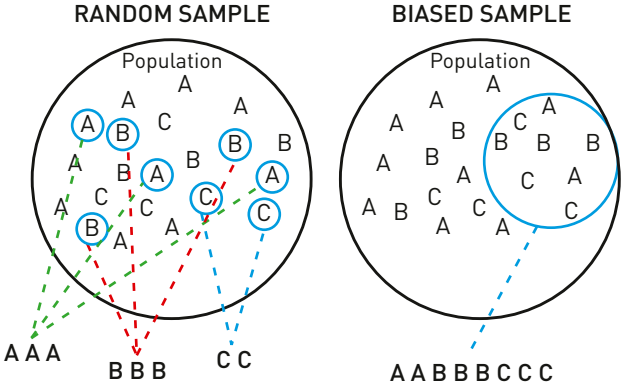


FIGURE 1 Personal characteristics are distributed in the random sample in the same proportions as in the population. The biased sample has certain elements overrepresented (C) and underrepresented (A).

Random sampling

Random sampling is a sampling procedure in which every member of the population has an equal chance of being selected – just as the Gold Lotto numbers do in each draw!

Imagine, for example, that we wish to draw conclusions about all 50 000 Psychology students in Queensland. QCAA has allocated a number to each Psychology student, so all we need to do is put the QCAA numbers in a barrel – just like a huge Gold Lotto barrel – roll the barrel and pull out one number at a time until we have enough for our experiment.

This would be very time-consuming, so we would use technology to help. All scientific calculators and computers have the capacity to generate a list of random numbers.

If we just instruct the computer to give (for example) 500 random numbers between 1 and 50 000, we can then get a list of the population from QCAA and select the students whose numbers appear in the 500 different positions shown in the random number list.

Stratified sampling

Stratified sampling (or stratified random sampling) is a process by which the effects of a certain variable can be eliminated as a possible confound in an experiment. This is done by ensuring that this variable is distributed within the sample in the same proportions as it is within the population. For example, if we wanted to draw conclusions about Psychology students, we should first note that there are 16 000 of these, 12 000 of whom are female. This means that if our sample were 50:50 males and females, the sample would not represent the population and our results could not be generalised to the population. In this case, stratification by gender would mean that we should take a sample of (for example) 160 students – 120 females and 40 males – in order to eliminate the possible confounding effects of gender.

stratified sampling
a sampling process by which the effects of a certain variable can be eliminated as a possible confound in an experiment

Stratified sampling involves a number of procedures:

1. Identifying a property that we believe may interfere with the effects of the IV on the value of the DV.
2. Measuring that property for each member of the population.
3. Dividing the population into particular strata (groups) based on the value of that variable.
4. Deciding on the number of participants required for the experiment.
5. Selecting participants in the same proportions as exist in the population to make up the sample (a stratified sample).
6. Selecting a random sample from each stratum, in the same proportions as exist in the population (a stratified random sample).

The stratum could really be any personal variable, such as age, years of completed education, ethnicity, gender, IQ or body mass.

Stratified sampling is used in the creation of many high-quality psychological measuring instruments, such as the Wechsler Intelligence Scale. These scales are stratified according to ethnicity, age group and years of completed education.

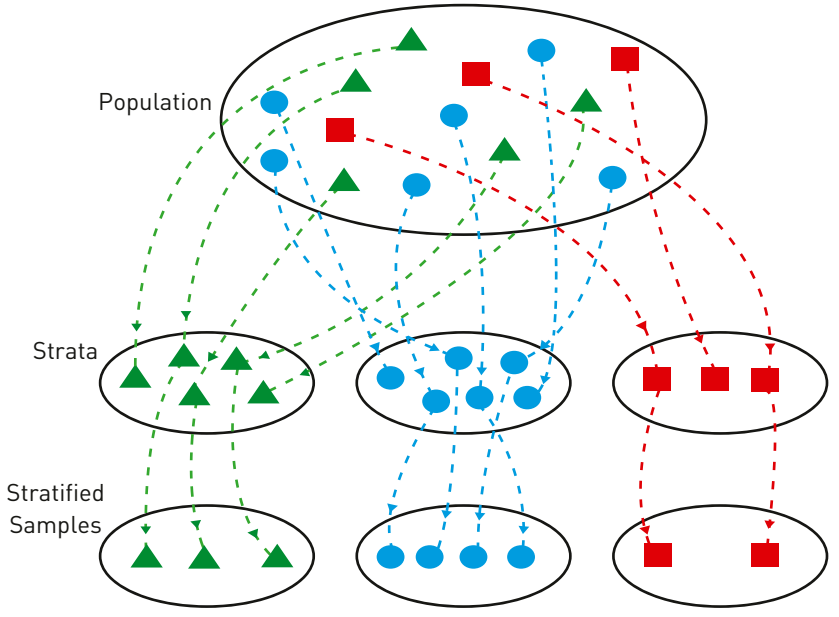


FIGURE 2 Stratified sampling involves dividing the population into distinct 'subgroups' and then selecting a separate sample from each subgroup in the same proportions as they occur in the population.

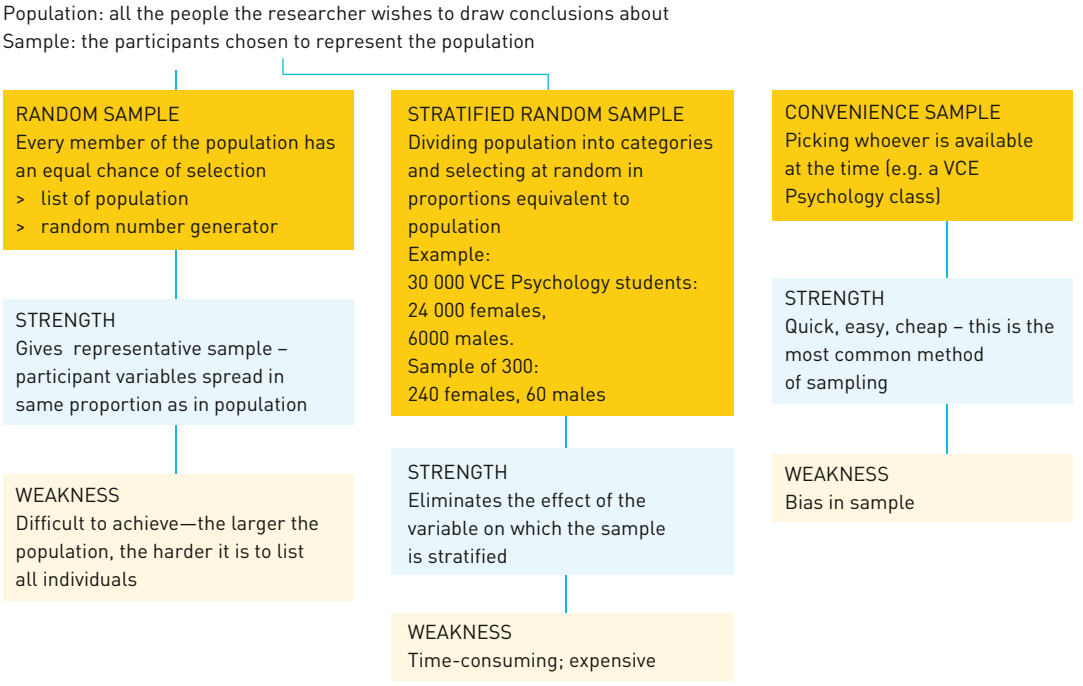


FIGURE 3 Sampling summary

experimental group (E-group) the group of research participants exposed to the independent variable; the results are compared with the control group so that the effects of the independent variable can be determined

control group (C-group) the group of research participants not exposed to variations in the independent variable; the results are compared with the experimental group so that the effects of the independent variable can be determined

random allocation a subject-selection procedure where all participants who have been selected for an experiment have an equal chance of being in the E-group or C-group

Experimental and control groups

In psychological research, participants may be randomly allocated to different groups. The basic experimental method uses two different groups called the **experimental group (E-group)** and the **control group (C-group)**.

Members of the E-group are exposed to the IV. This is referred to as the condition that receives the treatment. The treatment is the variable that the experimental group participants receive and the members of the control group do not.

The purpose of the E-group is to show the effects of the IV on the value of the DV.

The control group consists of the participants who are not exposed to the IV – they do not receive the treatment. The purpose of the C-group is to form a basis for comparison with the E-group.

After the experiment, the average value of the DV for the E-group is compared with the average value of the DV for the C-group. If there is a significant difference, it is concluded that the independent variable (the treatment) has caused this difference.

It is important that the experimental group and the control group are as similar as possible in relevant participant characteristics, and that they are treated as similarly as possible throughout the experiment.

Random allocation

Random allocation means that all participants who have been selected for an experiment must have an equal chance of being in the E-group or the C-group.

When the sample is large enough, this means that the E-group and the C-group will be equivalent on all participant characteristics, and the presence or absence of the IV will be the only difference between them – meaning that it is entirely responsible for any difference in the measured DV.

For example, suppose we performed an experiment to test the theory that 'sleep deprivation adversely affects performance on a problem-solving task', and we allocated all males to the E-group and all females to the C-group. No conclusions could be drawn from this research because the difference in results between the two groups may be due to differences in the gender of the participants, rather than (or as well as) the effects of the sleep deprivation. We would say that these results were confounded by gender.

Experimental designs

Another method of controlling extraneous variables is by the design of the experiment. We shall examine three experimental designs, each of which has certain advantages and certain disadvantages. A researcher will choose a design that best suits the population and variables to be investigated.

The three experimental designs we shall look at are repeated measures, matched participants and independent groups.

Repeated measures design

In a **repeated measures design** (also known as 'within participants design'), each participant is part of both the E-group and the C-group. For example, in the research described above, looking at the effects of sleep deprivation on problem-solving ability, all participants would be tested for problem-solving on two occasions (once in a normally rested state and once in a sleep-deprived state) and the results for each participant would be compared.

repeated measures design a subject-selection procedure where each participant is part of both the E-group and the C-group

The greater the time that passes between the two measurements being taken, the less chance there is that either practice or boredom will affect the results. The problem is, however, that increasing the interval between the two events increases the likelihood that participants will withdraw.

A better method of overcoming order effects is **counterbalancing**. In the counterbalancing procedure, half the participants will first perform the task with the IV present (experimental condition) and then perform the task with the IV absent (control condition). The other half of the participants will experience the conditions in the reverse order. Random selection should be used to decide which participants perform the tasks in which order.

counterbalancing a method for controlling order effects in a repeated measures design

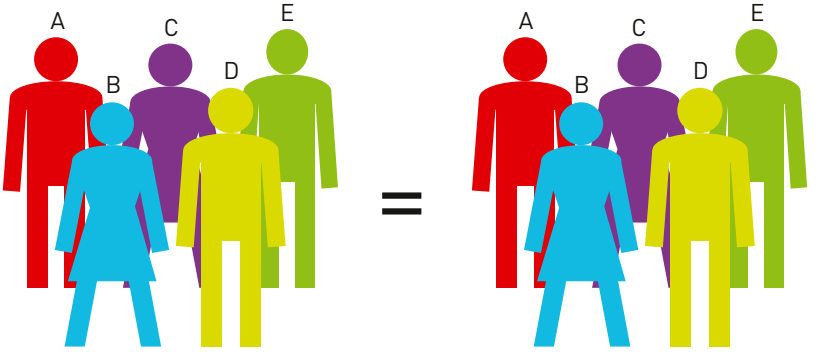


FIGURE 4 A repeated measures design involves using the same subjects in each condition of an experiment.

Matched participants design

The **matched participants design** enables a researcher to identify a likely confounding variable, and to eliminate the effects of this variable from the experiment. Participants can be ranked in accordance with their scores on this variable and then allocated to the respective groups.

matched participants design a subject-selection procedure that attempts to eliminate confounding variables by 'matching', on key characteristics, each individual in the experimental group with an individual in the control group

For example: An educational psychologist had designed a program that she believed would increase the rate at which Prep children learnt to read. She decided to test this by giving an E-group of children instruction using her program. As a C-group, she used children taught by traditional methods.

She believed that the intelligence (IQ) of each child could be a confounding variable, so she measured the IQ of each child. Then the two children with the highest IQ scores were randomly allocated, one to the E-group and one to the C-group. The two children with the third and fourth highest IQ scores were also randomly allocated, one to the E-group and one to the C-group. This procedure continued until all the children were allocated and the mean IQ of the E-group and the C-group were the same.

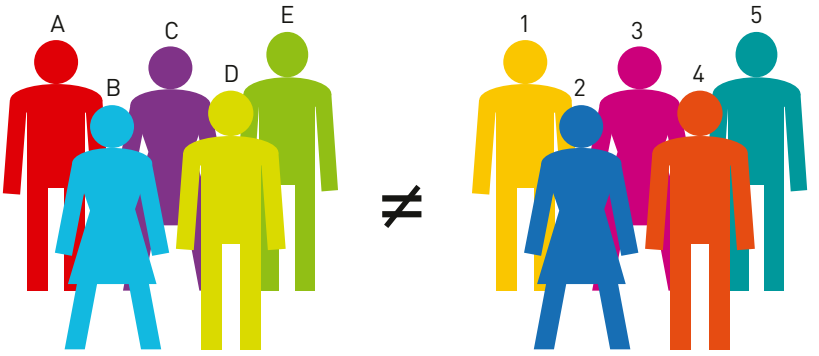


FIGURE 5 A matched pairs design involves using different but similar subjects in each condition of an experiment.

Independent groups design

independent groups design allocates participants to E-group or C-group at random; also known as 'between participants design'

The **independent groups design** (also known as 'between participants design') allocates participants to the E-group or the C-group at random.

Study tip

When conducting practicals, it may be easiest to use an independent groups design

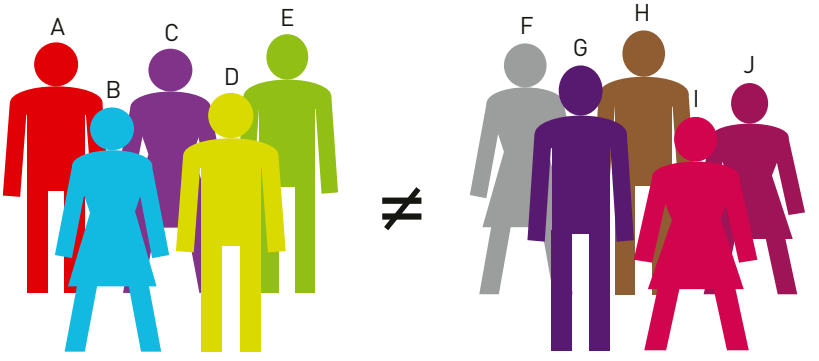


FIGURE 6 An independent measures design involves using different subjects in each condition of the experiment.

Twin and adoption studies

One way of eliminating interpersonal variables as potential confounding variables is to use participants who are as similar to each other as possible.

The nature-versus-nurture debate is a major theme in psychology. Twin studies – especially with identical twins – and adoption studies provide the strongest evidence for the balance between the contributions of genetics and the environment to personal variables.

Experimental design	Advantages	Disadvantages
Repeated measures	Using the same participants as the E-group and the C-group means that confounds caused by 'participant variables' will be eliminated.	• The repeated measure procedure takes a long time. • Participants have to take part in both conditions, so 'drop-outs' are likely.
	Uses fewer participants than other designs.	• The procedure can suffer from confounding variables known as order effects: participants may perform better on the task when doing it a second time because of the effect of practice, or participants may do worse the second time because of fatigue or boredom.
Matched participants	The variable on which the participants are 'matched' will not influence the results because its effects will be the same in the E-group and the C-group.	• It is very time-consuming (and therefore expensive) to find out the value of this variable for each participant. • If one of the pair drops out, the scores for the other must also be eliminated.
Independent groups	The procedure can all be done at once and drop-outs are unlikely.	• The procedure needs a large number of participants to ensure that the spread of participant variables in the sample will match the spread in the population.

TABLE 1 Advantages and disadvantages of some experimental designs

Developmental research designs

Three research designs are mainly used to study developmental change: longitudinal design, cross-sectional and sequential designs.

Longitudinal designs

In a **longitudinal study** the same participants are monitored at different times in their lives. A considerable amount of time exists between each test, for instance, a participant may be tested at five-year intervals for a number of years. A longitudinal design is a form of a repeated measures design.

Cross-sectional designs

In **cross-sectional studies**, participants of different ages, or cohorts, are investigated at one particular point in time. A cross-sectional design is a form of an independent groups design.

Sequential designs

Sequential designs attempt to overcome the limitations with both longitudinal and cross-sectional designs. They are a combination of both designs; for instance, the same participants from different cohorts may be tested over a long period of time. Sequential designs build on the strengths of both longitudinal and cross-sectional designs and eliminate many of the weaknesses, such as cohort effects (variations in characteristics affecting an area of study over time). They are rarely used, however, because of the considerable time and expense involved in carrying out this type of design.

longitudinal studies
a form of repeated measures design where the same participants are investigated over a period of time

cross-sectional design
a form of independent groups design, where data is collected at one time from participants of all ages and different age groups, and compared

sequential designs
a combination of longitudinal and cross-sectional designs, which draws on strengths and eliminates weaknesses of either approach

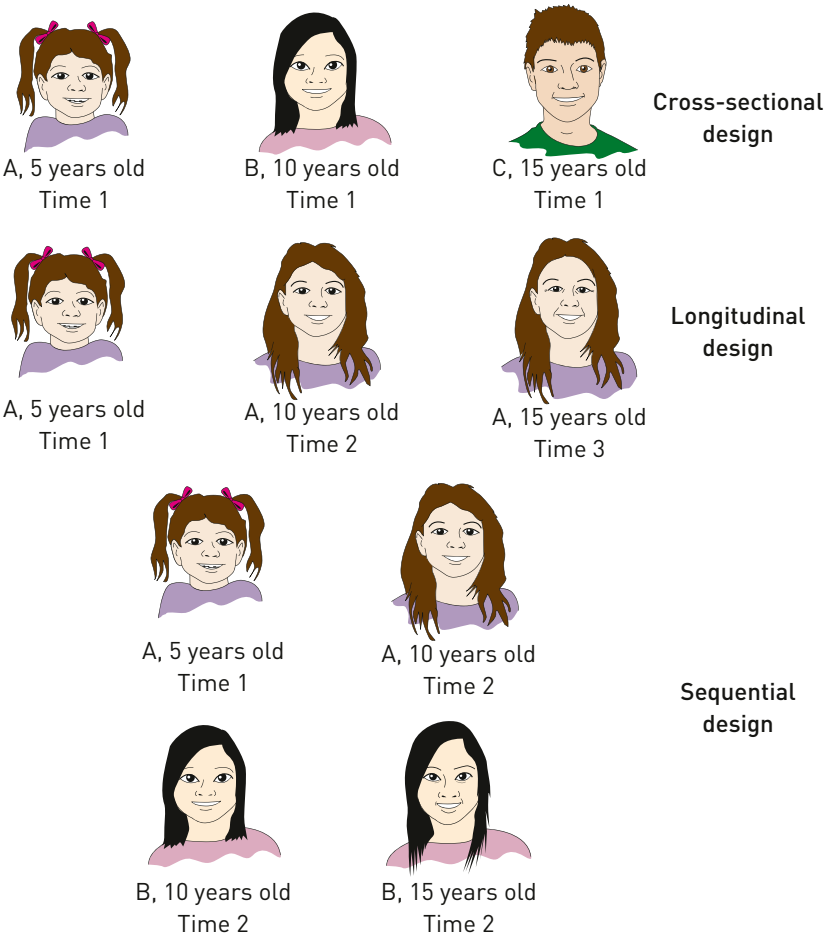


FIGURE 7 Developmental research designs

placebo effect refers to the participants' behaviour being influenced by their expectations of how they should behave, caused by the belief that they have received some treatment

single-blind procedure allocating participants to groups in such a way that they do not know whether they are in the E-group or the C-group

experimenter effect the outcome of an experiment being influenced by the person conducting the experiment

double-blind procedure the method of allocating participants to groups so that neither the experimenter nor the participants are aware of who is in the E-group or C-group

Controlling placebo and experimenter effect

Placebo effect

The **placebo effect** refers to the participants' behaviour being influenced by their expectations of how they should behave, caused by the belief that they have received some treatment. This means that the expectations of the participants, as well as (or instead of) the IV, may be affecting the value of the DV, and therefore that the results of the experiment are not valid.

The placebo effect can be eliminated by using a **single-blind procedure** in the experimental process – allocating participants to groups in such a way that they do not know whether they are in the E-group or the C-group.

Experimenter effect

The **experimenter effect** refers to the outcome of an experiment being unintentionally (or even intentionally) influenced by the experimenter. It occurs, for example, if the experimenter treats the members of the E-group and the C-group differently, and therefore influences the behaviour of the participants and the outcome of the experiment.

The experimenter effect can be addressed by using a **double-blind procedure** in the experimental process, ensuring that neither the experimenter nor the participants are aware of who is in the E-group or the C-group. This procedure is most commonly used when

there is a possibility that the expectations of either the experimenter or the participants will influence the outcome of the experiment.

Table 2 summarises the way in which psychologists control possible problem (confounding) variables in research.

Source of problem	Description of problem	Control procedures
Participants	• Participant variables • Interpersonal differences	• Large sample (independent groups) • Repeated measures • Matched participants
Procedure	• Artificial environment (laboratories or observation)	• Use naturalistic observation (with observer not in environment)
Design	• Order effects • Placebo/experimenter effects	• Counterbalancing • Independent groups • Single-blind • Double-blind • Inter-rater reliability check
Data collection	• Bias/distraction/confusion	• Standard procedures

TABLE 2 Controlling extraneous variables and bias

CHECK YOUR LEARNING 1.2

Describe and explain

1 **Explain** why extraneous variables need to be controlled and **provide** an example.
2 **Identify** two differences between a repeated measures design and a matched participants design.
3 **Describe** what a control group is.
4 **Explain** the purpose of an experimental group.
5 **Define** random allocation.
6 **Identify** at least one variable on which the sample should be stratified in the following research questions:
   a Does the Acme Reading Instruction Method increase the rate at which early primary school students learn to read?
   b Does consumption of one standard alcoholic drink interfere with an adult's problem-solving ability?
   c Do teachers who use PowerPoint presentations get better results than those who dictate notes?
   d Are girls better at Senior Mathematics than boys?
7 **Explain** the term placebo effect.

Apply, analyse and interpret

8 **Consider** why random allocation is a necessary part of the experiment process.
9 **Determine** how a psychologist could obtain a random sample for all the adult population of Toowoomba.
10 **Consider** the use of placebo effects. Provide an example of how a placebo effect could be used in an experiment.

Investigate, evaluate and communicate

11 **Evaluate** the benefits of a twin study against an independent groups design. **Justify** why a twin study may yield better results.

Check your obook assess for these additional resources and more:

» Student book questions
Check your learning 1.2

» Weblink
The population and sampling

» Weblink
Participant selection

» Weblink
Research designs

1.3 Data collection

KEY IDEAS

In this section, you will learn about:

- types of data
- scales of measurement
- data collection.

Deciding what type of data to collect and how to collect that data is a very important part of research design.

Types of data

Researchers wish to be as accurate as possible when collecting data, so the variables must be measured as precisely as possible. Data can be classified as qualitative or quantitative.

qualitative data descriptions of the characteristics of what is being studied

Qualitative data refer to descriptions of the characteristics of what is being studied. In psychological research this could be:

- emotional state – happy/sad/angry
- difficulty of task – easy/moderate/difficult/very difficult.

quantitative data measurements (numerical information) about the variables being studied

Quantitative data refers to measurements – numerical information about the variables being studied. Most psychological research aims to gather quantitative data because we can perform statistical procedures on these and, provided the data are accurate and precise, we can determine whether our results are significant and our hypotheses can be supported. Data can also be subjective or objective.

subjective data information about the variables being studied based on opinion, with no external yardstick by which they are measured

Subjective data are based on opinion, and there is no external yardstick by which they are measured. If you asked all the people in your class how they feel about mathematics, you would collect a wide range of responses – all of which are correct because they are based on the individual's own feelings.

objective data data that is measured according to an identifiable external criterion

Objective data are measured according to an identifiable external criterion. Each person using an objective measure correctly will obtain the same result. In simplest terms, if each person in the class measured the length and breadth of a desk, they would all obtain the same result.

Many standardised measures are used to gain psychological information in an objective way. This includes different IQ tests and any psychologist who administers one of these would obtain the same result for the same person under the same conditions.

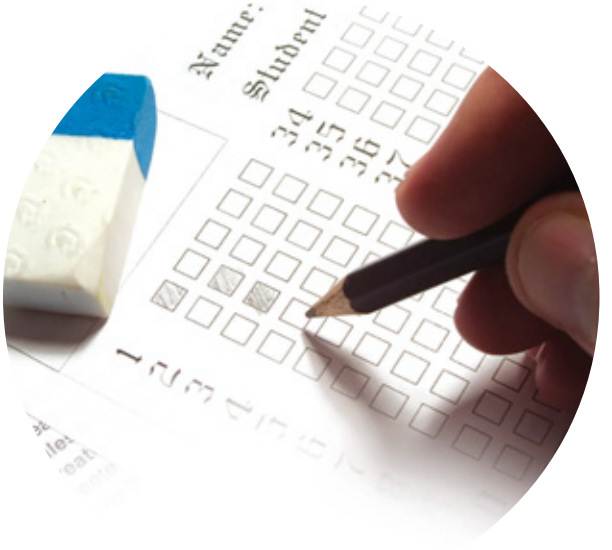


FIGURE 1 Self-report surveys collect subjective data.

Scales of measurement

In order of increasing precision, the scales of measurement used are:

- nominal scale
- ordinal scale
- interval scale
- ratio scale.

Nominal data: If we separate individuals by a property that has no quantitative value and where there is no order implied, we are collecting nominal data. Examples include:

- natural hair colour (brown/black/blonde/red/other)
- religion (Islam/Christianity/Hinduism/Buddhism/Sikhism/Judaism/other).

nominal data data that has qualitative value rather than quantitative value, where there is no ranking or ordering of the values implied



FIGURE 2 Hair colour is an example of nominal data that allows us to allocate individuals to groups.

Ordinal data: The data have a definite sequence, but the gap between one level and the next is not constant. Examples include:

- ages of people in your classroom – There is no question about who is the oldest (your teacher!), but the gap between the age of the teacher and the next oldest is several years, while the oldest student may be only a week older than the next oldest, who may have been born on the same day but 10 minutes before the next oldest.
- body mass of people in the room.

ordinal data data that has a definite sequence, but the gap between one level and the next is not constant

Interval data: In this case, the data are measured on a scale where each step is the same value, but zero doesn't mean zero! An example of such a scale is temperature.

If today is 30°C, does that mean that it is twice as hot as yesterday when it was 15°C? Of course not! If you were talking to an American friend who measures temperature in Fahrenheit, they would say today is 86° and yesterday it was 59° – obviously not the same quantities!

interval data data is measured on a scale where each step is the same value, but zero does not mean that the property does not exist

Ratio data: Ratio measurement is the most precise and rigorous. It is the strongest of all and we can perform the most powerful statistical tests with this data. Zero means 'zero' – the property does not exist – and each interval is the same. Ratio scales include length in centimetres (0 means zero and 1–2–3 etc. are all the same interval). Other examples include velocity and mass.

ratio data measurements that represent quantities in terms of equal intervals and an absolute zero point of origin

Data collection

Throughout this textbook, there are many research studies described or referd to. These show the various ways in which experiments are designed and data is collected.

Observation

naturalistic observation observation of voluntary behaviours occurring within the subject's natural environment

controlled observation observation of voluntary behaviours within a structured environment such as a laboratory

There are two types of observation: naturalistic and controlled. **Naturalistic observation** is when voluntary behaviours occurring within a subject's natural environment are documented. **Controlled observation** is when voluntary behaviours are monitored within a structured environment such as a laboratory.

	Strength	Weakness
Naturalistic observation	Highly realistic, especially if the observer is not visible.	There is a lack of ability to control the IV.
Controlled observation	Control over the environment enables more accurate observations,	Participant behaviour may be changed by the environment.

TABLE 1 Comparing naturalistic and controlled observation

Interview

All interviews involve interaction between the researcher and the participant. Interviews can be structured or clinical. In a structured interview participants are asked a set of pre-determined questions with a fixed choice of responses such as yes/no, or never/sometimes/often/always. In a clinical interview there are structured guidelines, but further questioning is used for clarification.

Strengths of a structured interview are that it is easy to compare participants and easy to replicate, however, data may be missed through limited choices in response. Strengths of clinical interviews are flexibility, and they are usually high in validity. However, they rely on the objectivity of the interviewer.

Questionnaires

All questionnaires are methods of collecting written responses from participants. They can take various forms:

- **Surveys:** May be question-and-answer or response to Likert-type scales (rating scales). Surveys are easy to replicate and to score and Likert scales can provide a means of quantifying data. They may be open to bias if participants are trying to appear in a particular way.
- **Psychological tests:** Personality and multiple-choice IQ tests are types of psychological tests. Strengths of psychological tests include being standardised, easy to replicate, and easy to score. Weaknesses include being difficult to construct and validate.

Technology in data collection

Technology can make some forms of data collection easier and quicker.

Computerised or automated data collection

Sometimes, a participant will respond to stimuli presented in a computer program or enter data onto a spreadsheet. In animal studies, responses such as pressing a button can be recorded. A strength of this data collection method is efficiency, as the researcher does not need to be present. Other strengths include accuracy, as response rates can be timed to the

millisecond, and ease of analysis – once the computer program has been written, data analysis can be instantaneous. A weakness of this method is the need for computer programming or specially constructed measuring devices.

Video/audio-taping

For clinical interviews and certain case studies (such as sleep studies), these recordings are very useful. A strength of this approach is that large amounts of data can be collected and analysed in detail. A weakness is that this analysis is time-consuming.

CHECK YOUR LEARNING 1.3

Describe and explain

1 In your own words, **describe** the following types of data:
   - **a** nominal
   - **b** ordinal
   - **c** interval
   - **d** ratio

2 **Summarise** the different methods of data collection.

Apply, analyse and interpret

3 **Compare** qualitative and quantitative data.

4 **Contrast** interval and ratio data.

5 **Explain** what a cohort effect is. **Consider** how it can affect the results in a cross-sectional research study.

6 **Consider** how sequential designs attempt to overcome the limitations of longitudinal and cross-sectional designs.

Investigate, communicate and evaluate

7 Before the 1950s, in countries such as Canada, the United States and Australia, left-handedness was strongly discouraged. Teachers were told to make sure that students wrote with their right hand. Some students were given harsh punishment and even had their left arm immobilised to ensure they used their right hand. In the 1950s, this attitude began to change, and today people are encouraged to use their preferred hand at school, whether left or right.

The hand preferences of 2000 people of various ages were recorded (Porac, Coren, & Duncan, 1980) and the results are presented in Figure 3.

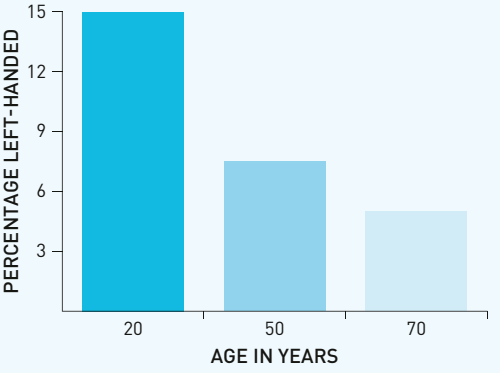


FIGURE 3 The hand preferences of 2000 people of various ages

- **a** **Identify** the type of research design used.
- **b** **Consider** what the graph suggests about left-handers as they age. **Identify** errors with this assumption.
- **c** **Explain** how changes in social attitudes can account for the results in the diagram.
- **d** **Discuss** the results that you would expect if this study was repeated today in Australia in fifty years time. **Justify** your suggestion.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 1.3
- » Increase your knowledge
  Creating a logbook
- » Increase your knowledge
  Collecting data
- » Weblink
  Scales of measurement

1.4 The quality of research

KEY IDEAS

In this section, you will learn about:

+ reliability
+ validity.

Research can only be as good as the measuring instruments used. The two indicators of the quality of a measurement scale are:

- **reliability**: how consistent a measuring instrument is
- **validity**: the extent to which an instrument measures what it is supposed to measure.

reliability
the extent to which a measure could be expected to produce the same result with the same subject(s) under the same conditions on other occasions

validity
the extent to which an instrument measures what it is supposed to measure

Reliability

There are four different types of reliability:

1. **Internal reliability:** This refers to the extent to which all the items in a research instrument contribute equally to the final score. A test would have a high internal reliability if the correlation between scores on the odd-numbered items and even-numbered items were high.
2. **Inter-rater reliability:** With an objective test, the same result should be obtained by anyone administering the test. The procedures to be used are therefore standardised – they are the same each time the test is administered.
3. **Parallel form reliability:** Some tests have more than one form that measures the same property. These can be very useful if the research is investigating change in the property measured. The property is measured before the treatment with the IV (pre-test) and again, with a parallel form, after the treatment (post-test).
4. **Test-retest reliability:** Any test should be checked to ensure that it would produce the same result if readministered to the same person under the same conditions at a different time.

Validity

There are also four different types of validity:

1. **Internal validity:** examines whether the results gained from a measure are truly due to the variable that it is thought to be measuring
2. **Content validity** (also known as face validity): a form of internal validity that involves examining the instrument to decide whether it appears to be measuring what it is supposed to measure
3. **Construct validity:** a form of internal validity that involves deciding whether the test can be used to support the theory that is being tested (e.g. Does an IQ test measure all of the abilities that are considered to make up IQ?)
4. **External validity:** a criterion-related validity that refers to the extent to which results from this measure are comparable with other, established measures of the variable.

Research in Psychology

The QCAA syllabus provides a list of suggested research throughout each topic. This research will help you engage with the content and may help you expand your knowledge. This book will flag relevant suggested research on the chapter opener. When you do the suggested research, you can refer to this section to determine the reliability and validity of the research.

CHECK YOUR LEARNING 1.4

Describe and explain

1 **Explain** what makes research reliable.
2 **Describe** what makes research valid.
3 **Summarise** the different types of reliability listed below, and provide an example of each:
   - **a** inter-rater reliability
   - **b** internal reliability
   - **c** parallel form reliability
   - **d** test-retest reliability
4 **Summarise** the different types of validity listed below, and provide an example of each:
   - **a** internal validity
   - **b** content validity
   - **c** construct validity
   - **d** external validity

Apply, analyse and interpret

5 **Consider** the importance of reliable and valid research.

Investigate, evaluate and communicate

6 A researcher is investigating whether eating the fruits of the gingko biloba (Figure 1) can improve memory. She has two parallel forms of a word-list memory test, Form A and Form B.
   - **a** **Explain** why it would be best for her to pre-test half the participants with Form A and half with Form B and then post-test each group with the other form.
   - **b** **Assess** the reliability and validity of this research.



FIGURE 1 Fruit from the ginkgo biloba tree

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 1.4
- » Video
  Reliable and valid research
- » Video worksheet
  Reliable and valid research
- » Weblink
  Is this valid?

1.5 Interpreting the data

KEY IDEAS

In this section, you will learn about:

+ descriptive statistics
+ the normal curve
+ inferring from data
+ drawing conclusions
+ measures of relationship.

Research originally sets out to draw conclusions and find out something useful about the population of interest. Generalisation of results occurs after the research is complete. For this to be possible, the following criteria must be met:

- The results must show statistical significance.
- All sampling procedures were appropriate.
- All experimental procedures were appropriate.
- All measures were valid.
- All possible confounding variables were controlled.

The good news is that, in psychology, although we use statistics, we never have to calculate more than the very simplest of them. Computer programs and calculators do it all for us!

It is very useful, however, to know how these statistics work and what they mean.

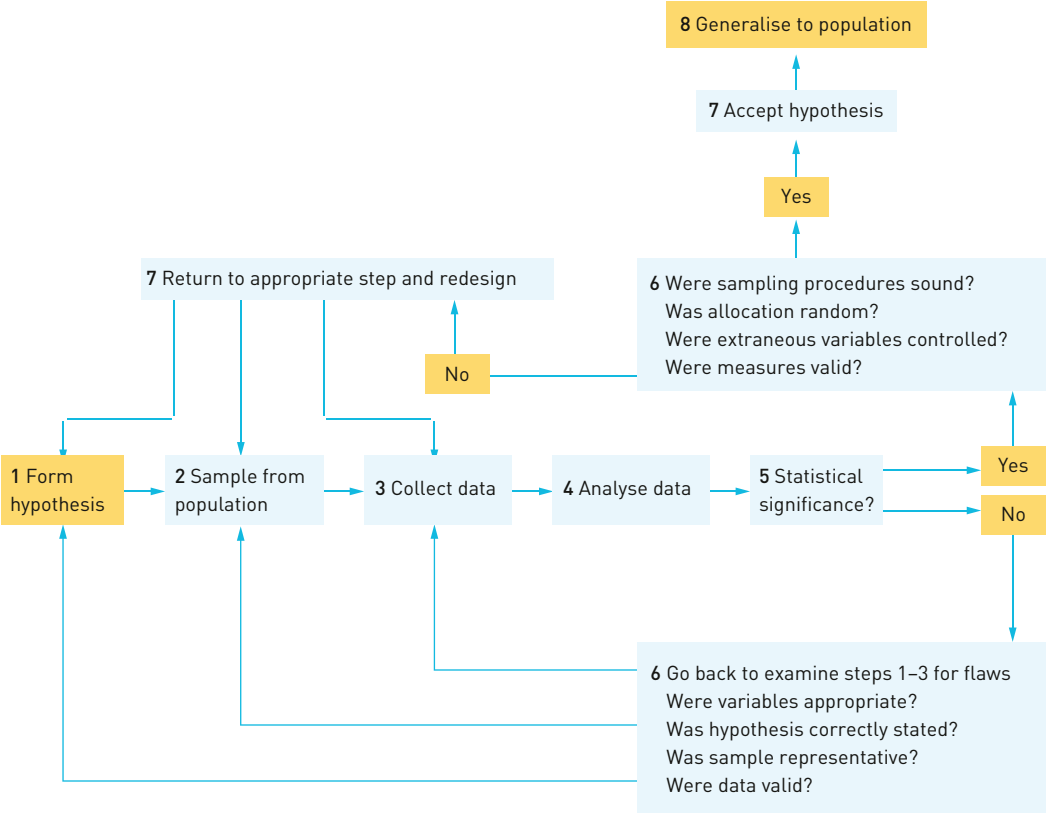


FIGURE 1 Decision-making in research

Descriptive statistics



When we collect data, it comes in a totally unorganised form. For example, Julie rolled a die 80 times and recorded the number shown on each throw:

1, 3, 6, 5, 2, 1, 6, 1, 5, 2, 1, 2, 5, 4, 3, 6, 5, 2, 3, 4, 1, 4, 3, 2, 5, 1, 6, 2, 3, 1, 5, 5, 2, 3, 5, 4, 1, 3, 5, 3, 6, 3, 1, 6, 6, 3, 3, 4, 3, 3, 6, 3, 1, 3, 4, 6, 2, 4, 6, 3, 4, 5, 4, 6, 2, 3, 4, 5, 5, 4, 2, 1, 5, 4, 5, 6, 1, 6, 2, 5.

How can this data be sorted?

Placing the data into a frequency table will make it much easier to perform simple calculations on it. Compare the dataset above with Table 1. Which would you prefer to work with?

Number on die	Frequency
1	12
2	11
3	17
4	12
5	15
6	13

TABLE 1 Frequency table

FIGURE 2 Placing data from rolling a die into a frequency table makes calculations easier.

Often we need to calculate what percentage of a dataset is represented by a certain score. This is easy to do using the formula:

$$\frac{\text{Number of times the score occurs}}{\text{Total number of scores in dataset}} \times 100$$

If we wished to discover what percentage of rolls scored 6:

$$\frac{13}{80} \times 100 = 16.25\%$$

Representing the data

The frequency table made the data better organised, but it still doesn't tell us much. So we can use a histogram or a frequency polygon – which are graphical representations of how often each score appears – to get a clearer picture of how the numbers rolled on the die. We could also show the data as a pie chart. It is always important to use a type of graph that communicates the information clearly and accurately.

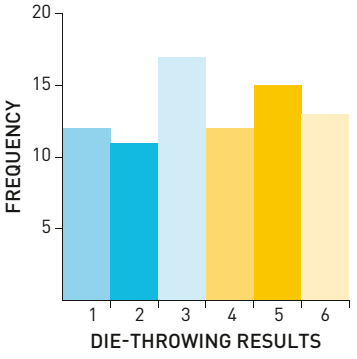


FIGURE 3 The histogram shows the number of occasions each number was thrown in 80 rolls of one die.

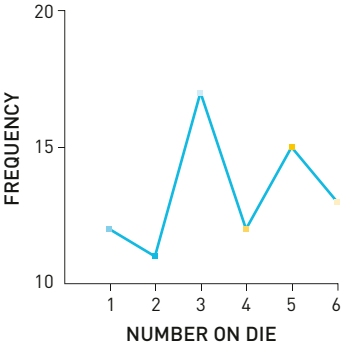


FIGURE 4 This frequency polygon shows the number of occasions each number was thrown in 80 rolls of one die.

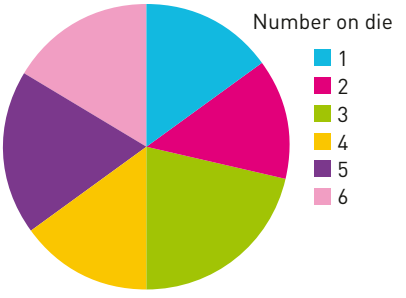


FIGURE 5 The pie chart makes it easier to register relative proportions.

Where one variable is continuous (meaning that it can have any value within a certain range) – such as body mass, age in months or IQ – we can express it in a table or on a line graph. For example, suppose your teacher sets you a group classwork assignment and you want to find what size of group is the most efficient.

The data in Table 2 is presented as the line graph shown in Figure 6.

Group size	Time (hours)
2	5.0
3	3.0
4	2.5
5	2.0
6	2.5
7	5.0

TABLE 2 Time taken to complete classwork for different-sized study groups

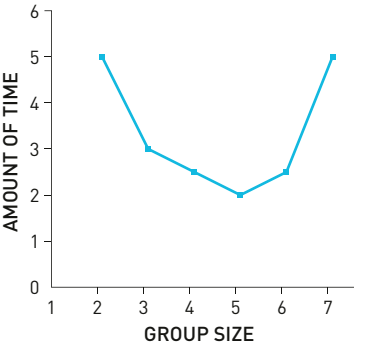


FIGURE 6 Time taken to complete classwork for different-sized study groups

The normal curve

When all scores in a set of data are plotted in a graph, psychologists hope that they will form a normal curve – also known as a bell curve because of its shape (Figure 7). This is because statistical procedures can be applied to the bell curve without further manipulation of the data.

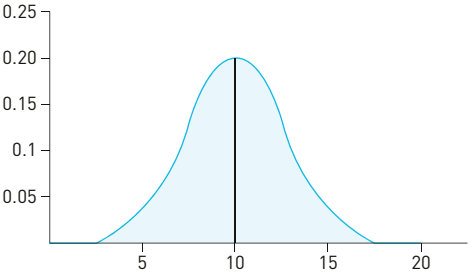


FIGURE 7 The normal curve

Student	IQ score	Student	IQ score
John	88	Hanna	111
Robert	94	Jacob	111
Kiet	99	Adelina	119
Luke	102	Ahmed	125
Kerry	105	Arisa	125
Shelley	111	Akash	130

TABLE 3 IQ scores of 12 students in a Grade 6 class

Measures of central tendency

Measures of central tendency tell us how the data are clustered near the central point of the dataset. You will notice that for the normal curve, the three measures – mean, median and mode – are all at the same point.

The dataset in Table 3 above represents the IQ scores of 12 students in a Grade 6 class. Using the data, we can calculate these three measures.

mean
the average of all the scores, calculated by adding up all the scores and dividing that total by the number of scores

median
the middle number (or mean of the two middle numbers) of a number series listed in numerical order

mode
the most commonly occurring score in the dataset

- **Mean**: The average of all the scores is calculated by adding up all the scores and dividing that total by the number of scores.

  $88 + 94 + 99 + 102 + 105 + 111 + 111 + 111 + 119 + 125 + 125 + 130 = 1320$

  $$\frac{1320}{12} = 110$$

  The mean IQ score for this group of children is 110. We write this as:

  $M = 110$ or $\bar{X} = 110$

- **Median**: This is the middle number (or mean of the two middle numbers) of a number series listed in numerical order. For this dataset, the median is:

  88, 84, 99, 102, 105, **111**, **111**, 111, 119, 125, 125, 130

  $$\frac{111 + 111}{2} = 111$$

- **Mode**: This is the most commonly occurring score in the dataset. For this dataset, the mode is 111.

Measures of variability (dispersion)

Measures of variability tell us about how scores are spread out. When used along with measures of central tendency, they tell us a great deal about the features of the dataset.

Score	Difference from mean	Squared difference from mean (variance)
88	–22	484
94	–16	256
99	–11	121
102	–8	64
105	–5	25
111	+1	1
111	+1	1
111	+1	1
119	+9	81
125	+15	225
125	+15	225
130	+20	400

TABLE 4 Variance of IQ scores in Grade 6 class from Table 3

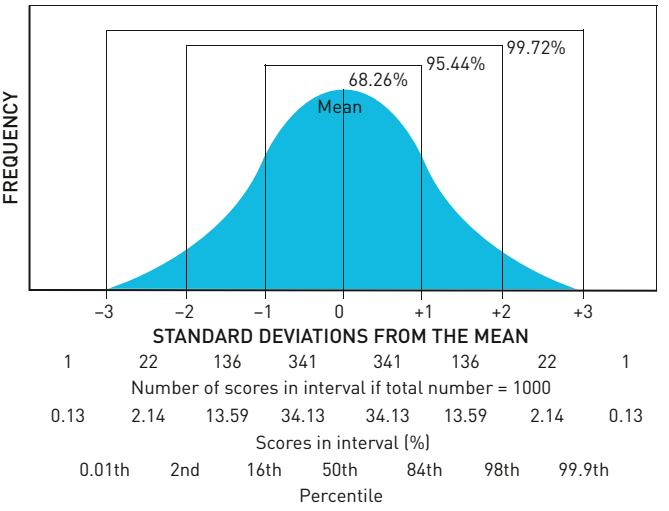


FIGURE 8 Distribution in a normal curve, showing percentiles by standard deviation

Three such measures are range, variance and standard deviation.

- **Range**: The most basic of these measures, range is the difference between the highest score and the lowest score in the dataset. For the IQ scores listed in Table 3, the range would be 130 – 88 = 42. This is not a very informative measure as it gives no indication of how the scores are spread along the range.

range
the difference between the highest score and the lowest score in the dataset

- **Variance**: Variance is a more useful measure than range because it uses information for each score in the dataset and gives us a measure of how much, on average, the scores differ from the mean.

variance
a measure of how much, on average, the scores differ from the mean

But there is a problem! Some of the scores are higher than the mean (positive difference) and some are lower (negative difference). So if we just take the average difference, the negatives and positives will tend to even out and the 'mean difference' that we calculate will be incorrect. The way we overcome this is to square the differences, so that all figures are positive. (Remember: –X multiplied by –X = $+X^2$)

Calculating the variance in our set of IQ scores, with a mean of 110, give the data in Table 4. For the set of scores in Table 4, the mean variance is 157. This score is an indication of the spread, but it is very hard to compare it with the original IQ scores as it is in squared units which don't mean much, so we need to go one step further and calculate the standard deviation.

- **Standard deviation**: The standard deviation is a very useful measure that tells us how far, on average, scores are different from the mean. This is done by taking the square root of the mean variance. So in this case, the standard deviation is $\sqrt{157} = 12.5$.

standard deviation
a measure that tells us how far, on average, scores are different from the mean

In a normal curve, a certain set percentage of scores will fall within one, two, three or four standard deviations of the mean, as shown in Figure 8.

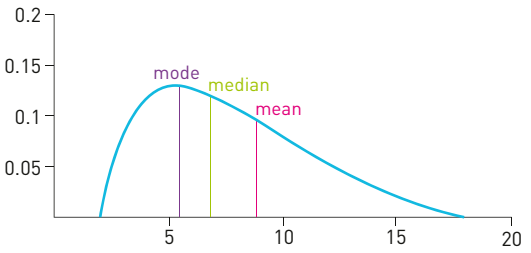


FIGURE 9 Positive skew

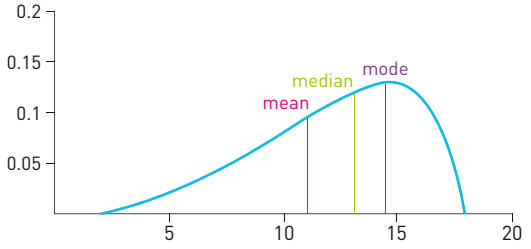


FIGURE 10 Negative skew

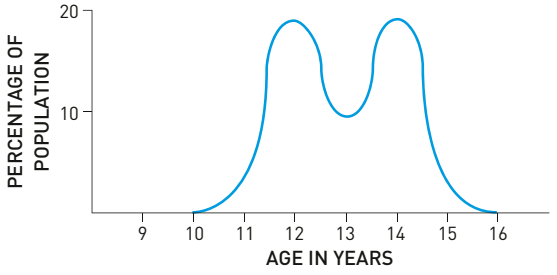


FIGURE 11 This bimodal distribution shows children have two growth spurts.

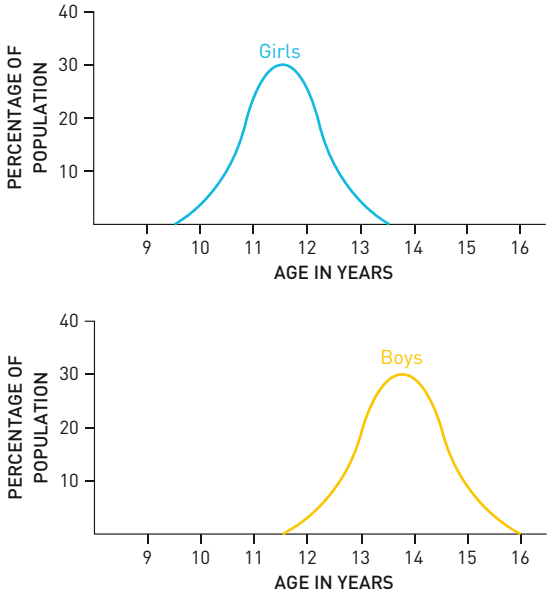


FIGURE 12 The onset of growth spurts in girls occurs about two years earlier than boys.

Skew of a curve

It is rare for all the data in a dataset to be able to be plotted into a smooth, well-balanced curve like the one in Figure 8. More often, the plot is biased or skewed one way or the other, either positive or negative (as seen in Figure 9 and Figure 10).

Sometimes a dataset will have more than one 'peak'. The curve in Figure 11 shows a bimodal distribution – this often occurs where two distinct populations are plotted on the same curve. What we need to do in this case is to sort out the members of the two different populations.

For example, if you were presented with a graph like the one in Figure 11 and told that it was the average age at which children experience their growth spurt, you would easily guess what had happened – and separate the girls' data from the boys' data to make two graphs that are meaningful (as seen in Figure 12).

Data in this form could be very difficult to work with, but fortunately there is a simple method of converting scores so that they form a bell curve.

Inferring from data

After the experiment, the researcher needs to decide whether the results could be due to chance alone – in which case no cause-and-effect relationship can be inferred.

To do this, the researcher calculates the mean score for the E-group and the C-group, and uses inferential statistics to decide whether the difference is statistically significant or is likely to have been caused by pure chance.

While the means are different, the question is whether they are different enough to show that the IV has caused a significant change.

In Figure 13 (p.27), the E-group mean is higher than the C-group mean, but is this statistically significant? This will depend on the size of the sample as well as the difference. The larger the sample, the less difference is needed to reach statistical significance.

P-values

The inferential tests will give a *probability* that the difference is caused by chance. This is expressed as a *p*-value, where $p = 0.03$ means that there are three chances in 100 (3 per cent) that this difference would be achieved by chance alone.

Psychologists are generally prepared to accept that a difference is statistically significant if the difference could have been caused by chance alone on five or less times in 100. This is stated as $p \leq 0.05$.

Inferential tests

One of the simplest inferential techniques is called a Student's **t-test**. 'Student' was actually a chemist named William Sealy Gosset who was working for the Guinness brewery in Dublin, Ireland in 1908. Gosset invented the t-test as a cheap and easy way of monitoring the quality of Guinness stout. His employers were afraid of other brewers also being able to use statistical methods for their quality control, so Gosset's identity had to be kept secret!

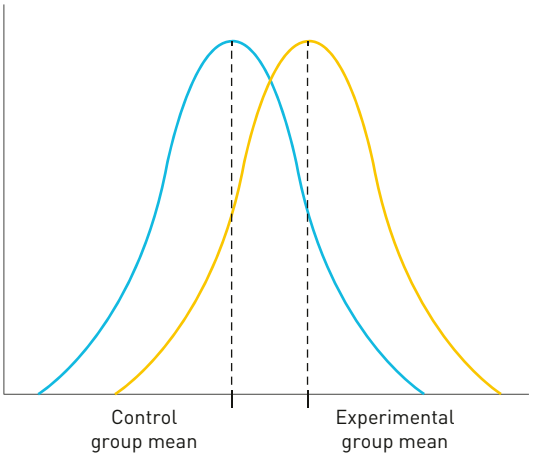


FIGURE 13 While the C-group and the E-group have different means, the importance of the difference depends on the sample size.

Alternatively, the **Mann-Whitney U test** can be used. The *U* test is a test of the null hypothesis. It does not require the assumption of normal distributions. The *U* test is used to compare the differences between two groups when the dependent variable is either ordinal or continuous.

The **Wilcoxen signed-rank-test** can also be used as an alternative to the t-test, when the population cannot be assumed to be normally distributed. It is used to compare two sets of scores from the same set of participants.

t-test
a comparison of means in data that reveals how significant the differences are

Mann-Whitney U test
typically used for ordinal data to test whether two means are equal or not

Wilcoxen signed-rank-test
a test compares two sets of scores from the same set of participants when the data is not normally distributed

Drawing conclusions

A **conclusion** is the final decision about what the results mean. This conclusion must be stated in terms of the original hypothesis. So a conclusion would be that the hypothesis is *rejected* or *supported*.

Psychologists never say that a hypothesis has been 'proven' or 'disproven'. After all, there may be another hypothesis that explains the relationship even better than the one that was tested.

A **generalisation** is a judgement about the extent to which the research findings can be applied to the population represented by the sample. The ability to generalise from a sample relies on all the following conditions being met:

- The sample must represent the population of interest.
- The results must reach statistical significance.
- The effects of all potentially confounding variables must have been controlled.

conclusion
the final decision about what the results mean in an experiment, either rejecting or supporting the hypothesis

generalisation
a judgment about the extent to which the research findings can be applied to the population represented by the sample

Errors

It is also important to be aware of errors in supporting or rejecting the hypothesis.
A **Type I error** has occurred if the null hypothesis is incorrectly rejected.
A **Type II error** has occurred if the null hypothesis is incorrectly kept.

Type I error
when the existence of a result is incorrectly assumed to be present

Type II error
when the absence of something is incorrectly assumed to be present

Measures of relationship

Correlational studies are intended to identify and describe the relationship between two variables. Unlike the experimental method, the correlational method makes no attempt to manipulate variables. Rather, the intent of such a study is usually to establish the strength and direction of the relationship that may exist between the two variables.

Pearson product moment correlation
a measure of the strength of the linear relationship between two continuous variables

Spearman correlation
a measure of two ordinal variables that uses the ranked values for each variable to examine how they change together but not necessarily at a constant rate

positive correlation
one in which the two variables change in the same direction – that is, as one increases (or decreases), so does the other

negative correlation
one in which the two variables change in the opposite direction – that is, as one increases, the other decreases

correlation
a statistical measure of the strength and direction of the relationship between two variables; does not show a cause-and-effect relationship, but describes the way in which the variables vary in relation to each other

scatter diagram
diagram that shows the values of the two variables for each participant in the sample by representing the intersection of those two values with a dot on a graph

The **Pearson product moment correlation** measures the linear relationship between two continuous variables: a change in one variable (variable A) is associated with a proportional change in the other variable (variable B). In contrast, the **Spearman correlation** measures the relationship between two ordinal variables and uses the ranked values for each to examine how the variables tend to change together, but not necessarily at a constant rate.

The relationship between variables can be examined using a scatter diagram (see Figure 15, p.29). For example, a Pearson correlation of $r = 1.0$ indicates a perfect linear relationship between two variables. When one variable increases, the other variable increases by a consistent manner, and is represented by a perfect straight line on a scatter diagram or scatter plot.

- Positive correlation: A **positive correlation** is one in which the two variables change in the same direction – that is, as one increases, so does the other; or as one decreases, so does the other. For example, we might expect to find a positive correlation between hours spent studying each week and results in senior Psychology – meaning that as the number of hours spent studying each week increases, the average Psychology results increase.
- Negative correlation: A **negative correlation** is one in which the two variables change in the opposite direction – that is, as one increases, the other decreases.

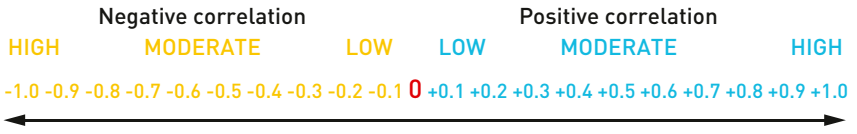


FIGURE 14 Negative and positive correlation

For example, we might expect to find a negative correlation between hours spent playing online games and study scores for Psychology – meaning that as the number of hours spent playing online games increases, the average study score in Psychology decreases.

- Strength of correlation: **Correlation** also shows the strength of the relationship. This is indicated by a correlation coefficient, expressed as a decimal number in the range of $-1.0 < r < +1.0$.
  - The (+) or (–) sign in front of the number shows whether it is a positive or negative correlation. The number following the positive or negative sign indicates the strength of the correlation. The higher the number, the stronger the correlation, whether positive or negative. Correlation coefficients of +1.0 or –1.0 show perfect positive or perfect negative correlations respectively. This would mean that as one variable increased by one unit, the other variable would increase by one unit (perfect positive correlation) or decrease by one unit (perfect negative correlation).
  - A correlation coefficient of $r = .00$ indicates that the two variables are not related in any way. In contrast, a correlation of $r = .80$ indicates that two variables are strongly correlated; a correlation of $r = .14$ indicates that two variables are weakly correlated.
- Scatter diagrams (scatter plots): Correlational data are often represented graphically by a **scatter diagram**. A scatter diagram shows the values of the two variables for each participant in the sample by representing the intersection of those two values with a dot on a graph.

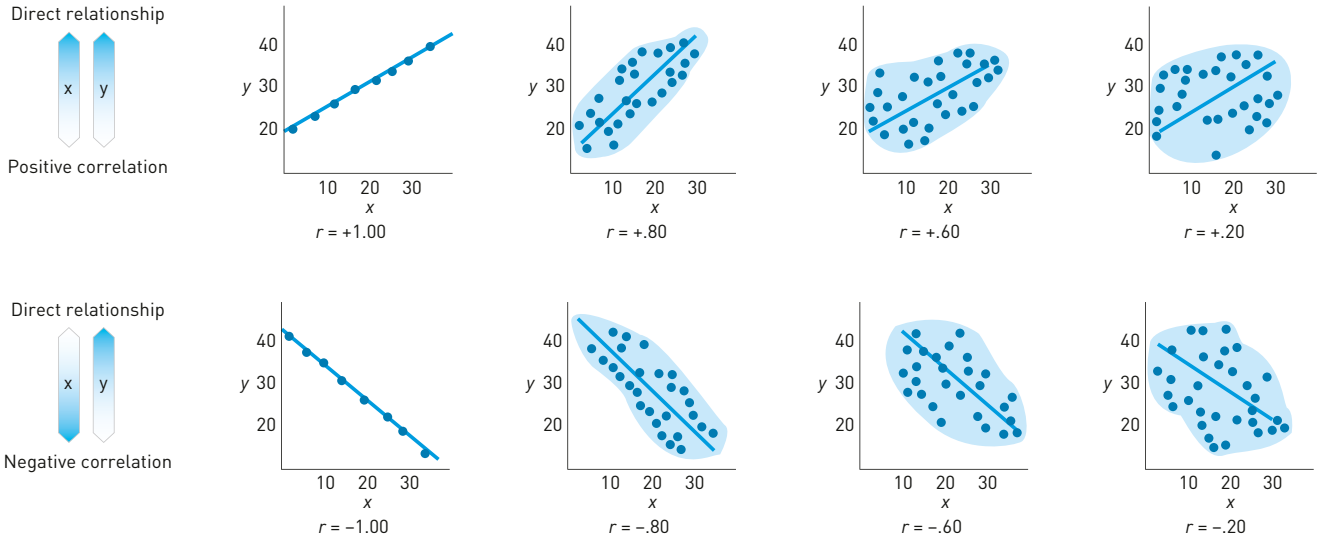


FIGURE 15 Scatter diagrams showing relationship and correlations – the scatter diagrams show various strengths and directions of correlation, from perfect positive correlation to perfect negative correlation.

CHECK YOUR LEARNING 1.5

Describe and explain

1 **Explain** what a significant p-value is.

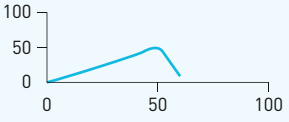
2 **Explain** the normal curve.

3 **Identify** the mean, median and mode from the following data: 20, 23, 23, 25, 25, 26, 29, 33, 35, 31, 29, 22, 27, 28

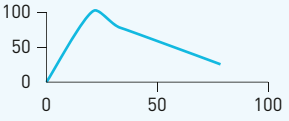
4 In your own words, **define** the range.

5 **Identify** and label the following graphs as either positively or negatively skewed.

a



b



6 **Explain** the difference between correlation and causation.

Apply, analyse and interpret

For questions 7–8, **consider** the brief descriptions of research and results. For each one, **indicate** whether the generalisation of findings is appropriate.

7 Professor Prada investigated whether personality type is related to the proportion of income spent on clothes. She assessed participants on the extroversion–introversion scale and found the following results:

Group	Proportion of net income spent on clothes
Extroverts	45%
Introverts	33%

8 Professor Prada uses a t-test and finds that, for this difference, $p = .06$. She concludes that extroverts spend significantly more on clothes than introverts.

Check your obook assess for these additional resources and more:

» Student book questions
Check your learning 1.5

» Weblink
Pearson correlation

» Weblink
Spearman correlation

1.6 Ethical considerations

KEY IDEA

In this section, you will learn about:

+ ethics in psychological research
+ confidentiality, voluntary participation, withdrawal, informed consent, deception and debriefing.

In psychological research, there are ethical considerations involved when working with both animals and humans.

- **Research with animals:** Although animals are used in research today, the guidelines protecting them are more stringent than they were when Harlow did his experiments with monkeys in the 1950s and 1960s (see Chapter 8). Animals must be protected, pain must be minimised and the animals must be well cared for.
- **Research with humans:** Psychological research most commonly involves human beings as participants. It is vital that the wellbeing of participants is safeguarded. The overriding principle is that there must be no physical or psychological harm to participants.

The ethics committee



FIGURE 1 Monash University – all universities conducting research will have an HREC

To ensure the wellbeing of participants, before beginning a study researchers must submit detailed plans of their proposal to the Human Research Ethics Committee (HREC) of their university or other research institution (such as a hospital or medical research body). The HREC will study the proposal and indicate any changes that must be made or additional procedures that are required before it will give approval for the study to proceed.

The Australian Psychological Society publishes a 'Code of Ethics' for psychologists. This includes a section on the conduct of psychological researchers, and draws together regulations and guidelines from bodies such as the National Health and Medical Research Council and guidelines such as the National Privacy Principles.

An HREC will take account of each of the following ethical considerations before giving approval:

- **The role of the experimenter:** The researcher must always act in a professional manner, making sure that the best interests of the participants, and of society in general, are met.
- **Participants' rights** (respect for participants): Researchers must always maintain respect for the participants. Participants' rights include those listed below.
  - **Confidentiality** (privacy): Participants must not be identified in any way in terms of test results, their involvement in the study or any other confidential data. Data needs to be stored and disposed of using secure procedures. The means by which confidentiality is to be established and maintained should be described to the participants at the beginning of the study.

confidentiality participants must not be identified in any way in terms of test results, their involvement in the study or any other confidential data

- **Voluntary participation**: Participants have the right to refuse to take part in a study. There must not be any pressure to take part in a study, nor should the participants be tricked into taking part.
- **Withdrawal rights**: Participants have the right to leave a study at any stage, regardless of the possible effects on the results. They also have the right to withdraw their results after the study has been completed. This must be explained to the participants before beginning the study.
- **Informed consent**: Participants must be given information about a study before they agree to take part. For participants who are either too young or too intellectually disabled to give their consent, their guardian must be given the information before giving consent on their behalf.
- **Deception in research**: The provision of false or incomplete information for the purpose of misleading research participants. This is only permitted if the results would be confounded if the participants had much information before taking part in the study. The researcher must ensure that participants do not unexpectedly suffer distress; the study must be stopped immediately if this occurs. Participants must be debriefed when the study is complete.
- **Debriefing**: Debriefing occurs after completion of the study and participants are told the results and conclusions of the study. Any erroneous beliefs about the study are corrected, especially if there was any deception involved. Participants are informed of the availability of, and how to obtain, counselling if they feel they need it.

voluntary participation
participants have the right to decline to participate in a study, they must not be pressured to take part in the study and must not be tricked into taking part

withdrawal rights
the right of participants to leave a study at any stage, including the right to withdraw their results after the study has been completed, regardless of the possible effects on the results

informed consent
the ethical basis for psychological treatment or experimentation requiring that the subject (or client) is fully aware of all procedures and their likely and possible effects, and participates on a voluntary basis

deception in research
the provision of false or incomplete information for the purpose of misleading research participants

debriefing
the experimental process in which, after the experiment, subjects are told of the purpose of the research, and any deception is explained; a vital ethical component of any psychological research

CHECK YOUR LEARNING 1.6

Describe and explain

1 **Identify** and **describe** the six key participants' rights.
2 **Describe** how the role of the researcher could influence research.
3 **Explain** the role of an ethics committee.
4 **Summarise** what must be included in informed consent procedures.
5 **Explain** what debriefing is and **identify** when it should occur in psychological research.

Apply, analyse and interpret

6 Researchers want to use a group of 10 year olds in a study. **Consider** the ethical implications of using this group, and **explain** how these could affect the study.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 1.6
- » Video
  Ethical considerations in senior psychology
- » Video worksheet
  Ethical considerations in senior psychology
- » Weblink
  Code of ethics

1.7 Student experiment

KEY IDEA

In this section, you will learn about:

+ what to include in a psychological research report.

The student experiment requires you to conduct your own research by modifying an existing experiment. To do this, you will need to develop a research question and hypothesis.

Research

Once you have developed a research question and defined the hypothesis, you will need to research the background for your experiment. This will involve analysing and interpreting any relevant background information that will help explain why you have modified the original experiment this way.

Design your experiment

After conducting your research, you need to design your experiment. This will include determining the type of sampling and the experimental design (Section 1.2), as well as how data will be collected and analysed (Section 1.3). Before you conduct psychological research, you need to consider the ethics of your conduct (Section 1.6). This includes preparing an informed consent form. During this course, your participants will likely be under 18 years of age, so you will need to receive consent from a parent or guardian. Once ethical considerations have been met, you can continue to plan your experiment.

Reporting the student experiment – APA style

As you read through psychological journals, you will see that there is a regular format followed by the authors – all must follow the formatting guidelines outlined in the latest edition of the *Publication Manual of the American Psychological Association* (APA), even in Australia. Each paper has the following sections: Abstract, Introduction, Method, Results, Discussion and References. The headings are always set out in the same way, starting with a capital letter and centred on the line.

Abstract

The abstract is written on its own page. Though it is presented first, it is written last and summarises the overall paper. It should be written as a single paragraph and be no more than 150 words.

Introduction

Study tip

In a journal article, the introduction does not have a heading.

The introduction must: state the research aim; explain the main concepts involved in the research; define all terms used in the research; summarise previous research; explain why the research was necessary; state the independent variable, the dependent variable and how they are operationalised; and state the experimental hypotheses it is testing.

Method

This section is intended to allow other people to understand your methodology and replicate it. The method can be subdivided into participants, measures and procedure.

Participants

Detail the age, sex, years of education and other common characteristics of the participants in the sample.

Measures

The tests and measures used must be described in detail. Any evidence of their validity or reliability should be quoted. Sources must be acknowledged.

Procedure

The testing procedures used are described in detail – from the selection of participants, to how you conducted the study. The description should provide specific details to ensure a future researcher could accurately reproduce your study. If procedures, such as counterbalancing, have been used to control extraneous variables, this is where they are described.

Results

In quantitative psychological research, the results must be shown step-by-step. The results section cannot have any discussion about the findings of the research. If data is being presented in a graph, it must be preceded by a table that summarises the results. Graphs should always have labelled axes, a title and constant intervals. There must be analytical statistics that demonstrate if there was any statistical significance between the experimental and control conditions.

Discussion

In quantitative psychological research, the discussion is based on the hypotheses introduced at the end of the introduction. You should outline the statistical analysis used to test an alternative hypothesis and provide a statement of support or non-support for the research hypothesis (Burton, 2018). Each hypothesis must be accepted or rejected in specific terms. If the hypothesis is supported, then you should discuss the main finding, consider whether it replicates previous research on the topic and deliberate on what your study has contributed to the body of knowledge on the topic.

If a hypothesis is rejected, it is necessary to provide a full explanation of the unexpected finding. An alternative hypothesis to replace the one that has been discredited should be suggested and rationalised. There should also be an explanation of the importance of the findings – what they mean and how they can be applied to the real world.

The discussion also includes comments noting any identified weaknesses in the current research and suggestions for further research on the topic.

CHECK YOUR LEARNING 1.7

Describe and explain

1 **Describe** the *abstract* of a report.
2 **Explain** why the method section covers the procedure in detail.
3 **Explain** what should be included in the results and discussion sections of a psychological research report.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 1.7
- » Video
  Conducting your student experiment
- » Video worksheet
  Conducting your student experiment
- » Weblink
  APA Style

1.8 Research investigation

KEY IDEAS

In this section, you will learn about:

- planning and designing your research
- communicating your research findings.

The research investigation requires you to evaluate a claim that will be provided by your teacher. To evaluate the claim, you will need to develop a research question and then obtain evidence to support or refute the claim.

Planning and designing your research

You will need to choose how you want to present your research investigation. This may need to be in consultation with your teacher.

Researching the claim

Once you have chosen a claim, you will need to conduct thorough research. However, before you begin, consider what you have already learnt about the claim during the year, record notes and use this as a basis for your research.

You will then need to develop a research question. A good scientific argument acknowledges both sides of an argument. You should research information that both supports and refutes your claim in order to develop a sophisticated argument.

Study tip

Take notes while you are reading through research. Using a logbook to keep track of your information will make it easier to find when you are writing your report.

Valid and reliable sources

Typically, research published in a journal, university, hospital or health organisation is valid and reliable. Psychological reports can be quite detailed, so it is important that you set aside time to read through these properly so that you are able to take notes and process any key information. By reading broadly, you can cross-check ideas, which will help you develop a credible argument.

Interpreting scientific evidence

When interpreting scientific evidence, you will need to apply your understanding of psychological results and data interpretation discussed throughout this chapter. Assessing the sampling method, experimental design and recorded data will help you establish a strong argument.

It is important to consider the research findings from all your research. You can look for patterns, as well as differences, in the research. Does one article support your claim, but two refute it? Were there any variables that weren't considered in one article that featured in another? How did the researchers obtain the data? Is there any correlation? These are all questions you should ask to validate the research you have gathered.

It can be tempting to just read the conclusion and discussion, but it is important to also read through the results and observe the tables and graphs.

Communicating your research findings

Once you have conducted your research, you need to present your findings and address the following:

Provide an overview

Your overview should cover the following:

- Include the claim and rationale for how you developed your research question.
- Present both sides of the argument.
- Explain the psychological theories behind the claim and any cause-and-effect relationships.

Analysis and interpretation

To analyse the data, you should consider any trends or relationships identified in your research. You then need to interpret these trends and relationships and state if it supports the argument or not.

Conclusion and evaluation

After interpreting the evidence, you need to provide a conclusion to your research question. You then need to evaluate the claim in terms of how you might improve or extend the research. Perhaps you read too broadly and didn't narrow down the key terms of the claim enough. Maybe you think your research was too narrow and didn't cover the key terms. Alternatively, you may have found new research that provides opportunity for future investigation. These are just some of the questions to ask yourself as you evaluate your investigation.



FIGURE 1 The conclusion answers your research question based on your conducted research.

CHECK YOUR LEARNING 1.8

Describe and explain

1 **Explain** if the claim needs to be true.
2 **Identify** possible limitations to research.

Apply, anylase and interpret

3 **Consider** the importance of reading broadly for your literature review.

Investigate, evaluate and communicate

4 **Develop** a research question about the following statement: 'Children who have a parent who experiences anxiety are more likely to develop an anxiety disorder'.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 1.8
- » Video
  Experimental skills
- » Video
  The research investigation
- » Weblink
  Search tools

1.9 Exam preparation

KEY IDEAS

In this section, you will learn about:

- managing your study
- using your class time wisely
- preparing for your exam.

Throughout the year, you will have many opportunities to prepare for your exams. By taking advantage of these opportunities, you are more likely to retain information from the entire year and prevent stress at exam time. The concepts you discuss in Units 1 & 2 will be relevant in Units 3 & 4, so it is best to retain as much information as you can.

Managing your study

Finding time to study can be difficult, especially when maintaining a social life, part-time work and extracurricular activities. The following tips are useful for staying motivated:

- Create a study timetable: A study timetable can help you organise your week around specific commitments. Perhaps you want to assign every Saturday night to seeing your friends and every Wednesday night to sports training? You might work Tuesday night and Saturday morning, which leaves you with Monday and Thursday nights to study. Recording this in your planner can help you stay focused and motivated.
- Use to-do lists: A to-do list helps you see what tasks you need to complete and when. Crossing items off a to-do list also reminds you of the progress you make each day.
- Set up a study environment: Create a study environment that you feel comfortable in. This could be your desk at home, school or local library. Ensure that there are no distractions, and that you have everything you need, such as a calculator, paper and pens.



FIGURE 1 Create a study environment with no distractions.

- Avoid distractions: When you set aside time to study, it is important to use that time to study. Avoid using your phone and don't have the TV on in the background.
- Reward yourself. It is important to study during your senior years of high school, but this does not mean you must neglect other areas of your life. After you have studied, reward yourself by catching up with friends, watching an episode from your favourite TV show or doing something you enjoy.

Using your class time wisely

During your lessons throughout the year, you will participate in practical experiments, research and class discussions about theories of psychology. By being an active participant in these discussions, you will have greater familiarity with psychological terms and theories. You will also be more comfortable with the subject matter and have a greater ability to think about the concepts.

Preparing for your exam

Some students find it useful to study in an exam-like setting. This may mean that you wear your school uniform and use certain pens or pencils. It is also a good idea to practise as many questions as you can to become familiar with the language and cognitive verbs used, as well as the way that you are expected to respond.

Your exam will include both multiple choice and short answer questions. You will need to get used to reading each type of question in detail. It is important to identify the topic that the question refers to and identify what the question is actually asking. Make sure to pay attention to key words. They may be phrased as 'What is *not* a theory of motivation?', or 'Explain how Ainsworth's *and* Bowlby's theories of attachment are different'.

By establishing what a question is asking you to do, you will be more confident in articulating a response. Knowing the information is not enough; you need to be able to use it correctly in order to answer the question in front of you.

Responding to cognitive verbs

During assessment tasks and examinations, you will be presented with **cognitive verbs**. Cognitive verbs are task words that prompt the type of response required to help students provide the right type of information when answering a question.

cognitive verbs words that prompt the type of response required to help students provide the right type of information when answering a question

It is important that you understand the difference between different task words. For example, a question that asks students to *compare* is different to one that asks them to *contrast*. The former requires a student to show similarities and differences, while the latter is asking to show only the differences.

Understanding what a cognitive verb is specifically asking for means a student can provide exactly what the examiner is looking for when formulating a response. Examiners want to award students marks, but they can only do so if a student provides the correct information. For example, if a student *describes* data in their answer, but does not *analyse* the data, they will not receive full marks.

Students may also encounter cognitive verbs that have multiple definitions; it is important that you are able to identify which definition is appropriate to the question.

The next page lists some of cognitive verbs you may encounter throughout this book and in your assessments (a full list of QCAA cognitive verbs is provided on your obook assess).

Study tip

Refer to your obook assess for more cognitive verbs.

Cognitive verb	Definition	Sample question
Analyse	Dissect to ascertain and examine constituent parts and/or their relationships; break down or examine in order to identify the essential elements, features, components or structure; determine the logic and reasonableness of information; Examine or consider something in order to explain and interpret it, for the purpose of finding meaning or relationships and identifying patterns, similarities and differences	**Analyse** the effects of sleep deprivation on cognitive ability.
Apply	Use knowledge and understanding in response to a given situation or circumstance; carry out or use a procedure in a given or particular situation	Camille is three years old. Whenever Camille's mother leaves the room, she becomes visibly distressed. **Apply** Mary Ainsworth's attachment theory to Camille.
Assess	Measure, determine, evaluate, estimate or make a judgment about the value, quality, outcomes, results, size, significance, nature or extent of something	**Assess** the prevalence of mental health in males.
Compare	Display recognition of similarities and differences and recognise the significance of these similarities and differences	**Compare** Ainsworth's theory of attachment with Harlow's theory of attachment.
Consider	Think deliberately or carefully about something, typically before making a decision; take something into account when making a judgment; view attentively or scrutinise; reflect on	**Consider** the impact of genetics on developing a specific phobia.
Construct	Create or put together (e.g. an argument) by arranging ideas or items; display information in a diagrammatic or logical form, make; build	**Construct** a diagram of a neuron, labelling the dendrites, soma and axon.
Contrast	Display recognition of difference by deliberate juxtaposition of contrary elements; show how things are different or opposite; give an account of the differences between two or more items or situations, referring to both or all of them throughout	**Contrast** the historical and the sociocultural approaches to normality.
Define	Give the meaning of a word, phrase concept or physical quantity; state meaning and identify or describe qualities	**Define** sleep apnoea.
Describe	Give an account (written or spoken) of a situation, event, pattern or process, or of the characteristics or features of something	**Describe** mindfulness theory.
Differentiate	Identify the difference/s in or between two or more things; distinguish, discriminate; recognise or ascertain what makes something distinct from similar things In mathematics, obtain the derivative of the function	**Differentiate** between REM and NREM sleep.
Discuss	Examine by argument; sift the considerations for and against; debate; talk or write about a topic, including a range of arguments, factors or hypotheses; consider, taking into account different issues and ideas, points for and/or against, and supporting opinions or conclusions with evidence	**Discuss** the cognitive appraisal theory of emotion.
Distinguish	Recognise as distinct or different; note points of difference between; discriminate; discern; make clear a difference/s between two or more concepts or items	**Distinguish** between the function of a motor neuron and a sensory neuron.

Cognitive verb	Definition	Sample question
Evaluate	Make an appraisal by weighing up or assessing strengths, implications and limitations; make judgments about ideas, works, solutions or methods in relation to selected criteria; examine and determine the merit, value or significance of something, based on criteria	**Evaluate** this statement: 'There is only one type of intelligence. Emotional intelligence is an extension of the multiple intelligences.'
Explain	Make an idea or situation plain or clear by describing it in more detail or revealing relevant facts; give an account; provide additional information	**Explain** the difference between sleepwalking and narcolepsy.
Hypothesise	Formulate a supposition to account for known facts or observed occurrences; conjecture, theorise, speculate; especially on uncertain or tentative grounds	**Hypothesise** the following question: Will children raised in Australia have higher intelligence than those raised in America?
Identify	Distinguish; locate, recognise and name; establish or indicate who or what someone or something is; provide an answer from a number of possibilities; recognise and state a distinguishing factor or feature	**Identify** the components of the forebrain.
Interpret	Use knowledge and understanding to recognise trends and draw conclusions from given information; make clear or explicit; elucidate or understand in a particular way Identify or draw meaning from, or give meaning to, information presented in various forms, such as words, symbols, pictures or graphs	Using Figure X, **interpret** the differences in sleep patterns over the lifespan.
Investigate	Carry out an examination or formal inquiry in order to establish or obtain facts and reach new conclusions; search, inquire into, interpret and draw conclusions about data and information	**Investigate** the role of egocentrism in children's development.
Justify	Give reasons or evidence to support an answer, response or conclusion; show or prove how an argument, statement or conclusion is right or reasonable	**Justify** how psychology is a science.
Predict	Give an expected result of an upcoming action or event; suggest what may happen based on available information	**Predict** what an individual would experience if they were unable to sleep for 48 hours.
Summarise	Give a brief statement of a general theme or major point/s; present ideas and information in fewer words and in sequence	**Summarise** what an anxiety disorder is.

Source: *QCAA Psychology 2019 v1.3 General Senior Syllabus*

CHECK YOUR LEARNING 1.9

Describe and explain

1 Prepare a study timetable for yourself. Include any other commitments such as sport, work, volunteering and social activities.
2 Write down all your subjects and decide how much study time each subject will require each week.
3 Think about what distracts you. Write these down so that you can create a positive learning environment.
4 **Identify** your preferred study habits. This could include the place you study or what you use to study, such as a workbook or a computer.

Check your obook assess for these additional resources and more:

» **Student book questions**
Check your learning 1.9

» **Increase your knowledge**
Make a study timetable

» **Weblink**
QCAA Syllabus

» **Weblink**
Exam preparation

CHAPTER 1

Review

Summary

1.1

- Psychological research involves experimentation. A true experiment is always aiming to discover natural laws of cause and effect – how do changes in one property cause changes in another?
- Psychological research is based on the scientific method, which is used to help discover natural laws and principles. The scientific method is a logical process of problem-solving that involves eight steps: identify the area of research; collect information; identify the research question and formulate the hypothesis; design the research method to test the hypothesis; collect and analyse the data; draw a conclusion – accept or reject the hypothesis; report findings; test the conclusion.
- A hypothesis in psychological research is a clear statement predicting how changes in the independent variable(s) will affect the value of the dependent variable(s). The hypothesis also clearly states the population about which the researcher intends to draw conclusions.
- Every experiment has at least one independent variable and one dependent variable.
- An extraneous variable is a variable other than the independent variable that could cause changes in the value of the dependent variable.

1.2

- In participant selection, a sample is chosen to represent the population. Two procedures used to make sure that the sample is representative are random sampling and stratified sampling (stratified random sampling).
- The basic experimental method uses two different groups called the experimental group (E-group) and the control group (C-group). Members of the E-group are exposed to the independent variable. The purpose of the E-group is to show the effects of the independent variable on the value of the dependent variable. The control group consists of the participants who are not exposed to the independent variable – they do not receive the treatment.
- The placebo effect refers to participants' behaviour being influenced by their expectation of how they should behave. The placebo effect can be eliminated by using a single-blind procedure in the experimental process.
- The experimenter effect refers to the outcome of an experiment being unintentionally (or intentionally) influenced by the experimenter treating the members of the E-group and the C-group differently. The experimenter effect can be addressed by using a double-blind procedure in the experimental process.

1.3

- There are various types of data:
  - qualitative data: descriptions of the characteristics of what is being studied
  - quantitative data: measurements, numerical information about the variables being studied
  - subjective data: based on opinion, with no external criterion by which they are measured
  - objective data: measured according to an identifiable external criterion.
- Collection of data is completed through observation, interviews, questionnaires, surveys, psychological tests and technology of data collection, and is measured through cross-sectional studies or longitudinal studies. The quality of data collection and its reliability and validity are essential to the success of the research.

- Three research designs are mainly used to study developmental change:
  - longitudinal designs: the same participants are monitored at several different times in their lives
  - cross-sectional designs: participants of different ages, or cohorts, are investigated at one particular point in time
  - sequential designs: attempt to overcome the limitations of both longitudinal and cross-sectional designs; they are a combination of both longitudinal and cross-sectional designs.

1.4
- Generalisation of results to the population occurs after the research is complete, provided these conditions are met:
  - Results show statistical significance.
  - All sampling procedures were appropriate.
  - All experimental procedures were appropriate.
  - All measures were valid.
  - All possible confounding variables were controlled.

1.5
- Correlational studies are intended to identify and describe the relationship between two variables. The correlational method makes no attempt to manipulate variables. The intent of such a study is to establish the strength and direction of any correlation that exists between the two variables. A positive correlation is one in which the two variables change in the same direction – as one increases or decreases, so does the other. A negative correlation is one in which the two variables change in opposite directions; that is, as one increases, the other decreases.

1.6
- Animals are used in research today with guidelines protecting them. Animals must be protected, pain must be minimised and the animals must be well cared for.
- The wellbeing of participants in psychological research must be safeguarded. The overriding principle in all psychological research is that there must be no physical or psychological harm to participants.
- Researchers must always maintain respect for the participants.
- Participants must not be identified in any way.
- Participants have the right to refuse to take part in a study.
- Participants have the right to leave a study at any stage.
- Participants must be given information about a study before they agree to take part.
- Researchers submit detailed plans of a research proposal to the Human Research Ethics Committee (HREC) of their research institution. The HREC gives approval for the study to proceed provided all ethical guidelines are met.
- The Australian Psychological Society's Code of Ethics includes a section on the conduct of psychological research, drawing together regulations and guidelines from bodies such as the National Health and Medical Research Council (NHMRC) and guidelines such as the National Privacy Principles (NPPs).

Key terms

- alternative hypothesis
- clinical interview
- computerised or automated data collection
- conclusion
- confidentiality
- confounding variable
- control group (C-group)
- controlled observation
- convenience sampling
- correlation
- counterbalancing
- cross-sectional design
- debriefing
- deception in research
- dependent variable (DV)
- double-blind procedure
- experimental group (E-group)
- experimenter effect
- extraneous variable
- generalisation
- hypothesis
- independent groups design
- independent variable (IV)
- informed consent
- interval data
- longitudinal studies
- Mann-Whitney U-test
- matched participants design
- mean
- median
- mode
- naturalistic observation
- nominal data
- null hypothesis
- objective data
- operationalisation
- ordinal data
- Pearson product moment correlation
- placebo effect
- population
- psychological tests
- qualitative data
- quantitative data
- random allocation
- random sampling
- range
- ratio data
- reliability
- repeated measures design
- sample
- scatter diagram
- scientific method
- sequential design
- single-blind procedure
- Spearman correlation
- standard deviation
- stratified sampling
- subjective data
- Type I error
- Type II error
- validity
- variance
- voluntary participation
- Wilcoxen signed-rank-test
- withdrawal rights

Revision questions

Multiple choice

Questions 1–3 refer to the following information:

A researcher has been investigating whether excessive time (more than five hours per week) spent playing online games causes a reduction in academic success at school. He compares the memory skills for learning a list of 40 botanical names of plants of students who spent more than five hours per week playing games with the memory skills of students who spent less than five hours per week playing games. When a test of significance was run, it was found that the difference in the mean scores had a statistical significance of $p = 0.02$. The researcher claimed this showed that playing online games causes reduced academic success for students.

1 Was the researcher correct? Why or why not?

- **a** Yes, because the results reached statistical significance.
- **b** No, because $p = 0.02$ is not statistically significant so no such conclusion can be drawn.
- **c** No, because school examinations are not a valid measure of academic achievement.
- **d** Unlikely, because he had not matched participants on any other variables so the results were likely to be confounded.

2 In this research, what is the independent variable?

- **a** whether participants spent more or less than five hours per week playing online games
- **b** students who played online games or students who did not play online games
- **c** academic success or academic failure
- **d** academic success; hours students spent playing online games

3 In this research the dependent variable is _____ operationalised as _____.

- **a** excessive time spent playing online games; number of hours per week spent playing online games
- **b** students who play online games; more than five hours per week spent playing online games

c academic success; average percentage score in school examinations

d academic success; score on test of memory of 40 botanical names of plants

4 Empirical research is the process by which psychologists and other scientists collect and analyse data. They can then make informed statements about properties of the population. In this sense, what does the word *population* refer to?

a all the people who live in a certain area

b all the people of a certain age

c all the people about whom the researcher wishes to draw conclusions

d all the people who took part in the experiment or research

5 Inferential statistics are statistical procedures. What do they allow us to do?

a Prove or disprove a hypothesis.

b Draw conclusions from data.

c Describe the properties of the data gathered.

d Manipulate data and calculate standard scores.

6 Which of the following shows the highest level of statistical significance?

a $p = 0.50$

b $p = 0.055$

c $p = 0.05$

d $p = 0.005$

7 The purpose of using different experimental designs is to try to reduce the influence of confounding variables, but each design may have its own problems. The problem of the sample becoming biased because of a change in the characteristics of the sample during the research is greatest in which design?

a repeated measures

b independent groups

c matched pairs

d independent measures

8 What is the purpose of the experimental group in research?

a Ascertain the effects of the dependent variable.

b Eliminate the effects of the dependent variable.

c Ascertain the effects of the independent variable.

d Eliminate the effects of the independent variable.

9 Which option is the best definition of a random sample?

a a group of participants selected from the population by picking names at random from the phone book

b a group of participants selected from the population by putting all the names in a hat and drawing them out at random

c a group of participants selected from the population in such a way that each member of the population has an equal chance of selection

d a group of participants selected from the population by means of a random number generator on a computer

10 A researcher wishes to use deception in an experiment, where participants would believe that they were taking part in research that investigated their ability to solve visual puzzles on a computer, but in reality the computer would 'crash' near the end of the test and their emotional response to the frustration would be measured. This research:

a would be ethical if no psychological or physical harm was caused to the subjects in the long term and debriefing procedures were carried out.

b would be ethical if the research aim was considered sufficiently important and the ethics committee of the researcher's university had approved it as long as debriefing procedures were carried out.

c would be ethical if the subjects gave informed consent about the deceit and debriefing procedures were carried out.

d would be unethical since deceit in research can never be ethical and is not permitted even if debriefing procedures are carried out.

11 What type of research design involves testing different age groups only once?

a longitudinal

b cross-sectional

c sequential

d matched pairs

12 Ashley tests the same participants of different ages for a number of years. He then compares participants born in different years to one another when they are a particular age. The differences among the same-age participants are more likely to be due to:

- **a** age rather than cultural change.
- **b** cultural change rather than unique historical events.
- **c** cultural change rather than age.
- **d** age rather than the environment.

Questions 13–14 refer to the following information:

Professor Pie is conducting some research to investigate how the human brain changes its responses when a person has been without sleep for 14 hours, compared with its responses one hour after awakening from a full night's sleep. To investigate this, she gives each of her first-year university psychology students a card and instructs them to attend the experimental session and hand in the numbered card, which will prevent them from being penalised 5 per cent from their semester mark.

13 Which ethical principle is Professor Pie violating in terms of the rights of participants in research?

- **a** voluntary participation in research
- **b** informed consent from participants
- **c** confidentiality of participant information
- **d** no physiological or psychological harm to participants

14 Later in the year, another researcher wishes to do further research and feels that the data collected by Professor Pie will be useful. The kind professor gives her colleague a list of the students and the data collected. Which further ethical consideration(s) of participant rights has/have now been violated?

- **a** voluntary participation in research
- **b** informed consent from participants
- **c** confidentiality of participant information
- **d** both informed consent and confidentiality of participant information

15 Professor Peabrain is researching the effects of increased vitamin intake through drinking carrot juice on the functioning of the rods in the eye. He gives his experimental group 125 mL of carrot juice each day, while he gives the control group carrot juice that has been boiled and cooled so that the vitamins are inert. What is the purpose of the control group in this experiment?

- **a** Show the effects of the independent variable.
- **b** Control or eliminate the effects of participant variables.
- **c** Form a basis for comparison with the experimental group.
- **d** Show the effects of the dependent variable.

Questions 16–18 refer to the following information:

A researcher is investigating the effects on the sleep cycle of subjects using a lavender-scented pillow, which she believes will decrease nightmares. She has two groups of subjects. Subjects in one group have lavender-scented pillows and subjects in the other they have pillows scented with other herbs. The researcher analyses the subjects' dreams for negative content the next day. The subjects are not aware of which herbs are thought to reduce nightmares and the researcher is not aware of which subjects are using lavender and which are using other herbs.

16 What type of design is the researcher using?

- **a** a single-blind design to eliminate the placebo effect
- **b** a single-blind design to eliminate subject expectations
- **c** a double-blind design to eliminate experimenter bias
- **d** a double-blind design to eliminate placebo and experimenter effects

17 Which of the following ethical guidelines has not been covered by the researcher?

- **a** confidentiality of participant information
- **b** informed consent from participants
- **c** voluntary participation in the research
- **d** withdrawal rights for participants

18 What additional procedure should the researcher follow with this sample?

- **a** She must obtain consent from participants' parents or guardians if participants are less than 21 years of age.
- **b** She must obtain consent from participants' parents or guardians if participants are less than 18 years of age.

c She must obtain consent from participants' parents or guardians if participants are less than 16 years of age.

d She must obtain consent from participants' parents or guardians if participants are less than 14 years of age.

Short answer

19 It is thought that adolescents will sleep for longer periods after they have spent the day studying or engaged in intense physical activity, rather than after a normal day's activity. A researcher wished to study this.

a **Explain** why an independent groups design would be less appropriate than a repeated measures design.

b **Identify** and **describe** a process that could be used to eliminate order effects.

20 **Describe** cohort effects. Give an example.

21 a **Explain** what is the meant by the ethical consideration of withdrawal rights in psychological research.

b **Explain** what is meant by the ethical requirement of confidentiality in psychological research.

Questions 22–29 refer to the following information:

Richard wished to compare the mood of Year 6 children after they had role-played being a victim of bullying (Condition 1) with their mood after they had role-played helping an injured person (Condition 2).

He decided to measure mood on a scale of 1 to 10, with 1 being 'depressed' and 10 being 'elated'. He obtained the figure by giving a 40-item 'mood test' from the internet.

He took his measurements with the first 30 children on the school's alphabetical roll. The role-plays took place on Monday afternoons, one week apart. He made sure that half the children role-played Condition 1 the first week and Condition 2 the second, with the other half role-playing the conditions in the opposite sequence.

Richard's results showed that the mean mood score for Condition 1 was 3.4 and the mean mood score for Condition 2 was 7.2. This difference was statistically significant.

22 **Identify** the population in this research.

23 Was Richard's sampling procedure appropriate? **Explain** your answer.

24 **Identify** the independent variable in this research.

25 **Identify** the dependent variable in this research.

26 **Consider** how the dependent variable was operationalised.

27 **Create** an appropriate experimental hypothesis for this research.

28 Answer the following questions about experimental design.

a **Identify** the experimental design used in this research.

b **Discuss** why Richard made sure that 'half the children role-played Condition 1 the first week and Condition 2 the second, with the other half role-playing the conditions in the opposite sequence'? **Identify** this procedure and consider one alternative.

29 In calculating the statistical significance, Richard found $p = .5$. **Interpret** what this means.

Check your obook assess for these additional resources and more:

- **Student book questions**
  Chapter 1 Review
- **Revision notes**
  Revision notes for Chapter 1
- **assess quiz**
  Test your understanding with an auto-correcting multiple-choice quiz
- **Flashcard glossary**
  Key terms in Chapter 1



UNIT 1

INDIVIDUAL DEVELOPMENT

Since psychology became established as a science more than 120 years ago, its links with traditional and social sciences have enabled researchers to investigate and explain the many changes that take place as a person matures, grows and develops as a unique individual over a lifespan. Unit 1 examines how human behaviour and mental processes are shaped and how each person's brain functions slightly differently.

What makes you the person you are? What makes us unique, even though we are all human beings?

Psychologists have taken up these questions and seek to understand the brain and the development of our specific behaviour and mental processes. The complex nature of our psychological development may be influenced in many ways – from the structure and function of our brains and nervous systems, to the many hereditary and environmental factors that influence the way we develop. This unit will explore the way our consciousness changes, and how sleep provides greater understanding of human behaviours and processes.

Unit 1 Topics

Topic 1	Psychological science A	Chapters 1–2
Topic 2	The role of the brain	Chapters 3–5
Topic 3	Cognitive development	Chapters 6–8
Topic 4	Human consciousness and sleep	Chapters 9–13

Unit objectives

→ Describe and explain the role of the brain, cognitive development, human consciousness and sleep.
→ Apply understanding of the role of the brain, cognitive development, human consciousness and sleep.
→ Analyse evidence about the role of the brain, cognitive development, human consciousness and sleep.
→ Interpret evidence about the role of the brain, cognitive development, human consciousness and sleep.
→ Investigate phenomena associated with the role of the brain, cognitive development, human consciousness and sleep.
→ Evaluate processes, claims and conclusions about the role of the brain, cognitive development, human consciousness and sleep.
→ Communicate understandings, findings, arguments and conclusions about the role of the brain, cognitive development, human consciousness and sleep.

Source: *QCAA Psychology 2019 v1.3 General Senior Syllabus*

FIGURE 1 Psychological understanding helps us better understand how we develop as individuals.

CHAPTER 2

Philosophy to psychology

Psychology is a broad and complex discipline that relates to other disciplines, such as biology and physiology, as well as social sciences, such as anthropology and sociology. This chapter examines the philosophical debates within the discipline of psychology and looks at the development of psychology as a science. The chapter also examines some of the key psychological approaches that have emerged throughout its history. We also distinguish between psychology, psychiatry and social work in this chapter. Finally, this chapter outlines various specialist fields of psychology and describes how each of these continues to contribute to our understanding of the relationship between mental processes and behaviour.

OBJECTIVES

→ Explain the philosophical debates within psychology, including free will versus determinism, nature versus nurture, and the mind-versus-body problem

→ Distinguish between psychology, psychiatry and social work

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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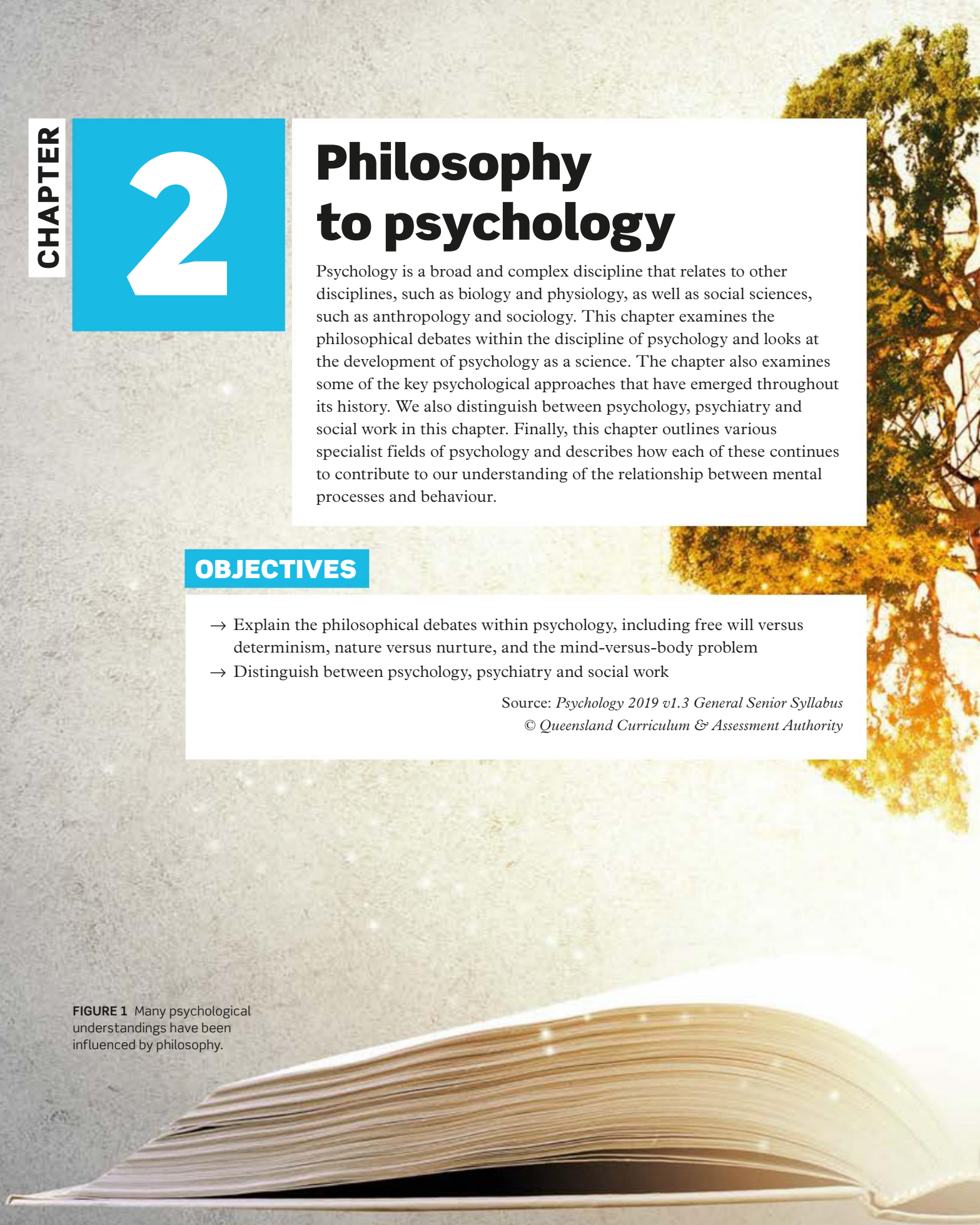


FIGURE 1 Many psychological understandings have been influenced by philosophy.

SUGGESTED RESEARCH

SUGGESTED RESEARCH	**2.1** Investigate and summarise the nature-versus-nurture debate (e.g. the case of the mixed-up brothers of Bogota in Dominus, 2015).

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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2.1 What is psychology?

KEY IDEAS

In this section, you will learn about:

- psychology's philosophical beginnings
- psychology as a science
- philosophical debates in psychology.

Psychology is the scientific investigation of mental processes (thinking, remembering and feeling) and behaviour. Understanding a person requires attention to the individual's biology, psychological experience and cultural context (Burton, Westen, & Kowalski, 2015).

Psychology is a science that overlaps with many other traditional and social sciences, such as biology, physiology, anthropology and sociology. Psychology is considered to be a science because it uses a systematic approach – known as the **scientific method** – to understand the mind and human behaviour. The scientific method is covered in Chapter 1 (Section 1.1).

scientific method a standardised way of making observations, gathering data, testing hypotheses and interpreting results to establish theories in order to describe and measure human behaviour

Psychology is a science based on three processes:

1. gathering factual information
2. forming theories to explain this factual information
3. testing these theories

But when did the fascination with the workings of the mind and body begin? What factors influenced the establishment of psychology as the multi-faceted discipline we know today?

From philosophy to psychology

Psychology is considered a relatively new discipline with links that can be traced back to the philosophers of ancient Greece. Indeed, the word **psychology** itself comes from two ancient Greek words: *psyche,* meaning 'mind' or 'soul', and *-logos,* meaning 'the study of' (Weiten, 1998).

psychology the systematic study of the mind (mental processes) and behaviour

Psychology began as **philosophy**, a discipline that tries to understand behaviour by using logic and reason, rather than observation and systematic experimental research methods. Because of this, many of the original ideas of psychology stem from what were once philosophical ideas.

philosophy a discipline that tries to understand behaviour by using logic and reason rather than observation and experimental research methods

The ancient Greek philosophers of the sixth to the fourth centuries BCE contributed significantly to our understanding of many areas of knowledge, including physics, metaphysics, mathematics, biology, zoology, government and ethics, although some of their theories are considered strange today. For example, Aristotle (384–322 BCE) believed that 'reasoning and thinking' took place in the heart, and that the brain was a large gland, situated in the head immediately behind the nose, that helped to cool down the 'forces of life that descended from heaven and entered the body' (McMahon, McMahom, & Romano, 1990).

At around the same time, Hippocrates (460–370 BCE) initiated the idea that medicine was a separate discipline from philosophy, and aimed to establish a more scientific approach to physiology. He proposed that humans consisted of four fluids or 'humours' – blood, phlegm, yellow bile and black bile – that needed to be balanced in the body for a person to enjoy good health.

SUGGESTED RESEARCH
2.1 Investigate and summarise the nature-versus-nurture debate
Go to page 456 »

Philosophical debates in psychology

Today, we know that mental processes occur in the brain, but Aristotle is still considered one of the first classical philosophers to explore psychological concepts of personality, perception, thinking and ethics, and to examine the relationship between the body and the mind: a concept referred to as **dualism**.

dualism
the view that the mind is a separate entity from the body and that our conscious awareness is not physical

The notion of dualism viewed the mind and brain as separate entities. According to Aristotle, the mind, which in ancient times was referred to as the 'soul', described the non-physical aspect of being human. It was a word used to represent consciousness, thinking, imagination and emotions – essentially, any mental process that could not be seen. In contrast, the body was the visible, human form.

Several ancient philosophical questions continue to underpin many areas of psychology and are just as relevant as they were during the time of Plato (427–347 BCE) and Aristotle (384–322 BCE). For example:

- Is human behaviour a result of 'free will', where a person makes a conscious decision to act in a particular way? Or is it 'determinism', where actions are governed by both internal and external forces outside the person's control?
- The mind-versus-body problem: is the mind a separate entity from the physical body (dualism) or is it part of the same system (monism)? (See Chapter 3 for more information on the mind-versus-body problem.)
- The nature-versus-nurture debate: which has greater influence on a person's mental processes and behaviour: **heredity** and genetics or environmental influence?



FIGURE 1 Aristotle (384–322 BCE) was the first to develop a theory about the nature of personality.

During the seventeenth century, René Descartes (1595–1650), a French mathematician, philosopher and physiologist, asserted that people could exercise 'free will'. In other words, they could decide for themselves to take a course of action and follow it through.

In contrast, in 1931, naturalist and biologist Charles Darwin (1809–82) took a 'deterministic' approach. He developed the theory of **evolution** and proposed that both animals and humans are programmed by nature (through genetic inheritance) to behave in ways that help their species survive.

heredity
genetic inheritance; the genetic characteristics received from the biological mother and father

evolution
the gradual changes in populations over generations (through genetic inheritance) that help their species to survive



FIGURE 2 René Descartes (1595–1650), French mathematician, philosopher and physiologist



FIGURE 3 A cartoon depicting Charles Darwin in his evolutionary tree: the idea is that all living things are related; all species evolved from common ancestors; and each time a new species evolves, a new 'branch' forms.

Animals that adapted to changes in their environment were strong, lived longer than others and produced more offspring; those that did not adapt, died. A good example is the case of the white peppered moth (refer to Case study 2.1). Darwin's theory placed significant emphasis on genetics and heredity, which underpin medicine and biology, and indeed the biological approach in psychology. He also recognised that the environment can play an important role in the survival and evolution of a species. In addition, Darwin's theory highlighted the nature-versus-nurture debate. To what extent are mental processes and behaviours due to the genetics or heredity (nature) of the organism, and to what extent are they due to environmental influences (nurture)?

CASE STUDY 2.1

Natural selection

During the Industrial Revolution in nineteenth-century Britain, the white peppered moth died out because industries poured out masses of soot and grime that covered everything. The dirt blackened trees and walls of buildings, making the white peppered moth stand out – easy pickings for birds that liked to eat them. So, through the process of natural selection, the rarer black moth of the same species thrived as it blended in with the filthy surroundings!



FIGURE 4 White and black peppered moths

Psychology as a science

Study tip

More information on the different approaches in psychology can be found on your obook assess.

From philosophical beginnings and debates, psychology evolved to explore questions of determinism, free will and nature–nurture using more scientific and often biologically based methods. Today, we refer to psychology as the systematic study of mental processes and behaviour, but when did psychology become a recognised science?

Wilhelm Wundt

Psychology was not considered a separate scientific discipline until 1879, when the first psychological laboratories to study humans were established. Wilhelm Wundt (1832–1920) has often been called 'the father of experimental psychology' and the 'founder of modern psychology', as he was the first to establish such a laboratory (the Institut für Experimentelle Psychologie, in 1879). Wundt situated his laboratory at the University of Leipzig, where he was Professor of Inductive Philosophy from 1875 to 1917. In 1881, he founded the first journal of psychological research. At that time, sciences such as chemistry and physics were successful in using the **structural approach**: breaking things down into smaller parts, and then investigating how they were related. Wundt thought that the human mind could be approached in the same manner and tried to explore the elements that make up consciousness.

structural approach
a psychological approach that involves reducing our conscious experiences into smaller, basic elements

functional approach
a psychological approach that focuses on people's conscious adaptation to the physical and social environment



FIGURE5 Wilhelm Wundt (1832–1920)

William James

natural selection process of survival of the fittest, where animals that adapted to changes in their environment were strong, lived longer than others and produced more offspring, while those that did not adapt, died

Unlike Wundt, who looked at the content of consciousness, William James (1842–1910), an American philosopher and psychologist, was more interested in the function and *purpose* of consciousness (known as the **functional approach** to psychology). He viewed consciousness as a continuous stream of thought, rather than as independent elements to be examined separately (Rawlings *et al.*, 2005).

After the publication of James's ideas in *The Principles of Psychology* (1890), psychology was viewed as an independent science rather than just a branch of philosophy. James believed that consciousness should be studied outside the laboratory in the real world. His work led to the development of intelligence tests for humans, and tests to see how quickly animals learnt to solve problems. James also studied moral and religious beliefs and behaviour. Based on the Darwinian idea of **natural selection**, James believed that consciousness or self-awareness must have been important to the survival of humans.

Early structural and functional psychologists, including Wundt and James, believed that studying conscious thoughts was central to understanding the mind. The structural approach (or structuralism) used introspection to study the structure of the mind and how its basic elements interact. In contrast, the functional approach (or functionalism) focused on the purpose or function of our consciousness and how it enables us to actively adapt to our environments. Systematic observation underpinned these early approaches to the study of the mind and behaviour, and provided the foundation for current psychological approaches that are based on empirical research.



FIGURE 6 William James (1842–1910)

CHECK YOUR LEARNING 2.1

Describe and explain

1 **Identify** and **explain** one key difference between psychology and philosophy.
2 **Describe** the ways philosophy contributed to our understanding of the brain.
3 **Explain** how two ancient Greek philosophers influenced psychology.
4 **Explain** what is meant by the term dualism.
5 **Explain** how the study of consciousness contributed to psychology emerging as a separate scientific discipline.
6 **Explain** the philosophical debate between free will and determinism.

Apply, analyse and interpret

7 **Consider** the contribution Darwin made to psychology with his theory of evolution.
8 **Distinguish** between the structural and functional approaches to psychology.

Investigate, evaluate and communicate

9 **Investigate** the nature-versus-nurture debate and provide an example (online research is required).
10 **Evaluate** the nature-versus-nurture debate. Based on your current understanding, present an argument for nature or nurture.

Check your obook assess for these additional resources and more:

» **Student book questions**
Check your learning 2.1

» **Suggested research**
Worksheet: Nature vs nurture debate – mixed up twins of Bogota

» **Increase your knowledge**
Approaches in psychology

» **Weblink**
Is psychology a science?

2.2 Psychology, psychiatry or social work

KEY IDEAS

In this section, you will learn about:

- psychology, psychiatry and social work
- specialist fields in psychology.

Psychiatry, psychology and social work are all areas that are concerned with helping people lead healthier, happier and more contented lives. They are also concerned with the reasons why people do certain things. But what are the exact differences?

Psychology versus psychiatry

But what about psychiatrists? Or should that be psychologists? Many people confuse the two professions because each works with psychological dysfunction and mental illness. The media and movies add to this confusion.

The 1999 movie *Analyze This*, for example, is about a powerful gangster (played by Robert De Niro) who experiences symptoms of anxiety, difficulty sleeping, withdrawal from family and friends, and impotence. He is taken to see a very reluctant psychiatrist (Billy Crystal) by one of his trusted hit men. This funny movie portrays the psychiatrist as approachable, but also rather strange himself.

The 1975 movie *One Flew over the Cuckoo's Nest* shows a completely different view of a psychiatrist. The lead character R.P. McMurphy, played by Jack Nicholson, is transferred from jail to a mental institution to assess his mental state. The movie offers us insight about how patients were treated in mental institutions until the late twentieth century, and the power that some psychiatrists had (and sometimes still have) over patients within institutions.

To control his 'disruptive' behaviours, McMurphy is given electroconvulsive (shock) therapy (ECT), the modern version of convulsive shock therapy, and is later forced to undergo a lobotomy. Patients who were violent or difficult to control became quiet and more



FIGURE 1 In *Analyze This*, Robert De Niro's character sees a psychiatrist (played by Billy Crystal) to treat various symptoms of mental illness.



FIGURE 2 Jack Nicholson plays R.P. McMurphy in *One Flew over the Cuckoo's Nest*.

controllable after having a lobotomy, as the area of the brain targeted was known to regulate emotion and personality. Success was limited, however, because of the lack of precision in the procedure. The damage to the brain was irreversible, and patients were left with varying degrees of permanent brain damage. Lobotomy is no longer used. ECT, which involves giving patients an electric shock to induce brain seizures, is still used to treat patients with severe depression, bipolar disorder (previously known as manic depression) and schizophrenia, if these disorders do not respond to medication.

What, then, is the difference between a psychologist and a psychiatrist?

- A registered psychologist helps individuals and groups to find solutions to their everyday problems and offers non-medical approaches to enhance one's mental health and wellbeing and improve overall quality of life.
- A psychiatrist is a qualified medical practitioner who specialises in mental illnesses, and is able to prescribe medication for mental disorders and perform medical procedures such as ECT. A psychiatrist must first complete a medical degree, followed by a minimum of two years as a resident (intern) in a hospital, followed by a five-year supervised specialist program in psychiatry.



FIGURE 3 When people think about consulting a psychiatrist, they generally picture the patient lying down on a couch while the psychiatrist takes notes. Is this a true picture?

Psychology versus social work

What is the difference between being a psychologist and being a social worker? Both are professions that try to help people with their problems, and there can be a significant crossover in what they do, but there are some basic differences. Psychologists study human behaviour and how the human mind works. They use this knowledge to diagnose mental health issues and work out treatment plans. Social workers usually work within the social service system to help people cope with problems related to poverty, legal issues, mental health or human rights.

Psychologists and social workers complete different degrees.

A bachelor-level social work degree will include some elements of basic human behaviour, and will also cover areas such as social welfare policy, foundations of social justice, family social work and community social work. Many jobs in this field will require a person to have also completed graduate qualifications in social work.

A four-year undergraduate degree program in psychology accredited by the Australian Psychological Society (APS) covers human behaviour in more detail, including topics such as biological bases of behaviour, social psychology, cultural and Indigenous psychology, research methods and statistics, personality, intelligence and abnormal psychology. To work as a registered psychologist requires additional postgraduate study and practical experience in the field, typically while under the supervision of a registered psychologist.

In general, psychologists complete higher levels of study and gain a deeper understanding of how the human mind works. They look to help people by developing treatment plans based on their more detailed understanding of behaviour. By contrast, social workers look at how they can help people access social services and assistance from agencies to cope with their problems.

The Australian Association of Social Workers (AASW) is the professional representative body of social workers in Australia, with more than 10 000 members. To become a member, you must complete an AASW-accredited Bachelor of Social Work degree or Master of Social Work, and meet minimum eligibility requirements.

The Psychology Board of Australia is the profession's peak body and is responsible for registering psychologists to practice. To be registered, you must complete a four-year undergraduate degree in psychology, followed by at least two years of practical experience, such as a masters or doctorate degree.

Social workers typically work in government agencies and in community-based organisations, commonly involving health, welfare, recreation, housing, employment and other community services. Organisations they work in can include hospitals, community health services and schools, aid advocacy bodies, detention centres and local councils. For example, social workers can work as members of multidisciplinary teams in hospitals with doctors, nurses and other allied health professionals.

Psychologists work across a wide range of areas. Many people typically think of psychologists working one-on-one with clients in counselling or clinical sessions. That is only one of the ways psychologists can work. Psychologists use their understanding of human behaviour to work in many other areas such as sports, education and training, human resources, marketing, justice and corrections, and public policy.

The major differences in the roles of the psychologist, psychiatrist and social worker are summarised in Table 1.

Psychologist	Psychiatrist	Social worker
• Completes a minimum four years of study (e.g. an APS accredited four-year Bachelor of Psychology OR a three-year undergraduate degree in psychology followed by an Honours program). • To become registered as a psychologist requires an additional two years of supervision under a qualified psychologist OR higher degree studies in psychology, including either a masters or doctorate in psychology.	• Completes a six-year medical degree. • Works as a resident doctor (intern) in a hospital setting for two years. • Undertakes specialist training in psychiatry, while supervised for five years.	• Completes an AASW-accredited Bachelor of Social Work degree or Master of Social Work (or qualifications from overseas recognised as comparable by the AASW).
• Unable to prescribe medication.	• Able to prescribe medication.	• Unable to prescribe medication.
• Engages in prevention, assessment, diagnosis and treatment of mental illness and other everyday issues. • Assesses developmental progress, and personal and community mental health and wellbeing.	• Can conduct medical procedures on patients.	• Finds ways in which individuals, families and community groups are able to improve situations with the help of various social service programs.
• Can perform restricted psychological assessments, including intelligence tests, achievement tests, aptitude tests, personality tests and other occupational inventories.	• Can perform certain assessments, such as personality tests.	• Can perform assessments and interventions ranging from targeted and brief specific-needs analyses through to comprehensive psychosocial and risk-assessments.

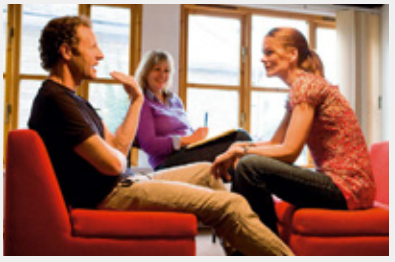
TABLE 1 Major differences in the roles of psychologists, psychiatrists and social workers

Specialist fields in psychology

Many people believe that psychologists mainly deal with mental illness and abnormal behaviour. This is not the case. Psychologists also work with people to help enrich their lives. In 2017, the APS launched its first national publicity campaign to emphasise that change is possible. This 'Believe in Change' campaign showcased how psychologists can work with people to help them make positive changes in their behaviour, and in their lives more broadly. The campaign encourages all Australians to seek psychological help for various mental health and life issues (see https://www.myhealthcareer.com.au/psychology/APS-believe-in-change-campaign).

The scope of psychology is broad and complex, and includes the study of animal behaviour as well as human behaviour. It explores many different fields of interest and many different populations, and uses a variety of research skills to unlock the mysteries of mental processes and behaviour.

Table 2 provides some information about the nine main specialities in psychology. If you would like more detail about any of these, you can visit the APS website (www.psychology.org.au).

Types of psychologists	Description
Clinical neuropsychologists 	• Assess, monitor and manage individuals with brain impairments. Provide a detailed assessment and conduct thorough non-drug-based tests. • Patients may suffer from: epilepsy, head injury, neurological disease, strokes, drug and alcohol disorders, learning disabilities, attention deficit disorders, dementia and mental illnesses such as schizophrenia.
Clinical psychologists 	• Assess, diagnose and treat psychological problems and mental illness. • Most clinical psychologists work in one or more sub-specialities, such as: alcohol and drug misuse, attention deficit disorders, anxiety disorders such as panic attacks and phobias, brain injury, chronic pain, eating disorders, educational functioning, loss, grief and bereavement, personality problems, sleep disorders, suicidal behaviour or obsessive compulsive disorder.
Counselling psychologists 	• Assist individuals, couples, families and groups with relationships, wellbeing, work, recreation, health and crisis management. • For individuals: help manage stress, grief and loss, chronic pain, depression, anger and violence, and recovery from eating disorders. • For couples: improve communication and parenting skills, manage conflict and divorce. • For families: deal with problems experienced in blended families and help with communication issues. • For organisations: help select new staff, evaluate and conduct new training programs, and help manage conflict resolution.

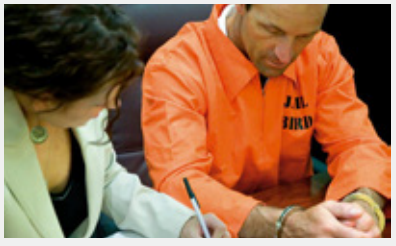
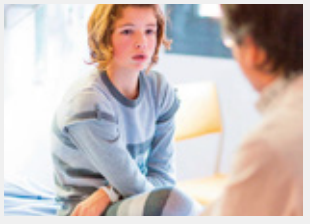
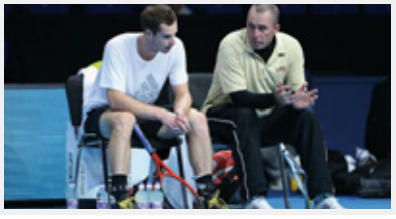
Types of psychologists	Description
Community psychologists 	• Work with community members and government organisations to address individual, social, political and environmental factors that impact on the psychological wellbeing of communities. • Conduct community-based research, assess community needs, coordinate projects, provide counselling and work with other people to break down existing social barriers (e.g. may work with migrant groups to assist them with adjusting to a new country by organising contact with other members of the same ethnic community, language support or housing).
Educational and developmental psychologists 	• Are concerned with how people develop and learn through their lives. Can work with very young children, adolescents, parents and young adults on many educational, social and developmental issues that occur over a lifespan. • Provide help to parents of young children with learning difficulties, problems of attachment, difficult behaviour, developmental concerns and disabilities. Alternatively, they may help teachers, parents and children with school avoidance, learning difficulties, low self-esteem, bullying and other behavioural problems.
Forensic psychologists 	• Work in criminal, civil and family legal areas and provide services to criminals, victims, justice personnel and police. • Aim to help understand the cause, treatment and prevention of criminal behaviour. • Perform psychological assessments and provide reports for courts and parole boards, appear in court as expert witnesses, design and deliver treatments for offenders, assess and treat victims of crime, intervene in child neglect/abuse cases and carry out research in forensic psychology (profiling).
Health psychologists 	• Work within the health-care system and promote the prevention and treatment of illness. • Understand how the effect of psychological factors related to health and illness can affect a person's ability to function. • Develop health promotion programs to assist with the prevention of illnesses such as cancer, heart attacks and stroke.
Organisational psychologists 	• Generally specialise in the areas of employment, human resource management, training and development, market research and advertising. • Assist in areas such as recruitment, job analysis, training and development, career coaching, organisational change, workplace research and performance reviews.
Sports psychologists 	• Assist individuals and teams involved in professional and amateur sports to maximise their performance and achieve their goals. • Also assist in improving mental skills, managing stress and performance anxiety, team building and time management.

TABLE 2 The nine main specialist fields in psychology

Psychology's contribution to understanding human behaviour

In sum, the scope of psychology is broad and complex. The contributions from other sciences, along with the vast body of knowledge gathered through academic and other specialist psychologists, have increased our understanding of the brain and nervous system and, consequently, mental processes and behaviour. Through the observation of behaviour and the use of other research methods, this knowledge has been successfully used by psychologists to help individuals, families, groups, communities and organisations by developing appropriate treatments and strategies to help people with a range of problems.

Psychology is not only helpful when people have problems; there is probably no human activity that has not benefited from psychological understanding.

> The science of the mind can only have for its proper goal the understanding of human nature by every human being, and through its use, brings peace to every human soul.
>
> Alfred Adler

CHECK YOUR LEARNING 2.2

Describe and explain

1 **Describe** three key differences between psychology, psychiatry and social work.
2 **Explain** the process of becoming a psychologist.
3 **Compare** the qualifications of a psychologist and a psychiatrist.
4 **Identify** the nine main specialist fields in psychology.

Apply, analyse and interpret

5 **Identify** a situation where a psychologist may work with a social worker. **Consider** why this may happen.

Investigate, evaluate and communicate

6 **Investigate** why scientific psychology is different from 'pop' psychology. Decide if you think this difference is important and communicate this through a short response.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 2.2
- » Weblink
  Social work in Australia
- » Weblink
  Psychologists in Australia
- » Weblink
  Psychiatrists in Australia

CHAPTER 2

Review

Summary

2.1

- Psychology began as philosophy: a discipline that tries to understand behaviour by using logic and reason rather than observation and experimental research methods.
- The biological approach is strongly influenced by Charles Darwin's theory of evolution – survival of the fittest. Human and animal behaviour is guided by the need to select the most genetically strong partners for the survival of the species.
- Psychology was not considered a separate scientific discipline until 1879. Wilhelm Wundt ('the father of experimental psychology') used a structuralist approach. His method was to break scientific data into smaller parts, then investigate how they were related.
- William James (1842–1910), an American philosopher and psychologist, was more interested in the function and purpose of consciousness (functionalism). Many of his ideas were based on the Darwinian idea of natural selection.

2.2

- Psychologists, psychiatrists and social workers are all dedicated to helping others. However, they each differ in their treatment approach. Psychologists focus on understanding mental processes and behaviour to diagnose mental health issues and can draw on a diverse array of assessment procedures and psychological tests to treat people, depending on their field of specialisation. In contrast, psychiatrists focus on prescribing treatments based on the medical model (i.e. medication) to help people, while social workers focus on finding solutions to social problems such as poverty and emotional or mental health.
- The Australian Psychological Society recognises nine distinct specialities – clinical neuropsychologists, clinical psychologists, counselling, community, educational and developmental, forensic, health, organisational and sport psychologists. Academic psychologists are found teaching within all of these areas.

Key terms

- abnormal
- biological perspective
- brain
- case study
- dualism
- evolution
- functional approach
- hereditary
- natural selection
- philosophy
- psychology
- scientific method
- structural approach

Revision questions

Multiple choice

1 Psychology is a science based on which three processes?
- **a** gathering of factual information, forming theories to explain these facts and testing these theories
- **b** gathering a range of information, using questionnaires and assessing them
- **c** observing the mental processes of humans, creating theories and then testing them
- **d** observing people and animals, forming theories through tests and then publishing the findings

2 What does philosophy use to try to understand behaviour?
- **a** observational and research methods
- **b** logic and reason
- **c** questionnaires and tests
- **d** dissection of animals and humans

3 Psychology as a discipline overlaps with other sciences. What are some of these?
- **a** biology, physiology, sociology and anthropology
- **b** biology, music, sociology and anthropology
- **c** anatomy, chemistry, sociology and anthropology
- **d** physics, anatomy, social science, medicine and philosophy

4 Psychology is a science because its practitioners advance knowledge and understanding by:
- **a** using scientific instruments such as computers and galvanometers in their research.
- **b** following rigorous scientific procedures.
- **c** working with human subjects.
- **d** working in scientific laboratories.

5 Wilhelm Wundt is considered the 'father of experimental psychology'. He adopted a structuralist approach to studying the 'mind'. What did this mean?
- **a** He examined consciousness by breaking it down into basic elements, as other scientists study chemicals.
- **b** He dissected the brain to examine its structures.
- **c** He looked at how consciousness can be switched on and off by putting people to sleep.
- **d** He gathered information about consciousness, then broke it down into chunks.

6 William James, whose approach was called functionalism, was interested in studying the _____ of the mind and consciousness.
- **a** purpose
- **b** structure
- **c** function
- **d** sensation

7 Dualism can be best defined as:
- **a** thinking that the mind and the body are the same
- **b** a view that the mind is separate from the body
- **c** the idea that the brain and the mind are the same
- **d** the idea that our conscious awareness is physical.

8 Darwin's research into the importance of heredity and environmental influences has influenced which debate in psychology?
- **a** the mind-versus-body
- **b** free will-versus-determinism
- **c** nature-versus-nurture
- **d** psychology-versus-philosophy

9 Psychologists who studied the structural and functional approach believed that:
- **a** studying conscious thoughts was central to understanding the mind
- **b** studying nature would explain any psychological tendencies of a human
- **c** focusing on the mind versus body debate could explain human behaviour
- **d** relied on logic and reason, rather than scientific observation.

10 A psychiatrist is:
- **a** a qualified doctor focusing on mental illness, they are able to prescribe medication and perform medical procedures

b someone who helps individuals resolve mental health issues without medication, focusing on non-medical approaches
c a doctor that focuses on neurological issues
d focused on developing surgical procedures to intervene in mental health.

11 Jamie has been living between commission housing and being homeless for the past year. He has been feeling low and has recently been in trouble with the police. Which of the following would best help Jamie?
a a psychiatrist
b a social worker
c a psychologist
d medication

12 Maria is in Grade 4 and she has often been crying and not sleeping since her grandmother became very sick and died three months ago. Her mother takes her to a psychologist who spends several sessions over some weeks talking with Maria. After this, Maria seems much more content and her sleep patterns are back to normal. What type of psychologist did Maria's mother most likely consult for such assistance?
a a sleep psychologist
b a counselling psychologist
c a clinical psychologist
d an educational and developmental psychologist

13 What has forensic psychology made important contributions to?
a our understanding of criminal behaviours
b our ability to predict likely criminal actions
c rehabilitation of criminals
d all of the above

14 Whom does an educational and developmental psychologist mainly work with?
a mentally ill patients with brain dysfunction
b organisations that run campaigns such as 'Quit' and 'Slip, Slop, Slap'
c parents, children and teachers
d teachers

15 What has counselling psychology contributed to our understanding of?
a the complex relationships that occur in the workplace (this information has been used to improve the performance of employees in organisations)
b symptoms such as concentration problems, memory loss, attention difficulties and language and learning difficulties
c treatments for offenders, and assessment and treatment for victims of crime
d management of stress, grief and loss, chronic pain and depression

Short answer

Describe and explain

★**16** **Identify** three philosophical debates in psychology, and briefly **describe** them.

★★**17** **Define** heredity, and **explain** what is meant by this term.

★★**18** **Summarise** what dualism means.

★**19** **Identify** two key differences between psychiatry and psychology.

★★**20** Using an example, **explain** what social work is.

★**21** Use the below table to briefly **describe** the nine main types of psychologist:

Type	Focus area	Example of work
Clinical neuropsychologist		
Clinical psychologist		
Counselling psychologist		
Community psychologist		
Educational and developmental psychologists		
Forensic psychologists		
Health psychologists		
Organisational psychologists		
Sports psychologists		

Apply, analyse and interpret

★★ **22 Consider** the nature-versus-nurture debate.

★★ **23** Use the table below to **compare** social work, psychology and psychiatry.

	Psychology	Psychiatry	Social Work
Education required			
Medication			
Role in helping individuals			
Assessments that can be performed			

★★ **24 Compare** clinical psychologists with education and development psychologists.

★★ **25 Distinguish** between the mind versus body debate and determinism versus free will.

★★ **26** Jake has been playing rugby at an elite level for three years. Recently he has been struggling to increase his performance. He finds that he is getting anxious before a game, because he doesn't want to let his team down. **Determine** what kind of psychologist Jake might choose to see.

Investigate, evaluate and communicate

★★★ **27 Investigate** one of the nine main specialist areas in psychology that interests you. Briefly **discuss** the speciality area outlining the types of organisations or groups of people who work in it, and receive support from it.

★★ **28 Evaluate** psychology's philosophical origins.

★★★ **29 Design** an experiment that could look at the nature versus nurture debate. This could compare mental health between adopted children and non-adopted children. In your design, **identify** the independent variable, dependent variable, population and sampling methods.

★★ **30** Philosophy was the beginning of modern psychology. **Discuss** why it was important for psychology to be recognised as a science.

Check your obook assess for these additional resources and more:

- **» Student book questions**
  Chapter 2 Review
- **» Revision notes**
  Revision notes for Chapter 2
- **» assess quiz**
  Test your understanding with an auto-correcting multiple-choice quiz
- **» Flashcard glossary**
  Key terms in Chapter 2

CHAPTER 3

Brain investigations

Humans' fascination with the brain's structure and function began well before the ancient Greeks. In fact, there is evidence of brain surgery dating back thousands of years, which of course continues today.

Over time, our understanding of the brain and its function has changed. As attitudes and technology advance, we now know how integral the brain and the central nervous system are to our existence, as well as our ability to interact with the world around us.

In this chapter, we examine the changing approaches to the study of the brain through history and the role the brain plays in enabling us to interact with the external world.

OBJECTIVES

→ Summarise the mind-versus-body problem, with reference to the Greek physician Claudius Galen and the French philosopher René Descartes

→ Describe early brain investigative techniques, including phrenology (Franz Gall in Sabbatini, 1997) and brain experiments (Pierre Flourens; Wilder Penfield in Kumar and Yeragani, 2011)

→ Explain how neuroimaging techniques can be used to enhance the understanding of brain–behaviour relationships, for example:

- positron emission topography (PET)
- magnetic resonance imaging (MRI)
- functional magnetic resonance imaging (FMRI)
- electroencephalograph (EEG)

Source: *QCAA Psychology 2019 v1.3 General Senior Syllabus*

SUGGESTED RESEARCH

SUGGESTED RESEARCH	**3.3** How neuroimaging can be used to understand brain–behaviour relationships in: PET (in Raine, Buchsbaum, & LaCasse, 1997)
SUGGESTED RESEARCH	**3.3** How neuroimaging can be used to understand brain–behaviour relationships in: MRI (in Maguire, Woollett & Spiers, 2006)

Source: *QCAA Psychology 2019 v1.3 General Senior Syllabus*

FIGURE 1 A man undergoing an EEG



3.1 Understanding the role of the brain

KEY IDEAS

In this section, you will learn about:

- psychology throughout the ages, including prehistoric times
- the brain-versus-heart debate
- the mind-versus-body problem.

In Chapter 2, the way psychology has progressed from philosophy was introduced, as was the way psychology continues to develop. But what did early psychological investigations look like? In this section, we will discuss psychology over time from its prehistoric beginnings.

Psychology throughout the ages

Have you ever experienced a really bad headache? In prehistoric times, you might have been held down and had a hole drilled into your skull while you were awake! Over the centuries, medical conditions and a range of physical and mental conditions have often been attributed to evil spirits, demon possession, sorcery or angry gods. Consequently, humans' understanding of the brain and nervous system took a number of detours along the way.

What inspired our prehistoric ancestors to contemplate what went on in their heads? The first archaeological evidence of treating brain-related ailments and mental illness dates back to prehistoric times, approximately 6000 BCE, with a procedure known as **trephination**. Trephination involved making a surgical hole in the skull while the patient was awake. This was to allow a healing spirit in or an evil spirit out. Cave paintings show that this method was used to manage a range of conditions, including headaches, epilepsy and psychosis. There seemed to be an understanding that a range of symptoms were related to the head and possibly the brain of the patient. Many of the patients lived after the operation, because scar tissue can be seen around the hole. Some skulls had more than one surgically made hole. This procedure is still in use today, with a clearer understanding of the brain and nervous system, and using far more sophisticated surgical instruments than the implements shown in Figure 2.

trephination an ancient surgical procedure that involves creating a hole in a patient's head while they are still awake



FIGURE 1 A Neolithic skull with a trephination – a hole in the skull – that was made with a sharp instrument, such as an obsidian-tipped tool



FIGURE 2 Neolithic trephining tools, used to make a hole in the skull of a person suffering from severe headaches, epilepsy and other mental conditions

Although many ancient cultures continued to use trephination as a treatment method, with some understanding of the brain's role in physical and mental illness, the philosophers and physicians of ancient Greece and Egypt held conflicting views. The ancient Egyptians attributed abnormal behaviours and physical illness to supernatural origins and used magic spells and prayer to help treat ailments. There was little understanding of the brain and nervous system. Indeed, they viewed the heart as the centre of intelligence and reason.

The anatomist Claudius Galen (130–210 CE) was one of the first to research the brain in detail. After observing people who had suffered strokes, he noted that they could lose a particular sense even though there was no apparent damage to the sensory organ. He deduced that the brain played an important role in sensation.

By the mid-seventeenth century, English doctor Thomas Willis (1621–75) had developed the terms 'hemisphere' and 'lobe' to discuss the brain, and theorised that particular cortical structures had specialised functions. Willis conducted an in-depth study of the brain and determined that automatic processes, such as breathing, heart rate and other motor functions, are controlled by specific areas of the lower brain. He also discovered the circle of arteries at the base of the brain – known as the 'Circle of Willis'.

In 1796, Franz Joseph Gall (1758–1828), a neuroanatomist and physiologist, suggested that **personality** was directly linked to brain structures, and he is noted for the development of **phrenology**. His theory looks at the brain as an organ, where the shape of the skull reflects a person's personality and intelligence. Although flawed, it links personality and intelligence with cortical structures.

Exploration and debate regarding the role of the brain and its functions continued over the centuries. The philosophers of ancient Greece were interested in explaining the experience of consciousness and argued whether or not the mind (referred to as the 'soul' in ancient times) was separate from the physical body. Knowledge about the brain and nervous system was the domain of physicians, doctors and physiologists.

personality
lasting and distinctive behaviours, thoughts, motives and emotions that typify how we react and adapt to other people and situations

phrenology
a pseudoscience that suggests our mental abilities and personality are controlled by 37 areas of the brain and that the shape and size of the skull can be measured to determine a person's character

CHALLENGE 3.1

Importance of the brain

The ancient Egyptians believed the gods would judge the souls of the dead by weighing their hearts on a scale against the feather of truth. If the scales balanced, the soul passed into the afterlife; if the heart was heavy with wickedness, it would be devoured by a soul-eating demon. The brain was considered an unimportant organ and was removed during mummification. Consider why the ancient Egyptians thought this.



FIGURE 3 Ancient Egyptians would remove the brain during mummification, as it was considered an unimportant organ.

The mind-versus-body problem

Raise your arm. Raise it up high, just as primary school students do when they want to answer a question. Did you raise your arm? If yes, why did you raise your arm? If no, why didn't you? What caused you to make the decision not to follow instructions?

mind-versus-body problem
a much debated and controversial question of whether the mind is a separate entity from the body, including the brain

body
the physical being, including the brain



FIGURE 4 The 'raise your arm' instruction is often used to introduce one of the oldest and most debated topics in psychology: the mind-versus-body problem.

The 'raise your arm' instruction is a classic example that has been used over centuries to highlight one of the oldest and most debated topics in psychology: the **mind-versus-body problem**. As introduced in Chapter 2, the mind-versus-body problem asks, 'What is the mind?' and 'What relationship does the mind have with the brain (body)?' Although we know that the brain is crucial to behaviour, our understanding of the relationship between the brain and the mind is not clear. Basically, the mind-versus-body problem relates to the question, 'Is the mind a separate entity from the brain and the body?' This debate emerged with the ancient Greeks.

In terms of the mind-versus-body problem, the **body** consists of physical entities (parts), including the brain, and these entities can be measured physically in terms of size, mass, shape and density. The body occupies space and exists in time. In contrast, the mind relates to our self-awareness, our ability to reflect, think and reason about ourselves and the world. In other words, it relates to consciousness – our awareness of ourselves and our environment. Hence, the act of deciding to raise your arm demonstrates how the mind can cause change in the body – it can make you raise your arm.

monism
the view that the mind is the same thing as the brain

materialistic monism
the view that consciousness (the mind) results from the complex physical interactions between the neurons

neuron
nerve cells, responsible for communication within the body

dualism
the view that the mind is a separate entity from the body and that our conscious awareness is not physical

The view that the mind is the same thing as the brain is known as **monism**. From a more biological perspective, **materialistic monism** views consciousness (the mind) as a result of complex physical interactions between **neurons**. Hence, according to materialistic monism, we are simply 'complicated physiological organisms' governed by the biological processes of our nervous systems (McLeod, 2007).

The view that the mind is a separate entity from the body is known as **dualism** (see also Chapter 2). According to dualism, the mind is our subjective experience (conscious awareness) and is non-physical or non-material. The mind is not composed of matter and cannot be physically measured in the same manner as the body (including the brain). The mind is therefore metaphysical and tied up with moral values, conscience and cultural experience, whereas the body is the physical aspect of the individual that can be observed and measured.

Dualism raises some fundamental questions:

- How can something non-physical (the mind) be related to something with physical characteristics (body/brain)?
- How can something non-physical (the mind) influence or produce changes in something that is physical (body/brain)?

René Descartes (1595–1650) was one of the first thinkers to offer a systematic description of the relationship between the mind and brain. You may have heard of Descartes's famous philosophical conclusion: 'Cogito ergo sum' (I think therefore I am.)

Descartes attempted to explain the mind-versus-body problem. He viewed the mind and body as two quite distinct systems – dualism. The mind is non-physical and responsible for our self-awareness, our ability to reflect, think and reason about ourselves

and the world; in essence, our consciousness. An interaction exists between the mind and the body. The mind creates our real experience of the world and interacts with our body. In order to study the mind, one's thoughts and feelings ('I think') must be observed because they make us exist in our world ('therefore I am').

Descartes was deeply religious and never questioned our actual existence in this world. He believed that it is our non-material mind (or soul) that constructs our reality and causes us to 'exist' – not our physical body. He believed that the body was controlled by the soul, something that only exists in humans. Indeed, the French word for 'soul' *(ame)* is the same word for 'mind'. Hence, when a person dies, the physical body dies, but the 'soul' continues to exist (McLeod, 2007).



FIGURE 5 René Descartes viewed the mind and body as two distinct systems.

Descartes was also a pioneering mathematician. He created the system of Cartesian coordinates, which ultimately led to the development of the statistical scientific methods that are used today in experiments to examine how one event can influence another; in other words, how one variable (cause – independent variable) can influence another variable (effect – dependent variable).

CHECK YOUR LEARNING 3.1

Describe and explain

1 **Explain** the significance of the mind-versus-body debate.
2 **Describe** the mind-versus-body debate with reference to René Descartes.

Apply, analyse and interpret

3 **Explain** the process of trephination.
4 **Summarise** the beliefs of Claudius Galen and Franz Joseph Gall.
5 **Consider** Descartes's views on the mind-versus-body problem.

Investigate, evaluate and communicate

6 **Investigate** early treatments, including trephination. Imagine that you were living 500 years ago. **Discuss** other explanations for the time other.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 3.1
- » Challenge
  Worksheet: 3.1 Importance of the brain
- » Increase your knowledge
  The brain-versus-heart debate
- » Weblink
  The role of the brain

3.2 The influence of different approaches over time

KEY IDEAS

In this section, you will learn about:

- early brain investigative techniques
- early brain experiments.

Consider the mind-versus-body problem. Regardless of whether the mind is viewed as a separate entity from the body (dualism) or whether it is part of the one system (monism), understanding the connection between brain structure and function remained a challenge up until the nineteenth century. Indeed, there were some very interesting and unusual approaches based on rather dubious notions about brain structure and function that gained support, despite the lack of scientific proof.

In this section we will learn about early brain investigative techniques based on the principles of phrenology and use of the psychograph. We will also investigate some early brain experiments.

Early brain investigative techniques

Phrenology

Originally known as 'cranioscopy', phrenology was first developed in 1796 by Franz Joseph Gall (1758–1828). It was considered a legitimate science by many during the nineteenth century, despite the lack of empirical evidence (controlled experiments). Gall believed that mental abilities and personality were controlled by 27 specific brain organs, which were supposedly located on the surface of the brain. The size of each brain organ was determined by how much it was used. Phrenologists strongly believed in the concept of 'use it or lose it': areas of the brain that were used became larger, and areas that were not used shrank. The shape and size of the skull were also thought to change in order to accommodate the internal brain organ changes. By carefully examining the lumps, bumps and indentations of the skull, the phrenologist claimed to be able to determine a person's character, intelligence and a range of other areas responsible for a variety of behaviours and functions. In 1800, Gall acquired a research assistant by the name of Johann Christoph Spurzheim (1776–1832) who was instrumental in changing the name to phrenology and adding a further 10 faculties to Gall's original 27, making a total of 37.

Psychograph

psychograph an electric-powered device that, using the principles of phrenology, measures a person's head to provide an assessment of a person's personality

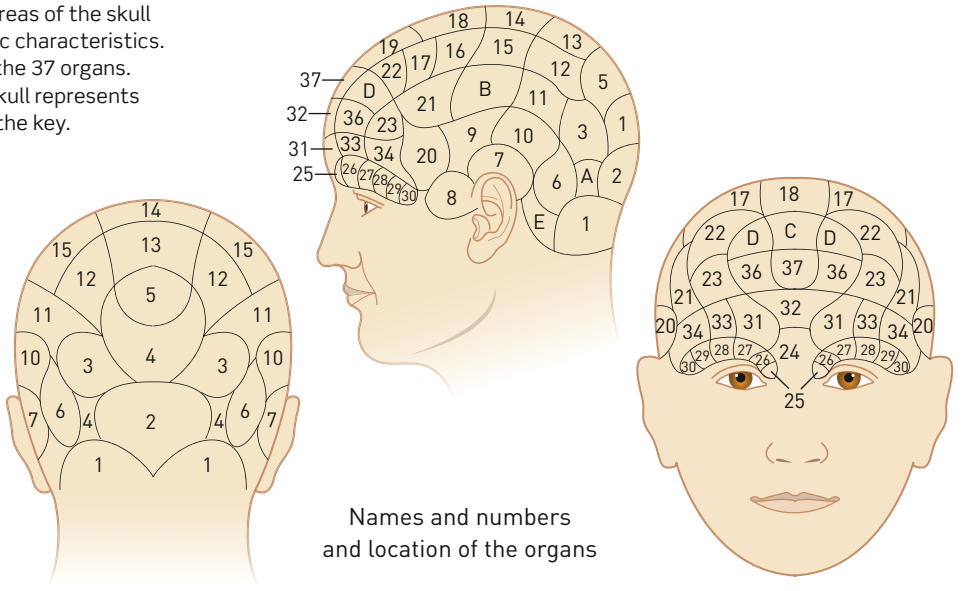
Based on the principles of phrenology, in 1931, Lavery and White invented the **psychograph**; an electric-powered device that automatically measured the lumps and bumps on a person's head. It had 32 probes and provided a personalised printout of one's personality. Those who underwent the test and received their report claimed that it was 'amazingly accurate'.

Were the results really accurate, or did people just like what was said about them in the report? Could these people be objective? These questions point to the problem with many other pseudosciences (beliefs and practices incompatible with the scientific method).

Faculty	Character	Associated behaviours
Adhesiveness	Love of friends – disposition to associate	• Excess: excessive desire for company • Deficiency: neglect of friends and society; the hermit disposition
Inhabitiveness	Love of home – desire to live permanently in one place; adapted to the necessity of a home	• Excess: prejudice against other countries • Deficiency: a nomadic/roving disposition
Continuity	Ability to focus and complete a task/story	• Excess: excessive focus on a task/story until completion • Deficiency: excessive fondness for variety; cannot finish one task before moving on to another; impatient
Vitativeness	Love of life – youthful vigour even in advanced age	• Excess: extreme tenacity to life; fear of death • Deficiency: lack of interest in a long life, letting go despite good health and reason to live
Alimenitiveness	Good appetite – pleasure in food and drink	• Excess: gluttony; lack of self-control with food/drink • Deficiency: poor appetite and enjoyment of food/drink
Acquisitiveness	Ability to save and accumulate savings/property	• Excess: miserly; greedy; theft; extreme selfishness • Deficiency: spend-thrift, wasteful, inability to save
Calculation	Ability to calculate by mental arithmetic – to add, subtract, divide, multiply, etc.	• Excess: propensity to count everything • Deficiency: inability to add, subtract, divide or multiply any figures; complete lack of aptitude in this area
Causality	Ability to use reason – ability to understand cause and effect, originality	• Excess: Excessive focus on theory with inability to see the practical result; a philosophical mind that is neither practical nor scientific • Deficiency: inability to comprehend dependencies between cause and effect and to act accordingly

TABLE 1 Some of the faculties associated with phrenology

If a personality description is worded in a positive and general manner, a person is more likely to believe it. After all, you would prefer to be described as 'kind' rather than 'nasty'. This phenomenon is often referred to as the Barnum Effect (or Forer Effect) which was named after an American showman and businessman called Phineas T. Barnum (1810–91) who made a fortune promoting hoaxes and human 'curiosities' such as the Bearded Lady and Tom Thumb (Forer, 1949).



Names and numbers and location of the organs

1. Amativeness
A. Conjugal love
2. Parental love
3. Friendship
4. Inhabitiveness
5. Continuity
E. Vitativeness
6. Combativeness
7. Destructiveness
8. Alimentiveness
9. Acquisitiveness
10. Secretiveness
11. Cautiousness
12. Approbativeness
13. Self-esteem
14. Firmness
15. Conscientiousness
16. Hope
17. Spirituality
18. Veneration
19. Benevolence
20. Constructiveness
21. Ideality
B. Sublimity
22. Imitation
23. Mirth
24. Individuality
25. Form
26. Size
27. Weight
28. Colour
29. Order
30. Calculation
31. Locality
32. Eventuality
33. Time
34. Tune
35. Language
36. Causality
37. Comparison
C. Human nature
D. Suavity

FIGURE 1 In phrenology, certain areas of the skull are thought to be linked to specific characteristics. This image shows the location of the 37 organs. Each numbered segment on the skull represents the corresponding organ listed in the key.

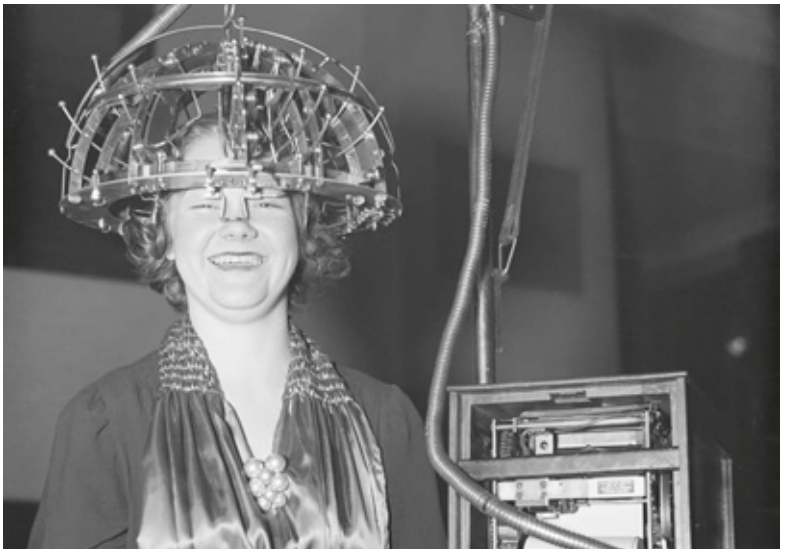


FIGURE 2 The automatic electric psychograph was a device that measured the size and shape of the skull in order to provide a printout of the person's personality.

Despite the doubt about the claims for phrenology's status as a pseudoscience, phrenology furthered the idea that the human brain is responsible for personality, emotions, perception and intelligence, and that different areas of the brain are responsible for different functions. Interestingly, more recent research has also found that areas of the brain that are not used do indeed deteriorate. However, we now know that the shape and size of the skull remains the same, no matter what changes take place in the brain. Even though phrenology maintained its popularity up until the early 1930s, the thirst to understand the brain continued through more scientific means.

Pierre Flourens

Pierre Flourens (1794–1867) was a French physiologist. Flourens was the founder of experimental brain science and also had an interest in anaesthesia. Flourens would localise areas of the brain in living animals, mostly rabbits and pigeons, and would observe the effects on their behaviour and cognition. He intended to determine if brain localisation (as suggested by Franz Joseph Gall) existed (Yildirim & Sarikcioglu, 2007).

From these experiments, Flourens provided evidence that the main areas of the brain were responsible for different functions. He found that by removing the cerebral hemispheres, all perceptions, motor controls and judgment also appeared to be removed (Yildirim & Sarikcioglu, 2007). His studies also showed that removing the cerebellum caused a loss in balance and motor coordination.

Because of these results, Flourens was able to conclude that the cerebral cortex was responsible for higher order thinking and that the cerebellum was implicated in regulating movement.

Early brain experiments

Our knowledge of brain structure and its functions comes from several sources:

- **case studies:** in-depth study of some behaviour/event through observation, diagnostic tests, interviews and analysis of medical records
- **autopsies:** surgically opening up the body of a deceased person to examine the location of damage/illness/cause of death
- **operations:** surgical procedures on patients with damaged brains.

The relationship between the brain and behaviour became increasingly obvious when doctors began observing patients with severe head injuries as case studies. Dramatic changes in personality, difficulty with memory tasks and problems with language comprehension or the production of grammatically correct speech led to the development of hypotheses (predictions) about which areas of the brain were damaged.

Cases such as that of Phineas Gage (see Chapter 5), who survived after a metal rod was accidentally thrust through his skull in 1848, gave scientists the opportunity to explore brain function by assessing the impact of damage on living examples. However, it was only possible to confirm the area of damage after the person died, during an autopsy or through surgery. Much of our early understanding of the brain was obtained through case studies, autopsies, operations and, later, lesioning, which is surgically damaging specific areas of the brain in animals such as monkeys, cats, dogs and rats.

Autopsies

Autopsies are not only carried out today to determine the cause of death, as often portrayed in *CSI* and other forensic television dramas. This method has been used for centuries to either determine the cause of death or confirm a hypothesis.

For example, Pierre Paul Broca conducted an autopsy of his patient to determine the location of damage in the brain. He found that this particular patient had a deep hollow on the left **frontal lobe**, close to the lower part of the primary motor cortex. When Broca saw a second patient with similar symptoms, he hypothesised that this patient would also have damage to what became known as **Broca's area**. Of course, Broca was only able to confirm his hypothesis after the patient died and he was able to conduct an autopsy.

frontal lobe
the largest lobe of the brain; has several functions, including initiating movement of the body, language, planning, judgment, problem-solving, aspects of personality and emotions

Broca's area
the speech production centre of the brain

Hemispheric specialisation

corpus callostomy
a surgical procedure that severs the corpus callosum

corpus callosum
the thick band of about 200 million nerve fibres connecting the right and left hemispheres

nerve
bundle of axons running together in the peripheral nervous system

An important source of knowledge about brain lateralisation has been gained through split-brain patients who have undergone a surgical procedure (**corpus callostomy**) that severs their **corpus callosum**, a thick band of **nerve** fibres that connect the two hemispheres of the brain and allow the hemispheres to communicate with each other. With epileptic patients, the corpus callosum allows the seizures that originate in one hemisphere to travel across to the other hemisphere. This technique is still used to manage severe epilepsy that does not respond to other methods.

After initially trialling the corpus callosotomy – split-brain surgery – on monkeys, Sperry and Gazzaniga (1966) began using the procedure on their epileptic patients, with great success. All the patients showed a significant reduction in the number of epileptic seizures, which enabled the patients to lead relatively normal lives with little evidence of impairment.

The unique function of each hemisphere was revealed when patients, under laboratory conditions, had images flashed to either their right or left visual fields while they looked at a dot in the middle of a screen. The severing of the corpus callosum allowed Sperry and Gazzaniga to discover that the left hemisphere of the brain is dominant for verbal tasks while the right hemisphere is dominant for non-verbal tasks.

Further research into hemispheric specialisation was also later conducted on people with normal brains using sophisticated neuroimaging equipment that will be discussed later in this chapter.

CHECK YOUR LEARNING 3.2

Describe and explain

1 In your own words, **explain** phrenology.
2 **Describe** what brain organs were believed to be, and explain where they were supposed to be located.
3 How many brain organs were thought to exist? **Identify** three.

Apply, analyse and interpret

4 As a phrenologist, **consider** what you would look for first.

Investigate, evaluate and communicate

5 **Discuss** the contributions of early brain experiments by Franz Joseph Gall and Pierre Flourens.

Check your obook assess for these additional resources and more:

» Student book questions
Check your learning 3.2

» Weblink
Hemispheric specialisation

» Weblink
Phrenology

» Weblink
Pierre Flourens

3.3 Brain research and neuroimaging techniques

KEY IDEAS

In this section, you will learn about:

- electrical brain stimulation and measurement
- neuroimaging techniques.

Direct electrical stimulation of cortical areas and the advent of more sophisticated neuroimaging devices have allowed researchers to build their understanding of normal as well as damaged brains. In most instances, this can be done without using invasive procedures. Some devices have been applied directly to actual brain tissue, while others produce highly detailed images of the structures in the brain.

Electrical brain stimulation and measurement

Electrical stimulation of the brain (ESB)

Originally, in order to examine which brain structures were damaged, doctors and researchers needed to wait until the patient died. This changed with Wilder Graves Penfield (1891–1976), an American-Canadian neurosurgeon who is best known for his work on mapping the brain. Penfield covered new territory in exploring the nervous system, believing that it was the key to explaining the mystery of the mind (Kumar & Vikram, 2011).

Penfield had a great interest in epilepsy, and dedicated much of his research to finding a cure. Penfield used a different approach to studying the brain, creating a map of the brain and documenting the functions of the body controlled by different brain segments (Kumar & Vikram, 2011). He used an **electrical stimulation of the brain (ESB)** device that sent a mild electrical impulse through a probe to map the functions of various regions of the brain.

electrical stimulation of the brain (ESB) a technique that sends mild electrical impulses through a probe to map the brain

Penfield's new method of treating patients with severe epilepsy was known as the 'Montreal procedure'. This involved opening up the patient's skull (while only using a local anaesthetic), and destroying (lesioning) the neurons in the brain where the seizures originated. As no two brains are identical, Penfield would systematically map the brain using the ESB device while they were awake on the operating table to make sure that he did not accidentally damage unaffected areas. During surgery and after requesting the permission of his wakeful patients, he proceeded to probe the exposed brain and ask his patients what they felt. He would carefully number each section until he eventually mapped the primary somatosensory and primary motor cortices of the brain.

Penfield discovered that the right somatosensory cortex controlled sensation on the left side of the body and the left somatosensory cortex controlled the right side of the body. Penfield's work contributed significantly to our understanding of brain structure and function of those areas and the **contra-lateral** nature of the human brain. Penfield's research also led to the mapping of the cortical homunculus, a distorted representation of the areas of the brain and the body parts that they control. The homunculus maps the areas of the human brain dedicated to motor or sensory functions for different areas of the body. Penfield and his team were the first to identify that there is a difference between sensory and motor function, and to map these separately.

contra-lateral the physiological nature of how one side of the brain controls the opposite side of the body

CHALLENGE 3.3

Awake during surgery

Penfield was able to operate on the brain using only local anaesthetic because there are no pain receptors in the brain – even today, surgery on the brain is carried out using only a local anaesthetic on the skull.

Consider and compare the advantages and disadvantages of having a patient awake during brain surgery.

Electroencephalograph (EEG)

Brain research techniques showing the brain at work have been around since the 1920s when Hans Berger (1873–1941) first measured electrical impulses from the human head (Giles, 2005). He used two sheets of tin foil (which served as electrodes), placed them around his son's scalp and recorded a pattern of electrical activity from the boy's brain. He was the first to measure the brain in action and in 'real time' – as it occurs. This device became known as the **electroencephalograph (EEG)**. During the 1950s, the tin foil was replaced with small electrodes and hospitals began using the EEG to detect abnormalities in brain function caused by head injuries, epilepsy and a range of other conditions. Today, the EEG detects, amplifies and records the electrical activity of the brain and portrays this as brain waves, displayed on a computer. This device has also played an important role in the study of consciousness and sleep.

electroencephalograph (EEG) a device that detects, amplifies and records electrical activity in the brain in the form of brainwaves

Although it provides useful information about the electrical activity of the brain, the EEG is unable to show the specific location of that activity.

Researchers are now also able to monitor mental processes in real time with the use of 'functional' neuroimaging devices such as **functional magnetic resonance imaging (fMRI)**. Mapping of the human brain has gone beyond mapping the physical structures. We are now able to compile a comprehensive brain profile that helps us to determine which areas of the brain are active during mental processes such as thinking, calculating, watching a video or completing a Sudoku puzzle.

functional magnetic resonance imaging (fMRI) special imaging technology used to see which parts of the brain are active

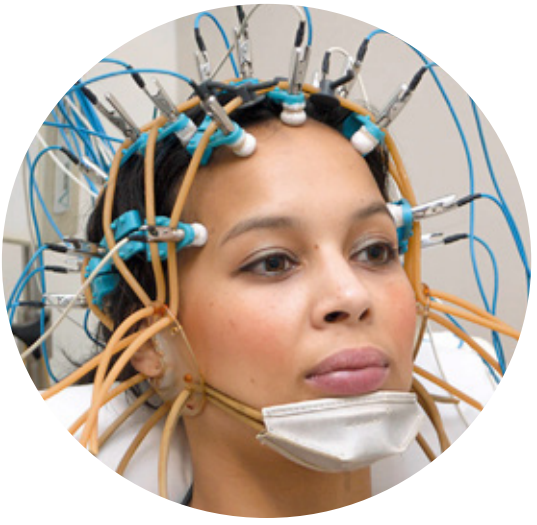


FIGURE 1 By attaching electrodes to a patient's head, an EEG records electrical activity from different parts of the brain as it reacts to external visual or auditory stimuli.

Neuroimaging techniques

Neuroimaging

Brain neuroimaging was first invented by Italian physiologist Angelo Mosso (1846–1910) in the late 1800s. He began recording the 'pulsations' (of blood) of the human cerebral cortex following surgical procedures. He noticed that these pulsations changed during cognitive tasks and concluded that blood flow to the brain increases during mental processing. He developed a technique known as 'human circulation balance' that enabled the researcher to determine how blood travelled through the brain as a person experienced a range of emotions or while undertaking cognitive tasks. To some extent, this procedure was the precursor to today's PET and fMRI scans.

By the early 1900s, a brain-imaging technique known as the 'pneumoencephalograph' gained notice. Pneumoencephalography involved draining the patient of cerebral spinal fluid (the fluid

SUGGESTED RESEARCH
3.3 PET (in Raine, Buchsbaum & LaCasse, 1997)
Go to page 456 »

found in the brain and **spinal cord**) and replacing it with oxygen. This allowed researchers to obtain a clearer image of the brain using X-rays. However, it was a painful and risky procedure that patients did not tolerate well.

spinal cord the bundle of nerve fibres connecting the brain with the peripheral nervous system

Since then, the CT (computed tomography) scan was developed in 1972, followed by the MRI in 1977, while the fMRI made its appearance around 1990. Subsequently, sharper, clearer images of the brain and nervous system, as well as the ability to monitor and track mental processes in real time, have emerged, enabling researchers to obtain a better understanding of which brain structures are activated during mental and motor activities.

We will now examine several neuroimaging devices that are used not only by doctors and neurosurgeons, but also cognitive, biological, behavioural, social and neuropsychologist researchers studying the brain and nervous system.

Positron emission tomography (PET)

Position emission tomography (PET) is a technique based on the understanding that there is increased blood flow and glucose consumption when particular areas of the brain are activated during cognitive processing. PET measures the volume and location of blood flow in the brain by tracking a radioactive substance such as glucose that has been injected into a person's bloodstream. The radioactive substance, or tracer, gives off positrons (minute particles with a positive charge) and a radiation detector camera surrounding the person's head is able to monitor the areas of the brain from which these 'positrons' are emitted. PET scans are a valuable tool in monitoring functional and, to a lesser extent, structural changes in patients with degenerative conditions such as Alzheimer's disease and schizophrenia.

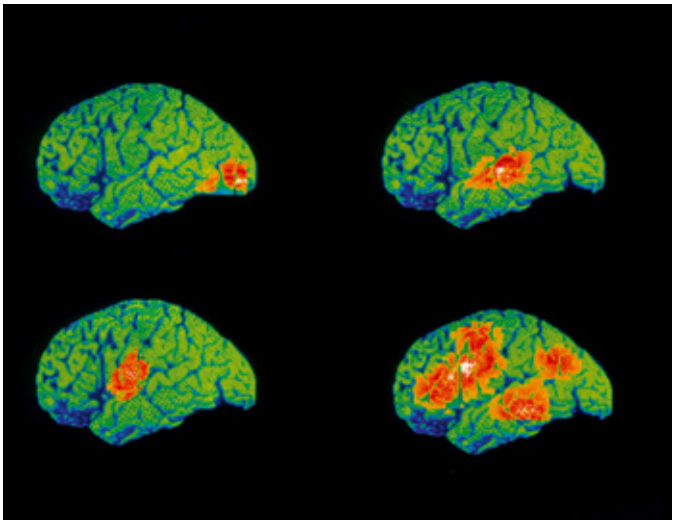


FIGURE 2 This coloured positron emission tomography (PET) scan shows the areas of the brain involved in processing vision, sound and speech. Active areas on the left side of the brain are in red and yellow.

Advantages of the PET technique**:**

- PET provides information about the function and corresponding location of particular areas of the brain during motor and cognitive tasks.
- It allows researchers to see the brain in action when a person is under the influence of drugs.
- It provides valuable comparisons of a patient's mental functioning as their disease progresses, such as the deterioration seen in sufferers of Alzheimer's or Parkinson's disease.

Limitations of the PET technique:

- It can be expensive to run.
- It uses radioactive material to show areas of activation; this has a short time limit.

positron emission tomography (PET) a technique that measures the volume and location of blood flow in the brain by tracking a radioactive substance (e.g. glucose) that has been injected into the person's bloodstream

Magnetic resonance imaging (MRI)

Magnetic resonance imaging (MRI) uses harmless magnetic fields and radio waves to produce a computer-enhanced image of the structure of the brain. The person lies in a chamber that houses a large magnet. The magnet creates a strong magnetic field that organises the protons of hydrogen atoms into parallel lines. The aligned protons produce a

magnetic resonance imaging (MRI) a neuroimaging procedure that uses harmless magnetic fields and radio waves to produce a computer-enhanced image of brain structure

faint signal that is processed by a computer that enhances them to a highly detailed 3D image that can be manipulated to view different angles and areas of the brain. The MRI shows structures 1 millimetre apart.

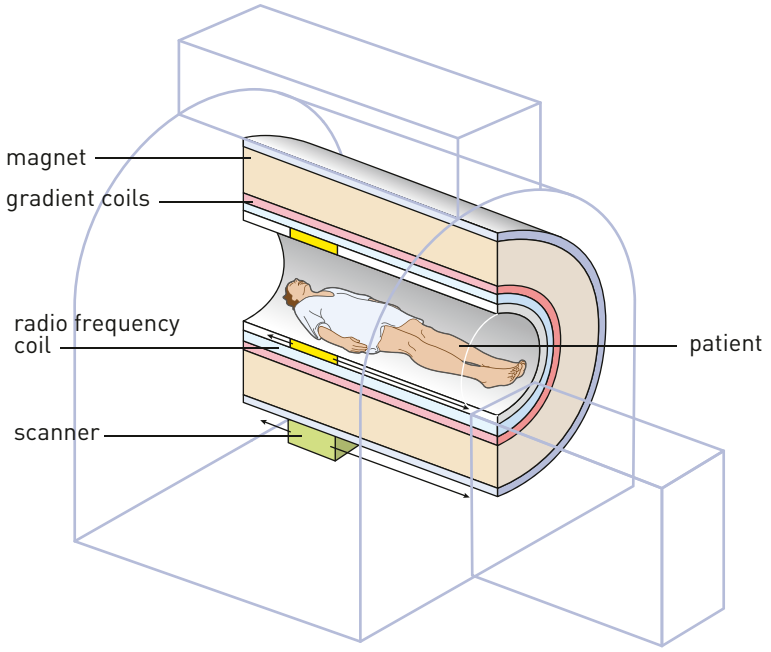


FIGURE 3 Diagram of an MRI scanner

Advantages of the MRI technique:

- It produces detailed 3D computer-enhanced colour images that can be manipulated by the researcher.
- It uses harmless magnetic fields and radio waves.

Limitations of the MRI technique:

- MRI is expensive.
- It cannot be used on people with internal metal devices such as pacemakers, steel pins and metal joint replacements, as the metal interferes with the magnetic image and can pose a physical risk to the person.
- It does not provide information about cognitive or motor activity (function) – only highly detailed images of the brain and body.
- Some people find the MRI chamber claustrophobic and require sedation during the procedure.

Functional magnetic resonance imaging (fMRI)

Functional magnetic resonance imaging (fMRI) works on the same basis as the traditional MRI with the distinction that it also monitors blood flow and oxygen consumption to reveal areas of greater brain activity and, hence, function. As the person is performing a mental task, the functional aspect of this technology produces an image every second to show the location(s) and level of brain activation as it happens in 'real time'. This allows the researcher to accurately monitor which brain regions become active as this occurs. fMRI provides a powerful combination of highly detailed structural images showing which brain structures are activated during cognitive tasks (functional) in real time.

Advantages of the fMRI technique:

- fMRI produces high-resolution computer-enhanced 3D images of the brain and body to 1 mm accuracy.
- It enables researchers to view the blood flow and oxygen consumption of a specific area of the brain.
- It provides detailed information about the physical structure and shows the brain in action (function).

Limitations of the fMRI technique:

- It is very loud, requiring people to wear earplugs/headphones.
- The chamber can be claustrophobic.
- It is unable to detect which brain receptors are being activated by particular neurotransmitters, drugs and treatment chemicals.
- Precision of activation is questionable as it does not show the sequence of activation – just the areas involved.

SUGGESTED RESEARCH
3.3 MRI (in Maguire, Woollett & Spiers, 2006)
Go to page 456 »

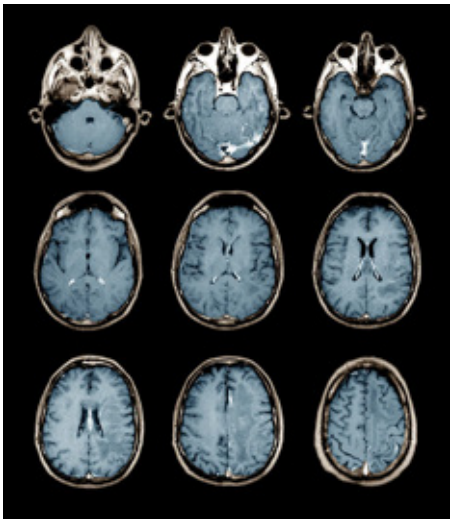


FIGURE 4 The MRI provides a highly detailed 3D image of the brain that can be examined in cross-sections. It shows the structure of the brain and is powerful in enabling the detection of small tumours or changes in the brain.

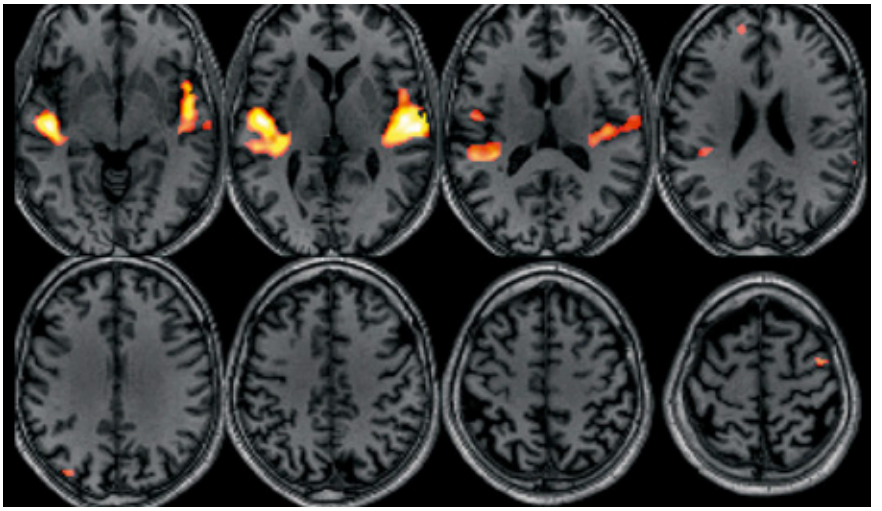


FIGURE 5 The fMRI images show the activity patterns of the brain while listening to music.

CHECK YOUR LEARNING 3.3

Describe and explain

1 **Identify** what the following acronyms stand for, and **explain** what they are:
   - **a** PET
   - **b** MRI
   - **c** fMRI
   - **d** EEG

2 **Identify** which of the neuroimaging devices track oxygenated blood to determine brain activity.

Apply, analyse and interpret

3 **Compare** an MRI scan and an fMRI scan.

4 If a scan created colour images that showed brain structure, **determine** what type of neuroimaging technique was used.

Investigate, evaluate and communicate

5 **Evaluate** how a researcher could use two of PET, MRI, fMRI or EEG (you may wish to conduct additional research to answer this question).

6 Wilder Penfield's work was critical in mapping the brain and discovering the somatosensory cortex. **Evaluate** how valuable this discovery was.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 3.3
- » Challenge
  Worksheet: 3.3
  Awake during surgery
- » Suggested research
  Worksheet: 3.3 PET (in Raine, Buchsbaum & LaCasse, 1997)
- » Suggested research
  Worksheet: 3.3 MRI (in Maguire, Woollett & Spiers, 2006)

SCIENCE AS A HUMAN ENDEAVOUR

3.4 Neuroimaging and understanding

KEY IDEA

In this section, you will learn about:

+ how neuroimaging techniques have improved neuropsychological knowledge
+ the connections between physiological processes and behaviour.

Every day, psychologists, researchers and medical professionals use neuroimaging. It is used to treat, diagnose and understand the brain's functionality. Understanding the connections between the brain's physiological processes and the behaviour, cognitions or emotions produced is vital in understanding how the brain functions. From the earliest considerations of the mind-versus-body problem, through to today, scientists have dedicated time to researching how the brain functions – and why it functions the way it does. The development of improved neuroimaging techniques has increased scientific and psychological understanding of brain functioning.

Computed tomography (CT)

computed tomography (CT) a device that produces a high-resolution, 3D computer-enhanced image of the brain

Computed tomography (CT) produces a high-resolution, 3D computer-enhanced image of the brain. The patient is injected with a substance known as 'contrast' iodine that highlights the brain's blood vessels and enables the interpretation of the CT image. While the patient is lying down in the CT device, a quick succession of X-ray images are taken in an arc around the head, which are then combined to produce the 3D representation of the brain on the computer screen. As CT scans generate detailed images of the brain and other parts of the body, doctors are able to detect tumours, broken bones and other structural abnormalities.

Advantages of CT scans:

- They are a relatively safe and cost-effective procedure.
- They provide clear 2D images of the structure of the brain/body.
- They enable researchers to view the structure of the brain in both 2D and 3D.
- They are useful in identifying precise location and extent of damage from tumours, stroke or other brain traumas.
- They are can identify areas of abnormality in brain structures among people suffering from psychological disorders such as depression, schizophrenia, Parkinson's disease and Alzheimer's disease.



FIGURE 1 CT scans provide detailed 2D images using X-ray images. The radiographer examines the image of the patient's brain on a screen in another room.

Limitations of CT scans:

- CT scans provide detailed high-resolution images of brain structure but do not provide information about brain activity during cognitive tasks (does not show the function of the brain).
- They use X-ray technology, which emits radiation, so frequent use is not recommended.
- Images are black and white.

Single photon emission computed tomography (SPECT)

Single photon emission computed tomography (SPECT) is an imaging technique that works on a similar basis to PET. It uses radioactive tracers and a scanner that detects gamma rays (radiation). The SPECT takes a succession of 2D images that are combined to form a true 3D computer-enhanced image that is easily manipulated on screen to see the section of the brain from different angles. SPECT tracers are measured directly as they move through the bloodstream. Although PET produces clearer images, SPECT is cheaper and more widely used.

single photon emission computed tomography (SPECT) an imaging technique that detects gamma rays (radiation) and uses a number of 2D images to create an accurate 3D image

Advantages of the SPECT technique:

- SPECT is cheaper to run than a PET scan.
- It provides a true 3D image of the brain that can be digitally manipulated on screen for examination.

Limitations of the SPECT technique:

- Scans take longer to complete.
- Images are not as detailed as PET scans.
- It uses a radioactive tracer that requires injection into the blood stream.

With the development of sophisticated neuroimaging devices, we are now able to build on our already extensive knowledge of the brain and nervous system. From our prehistoric beginnings, to the present day, we have the opportunity to explore the structure and function of our brain and nervous system in a variety of settings without needing to use damaged brains or wait for the person to die so that an autopsy can be conducted.

The use of techniques such as these makes researching the brain safer for individuals, and allows scientists to link the connections between physiological processes and behaviours.

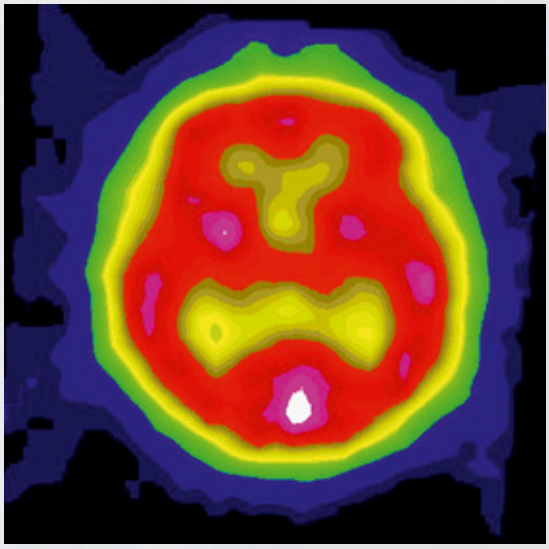


FIGURE2 A SPECT image of a healthy brain. SPECT provides valuable functional information about the brain.

CHECK YOUR LEARNING 3.4

Describe and explain

1 **Describe** what the acronyms CT and SPECT stand for, and **explain** what they are.

Apply, analyse and interpret

2 **Compare** the uses of CT and SPECT.

3 If a psychologist wanted to know which area of the brain was activated during speech, **consider** which brain technique would be the most appropriate.

Investigate, evaluate and communicate

4 **Investigate** the use of neuroimaging techniques in understanding disease.

5 Neuroimaging techniques allow psychologists and doctors to develop a clearer image of the brain, which allows them to develop understanding about areas of responsibility. **Assess** how important being able to understand brain regions is.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 3.4
- » Video
  Neuroimaging techniques
- » Weblink
  CT scan
- » Weblink
  SPECT imaging

CHAPTER 3

Review

Summary

3.1

- The anatomist Galen (130–210 CE) was one of the first to research the brain in detail and discovered that the brain played an important role in sensation after observing people who suffered strokes.
- The mind-versus-body problem relates to the question, 'Is the mind a separate entity from the brain and the body?' and is a debate that emerged with the ancient Greeks.
- According to the mind-versus-body debate, the body consists of physical entities (parts), including the brain, and these entities can be measured physically in terms of size, mass, shape and density. The body occupies space and exists in time. In contrast, the mind relates to our self-awareness, our ability to reflect, think and reason about ourselves and the world. In other words, it relates to consciousness – our awareness of ourselves and our environment.
- Monism is the view that the mind is the same thing as the brain while dualism is the view that the mind is a separate entity from the body.

3.2

- Phrenology was first developed in 1796 by Franz Joseph Gall and was based on the notion that mental abilities and personality were controlled by 27 specific brain organs, which were supposedly located on the surface of the brain. The size of each brain organ was determined by how much it was used. Gall's assistant, Johann Christoph Spurzheim, later added a further 10 faculties.

3.3

- Brain research methods over time have included case studies, lesioning, operations, autopsies and animal studies/experiments.
- Non-invasive brain research methods:
  - brain stimulation: electrical stimulation of the brain (ESB), deep brain stimulation (DBS) methods and electroencephalograph (EEG)
  - neuroimaging: computed tomography (CT); positron emission tomography (PET), single photon emission computed tomography (SPECT), magnetic resonance imaging (MRI) and functional magnetic resonance imaging (fMRI)

Key terms

- body
- computed tomography (CT)
- corpus callostomy
- corpus callosum
- dualism
- electrical stimulation of the brain (ESB)
- electroencephalograph (EEG)
- frontal lobe
- functional magnetic resonance imaging (fMRI)
- magnetic resonance imaging (MRI)
- materialistic monism
- mind-versus-body problem
- monism
- nerve
- neuron
- Parkinson's disease
- personality
- phrenology
- positron emission tomography (PET)
- psychograph
- single photon emission computed tomography (SPECT)
- spinal cord
- split-brain
- trephination

Revision questions

Multiple choice

1 Trephination is a procedure where a hole is made in the skull of a living person to relieve headaches, epilepsy and other physical and mental symptoms. When was this procedure practised?
   - **a** only prehistoric times
   - **b** prehistoric times and is still used today with more sophisticated surgical tools
   - **c** only ancient Greek times
   - **d** Middle Ages

2 Ancient Egyptian priests prepared the dead for the afterlife through sophisticated mummification processes. Which organ was *not* placed into a jar?
   - **a** liver
   - **b** lungs
   - **c** brain
   - **d** heart

3 Psychology uses a number of neuroimaging techniques. What does an fMRI show?
   - **a** X-rays with detailed information about the structure of the brain and body
   - **b** highly detailed 3D images of the brain's structure that can track the flow of oxygen when a person is asked to perform a mental task such as recalling a song title
   - **c** brightly coloured pictures of the brain at work after injecting radioactive glucose
   - **d** highly detailed 3D images of the brain's structure

4 What is the name given to the use of general statements that apply to most people?
   - **a** Barnum Effect
   - **b** Bartlet Effect
   - **c** phrenology effect
   - **d** none of these answers

5 According to a phrenologist, your brain is made up of _____ brain organs, and the size of these can influence your personality and character.
   - **a** 27
   - **b** 52
   - **c** 13
   - **d** 37

6 Wilder Graves Penfield contributed significantly to our understanding of the brain. He used a probe that delivered a weak electrical charge that he applied to different locations on the surface of the brains of his patients undergoing surgery. Which of the following structures did Penfield map?
   - **a** primary somatosensory and primary motor cortices
   - **b** auditory cortex
   - **c** primary somatosensory cortex and Broca's area
   - **d** primary motor cortex and the visual cortex

7 What does a CT scan use?
   - **a** X-ray technology
   - **b** tracer to track oxygenated blood flow through the brain
   - **c** magnets
   - **d** radio waves

8 What is one advantage of using an MRI?
   - **a** It's cheap to run.
   - **b** It produces highly detailed 3D images of the brain.
   - **c** It shows which areas of the brain are active during mental tasks.
   - **d** It's very quiet.

9 What does PET do?
   - **a** It tracks radioactive glucose that is injected into the patient to show which areas of the brain are active during mental processes.
   - **b** It uses X-ray technology to show the structures of the brain.
   - **c** It tracks oxygenated blood in the brain during thinking tasks and produces a detailed computer-generated image.
   - **d** It uses infrared technology to detect the concentration of oxygenated blood during mental tasks.

10 Which of the following neuroimaging devices is the most effective in detecting and tracking activity in the brain in action in real time?
   - **a** PET
   - **b** MRI
   - **c** SPECT
   - **d** MEG

11 Dinesh fell off a ladder while trying to paint the outside of his house. Which of the following neuroimaging devices would a doctor recommend to provide the clearest images of the brain?

- **a** SPECT
- **b** EEG
- **c** MRI
- **d** fNIRS

12 Researchers use a number of neuroimaging devices to assist in exploring the brain and nervous system, with great success. Which of the following is the most portable and allows the patient to move their head around during the recording process?

- **a** MRI
- **b** MEG
- **c** fNIRS
- **d** PET

13 A corpus callostomy is when:

- **a** a patient has their corpus callosum severed to separate the two hemispheres
- **b** a patient has their corpus callosum reconnected after brain damage
- **c** a doctor learns about the functions of each hemisphere by connecting different areas
- **d** nerves are severed in the brain.

Short answer

Describe and explain

★★ **14** Over the centuries, different cultures held different beliefs about the role of the brain. **Create** a timeline that reflects the changes in beliefs regarding the brain and nervous system.

★★★ **15** **Explain** how case studies, autopsies and surgical procedures have contributed to our understanding of features of the brain.



★ **16** **Explain** what phrenology is.

★★ **17** **Describe** the following devices, and **explain** how they are used:

- **a** PET
- **b** MRI
- **c** fMRI
- **d** EEG

★★ **18** **Identify** one advantage and one limitation of each of the following:

- **a** PET
- **b** MRI
- **c** fMRI
- **d** EEG

★ **19** **Summarise** the mind-versus body debate.

Apply, analyse and interpret

★★ **20** **Compare** monism and dualism.

★★ **21** Phrenology was based on interpreting the lumps and bumps on the skull. **Identify** two problems with doing this.

★★★ **22** Using examples, **differentiate** between neuroimaging techniques and electrical brain stimulation.

★★ **23** Complete the following table and **compare** neuroimaging techniques:

	Description	Applications	Advantages	Limitations
PET				
MRI				
fMRI				
EEG				

Investigate, evaluate and communicate

★★★ **24** If researchers wish to identify which areas of the brain are active while a person is completing a puzzle, which two neuroimaging devices would you recommend they use? **Justify** your reasoning.

★★ **25** **Describe** and **evaluate** the investigations that Pierre Flourens conducted.

★★★ **26** Ethics are now a major part of modern psychology and psychological experiments. **Assess** early brain investigations and experiments, in your assessment **consider** the knowledge that has been developed from these investigations.

★★ **27** **Evaluate** this statement: 'fMRI scans provide superior knowledge compared with EEG recordings'.

★★ **28** **Describe** Wilder Graves Penfield's research and **evaluate** the contribution to modern brain techniques.

★★★ **29** Different situations can require different brain investigation methods. **Comment** on why it is important for both research and health to have different methods. In your response you could **consider** ethics, health issues and different conditions.

★ **30** **Discuss** the advantages and limitations of using an MRI.

★★ **31** A researcher wants to gain information about the activity of the brain during different activities and states of consciousness. **Justify** why using a combination of neuroimaging and electrical brain stimulation/measurement techniques would be beneficial.

★★★ **32** **Create** a methodology to monitor someone's brain activity while they are studying.

Check your obook assess for these additional resources and more:

» Student book questions
Chapter 3 Review

» Revision notes
Chapter 3 Revision

» assess quiz
Test your understanding with an auto-correcting multiple-choice quiz

» Flashcard glossary
Key terms in Chapter 3

CHAPTER 4

The nervous system

Think about how your body works. Right now you are reading this page, but you are not telling your eyes to read the text; more importantly, you are not consciously reminding your heart to keep beating or your lungs to keep breathing. These are automatic processes that your body completes without conscious thought or instruction. But how does this happen? Your body needs to coordinate communication between all of its organs, systems and muscles, and this is where your central and peripheral nervous systems are involved.

When studying the roles of the central and peripheral nervous systems as communication structures between the internal and external worlds, it is easy to consider them separate entities with individual responsibilities. However, this is not how the human nervous system operates in reality. The peripheral nerves connect all of the parts of the body with the central nervous system.

OBJECTIVES

→ Recognise the basic structure and function of the human nervous system, including the central (i.e. brain and spinal cord) and peripheral (i.e. somatic and autonomic) nervous systems

→ Construct a diagram of a neuron, including the axon, dendrites, the cell body and synapses

→ Distinguish between sensory, motor and interneurons

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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FIGURE 1 Digital rendering showing the brain and spinal cord (components of the central nervous system)



4.1 The nervous system

KEY IDEAS

In this section, you will learn about:

- the basic structure of the human nervous system
- the central and peripheral nervous systems
- the somatic and autonomic nervous systems.

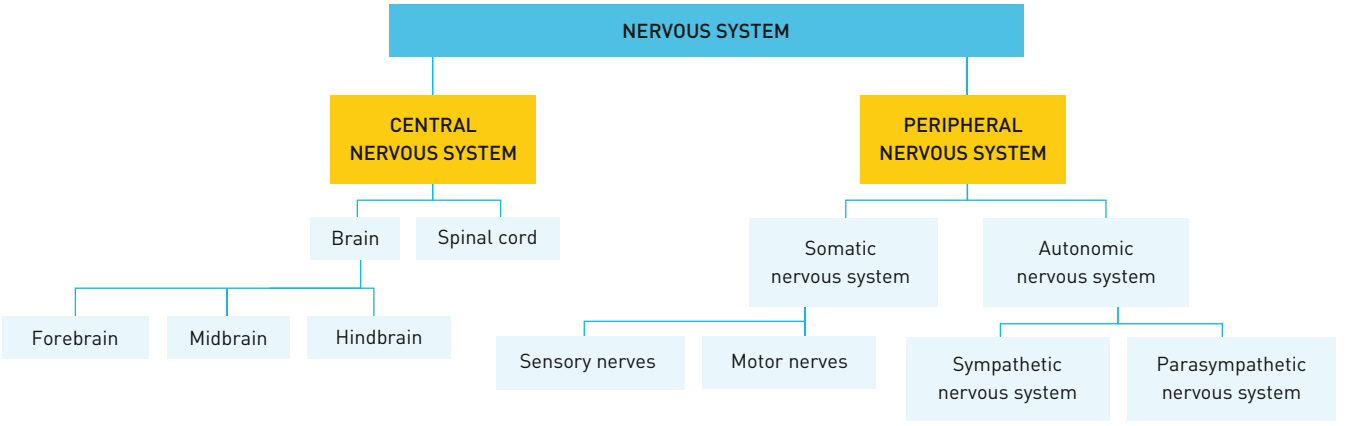


FIGURE 1 The human nervous system

central nervous system (CNS) composed of the brain and the spinal cord and controls the body by processing and responding to sensory input from the peripheral nervous system

peripheral nervous system (PNS) composed of all the nerves and ganglia outside the brain and spinal cord that communicate information to and from the central nervous system

somatic nervous system transmits sensory information to the CNS and carries motor commands from the CNS to the skeletal muscles

The human brain does not act in isolation. It needs to receive information from the body's sense organs – the eyes, ears, skin, nose and tongue – which are constantly receiving information from the environment. The brain is also connected with the muscles and glands in the body so that an organism is able to respond to and act on its current environment.

The two major divisions of the nervous system are the **central nervous system (CNS)** and the **peripheral nervous system (PNS)**. The CNS comprises the brain and spinal cord. It controls the body by processing and responding to sensory input from the peripheral nervous system. The PNS is made up of the nerves and ganglia outside the brain and spinal cord that communicate information to and from the central nervous system. The peripheral nervous system also has two subdivisions: the **somatic nervous system** and the **autonomic nervous system**. The somatic nervous system transmits sensory information into the central nervous system and carries motor commands from the CNS to the skeletal muscles. The autonomic nervous system is responsible for communications between the body's non-skeletal (visceral) muscles and the internal organs and glands that regulate bodily functions, such as heart rate, digestion, respiratory rate, pupillary response, urination and sexual arousal. It operates without voluntary control or conscious awareness and consists of two branches known as the **sympathetic nervous system** and **parasympathetic nervous system**. The sympathetic branch of the autonomic nervous system serves an important adaptive function by helping prepare the body for intense physical activity, often referred to as the 'fight-flight-freeze response'. The parasympathetic branch of the autonomic nervous system serves to relax the body and inhibit, or slow, many high-energy functions, such as heart rate, breathing and some glandular functions. Figure 2 illustrates the nervous system and its divisions.

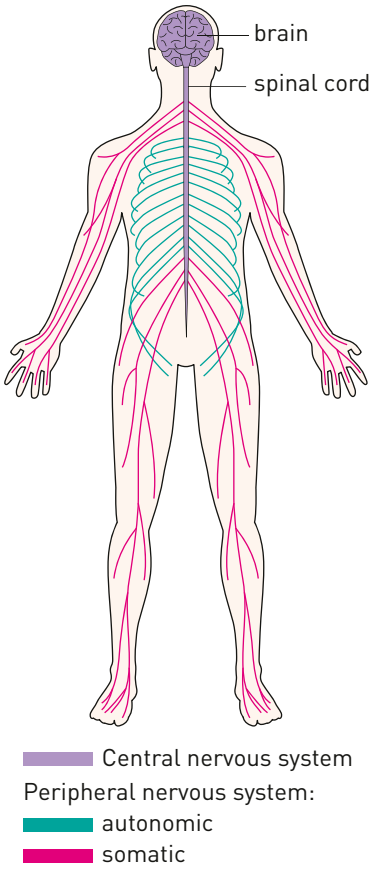


FIGURE 2 The human nervous system includes the central nervous system (brain and spinal cord) and the peripheral nervous system (somatic and autonomic nervous systems).

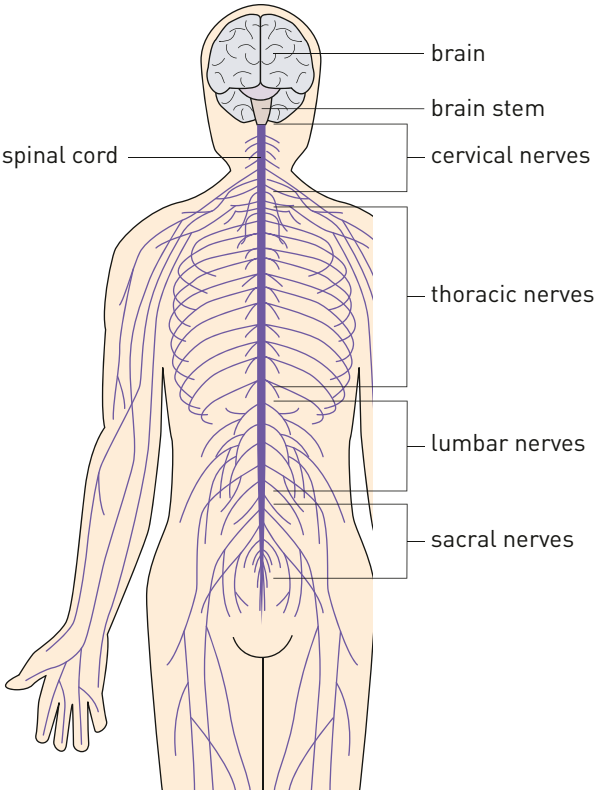


FIGURE 3 The upper section of the spinal cord is responsible for communication between the brain and upper parts of the body, while the lower section is responsible for communication between the lower parts of the body and the brain.

autonomic nervous system
responsible for communications between the body's non-skeletal muscles and the internal organs and glands that carry out bodily functions

sympathetic nervous system
branch of the autonomic nervous system that activates the fight-flight-freeze response

parasympathetic nervous system
branch of the autonomic nervous system that is responsible for maintaining day-to-day functioning of the body, such as digestion, heart rate, breathing and some glandular functions

Central nervous system

The CNS comprises the brain and the spinal cord. The spinal cord runs from the base of the brain (the **brain stem** connects the brain to the spinal cord) inside the bones of the spine (vertebrae) to the lower middle section of the spine. It enables the brain to communicate with the rest of the body by conveying messages from the brain to the PNS, and from the PNS to the brain (see Figure 3). The spinal cord is segmented, with the upper section responsible for communication between the brain and the upper parts of the body, and the lower section responsible for the lower parts of the body, such as the legs, toes and feet (see Figure 2).

brain stem
part of the brain that connects the brain to the spinal cord

Peripheral nervous system

The peripheral nervous system has two functions:

- to communicate information from the body's organs, glands and muscles to the CNS, from both the outside world (such as environmental temperature and sensation on the skin, via sensory neurons) and the inside world (such as aches and pains)
- to communicate information from the CNS to the body's organs, glands and muscles, via motor neurons.

The peripheral nervous system has two subdivisions: the somatic nervous system and the autonomic nervous system.

Somatic nervous system

The somatic nervous system is responsible for the voluntary movement of skeletal muscles (striated or 'striped' muscles). It is a network of nerves that communicates sensory information to the CNS and motor information from the CNS.

The somatic nervous system receives sensory information from sites around the body, including the skin and muscles. This sensory information is carried to the CNS by sensory neurons (sensory nerves). Motor information is carried from the CNS via motor neurons (motor nerves). Neurons are covered in more detail in Section 4.2.

CHALLENGE 4.1

Fight, flight or freeze?

The sympathetic nervous system serves an important adaptive function by helping prepare the body for the fight-flight-freeze response to emergencies. What are some of the likely sympathetic responses activated when you experience a threat or intense anxiety?

Autonomic nervous system

The autonomic nervous system of the PNS is mostly responsible for the communication of information between the CNS and the body's non-skeletal muscles (also known as 'smooth' or 'visceral' muscles), as well as the internal organs and glands that carry out the basic bodily functions necessary for survival, such as digestion and heartbeat. Because the autonomic nervous system operates without voluntary control or conscious awareness, it enables the organism to have the cognitive resources to pay **attention** to other matters, such as responding to threats or other survival needs in the external environment.

attention
narrowing the focus of awareness to a stimulus of interest

The autonomic nervous system controls the function of internal organs (viscera) through the following:

- adrenal medulla (adrenal gland)
- blood vessels (smooth muscle)
- eyes (the iris; smooth muscle)
- gall bladder
- gastrointestinal tract
- glands
- heart (cardiac muscle)
- liver
- muscles
- pancreas
- skin (around hair follicles; smooth muscle)
- stomach, intestines and bladder (smooth muscle)
- sweat glands

Even though the actions of the autonomic nervous system are usually involuntary, some, such as breathing and blinking, can be voluntarily instigated. For example, you are generally

unaware of each time you inhale and exhale, but you can deliberately hold your breath during a medical examination and breathe out on demand.

The sympathetic and parasympathetic branches of the autonomic nervous system

The autonomic nervous system is further divided into two branches: the sympathetic nervous system and the parasympathetic nervous system. These two systems work together in complementary ways but have different roles.

The sympathetic nervous system is like an emergency system that becomes active when an organism perceives itself to be in danger or is stressed. It readies the body in response to a threat by increasing heart rate, dilating pupils, stopping digestion and redirecting blood away from the stomach to the muscles to ensure extra oxygen is available for an urgent response (Burton, Westen, & Kowalski, 2015).

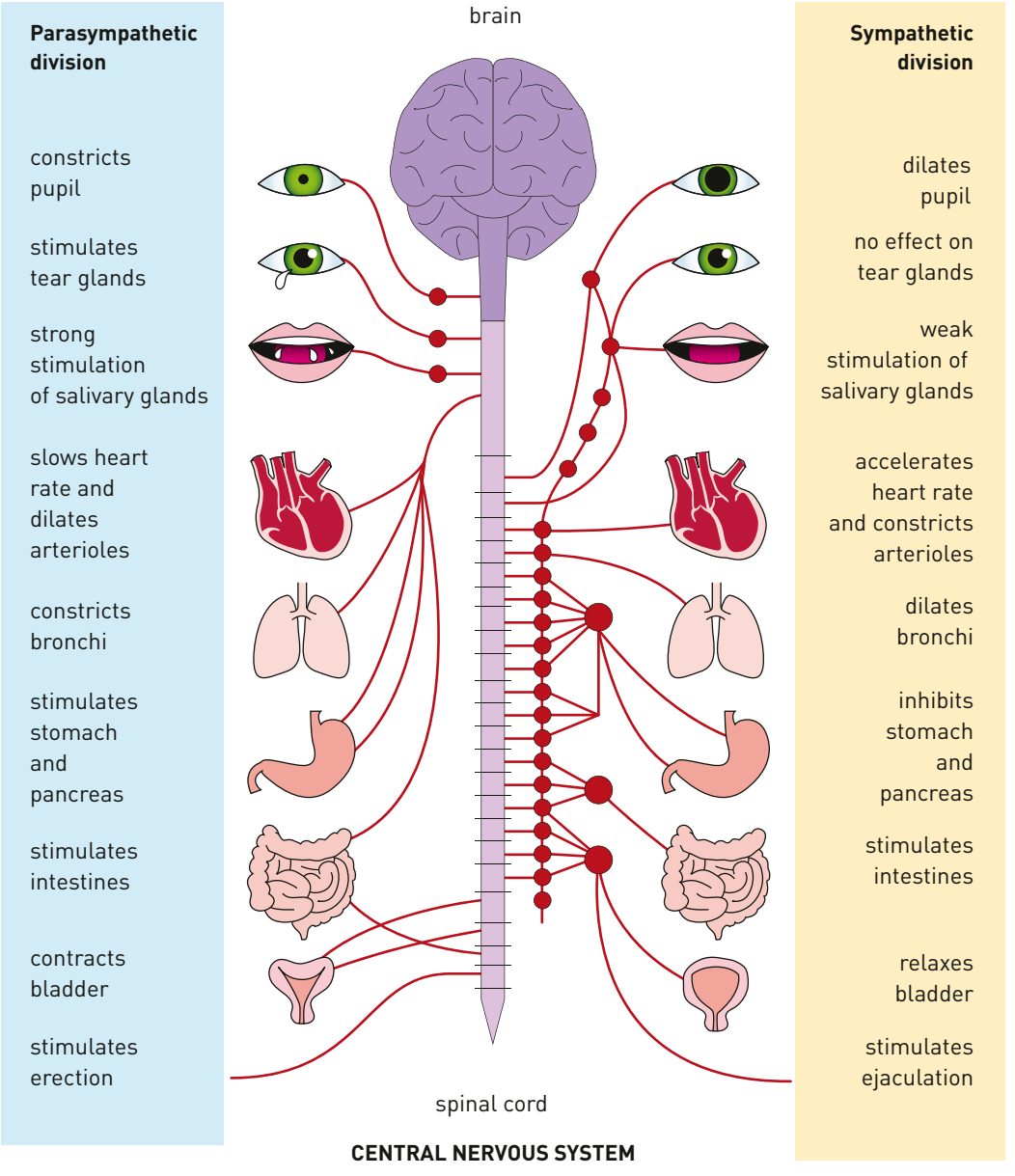


FIGURE 4 The role of the autonomic nervous system during different levels of arousal

fight-flight-freeze response
a physiological response to stress that causes an organism to react in a combative manner (fight), by removing themselves from the situation (flight) or by not reacting at all (freeze)

homeostasis
the state of balance in the body's metabolism

This is known as the **fight-flight-freeze response**, a physiological response to stress that causes an organism to react in a combative manner (fight), by removing themselves from the situation (flight) or by not reacting at all (freeze). It is more commonly known as the fight-or-flight response.

In contrast, the parasympathetic nervous system operates in circumstances where it is relatively calm. It is responsible for maintaining automatic day-to-day bodily functions, such as digestion, normal heart rate and normal breathing. This regular bodily functioning is also known as **homeostasis**.

Both the sympathetic and parasympathetic nervous systems affect the same tissues and organs, but in the opposite way. While the parasympathetic nervous system allows us to go about our everyday tasks, and keeps our bodily functions in a state of balance, the sympathetic nervous system prepares the same organs to deal with threats or stressors.



FIGURE 5 The fight-flight-freeze response: the threatened animal's sympathetic nervous system is activated.



FIGURE 6 Homeostasis: the animal's parasympathetic nervous system maintains the body's metabolic balance during times of low arousal and no threat.

CHECK YOUR LEARNING 4.1

Describe and explain

1 **Explain** the difference between the central nervous system and the peripheral nervous system.
2 **Describe** the autonomic nervous system.
3 **Explain** what happens in the fight-flight-freeze response.
4 **Explain** the role of the somatic nervous system.
5 **Construct** a labelled diagram (similar to Figure 3) to illustrate your understanding of the structure and function of each component of the human nervous system. Make sure that you include:
   a the central nervous system, peripheral nervous system, somatic nervous system and autonomic nervous system (sympathetic; parasympathetic)
   b the role of each system (you can use dot points).

obook assess

Check your obook assess for these additional resources and more:

» Student book questions
Check your learning 4.1

» Challenge
4.1 Fight, flight or freeze?

» Weblink
Nervous system anatomy

» Weblink
Fight, flight or freeze

4.2 Structure of a neuron

KEY IDEAS

In this section, you will learn about:

+ the structure of a neuron.

As outlined in Section 4.1, the somatic nervous system is part of the peripheral nervous system (PNS). The somatic nervous system is responsible for the voluntary movement of our muscles, organs and reflex movements. These reflexes include the blinking reflex, knee-jerk reflex, gag reflex, and the startle and rooting reflexes in infants. The somatic nervous system helps our body adjust to external stimuli through voluntary movement of the skeletal system.

Neurons receive information from other neurons, process this information and then communicate it to other neurons. In other words, neurons receive, process and transmit information to each other. Neurons generally comprise three elements: **dendrites**, the **soma** and the **axon**.

dendrites
branch-like segments of a neuron that receive signals from other neurons or sensory receptors via the synapses and deliver these to the soma

soma
the cell body and largest part of the neuron; controls metabolism and maintenance of the cell

axon
the part of a neuron along which the electrochemical nerve-impulse is transmitted

Structure	Description
Dendrites	A neuron can have hundreds or thousands of dendrites that look like branches coming off the soma. The dendrites receive information from other neurons, which they carry from the synapses to the soma.
Soma	The largest part of the neuron is the soma or cell body. It controls the metabolism and maintenance of the neuron. In most neurons, the soma receives messages from other neurons.
Axon	The axon is a nerve fibre that extends from the soma and carries information towards the cells that communicate with that neuron. Some axons have two or more offshoots, and some can be up to a metre long.
Myelin	The axons of most neurons are covered in a myelin sheath, which is a coating of cells that facilitates the transmission of information to other neurons. Axons with myelin are white rather than grey. Myelin protects the axon from potential chemical and physical interference to the electrical impulses that travel along it. The insulation provided by the myelin sheath also enables information to travel much faster – up to 400 kph.
Axon terminals	Axon terminals are found at the end of the axon branch and transmit messages to the next neuron. Axon terminals have terminal buttons. These terminal buttons have sacs that secrete a chemical called a neurotransmitter whenever electrical impulses are sent down the axon. Although they never actually touch, the axon terminals of one neuron link with the dendrites of the next neuron.

TABLE 1 The structure of a neuron

Dendrites

Dendrites look like trees (the word *dendron* is Greek for 'tree'). They receive information from other neurons or sensory receptors via **synapses** (the connection between two neurons) and deliver this to the cell body or soma.

synapses
the junction between two neurons

Soma

The soma is the cell body. It is the largest part of the neuron and controls the metabolism and maintenance of the cell.

Axon

The axon is a nerve fibre that carries information away from the soma at their ends towards other cells in contact with the neuron. This information is carried as an electrical impulse, referred to as an 'action potential'. The end of each axon has terminal buttons that secrete chemicals called **neurotransmitters**, which help the communication across nerve synapses whenever information is sent down the axon in the form of electrical impulses (see Figure 1).

neurotransmitters
chemicals that help the communication across nerve synapses

Glial cells

The **glial cells** are cells that are not part of the neuron but have an important role in supporting neurons. There are four identified functions of glial cells:

1. They surround neurons and hold them in place.
2. They supply nourishment and oxygen to neurons.
3. They remove dead neurons.
4. They insulate one neuron from another and increase the speed of transmission of nerve impulses. To do this, glial cells produce myelin.

glial cells
cells that play an important role in supporting neurons by surrounding and holding them in place, supplying nourishment and oxygen, removing dead neurons and insulating neurons to increase the speed of nerve impulse transmission

Myelin

Myelin is a white, fatty, waxy substance that covers the axon to insulate it from the surrounding fluid and other neurons, protecting it from electrical interference from other neurons. This increases the efficiency of transmission of nerve impulses. Only the axon is covered, not the cell body. Myelin is produced in the brain and spinal cord by glial cells in a process called **myelination**. Myelinated neurons are faster in conducting messages as they move through the nervous system.

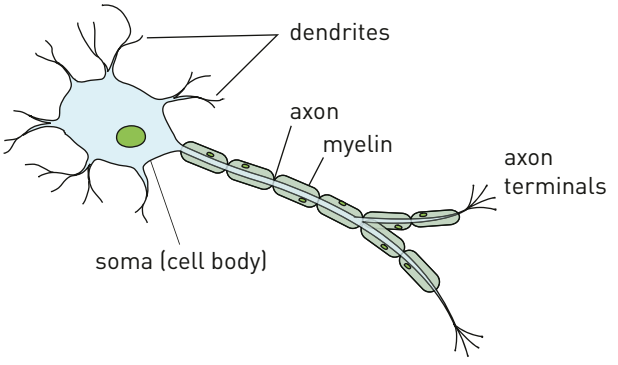


FIGURE 1 Structure of a neuron

Survival of an organism is dependent on how quickly messages can move through the nervous system: for example, processing spoken language quickly or pouncing on prey.

myelin
a white fatty, waxy substance that covers the axon to insulate it from the surrounding fluid and from other neurons

myelination
the production of myelin, which insulates a neuron's axon, speeds transmission and aids coordination

CHECK YOUR LEARNING 4.2

Describe and explain

1 **Explain** what the following elements are responsible for in a neuron.
   - **a** dendrites
   - **b** soma
   - **c** axon
   - **d** synapse

Apply, analyse and interpret

2 **Compare** the axon and axon terminals.

3 **Consider** the effects if myelination didn't occur.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 4.2
- » Interactive
  The neuron
- » Weblink
  Neuron structure
- » Weblink
  Neurotransmitters

4.3 Types of neurons

KEY IDEAS

In this section, you will learn about:

- types of neurons
- communication between neurons
- reacting to our senses.

As discussed in Section 4.2, neurons have a basic structure that they all follow. This section will cover the different types of neurons and their roles. It will also introduce communication between neurons. For instance, sensory neurons can carry nerve impulses from sensory stimuli towards the brain and spinal cord (afferent neurons), and motor neurons can carry neural impulses away from the CNS and the brain towards the body to cause movement (efferent neurons).

Neurons operate as part of the somatic nervous system. They are how the body receives information from the outside world and responds to this action with movement. Sensory neurons play an important part in our lives by transmitting sensory information from our environment to our brain. Our abilities to touch, taste, see, hear and smell all come from a process beginning with our sensory neurons registering an external stimulus, and then relaying that information to the CNS. Motor neurons can then carry signals from the brain and spinal cord to the muscle fibres so that our bodies can respond to the stimulus.

Types of neurons

Motor neurons

motor neurons neurons that communicate messages from the CNS to the particular muscles that an organism intends to move at any particular moment

Motor neurons are neurons that communicate messages from the CNS to the particular muscles that an organism intends to move at any particular moment and are referred to as efferent neurons. The CNS and PNS work together to enable an organism to interact with the environment. For example, in Figure 1, when a child pats a dog, the motor neurons are responsible for initiating the movement. These neurons carry information from the child's brain to the muscles in her arm and hand that allow her to move to pat the dog.

Sensory neurons

sensory neurons neurons that carry sensory information from the body and from the outside world into the CNS

Sensory neurons are neurons that carry sensory stimuli from the body and from the outside world into the CNS. Sensory neurons that carry nerve impulses from sensory information towards the CNS and brain are referred to as afferent neurons. In Figure 1, these convey the sensation of the dog's fur – detected by sensory receptors on the skin of the child's hand – to the brain. Here, this information (the sensation of the touch of the fur) would be processed as feeling soft.

Study tip

Remember neurons as SAME and I: Sensory Afferent, Motor Efferent, and Interneurons.



FIGURE 1 When this child pats her dog, the movement is initiated by motor neurons, while sensory neurons carry information about the feel of the dog's fur.

Interneurons

interneurons neurons that transmit information between motor and sensory neurons and the CNS

Interneurons carry information between the motor and sensory neurons in the CNS. Interneurons are especially important in transmitting impulses between other neurons as part of a reflex arc. For example, if a sensory neuron sends a message that a hand is touching a hot plate, the interneuron will send the message to the motor neuron that the hand needs to move quickly.

CASE STUDY 4.3

Motor neuron disease

Motor neuron disease (MND) is a debilitating illness that attacks nerve cells throughout the human body that are responsible for muscle control. It can affect a person's ability to move, speak, breathe and swallow. MND is fatal, with no known cure at this stage.

MND is the group name for several diseases that cause muscle degeneration. These diseases include amyotrophic lateral sclerosis (ALS), progressive muscular atrophy (PMA), progressive bulbar palsy (PBP) and primary lateral sclerosis (PLS). MND can be difficult to diagnose, as the symptoms are often mistaken for other conditions; also, symptoms do not always present the same way in each individual. Diagnosis of MND is made through blood tests, nerve conduction studies, electromyography (EMG) and MRI scans.

The early symptoms may be mild and include:

- stumbling, or weakness of leg muscles
- weakness in hand muscles that makes it difficult to hold objects
- slurring of speech or swallowing difficulties.

Later symptoms may include:

- breathing difficulties
- fatigue caused by muscle exhaustion
- insomnia
- changes in cognition
- pain and discomfort.

Like many diseases that affect the nervous system or neurons, MND can affect anyone – even people who are incredibly fit and active. One of the first prominent sufferers of the disease was Lou Gehrig, a famous American baseball player in the 1930s (the name Lou Gehrig's Disease is often used interchangeably with ALS).

However, in more recent times, a notable case is Australian Neale Daniher. Daniher played AFL football for Essendon in the 1980s and later went on to coach the Melbourne Demons AFL team.

Through his public profile, Daniher has helped to bring attention to the disease through events such as The Big Freeze fundraiser which is held at the MCG each year. The Big Freeze involves members of the AFL community sliding into a pool of icy water to raise money to help find a cure for MND. To date, The Big Freeze has been able to contribute over 20 million dollars to research and care for those diagnosed with MND.

Communication between neurons

A synapse is the junction between two nerve cells. This minute gap between two neurons is where the end of the axon, called **terminal buttons** of the presynaptic (before the synapse) neuron, comes into close proximity with the receptor sites on the dendrites of a postsynaptic (after the synapse) neuron.

terminal buttons bulb-like structures at the end of the axon that release neurotransmitters

The process of neurons communicating with other neurons is known as synaptic transmission. The neurotransmitter that is secreted from the presynaptic neuron affects the activity of the postsynaptic neuron with which it communicates. In other words, neurons communicate via a chemical process.

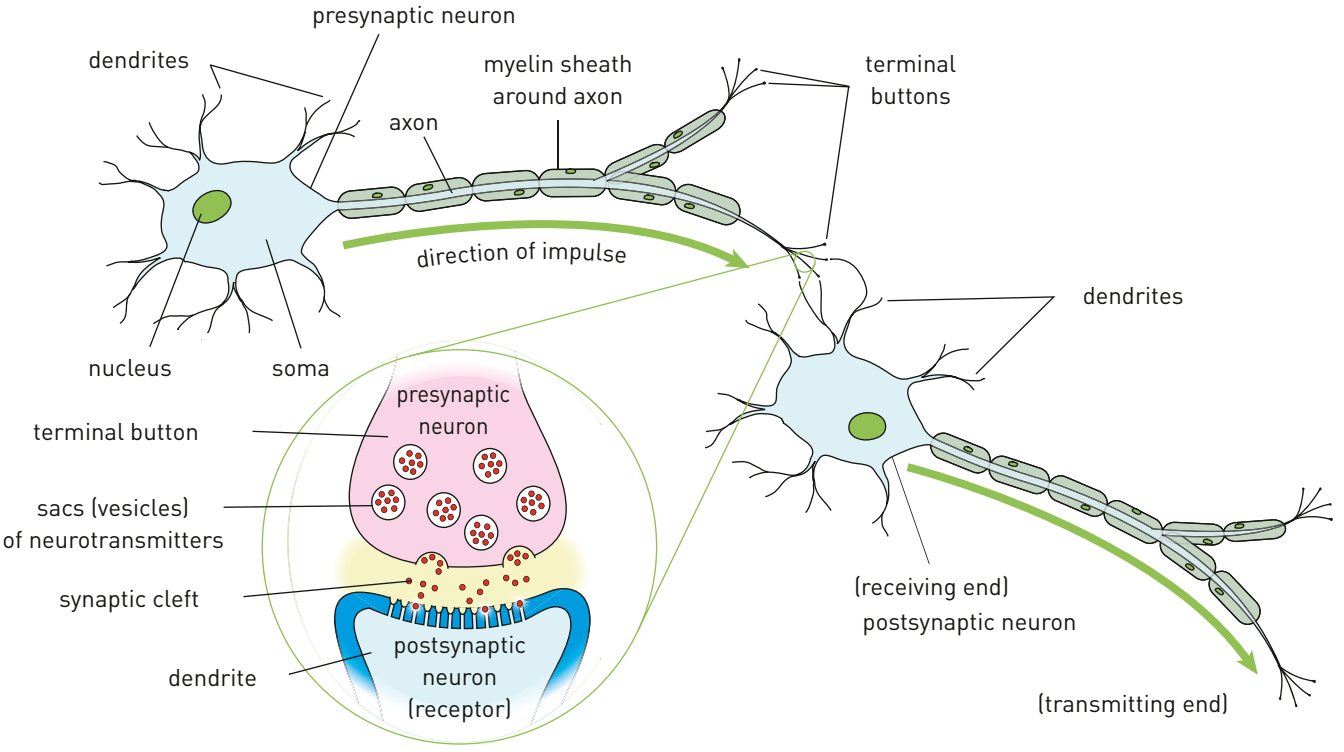


FIGURE 2 Information received by dendrites travels along the axon to terminal buttons.

It is important to remember that the neural structure of the brain is very complex. In reality, synapses can be located at several points along a neuron (at dendrites, the axon or the soma), and many terminal buttons can form synapses with a single neuron.

However, it is easier to think of communication as starting with the dendrites receiving information (neurotransmitter) from the synapse, the information being passed as electrical impulses through the soma along the axon, and a neurotransmitter being secreted from the terminal buttons to a synapse shared with the dendrites of another neuron.

These pathways are known as **neural pathways** and allow one part of the nervous system to communicate with another. A neural pathway can carry messages from the body to the brain (afferent pathways), from the brain to the body (efferent pathways) or within the brain itself.

neural pathways bundles of neurons that provide connections between one part of the nervous system and another

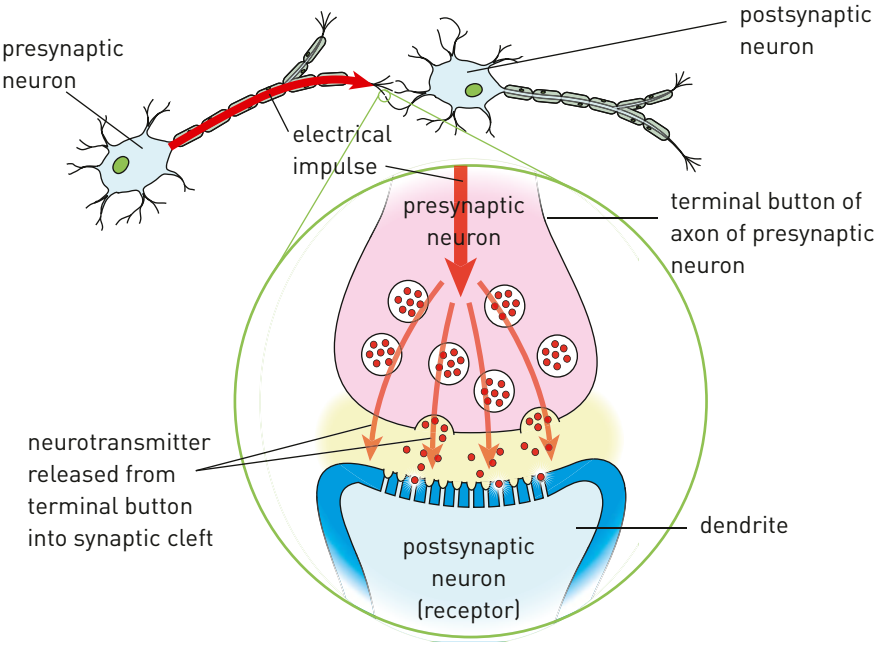


FIGURE 3 A synapse is the junction between two neurons. The presynaptic neuron releases molecules of neurotransmitters, which then fit into receptor sites on the postsynaptic neuron. The charge builds up until a signal, the 'action potential', is sent down the postsynaptic axon.

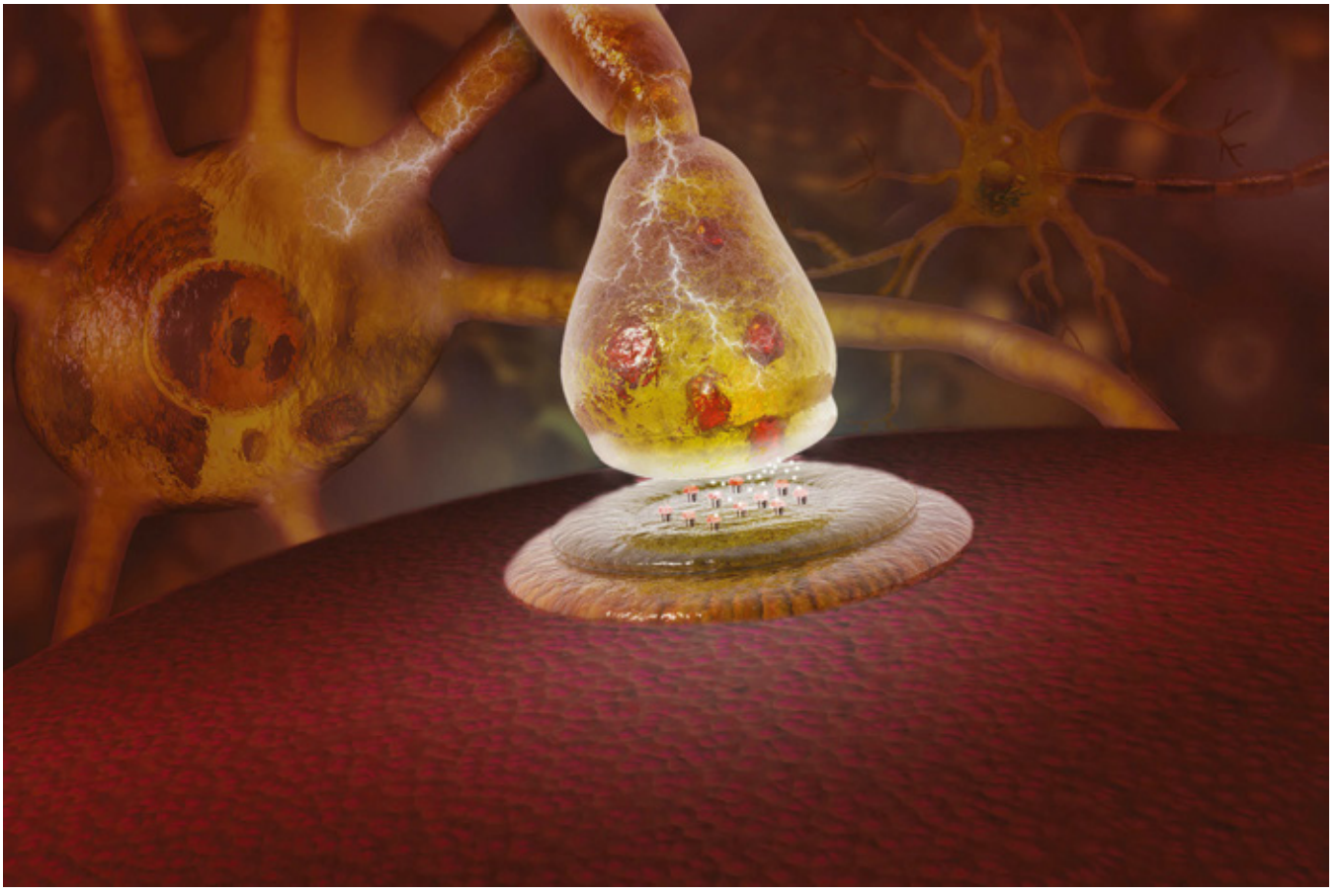


FIGURE 4 Axon of a neuron sending an electrical impulse to stimulate the release of neurotransmitters, which cross the synapse and attach to receptors on the next cell, passing the message along

Reacting to our senses

Our reaction time is the time it takes to intentionally or voluntarily respond to an external stimulus: from the time it is received by our sensory neurons, to the time we react or change our behaviour. For instance, when our arms feel the cold, our reaction may be to rub our skin in an attempt to warm them or go put on a jacket.

Our ability to detect stimuli through the sensory neurons gives our brains an opportunity to consciously respond to hazards in our environment. Our ability to process sensation can also bring us enjoyment, such as the taste of chocolate on our tongue or the sound of beautiful music.

Reaction times, of both voluntary and involuntary responses, can be studied in psychology. With factors such as preparation, practice and strength of a stimulus among the variables that can impact on a person's reaction time, it is possible for us to improve our reaction times in certain circumstances.

Studies have found that athletes have faster visual reaction times than non-athletes (Akarsu, Caliskan, & Dane, 2009). Even professional gamers, who physically sit all day at a screen, have been found to have faster reaction times than the average person because they spend so much of their time reacting to visual stimuli in their games.

A study by the University of Rochester (Green, Bavalier, & Pouget, 2010) found that experienced gamers had developed a heightened sensitivity to external stimuli, which ultimately improved their ability to make good decisions quickly.



FIGURE 5 Highly trained athletes, such as Chris Lynn who plays for the Brisbane Heat in the KFC Big Bash League, have much faster reaction times than the average person.

CHECK YOUR LEARNING 4.3

Describe and explain

1 **Explain** the difference between a sensory and a motor neuron.
2 **Describe** an interneuron.
3 Alex picked up his sister's hair straightener when it was still hot. **Identify** what neurons would be involved.

Apply, analyse and interpret

4 **Consider** human survival and daily life without interneurons.

Investigate, evaluate and communicate

5 Read Case study 4.3. **Investigate** treatment options for people diagnosed with motor neurone disease (MND).

Check your obook assess for these additional resources and more:

» Student book questions
Check your learning 4.3

» Video
Neuron type and structure

» Weblink
Reaction test time

» Weblink
Motor neuron disease

CHAPTER 4

Review

Summary

4.1
- The nervous system comprises two main components: the central nervous system, which includes the brain and spinal cord, and the peripheral nervous system, which includes the remainder of the body (e.g. limbs, facial nerves, skeletal muscles, organs and glands).
- The peripheral nervous system is further divided into the somatic nervous system, which controls voluntary movement of skeletal (striated) muscles, and the autonomic nervous system, which controls involuntary muscles (smooth muscles), organs and glands.
- The autonomic nervous system is further divided into two branches: the sympathetic nervous system, responsible for activating the body in times when alertness or arousal is required (for example, the fight-flight-freeze response), and the parasympathetic nervous system, which is involved in maintaining the body's regular, day-to-day levels of arousal and homeostasis.

4.2
- Neurons are generally composed of three elements: soma, axon and dendrites.
  - The soma is the cell body.
  - The axon carries information away from the soma. The end of each axon has terminal buttons that release a neurotransmitter whenever information is sent down the axon in the form of electrical impulses.
  - Dendrites receive neurotransmitters from the synapse where they have been released from other neurons.
- The process of nerve impulse transmission involves neurons receiving, processing and sending information from one cell to another through the release of neurotransmitters into the synapses. A synapse is the space between the end of one neuron and the beginning of a neighbouring neuron.

4.3
- Our senses work by sensory neurons transmitting information from an external stimulus to the CNS. Motor neurons engage a response to the stimulus by carrying signals from the brain back to muscle fibres.

Key terms

- attention
- autonomic nervous system
- axon
- brain stem
- central nervous system
- dendrites
- fight-flight-freeze response
- glial cells
- homeostasis
- interneurons
- motor neurons
- myelin
- myelination
- neural pathways
- neurotransmitters
- parasympathetic nervous system
- peripheral nervous system
- sensory neurons
- soma
- somatic nervous system
- sympathetic nervous system
- synapses
- terminal buttons

Revision questions

Multiple choice

1 The central nervous system consists of which two parts?
- **a** the brain and spinal column
- **b** the autonomic and somatic nervous systems
- **c** the brain and spinal cord
- **d** the cerebral cortex and the spinal cord

2 The peripheral nervous system consists of which two parts?
- **a** the brain and spinal cord
- **b** the automatic and somatic nervous systems
- **c** the sympathetic and parasympathetic nervous systems
- **d** the somatic and autonomic nervous systems

3 Moving your leg is an action that is made by which system?
- **a** somatic nervous system
- **b** autonomic nervous system
- **c** sympathetic nervous system
- **d** parasympathetic nervous system

4 Motor neurons enable us to:
- **a** feel the silky coat of a puppy
- **b** smell the scent of a flower
- **c** play the piano
- **d** see a ball when it is thrown.

5 Sensory neurons in your toes are part of which nervous system?
- **a** central
- **b** peripheral
- **c** autonomic
- **d** sensory

6 Which of the following is true of the sympathetic nervous system?
- **a** In normal daily life, it has nothing to do; it is responsible for the fight-flight-freeze response when a person is confronted by a threat.
- **b** In normal daily life, it works all the time to ensure that the body's metabolic systems are in balance.
- **c** It operates at a level of conscious awareness.
- **d** It is part of the somatic nervous system that operates on the body.

7 Which of the following is a true statement about the parasympathetic nervous system?
- **a** In normal daily life, it has nothing to do; it is used to return the body functions to their normal levels after sympathetic arousal.
- **b** In normal daily life, it works all the time to ensure that the body's metabolic systems are in balance.
- **c** It operates at a level of conscious awareness.
- **d** It is part of the somatic nervous system that operates on the body.

8 What is the function of glial cells in the brain?
- **a** They act as glue to stick the neurons together.
- **b** They produce myelin to insulate axons.
- **c** They remove dead and damaged neurons.
- **d** All of these are correct.

9 To transmit nerve impulses, neurotransmitters are released into the:
- **a** synapse
- **b** soma
- **c** dendrite
- **d** axon

10 The molecules of neurotransmitters fit into receptor sites on the _____ of the postsynaptic neuron.
- **a** terminal button
- **b** dendrite
- **c** soma
- **d** axon

11 Without myelin, a neuron would not:
- **a** have coated axons
- **b** deliver messages between neurons quickly
- **c** be protected from chemical and physical interference
- **d** all of the above.

12 Interneurons would be responsible if:
- **a** you stepped on something sharp and pulled your foot away before you realised
- **b** you noticed that your hand was holding onto ice and you pulled it way because it hurts
- **c** you were holding onto a hot tray, despite knowing it is too hot
- **d** you felt rocks beneath your back while camping and chose to move your sleeping bag.

13 The PNS has two main functions. These are to:

- **a** communicate information from the body's organs, glands and muscles to the CNS from both the outside world and the inside world, and communicate information from the CNS to the body's organs, glands and muscles via motor neurons
- **b** communicate information from the body's organs, glands and muscles to the CNS from both the outside world and the inside world, and segment the spinal cord
- **c** communicate information from the body's organs, glands and muscles to the CNS from both the outside world and the inside world, and to communicate information from the CNS to the body's organs, glands and muscles via sensory neurons
- **d** communicate information from the CNS to the body's organs, glands and muscles via motor neurons, and enable the brain to communicate with the rest of the body.

14 Neurons communicate via:

- **a** the myelin sheath
- **b** a chemical process
- **c** the soma
- **d** glial cells.

Short answer

Describe and explain

★★ **15** Mel was baking cupcakes for her friend's birthday on the weekend. She was distracted talking to her mother and picked up a hot tray. Before Mel had time to think about what she was doing, she had dropped the tray. **Explain** how Mel was able to react so quickly.

★★ **16** Rasmus has been bullied by people at school for a while. As soon as Rasmus sees the bullies, his heart starts to race, his pupils dilate and he feels the need to urinate. **Identify** which system is responsible for this reaction.

★ **17** In the peripheral nervous system, the _____ nervous system involves voluntary activity, whereas the _____ nervous system is involuntary.

★★ **18** **Summarise** the myelineation process.

★ **19** **Describe** the two functions of the peripheral nervous system.

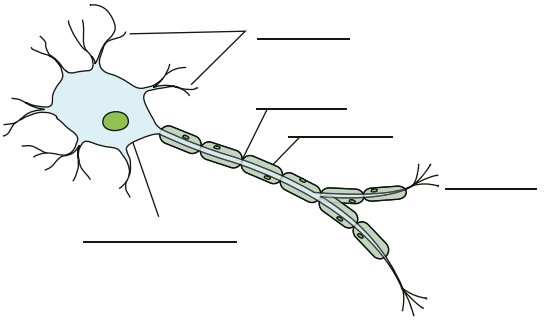
★ **20** **Describe** a neural pathway.

★ **21** **Identify** two characteristic features of someone who is experiencing the fight-flight-freeze response.

★ **22** Complete the following table to **explain** and **describe** the function of each component of a neuron.

Structure	Description	Function
Dendrites		
Soma		
Axon		
Myelin		

★ **23** **Identify** and label the components of a neuron:



★★ **24** Daniel has been outside for the last three hours. As the sun begins to set, Daniel realises it is getting colder. **Identify**:

- **a** the neuron responsible for alerting Daniel to this
- **b** which part of the parasympathetic nervous system will be active to relieve this feeling.

★ **25** Sensory neurons communicate via _____ pathways, and motor neurons communicate via _____ pathways

Apply, analyse and interpret

★★ **26** Communication between neurons can be interrupted by substances, such as alcohol and pain relief medication. **Consider** the implications of disrupting neuron communication. In your response, acknowledge the advantages and disadvantages.

★★★ **27** **Differentiate** between sensory nervous, motor nervous and interneurons.

★★ **28** When Jeanna was feeding her fish last night, she realised that the water temperature was too warm when her hand touched the water. **Determine** how Jeanna knew this.

★★ **29** **Compare** the central nervous system with the peripheral nervous system.

★★★ **30** People often emphasise the importance of the sympathetic nervous system as it is the survival system. **Consider** what may happen if the parasympathetic nervous system were malfunctioning.

Investigate, evaluate and communicate

★★ **31** **Discuss** the following statement: 'Without functioning interneurons, humans would not be able to survive'.

★★★ **32** The parasympathetic nervous system maintains our general bodily functions, such as breathing, heart rate and digestion. **Assess** what the consequences may be if these processes were not automatically controlled by the parasympathetic nervous system.

★★★ **33** **Evaluate** the following statement: 'The peripheral nervous system is more important than the central nervous system'.

★★ **34** **Design** a method for how you would scientifically measure the fight-flight-freeze response.

★★★ **35** **Predict** what may happen if a postsynaptic neuron were unable to receive the neurotransmitters that were released into the synapse.

Check your obook assess for these additional resources and more:

» Student book questions
Chapter 4 Review

» Revision notes
Revision notes for Chapter 4

» assess quiz
Test your understanding with an auto-correcting multiple-choice quiz

» Flashcard glossary
Key terms in Chapter 4

CHAPTER 5

The brain

The brain is one of the most important organs in the human body. This chapter outlines the basic structure and function of the hindbrain (cerebellum and medulla), midbrain (reticular formation) and forebrain (hypothalamus, thalamus and cerebrum). You will also learn about the role of the cerebral cortex in the processing of complex sensory information and the role of specific brain regions in localisation of function.

OBJECTIVES

→ Consider that the brain can be divided into a number of discrete areas, including the hindbrain, midbrain and forebrain

→ Understand the role of specific brain regions in localisation of function, including Broca's area, Wernicke's area and Geschwind's territory

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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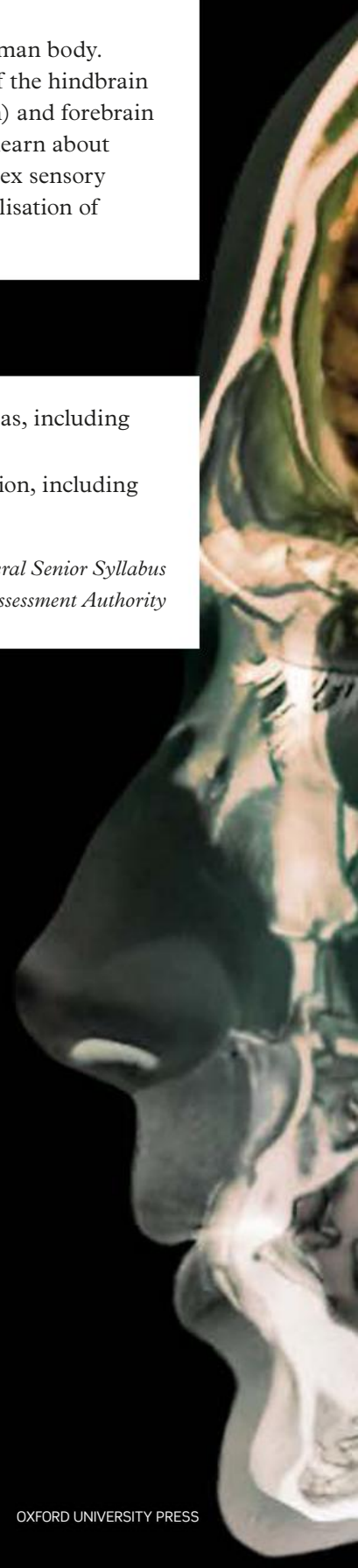


FIGURE 1 In this image, the brain's structure can be seen, including the folds of the cerebral cortex.

SUGGESTED RESEARCH

SUGGESTED RESEARCH	**5.2** Brain-behaviour relationships in brain structure (e.g. the case of Phineas Gage in Damasio, Grabowski, Frank et al., 1994)

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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5.1 The hindbrain, midbrain and forebrain

KEY IDEAS

In this section, you will learn about:

+ the different components of the brain, including the hindbrain, midbrain and forebrain.

The brain is the organ at the centre of all of our mental faculties. It is the largest part of the human nervous system, containing between 10 and 100 billion nerve cells (Carlson *et al.*, 2007). It is responsible for regulating the body's physiological processes, controlling behaviour and processing sensory information from the environment, as well as higher order processes such as memory, perception, consciousness, learning and language (Carlson *et al.*, 2007). It is also responsible for those functions that are vital to basic survival, including our heartbeat, body temperature, respiration and digestion.

This chapter outlines the basic structure and function of the hindbrain (cerebellum and medulla), midbrain (reticular formation) and forebrain (hypothalamus, thalamus, and cerebrum). You will also learn about the role of the cerebral cortex in the processing of complex sensory information and the role of specific brain regions in localisation of function.

Components of the brain

hindbrain the primitive parts of the brain comprising the cerebellum, pons and medulla, adjacent to the spinal cord

midbrain connects the hindbrain with the forebrain and controls arousal levels, attention and consciousness

forebrain part of the brain responsible for higher order thinking processes; includes the cerebral hemispheres

The brain comprises three components: the **hindbrain**, the **midbrain** and the **forebrain.** The hindbrain is the primitive part of the brain comprising the cerebellum, pons and medulla, adjacent to the spinal cord. The midbrain connects the hindbrain with the forebrain and controls arousal levels, attention and consciousness; it essentially comprises the reticular activating system (RAS). The forebrain is responsible for higher order thinking processes, and includes the cerebral hemispheres. These structures interact and work together to enable our body to behave and function in accordance with our thoughts and feelings.

The hindbrain

The hindbrain is often referred to as the 'lower brain'. It mainly supports bodily functions and it is the link between the spinal cord and the brain. It is important for movement and balance. It includes the brainstem, medulla, pons, cerebellum, and part of the reticular formation, a network of neurons that connects the hindbrain and forebrain.

The medulla

The first major component of the hindbrain is the medulla. The medulla is a continuation of the spine. Its role is the control of breathing, heartbeat and digestion.

The pons

The pons sits above the medulla and receives information sent from visual areas to control eye and body actions.

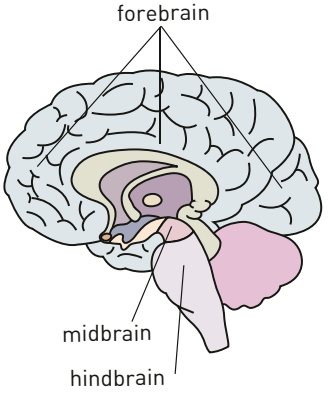


FIGURE 1 This is a cross-section of the right-hand side of the human brain if it were sliced through from top to bottom. Note the three main components of the brain: the hindbrain, the midbrain and the forebrain.

The cerebellum

The **cerebellum** is a walnut-shaped area that receives information from the pons. The cerebellum's role is to coordinate the sequence of body movement.

cerebellum
a component of the hindbrain that coordinates the sequence of body movement

The midbrain

The midbrain sits above the hindbrain and below the forebrain (see Figure 1). It is responsible for the regulation of sleep, motor movement and arousal. It includes part of the **reticular formation**.

reticular formation
a network of neurons that sits across both the midbrain and hindbrain and connects the hindbrain and forebrain; plays an important role in the control of arousal and the 'sleeping and waking' cycle

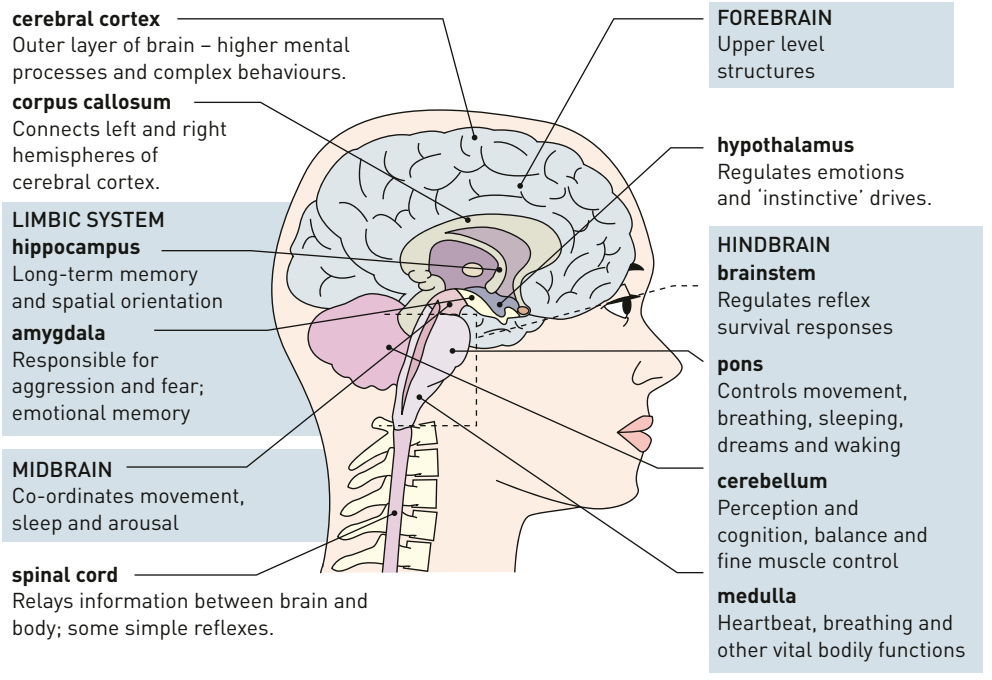


FIGURE 2 Main substructures of the hindbrain, midbrain and forebrain

Reticular formation

Although the reticular formation is mostly situated as part of the midbrain, it is in fact a network of neurons that is part of *both* the midbrain and hindbrain, as well as connecting the hindbrain and forebrain (see Figure 3). The reticular formation is important in the control of arousal and in the sleeping and waking cycle.

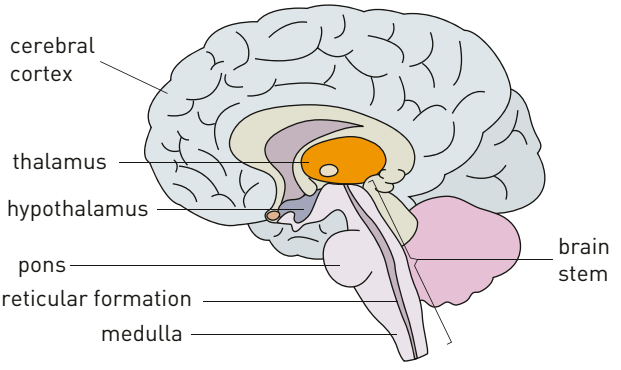


FIGURE 3 The location of the thalamus, hypothalamus, medulla oblongata, reticular formation, pons and cerebral cortex in the forebrain

The forebrain

The forebrain includes a number of important brain structures, including the cerebrum, the hypothalamus and the thalamus.

The cerebrum

The cerebrum is the biggest and most recognisable part of the forebrain. It is covered by a thin layer known as the cerebral cortex (or cortex), and divided into the left and right cerebral hemispheres. These are separated by the longitudinal fissure – a deep groove that runs from the front to the rear of the cortex.

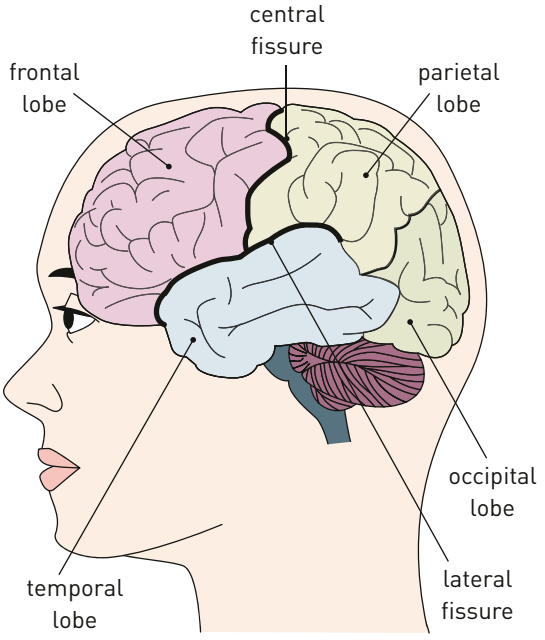


FIGURE 4 This diagram shows the left-hand side of the human cerebral cortex. Note the central fissure.

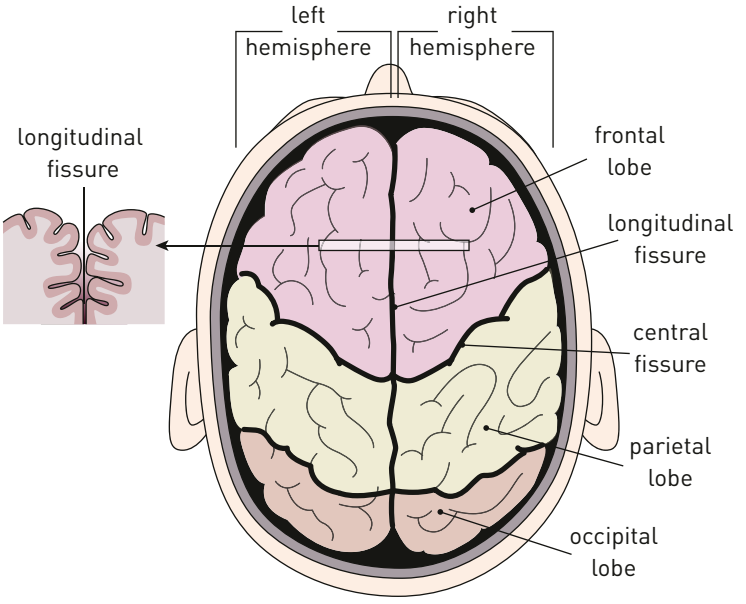


FIGURE 5 A diagram of the left and right human cortices viewed from above. Note the longitudinal fissure that separates the brain into the right and left hemispheres.

corpus callosum
a set of neural fibres that bridges the gap between the two brain hemispheres

amygdala
an almond-shaped structure, located in the medial temporal lobe of the brain that is central to emotion, aggression and implicit learning; it is vital in initiating and processing emotional responses and in forming emotional memories

hippocampus
located in the brain's medial temporal lobe and involved in the transfer of information from short-term memory to long-term memory

hypothalamus
structure in the forebrain that plays a major role in controlling emotion and motivated behaviours, such as eating, drinking and sexual activity

The hemispheres are almost symmetrical in appearance and are joined by the **corpus callosum**, a set of neural fibres that connect the two brain hemispheres (see Figure 5 and 6). Each hemisphere has a central fissure that runs from the top of each hemisphere and down the sides, separating the front (anterior) of the cerebral cortex from the rear (posterior).

Later in your psychology studies, you will learn about the functions of two structures – the **amygdala**, located in the medial temporal lobe of the brain that is central to emotion, aggression and implicit learning, and the **hippocampus**, located in the medial temporal lobe and involved in the transfer of information from short-term memory to long-term memory. The hippocampus and amygdala are important in the formation of memories and emotions, and both are considered very important in the study of phobias.

The hypothalamus

The **hypothalamus** is a small structure that has a very important role in the control of basic survival actions: sleep, regulation of body temperature, expression of emotions, and the four 'F's' – feeding, fighting, fleeing and fornication (see Figure 3).

The thalamus

The **thalamus** is located beneath the cerebral cortex, deep within the cerebral hemispheres. It is divided into two egg-shaped parts that sit side by side, with one part located in each hemisphere (see Figure 3). The thalamus is the 'communications centre' of the brain and it receives information from the ears, eyes, skin and other sensory organs (with the exception of the nose). It also has an important role in regulating the overall activity in the cortex.

The thalamus has two important roles to play. First, it enables an organism to process sensory stimuli in the environment. When humans are in normal waking consciousness, our senses are continually bombarded with information from the outside world. The thalamus receives the incoming information from all of our senses (except smell) and then relays this information to the relevant part of the cortex where it can be processed into meaningful

information. For example, the sight of a colourful coffee mug would be received as sensations in the sensory receptors in our eyes; the information would then be conveyed to the thalamus, which would then direct it to the primary visual cortex in both the left and right occipital lobes. The person would then interpret it as being a 'colourful coffee mug'.

The second role of the thalamus is to determine which of the incoming sensory information is the most important for us to pay attention to. Research using positron emission tomography (PET) scans has indicated that, when people pay attention to specific sensory information, specific parts of the reticular formation and the thalamus are active (Kinomura *et al.*, 1996). The information is then transmitted to the relevant part of the cortex, which then communicates back to another part of the thalamus to indicate which parts of the sensory stimuli the person must pay attention to, and which parts to ignore (Burton *et al.*, 2015).

thalamus
a structure which is shaped like two eggs beneath the cotex, it processes incoming sensory information and transmits it to other, higher parts of the brain for further processing. It also directs attention to specific sensory systems

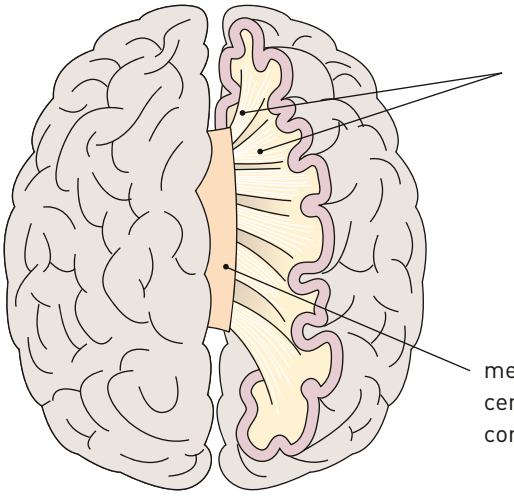


FIGURE 6 The two hemispheres of the cerebrum as seen from above. Part of the cortex has been removed to show the corpus callosum, which joins the two together.

CHECK YOUR LEARNING 5.1

Describe and explain

1 **Construct** a labelled diagram to illustrate your understanding of the structure and function of each component of the brain. Make sure that you include the hindbrain, midbrain and forebrain.
2 **Explain** the role of the corpus callosum.
3 **Describe** the location and structure of the thalamus and hypothalamus.
4 **Explain** the role of the midbrain.
5 **Describe** what the cerebrum is responsible for.

Apply, analyse and interpret

6 Henry is lying on the sofa and watching television. He is feeling quite relaxed and is nodding off to sleep. **Determine** which part of Henry's brain would be active.
7 A fire alarm sounds. **Consider** which areas of the brain would be active and what may be happening in each.

Check your obook assess for these additional resources and more:

» Student book questions
Check your learning 5.1

» Weblink
The hindbrain

» Weblink
The midbrain

» Weblink
The forebrain

5.2 Structure of the brain

KEY IDEAS

In this section, you will learn about:

- the different structures of the brain, including the cerebral cortex, frontal lobe, parietal lobe, temporal lobe and occipital lobe.

In studying the interaction between the cognitive processes of the brain and its structure, it is easier to consider each of the structures of the brain as being separate with individual responsibilities. However, this is not really how the nervous system operates.

With neuroimaging techniques (see Chapter 3), scientists have been able to observe the parts of the brain that are active during different types of cognitive processes, and it is apparent that many parts of the brain are active at any given time. Therefore, it is important to remember that different parts of the brain interact with each other and are not discrete, isolated structures.

The cerebral cortex

The role of the cerebral cortex

As we saw earlier in this chapter, the brain comprises three components: the hindbrain, the midbrain and the forebrain. The outer layer of the forebrain is called the cerebral cortex, which is responsible for receiving information from the environment, for controlling our responses and for higher order thinking processes including problem-solving and planning. It is also very much involved in memory, language and the regulation of emotions. The cerebral cortex of humans is much larger in proportion to body mass than in any other animal; this is the point of difference between humans and animals in terms of intellectual functioning. It enables us to plan and carry out a series of body movements and use words to make intelligible conversation. The cortex allows us to undertake a range of tasks, from the simple (e.g. making toast) to the complex (e.g. constructing buildings and developing computers). It also allows us to detect the difference between pieces of information, to understand the meaning of this information and to think in abstract and symbolic ways, enabling creativity in art, writing, debating and the use of metaphor (Burton *et al.*, 2015).

Structure of the cerebral cortex

The cortex is very thin (approximately 3 millimetres) and contains billions of neurons. Humans have the greatest number of cognitive abilities and this is why they also have the largest, most complex cortex of all organisms. Its convolutions – the many folds, grooves and bulges – make the surface area (and volume) of the cortex large enough to contain an enormous number of neurons and blood vessels that can supply energy. The bulges are known as gyri (singular: gyrus), and the valleys are called sulci (singular: sulcus).

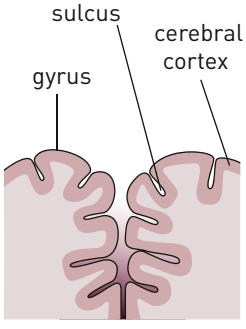


FIGURE 1 Convolutions in the cerebral cortex

Lobes of the cerebral cortex

The cortex of each cerebral hemisphere comprises four distinct regions known as lobes. Each is named after the plate of the skull protecting it: frontal lobe, parietal lobe, occipital lobe and temporal lobe.

Visually, the lobes appear symmetrical for each hemisphere. The left and right hemispheres both have one of each of the four lobes, making eight lobes in total. It is important to remember that while the cortex is studied as a series of separate lobes, in reality the lobes work together, and the region of one lobe may have a similar or related function to the neighbouring region of another lobe. The sections of the cortex are given particular names to make the brain easier to study.

CHALLENGE 5.2

Cortical area

Relative to their body size, animals have a smaller cortical area than humans and therefore do not have the same level of intellectual functioning. Try to imagine the cortex as a piece of fabric set out flat on a table, which is then scrunched up to fit inside a box. This is similar to what happens to the cortex to be able to fit inside the human skull; spread out, the cortex covers an area the size of a 70-centimetre television screen. Suggest why people evolved to have a larger cortex.

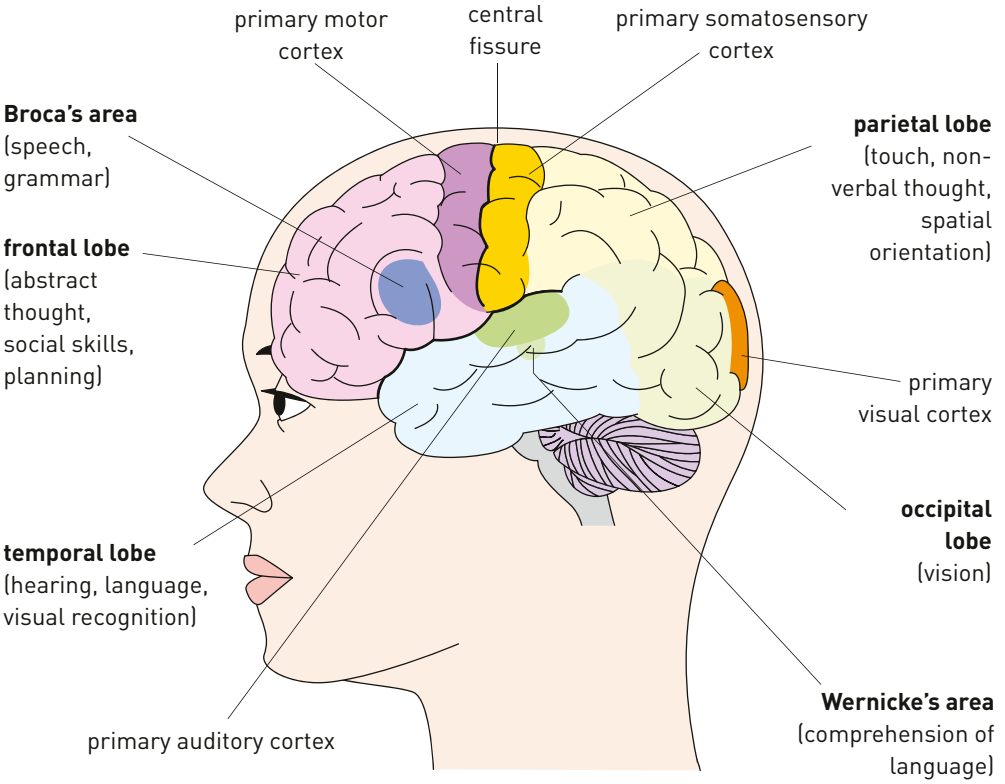


FIGURE 2 The main functions of the lobes of a typical left cerebral cortex. Although most people have Broca's and Wernicke's areas in their left hemisphere, some people (about 3–5 per cent) have them in their right hemisphere.

Primary cortices

The primary areas of the cortex comprise approximately 25 per cent of the total cortex. When the senses first receive information from the environment, the information is sent to the thalamus, which then relays it to the *primary cortex* of the relevant lobe (refer to Figure 3, p.112). The primary cortex begins processing and interpreting incoming sensory information. For example, the **primary visual cortex** in the occipital lobe receives visual

primary visual cortex located in the occipital lobe and involved in the processing of information from the eyes

primary auditory cortex
located in the upper part of the temporal lobe; receives sound information from the ears in the temporal lobe

information from the eyes; the **primary auditory cortex** in the temporal lobe receives sound information from the ears; and the **primary somatosensory cortex** in the parietal lobe receives information from touch receptors on the skin.

Note that there is no primary sensory cortex in the frontal lobe; rather, this contains the **primary motor cortex**, which controls our movements.

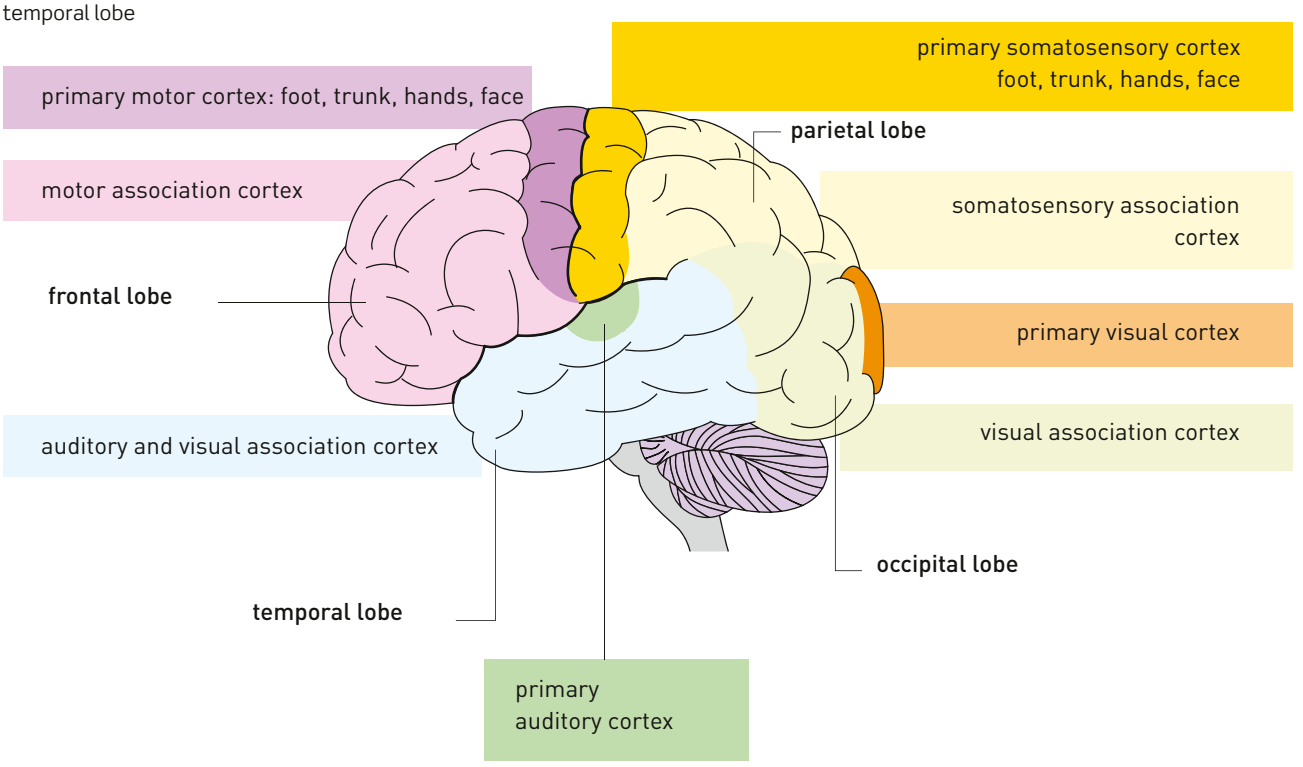


FIGURE 3 The location of primary cortices and association areas of the left hemisphere. Note the location of the primary cortices and association areas.

primary somatosensory cortex
located at the front of each parietal lobe; processes sensations such as touch, pressure, temperature and pain from the body

primary motor cortex
located at the rear of each frontal lobe; responsible for movement of the skeletal muscles of the body

Roles of the lobes in cognitive processes

Frontal lobe

The **frontal lobe** is the largest of the lobes and has several functions, including initiating movement of the body (motor functions), language, planning, judgment, problem-solving, aspects of personality and regulation of emotions. The association area of the left frontal lobe (Broca's area) is also responsible for the production of speech. Much of the frontal lobe is the association area. This is the part of the frontal lobe responsible for cognitive processes such as attention, planning and problem-solving, as well as aspects of personality. The frontal lobe comprises the primary motor cortex for each hemisphere.

People with frontal lobe damage may be unable to learn from experiences; for example, if they attempt a problem-solving task they will be unable to evaluate which of their problem-solving strategies was previously most successful and will therefore have to go through a trial-and-error process of solving the problem every time they are confronted with it. This is known as 'perseverating' (as opposed to perseverance). People with frontal lobe damage also are likely to make mistakes in planning because they lack foresight.

SUGGESTED RESEARCH
5.2 Brain-behaviour relationships in brain structure
Go to page 456 »

The primary motor cortex is situated at the rear of each frontal lobe, next to the central fissure. It is the part of the frontal lobe that is responsible for movement of the skeletal muscles of the body. The left primary motor cortex is responsible for the movement of the right-hand side of the body, and vice versa; this is called contralateral organisation. If the *right* primary motor cortex is damaged, a person will be unable to move parts of their body on the left side such as their left hand and leg; the reverse will happen if the left primary motor cortex is damaged.

Parietal lobe

Much of the **parietal lobe** is taken up by the primary somatosensory cortex (see Figure 3). It is situated at the front of each parietal lobe, just behind the central fissure, and receives sensations such as touch, pressure, temperature and pain from the body.

As in the primary motor cortex of the frontal lobe, the primary somatosensory cortex functions in a contralateral organisation. If the primary somatosensory cortex of the *right* parietal lobe is damaged, a person will be unable to process sensation from parts of the body on the left side, and the relevant body part will be numb. The reverse will happen if the left primary somatosensory cortex is damaged.

Temporal lobe

The **temporal lobe** processes auditory information – sensations received in the ears. The primary auditory cortex is in the upper part of the temporal lobe (see Figure 3). The temporal lobe performs the complex auditory analysis that is necessary for understanding human speech or listening to music. Parts of the lobe are especially sensitive to particular types of sounds. Patients whose temporal lobe is electrically stimulated are likely to report hearing sounds, even if there is no actual sound in the room for their ears to hear.

A person with a damaged primary auditory cortex is likely to experience forms of deafness. People with a damaged right auditory association cortex are unable to recognise the pattern of sounds that do not have words or to locate a sound in space, for example, finding a ringing mobile phone in a room.

Occipital lobe

The **occipital lobe** is entirely concerned with vision. Information from the left side of each retina is processed in the left occipital lobe and information from the right side of each retina is processed in the right occipital lobe. Information from the centre of the visual field and the centre of each retina is processed in the occipital lobe (see Figure 3).

Different parts of the primary visual cortex of the occipital lobe process different types of visual stimuli, and the **association areas,** regions of the cerebral lobes that are not part of the sensory or motor cortices integrate the information between the motor and sensory areas and higher order mental processing, organise them into more complex forms to enable interpretation (perception).

Association areas of the cortex

The remaining 75 per cent of the cortex consists of the association areas. These are involved in the integration of the information between the motor and sensory areas and higher order mental processes. This includes complex cognitive processing such as decision-making, thinking, planning, initiating movement, analysis, synthesis and language.

frontal lobe
the largest lobe of the brain; has several functions, including initiating movement of the body, language, planning, judgment, problem-solving, aspects of personality and emotions; extremely well developed in higher mammals

parietal lobe
the location of the primary somatosensory cortex in the brain; it enables a person to perceive their own body and to perceive where things are located in their immediate environment

temporal lobe
the part of the forebrain beneath the temporal plate of the skull, at the side of the head above the ears; contains Wernicke's area and the primary auditory cortex

occipital lobe
the cerebral cortex at the rear of the brain; the location of the primary visual cortex and association areas involved with integration of visual stimuli

association areas
regions of the cerebral lobes that are not part of the sensory (visual, auditory, somatosensory) or motor cortices and integrate the information between the motor and sensory areas and higher order mental processing

Association areas of the frontal lobe

Broca's area
the speech production centre of the brain

- **Language:** The association area of the left frontal lobe includes **Broca's area**. This area coordinates the movement of the lips, tongue and vocal cords for articulation of words (see Figure 2). It also relies on other parts of the frontal lobe for planning sentences and the muscle movement necessary to produce meaningful speech. Broca's area is located near the primary motor cortex of the left frontal lobe. This close proximity of the language and motor areas enables these parts of the brain to communicate quickly with each other, enabling a person to engage in conversation and communication.
- **Emotional regulation:** Most of our emotional responses are caused by the limbic system – especially the amygdala. This is a small almond-shaped set of neurons within the brain, rather than in the cerebral cortex, however, parts of the cortex are also involved through two-way communication with the amygdala.
- **Prefrontal cortex:** Located behind the forehead and above the eyes, it comprises the entire non-motor anterior region of the frontal lobe. The prefrontal cortex is involved in making plans and predicting outcomes, helping to regulate emotion and behaviour by anticipating the consequences of our actions. Additionally, it is involved in anxiety and brain functions such as working memory and our ability to focus our thoughts. This area developed prominently during the evolution of mammals; the same is true of some species of dolphins.

Association areas of the temporal lobe

Wernicke's area
part of the left temporal lobe, responsible for language reception and interpretation and for creation of grammatically correct speech

The left temporal lobe contains **Wernicke's area,** which is responsible for storing receptor codes that interpret the meaning of language. People with damage to their left temporal lobe are likely to have difficulty comprehending both written and spoken language.

People with a damaged right temporal lobe tend to be unable to recognise songs, faces or paintings. The association areas of the temporal lobe are also important for the processing of memory.

CHECK YOUR LEARNING 5.2

Describe and explain

1 **Describe** the structure of the cerebral cortex. In your answer, refer to the thickness of the cortex, its size, the convolutions and fissures.
2 **Identify** the four lobes of the brain.

Apply, analyse and interpret

3 **Compare** and **differentiate** between the following:
   - **a** primary auditory cortex
   - **b** primary somatosensory cortex
   - **c** primary visual cortex
   - **d** primary motor cortex

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 5.2
- » Suggested research
  Worksheet: 5.2
  Brain behaviour relationships
- » Challenge
  Worksheet: 5.2
  Cortical area
- » Video
  The brain

5.3 Specific brain regions

KEY IDEAS

In this section, you will learn about:

- hemispheric specialisation and specific brain regions, including Broca's area, Wernicke's area and Geschwind's territory.

In Section 5.2, the association areas of the frontal and temporal lobes were identified, and both of these regions were implicated in the role of language production and comprehension. This section will expand on the role of Broca's area and Wernicke's area. It will also introduce Geschwind's territory.

Broca's area

As discussed already in the section on the frontal lobe, Broca's area is responsible for the coordination of speech. In 1861, Pierre Paul Broca, a young surgeon, was working in a hospital at Bicêtre in Paris, when a patient was transferred from the insane asylum to the surgical ward because of gangrene in his right leg. This patient had great difficulty speaking and was only able to make a few sounds, the most common being one that sounded like 'tan'. In fact, 'tan, tan' was his answer to most questions and led to the hospital staff nicknaming him Tan. Tan was able to communicate by gestures but occasionally would angrily blurt out the phrase, 'Sacré nom de Dieu!' ('Holy name of God!') in extreme frustration.



FIGURE 1 Pierre Paul Broca (1824–80), French physician

Broca was fascinated with his new patient. Tan was 51 years old and had been in hospital for 21 years following a head injury that left him without the ability to speak. Apart from Tan's lack of speaking ability, he was otherwise intellectually normal. In addition, he was developing paralysis in his right arm and right leg.



FIGURE 2 Tan's brain is on display at the Musée de l'Homme and the Musée Dupuytren in Paris.

Tan died just six days after becoming Broca's patient. Broca performed an autopsy on him and found significant damage to Tan's left hemisphere. The lesion (tissue damage) was centred in Tan's left frontal lobe near the motor cortex region that controls the muscles used in speech.

Broca pinpointed this specific location of the brain as being responsible for the function of speech production – an area of the brain now known as 'Broca's area'. Broca's case study led to an important breakthrough. While such case studies lack control (refer to Chapter 1 for limitations with case studies), Broca was able to study Tan's case in detail because he had been a hospital patient for such a long time.

Broca went on to study another eight patients with similar language difficulties (people unable to speak fluently, but able to comprehend language) and found similar brain damage. This specific deficit in the brain destroyed speech in an otherwise normal healthy person (see Broca's aphasia in Chapter 6). Broca provided the first compelling clinical evidence that clearly connected a specific behaviour to a specific brain area, an example of localisation of function.

Wernicke's area

As discussed earlier in the section on association areas of the temporal lobe, Wernicke's area is responsible for language reception and interpretation, and for the creation of grammatically correct speech.

Broca's findings initially received some criticism because the idea of a single area of the brain being responsible for certain behaviours (location of function) had not been accepted. However, further support for Broca came just 12 years later: in 1873, a German physician named Carl Wernicke examined a patient with a different language difficulty that he attributed to damage in a different region of the brain – the area now known as Wernicke's area.

See Chapter 6 for information on two types of aphasia (Broca's aphasia and Wernicke's aphasia) caused by injury to the frontal and temporal lobes.



FIGURE 3 Carl Wernicke

Geschwind's territory

More recently, a third area of the brain that is important to language has been identified. British scientists have discovered that the inferior parietal lobule provides a connection between Broca's area and Wernicke's area via a bundle of nerve fibres. They have named this area **Geschwind's territory**, after the famous American neurologist Norman Geschwind, who had theorised that there might be such a connection (Geschwind, 1970).

Geschwind's territory
area of the brain that provides a connection between Broca's area and Wernicke's area

Geschwind and other scientists had been puzzling over how humans internalise words – how we come to understand that a word has a particular meaning or an association with a particular object (Prpić, 2015). How do we hear a sound, understand that it represents a word, and that the word then represents a certain object or concept? We have known for some time that Broca's area and Wernicke's area are linked by the arcuate fasciculus, a bundle of curved neural fibres. The connection helps explain how we take the input from words we hear or read and link them to those areas of the brain responsible for speech production.

More recent research suggests that Geschwind's territory provides a parallel pathway connecting Broca's area and Wernicke's area, but that the connection does not develop until we reach five to seven years of age (Bell, 2013). This is important because it suggests that there are some vital connections in the brain that do not form until well into childhood (Bell, 2013).

Geschwind's territory is located in an area in the brain where the neurons are multimodal – able to simultaneously process a range of stimuli, such as auditory and visual. As a result, it is the ideal area for processing the multiple properties of words – how they sound, how they look and what they represent. Therefore, Geschwind's territory enables the brain to interpret and classify things, which is a prerequisite for abstract thinking (Prpić, 2015).

Thus, the discovery of Geschwind's territory is vital to our understanding of how humans developed higher order thinking and the ability to construct and maintain abstract concepts.

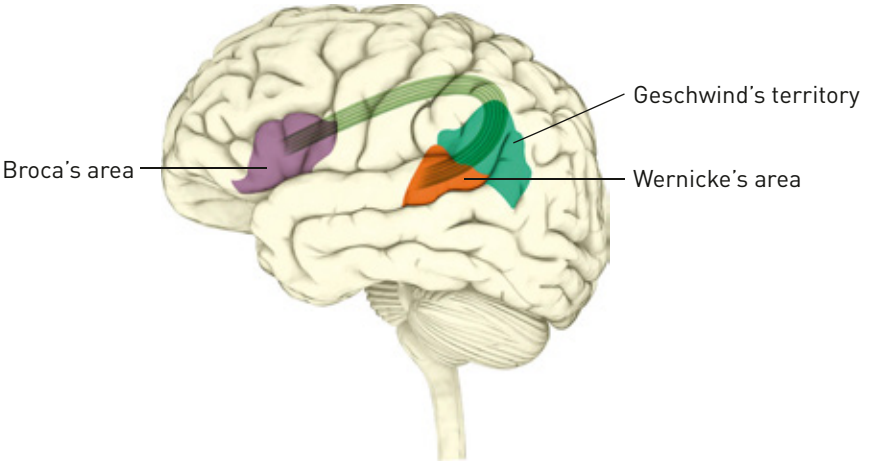


FIGURE 4 Geschwind's territory is located between Broca's area and Wernicke's area.

CHECK YOUR LEARNING 5.3

Describe and explain

1 **Describe** localisation of function.

2 **Explain** the function of the following areas:
- **a** Broca's area
- **b** Wernicke's area
- **c** Geschwind's territory

3 Jason's unable to form structural or coherent sentences. **Identify** which area of the brain would most likely be affacted.

Apply, analyse and interpret

4 **Compare** Broca's, Wernicke's and Geschwind's area.

Investigate, evaluate and communicate

5 **Investigate** a specific area of the brain. Choose one lobe, or an area in a particular lobe. Summarise the effects of damage to this area.

Check your obook assess for these additional resources and more:

- » **Student book questions**
  Check your learning 5.3
- » **Weblink**
  Language production
- » **Weblink**
  Speech in the brain
- » **Weblink**
  Connecting brain functions

SCIENCE AS A HUMAN ENDEAVOUR

5.4 The case of Phineas Gage

KEY IDEAS

In this section, you will learn about:

- how localisation of function in the brain can be used to develop projected behavioural impacts when these areas are damaged.

Phineas Gage was a railway worker who, in 1848, was involved in a workplace accident that resulted in a metal rod being thrust through the top of his skull, behind his left eye socket and through his left cheekbone. Miraculously, he survived the accident and was able to speak and move because the motor cortex and Broca's area had not been affected. However, Gage was left with permanent brain damage to his prefrontal cortex. The brain damage resulted in personality changes; he went from being a calm and responsible man (prior to the accident), to one who was emotionally volatile, impulsive, irresponsible and incapable of making good judgments or carrying out planned behaviours. Gage's unfortunate accident, while tragic for him, gave researchers valuable information about the functions of the prefrontal cortex.

Gage was 25 at the time of the accident, and went on to live a relatively normal life, considering his injuries, until he died at age 36. After the incident, his friends reported changes in his temperament, and his mother suggested that there may be some memory impairment. Despite this, most of the damage appears to have been temporary, and Gage was able to return to being a functional and socially normal person. His recovery took time, which can be seen in Figure 2. After approximately two months, Gage was able to return home to live with his parents and slowly began to complete small, relatively easy chores. Four years after the accident, doctors determined that he had recovered, though with some ongoing personality changes. He went on to work in Chile, until 1860 when he began to experience epileptic seizures, which ultimately caused his death. Gage's accident provided insight into the frontal lobe's involvement.

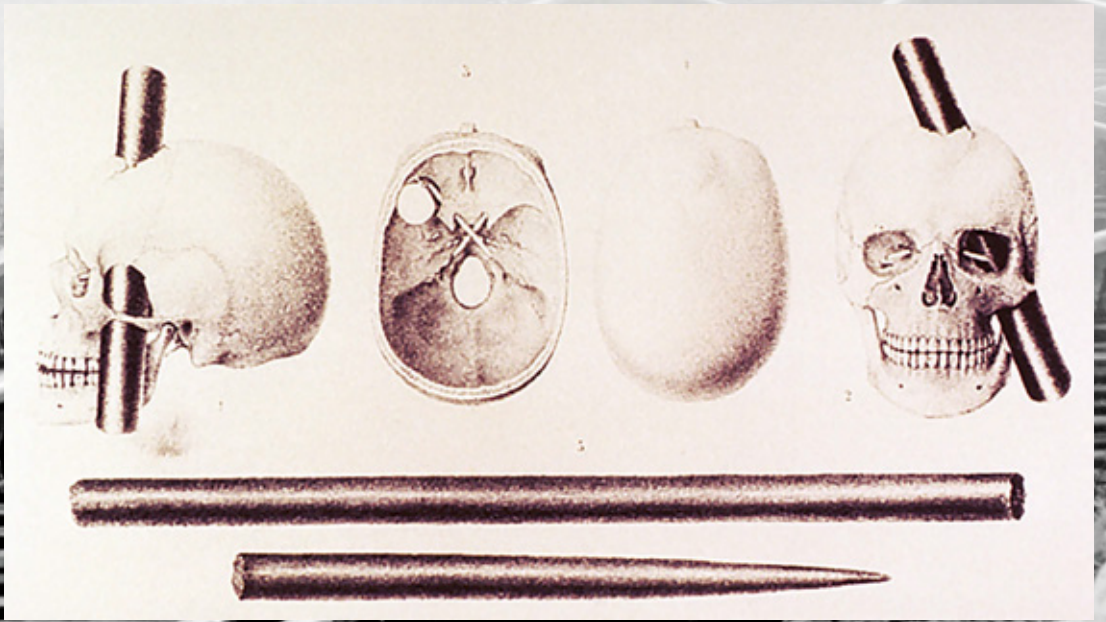


FIGURE 1 Phineas Gage was involved is a serious accident at work. A metal rod was thrust through his skull behind the eye socket, penetrating the prefrontal cortex of his frontal lobe.

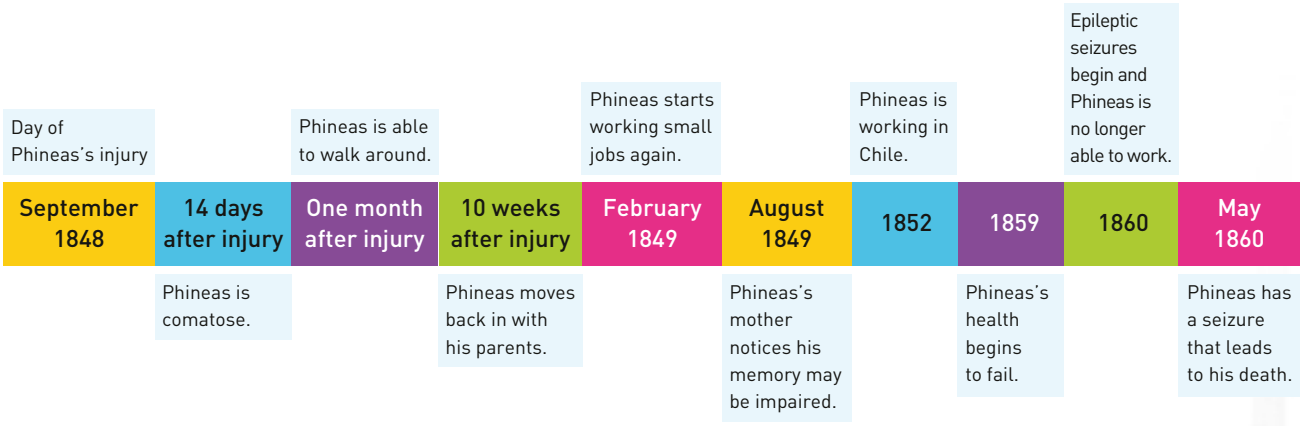


FIGURE 2 Timeline of Phineas Gage's life after his injury

CHECK YOUR LEARNING 5.4

Describe and explain

1 **Describe** the areas of Gage's brain that were affected by the metal rod that penetrated his skull.

2 **Explain** why the case of Phineas Gage is important in understanding localisation of areas of the brain.

Apply, analyse and interpret

3 Based on your knowledge of brain structure and function, **consider** what may have happened if the metal rod had gone through the right eye socket rather than the left.

Investigate, evaluate and communicate

4 Based on your understanding of the brain's functions, **evaluate** why Gage was able to continue his life relatively normally.

5 **Investigate** what treatments would be available if a similar injury occurred today.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 5.4
- » Suggested research
  Worksheet: 5.4 Brain structure (e.g. Phineas Gage)
- » Weblink
  Phineas Gage
- » Weblink
  Brain injury

CHAPTER 5

Review

Summary

5.1
- The brain comprises the hindbrain, midbrain and forebrain. The hindbrain includes the cerebellum, medulla and part of the reticular formation. The midbrain includes part of the reticular formation. The forebrain includes the thalamus, hypothalamus and cerebrum.
- The thalamus is responsible for regulation of sleep and is a relay centre for incoming sensory information to parts of the cortex for further processing and interpretation.
- The left and right hemispheres of the brain are connected by the corpus callosum.

5.2
- The cerebral cortex is the 3-millimetre-thick, highly convoluted outer covering of the cerebrum. It is the centre of human capacity to think, solve problems, plan and communicate using formal language.
- The frontal lobe in each hemisphere includes the primary motor cortex, which is responsible for body movement.
- Each of the other lobes contains a primary sensory area: parietal lobe (primary somatosensory cortex), temporal lobe (primary auditory cortex) and occipital lobe (primary visual cortex).

5.3
- The association area of the left frontal lobe contains Broca's area, which is responsible for speech production. Other parts of the association cortex in both the left and right frontal lobes are involved in higher order mental processes and in the regulation of emotion and planning.
- The association areas of the temporal lobe are responsible for auditory processing and the left lobe contains Wernicke's area (for comprehension of speech). These areas are also involved in recognition of objects and faces and in memory.
- In general, each hemisphere is responsible for contralateral (opposite) sides of the body, but the hemispheres are also specialised in performing particular functions. In most people, the left hemisphere controls language and the right hemisphere controls types of spatial and visual processing.

Key terms

- amygdala
- association areas
- Broca's area
- cerebellum
- corpus callosum
- forebrain
- frontal lobe
- Geschwind's territory
- hindbrain
- hippocampus
- localisation of function
- midbrain
- occipital lobe
- parietal lobe
- reticular formation
- temporal lobe
- Wernicke's area

Revision questions

Multiple choice

1 When asked to perform a number of actions in a specific order (e.g. touch your nose and then your toes), the part of the brain you are primarily activating is the _____.
   - **a** cerebellum
   - **b** thalamus
   - **c** corpus callosum
   - **d** hypothalamus

2 Heart-rate activity and perspiration are controlled by the _____.
   - **a** medulla
   - **b** thalamus
   - **c** corpus callosum
   - **d** reticular formation

3 Which of the following is not involved in producing body movement?
   - **a** motor cortex
   - **b** medulla
   - **c** cerebellum
   - **d** frontal lobe

4 What is a particular behaviour typically controlled by?
   - **a** a single brain structure
   - **b** one or two structures
   - **c** a network of structures
   - **d** the motor cortex only

5 It would be the most damaging to humans if the _____ was impacted by a brain injury.
   - **a** corpus callosum
   - **b** medulla
   - **c** reticular formation
   - **d** thalamus

6 The cerebral cortex of the human brain is a much-folded layer covering the cerebrum. What is the advantage of this folding?
   - **a** It allows a greater volume and thus number of brain cells to be contained within the human skull.
   - **b** It allows greater blood flow to the cortex and therefore more oxygen can be available.
   - **c** It allows greater blood flow to the cortex and therefore more blood sugar can be available.
   - **d** All the answers are correct.

7 Which of the following statements about hemispheric specialisation is true?
   - **a** The right hemisphere controls all the language functions in all humans.
   - **b** The left hemisphere controls all spatial interpretation in all humans.
   - **c** Most functions are performed by the left and right hemispheres working together: the left hemisphere dominates in logical, sequential thought and the right hemisphere dominates in intuitive and creative processing.
   - **d** Most functions are performed by the left and right hemispheres working together: the left hemisphere dominates in artistic appreciation and the right hemisphere dominates in mathematical processing such as algebra.

8 The left cerebral hemisphere generally controls the right side of the body and vice versa. This is called _____ organisation.
   - **a** unilateral
   - **b** contralateral
   - **c** ipsilateral
   - **d** bilateral

9 If your temporal lobe were electrically stimulated, what would probably be your experience?
   - **a** You would hear sounds.
   - **b** You would see visual stimuli.
   - **c** You would feel sensations in your skin.
   - **d** You would move parts of your body.

10 How does the left hemisphere process information?
   - **a** analytically
   - **b** visuospatially
   - **c** globally
   - **d** independently

11 Damage to the _____ can result in deficits in the ability to plan, problem solve, and make sound judgments.

- **a** temporal lobe
- **b** occipital lobe
- **c** thalamus
- **d** association area

12 Geschwind's territory could be defined as:

- **a** the area of the brain that connects Broca's and Wernicke's area
- **b** the area of the brain responsible for sending information to Broca's area
- **c** the area of the brain next to Broca's area
- **d** the area of the brain next to Wernicke's area.

13 The primary cortex found in the occipital lobe is:

- **a** the primary motor cortex
- **b** the primary auditory cortex
- **c** the primary somatosensory cortex
- **d** the primary visual cortex.

14 The cerebellum is part of the:

- **a** Broca's area
- **b** Temporal lobe
- **c** Primary motor cortex
- **d** forebrain.

15 The hippocampus is implicated in:

- **a** emotion and aggression
- **b** memory
- **c** connecting the two hemispheres of the brain
- **d** balance and movement

Short answer

Describe and explain

★ **16** On a separate piece of paper, complete the following table to **describe** the function and structure of the following:

	Structure	Function
Hindbrain (cerebellum and medulla)		
Midbrain (reticular formation)		
Forebrain (hypothalamus, thalamus and cerebrum)		

★★ **17** **Describe** the role of the thalamus in processing sensory information.

★ **18** **Describe** the role of the hypothalamus in our survival.

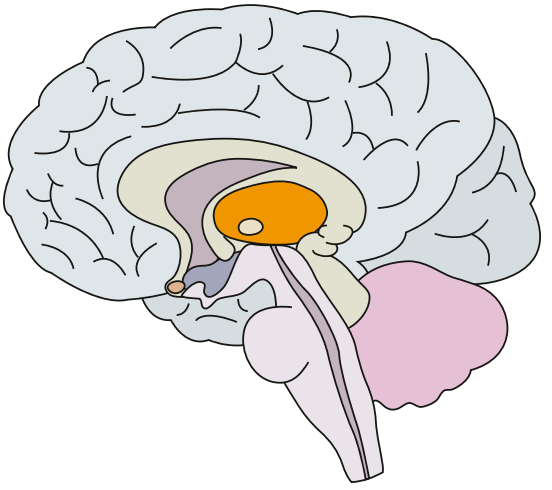
★★ **19** **Explain** the role of the reticular formation in our daily life.

★ **20** A patient has a head injury that resulted in the inability to move her left hand. **Identify** which part of her brain was most likely damaged.

★ **21** On a separate piece of paper, complete the table below to **explain** the role of the cortex in each lobe:

Lobe of the brain	Cortex
Temporal lobe	
Frontal lobe	
Occipital lobe	

22 Label the diagram below to **identify** the location of each of the lobes of the brain:



Apply, analyse and interpret

★★ **23** **Differentiate** between the roles of Broca's and Wernicke's area.

★★ **24** **Distinguish** between the forebrain, midbrain and hindbrain.

Investigate, evaluate and communicate

★★★ **25** The corpus callosum bridges the gap between the two hemispheres of the brain. Despite its importance in facilitating communication between the hemispheres, people are able to lead relatively normal lives when this is medically severed. **Assess** why this is possible.

★★★ **26** The frontal lobe has several association areas including language, emotional regulation and the prefrontal cortex. **Discuss** the behaviour and personality changes seen in Phineas Gage referring to the role of the association areas.

★★ **27** **Consider** the discovery of Geschwind's territory. **Comment** on the impact this had on understanding the brain.

★★ **28** **Hypothesise** what may happen to someone with damage to their occipital lobe.

★★ **29** **Discuss** the benefits of Broca being able to replicate his study on further patients.

★★ **30** Broca and Wernicke were able to study patients who had existing injuries. **Propose** another way that their research could have been conducted.

Check your obook assess for these additional resources and more:

» Student book questions
Chapter 5 Review

» Revision notes
Revision notes for Chapter 5

» assess quiz
Test your understanding with an auto-correcting multiple-choice quiz

» Flashcard glossary
Key terms in Chapter 5

CHAPTER 6

Developing and malfunctioning brains

Recent years have seen significant advances made in our understanding of the development of the human brain, from infancy through to adolescence and adulthood. Beginning in the womb, our brains begin to grow and develop at a very early stage in life. While you were still a foetus, your brain started to function at 10 weeks – and continues to refine all the way into early adulthood.

These periods of rapid development from infancy to adolescence inform who we become. Even during the earliest period of development, our experience of our environment, along with predetermined genetic factors, play an important role in what scientists believe is an orderly process over time.

We can gain valuable knowledge about the way the human brain works from looking at the behaviour and functioning of individuals who have sustained a brain injury, or cases where the brain has been damaged and is not working in a typical way. Abnormalities may result from brain injury, invasive surgery, illness or unusual neural connections. All these situations affect cognitive processes, some of which typically occur without conscious awareness. Each situation offers insight into the way the brain works and provides us with a greater understanding of our conscious experience.

In this chapter, you will learn about brain development in infancy and adolescence. You will also examine 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.

OBJECTIVES

→ Understand infancy and adolescence as periods of rapid development and changes in brain structure and function, with reference to myelin, synaptic pruning and the forebrain (frontal lobe)

→ Communicate the nature of neural plasticity with reference to brain development (deprived versus enriched environments) and brain damage.

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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FIGURE 1 Children develop with plasticity of the brain, and adults can recover from injury because of neural plasticity.

SUGGESTED RESEARCH

SUGGESTED RESEARCH	**6.1** The influence of learning on infant brain development (e.g. the effects of learning in infancy on brain structure and function in adolescence in Rutgers University, 2014)
SUGGESTED RESEARCH	**6.1** Brain-behaviour relationships in the developing brain (e.g. the adolescent brain in *Inside the teenage brain* 2002).
SUGGESTED RESEARCH	**6.3** Neuroplasticity in enriched and deprived environments (e.g. brain changes in response to experience in Rosenzweig, Bennet, & Diamond, 1962; Hyde, Lerch, Norton, Forgeard, Winner, Evans, & Schlaug, 2009; Draganski, Gaser, Busch, Schuierer, Bodgahn, & May, 2004).

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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6.1 Plasticity over the lifespan

KEY IDEAS

In this section, you will learn about:

- brain plasticity in infancy
- brain development during adolescence.

infancy
a lifespan stage, between birth and childhood (approximately 0 to 2 years of age)

adolescence
a lifespan stage, between childhood and young adulthood (approximately 12 or 13 years to 18 or 19 years of age)

plasticity
the ability of the brain's synapses to be modified

developmental plasticity
the development and consolidation of neural pathways in babies, children and adolescents

adaptive plasticity
the ability of the brain to change, adapt and grow throughout life

proliferation
the first stage in the development of the nervous system, where cells destined to become neurons divide and multiply

migration
during developmental plasticity, the movement of newly formed neurons

Infancy and **adolescence** are periods of rapid development of the brain. However, the brain is capable of learning throughout the lifespan because of its **plasticity**. Plasticity of the brain refers to the way it changes in response to stimulation from the environment. The process of plasticity occurs at the synaptic connections in the brain. Plasticity is necessary for learning to take place and is present throughout a healthy person's lifetime.

Brain plasticity in infancy

Generally, an infant or a child's brain will have more plasticity than an adult's brain. This is referred to as **developmental plasticity** – the ability of synapses to be modified (Garrett, 2009). Although changes to the brain occur more frequently in the foetal stage, as well as during infancy, childhood and adolescence (developmental plasticity), these changes continue throughout life as learning takes place (**adaptive plasticity**) and do not diminish with age. Adaptive plasticity is covered in more detail in Section 6.2.

Prior to birth and for the first years of life, a child's neurons are quite flexible in terms of their function. The development of the nervous system starts before birth when the brain and spinal cord are formed. Development then goes through five stages:

- proliferation
- migration
- circuit formation
- synaptic pruning
- myelination.

Proliferation is the division and multiplication of the unborn baby's cells that will become neurons, which creates approximately 250 000 cells per minute. This process marks the beginning of the development of the nervous system.

During **migration**, newly formed neurons move outward to their destined location. The role that a particular neuron has might be determined by where it is located at the time of its formation. Different brain structures form during different stages of development.



FIGURE 1 Developmental plasticity is evident during infancy.

SUGGESTED RESEARCH
6.1 The influence of learning on infant brain development
Go to page 456 »

However, before a baby is born and just after birth, the neurons are flexible. This is why brain tissue from a foetus can be transplanted into part of an adult brain and the transplanted neurons will adapt, form synapses and take on the function of the brain area into which they have been placed (Garrett, 2009).

Circuit formation occurs when the axons of new neurons grow out to target cells and form synapses with them, for example, axons for motor neurons grow to the spinal cord where the neurons form synapses with other neurons in this location. This process of forming new synapses is also referred to as **synaptogenesis**.

circuit formation
a process that involves axons of new neurons growing out to target cells, forming new synapses (also known as synaptogenesis)

synaptogenesis
the process of moulding or forming new synapses

Synaptic pruning involves the elimination of excess neurons and synapses; that is, those that have not established a connection with a neighbouring cell will die. The nervous system also refines itself by eliminating excessive synapses and strengthening or weakening synapses according to whether their presynaptic and postsynaptic neurons fire together. A neuron that does not fire at the same time as its neighbouring neurons is probably a neuron that has found its way into an inappropriate area during synapse formation, and might be part of circuit pruning. Pruning occurs during infancy and childhood, but there is a second wave of pruning in early adolescence. During this entire process, the brain produces many more neurons than will ever be used; the excess will eventually be eliminated through pruning.

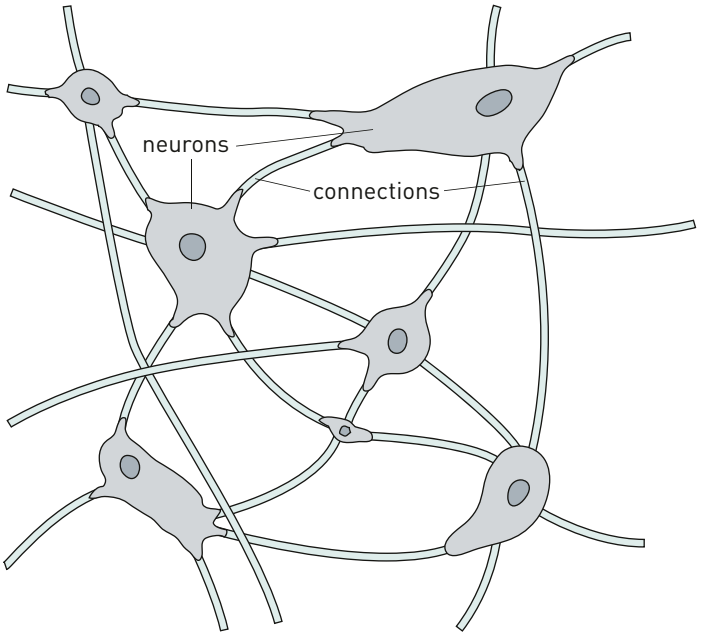


FIGURE 2 During development in childhood and adolescence, the brain develops many neural pathways and connections. Unused connections are pruned.

Myelination, a process where the axons of the neurons in a child's brain become insulated by myelin, is the final stage before the brain becomes fully mature. Myelin is a white, fatty, waxy substance that coats some axons and protects them from electrical interference from other neurons. Myelin speeds up the rate of transmission of signals within the neuron. The myelination process begins before a baby is born and does not finish until about 23 years of age (Sowell *et al.*, 1999). The lower structures of the brain are the first to be myelinated. This is followed by the cerebral hemispheres, where myelination begins at the occipital lobes, followed by the temporal and parietal lobes and, finally, the frontal lobes.

synaptic pruning
the loss of excess neurons and synapses usually formed in infancy and childhood

myelination
the production of the white, fatty covering that insulates a neuron's axon, speeds transmission and aids coordination

Research has found that during this time of heightened brain plasticity, learning new skills, such as how to speak a second language or how to play a musical instrument, can be easier than in later life. A child could pick up how to play the cello, for instance, with much greater ease than an adult could. Because a child's brain has greater plasticity than an adult's, it is able to use other parts of the brain to form alternative neural connections. A child's brain is also able to compensate for any missing or damaged part of the brain as a result of this plasticity. For example, it is more likely that a child will recover from damage to the part of the brain that is responsible for language than an adult will (Garrett, 2009). Table 1 provides summary of developmental plasticity.

Stage	Description
Proliferation	Foetal neurons divide and multiply, creating about 250 000 cells per minute.
Migration	Once formed, neurons move to their final location in the central nervous system and the locations determine what their function will become.
Circuit formation	The axons of the new neurons move outwards towards adjacent cells and circuits are completed.
Synaptic pruning	Pruning occurs in childhood and a second phase during adolescence. Far more neurons are created than will eventually be needed. During circuit pruning extra neurons are removed.
Myelination	Gradually, throughout childhood and adolescence and into young adulthood (about age 23), myelin sheathing grows around the axons of many neurons, insulating them and making neural transmission more efficient.

TABLE 1 Stages of developmental plasticity

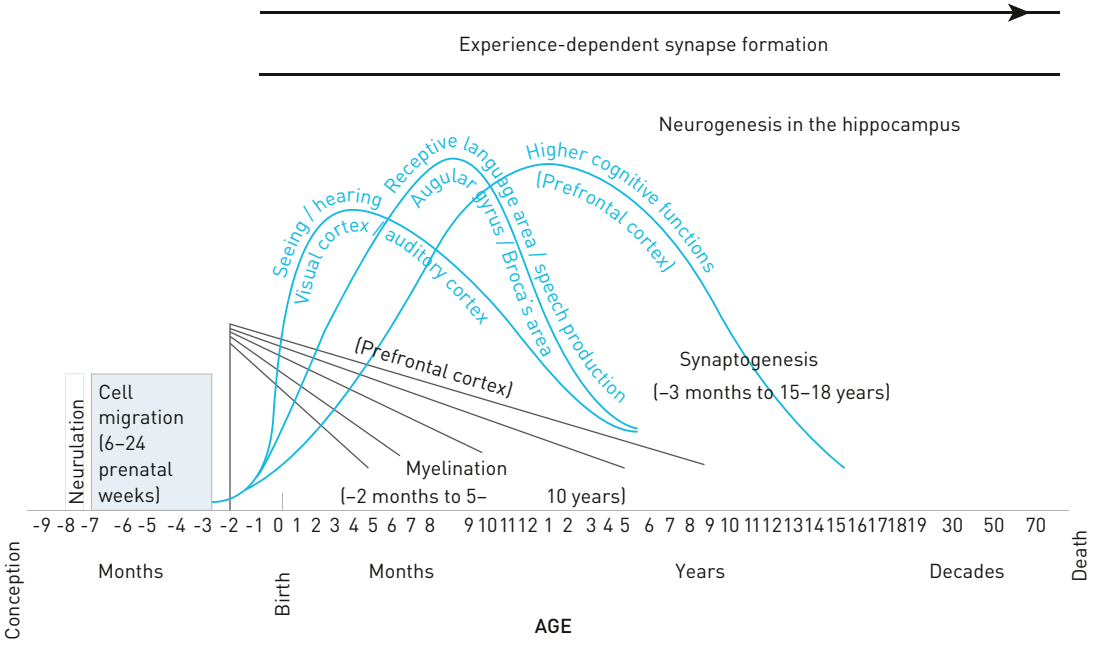


FIGURE 3 The development of different parts of the brain



FIGURE 4 The hearing and eyesight development of young children must be regularly checked for deficits.

SUGGESTED RESEARCH
6.1 Brain-behaviour relationships in the developing brain
Go to page 456 »

Brain development during adolescence

During adolescence in humans, there is a large amount of development in structures of the brain.

- **Cerebellum:** There is an increase in the number of neurons and synapses in the cerebellum, the part of the brain responsible for balance, muscle tone and the performance of motor skills. This might explain why some teenagers are more physically uncoordinated than older adults.
- **Amygdala:** The amygdala becomes more active in adolescence.
- **Corpus callosum:** The corpus callosum thickens and there is an increase in the number of connections (or nerve fibres) between the two hemispheres.
- **Frontal lobe** (including prefrontal cortex): The frontal lobe is responsible for motor movement and higher order thinking.

Frontal lobe development

The frontal lobe of the left hemisphere is the very last part of the brain to undergo the process of myelination.

Studies of adolescents' brains show a huge amount of development around puberty. The number of neurons and the complexity of their connections increase in the cerebellum. As unused connections developed throughout an adolescent's life so far are pruned, other useful connections are strengthened. The process of myelination continues through adolescence or later, with the highest brain levels myelinating last.



FIGURE 5 The teenage brain is still changing and developing, which may explain the differences in teenage emotion and behaviour.

During early adolescence, there is a second burst of production of cortical grey matter. Cortical grey matter is the covering of the cerebral hemispheres – it looks grey in colour because the axons do not have myelin covering them. The brain prunes the connections as it did during infancy and only retains the connections that are used. The last part of the brain to develop is the prefrontal cortex, which is responsible for problem-solving, complex planning, impulse control, risk management and critical thinking – perhaps a possible reason why adolescents can be very impulsive!

Neuroscientists have found that during this time, when the prefrontal cortex is still in development, the adolescent brain may rely instead on the amygdala, a part of the limbic system, which plays an important role in processing our emotions. The hyper-emotional states we might experience and bad decisions we might make during our teenage years could therefore be attributed to our brain relying on our amygdala to process information rather than our prefrontal cortex.

Our delayed ability to employ mature or rational thinking to make sensible or safe decisions is one of the reasons why some states in Australia, including Queensland, have increasingly strict rules in place for young, probationary licensed drivers. Certain restrictions apply when you drive using a P1 (red P plate) or P2 (green P plate) licence in Queensland. For example, P1 licence holders need to ensure that any passengers having a phone conversation do not use the loudspeaker, as this may distract the driver. Such restrictions are in place because statistics show younger, inexperienced drivers (17 to 20 years of age) are prone to more road accidents, representing almost 12.4 per cent of all road deaths in Queensland (Queensland Government, 2012).

While teenagers are, of course, capable of critical thinking, it is a process that becomes easier in adulthood when the prefrontal cortex is fully developed. As our understanding of brain development increases, it is becoming clear that this final process of brain development can continue into our mid-twenties. While society might say a person is an adult when they turn 18 and are given the right to vote and drive, in actual fact our brains are not fully developed until much later.

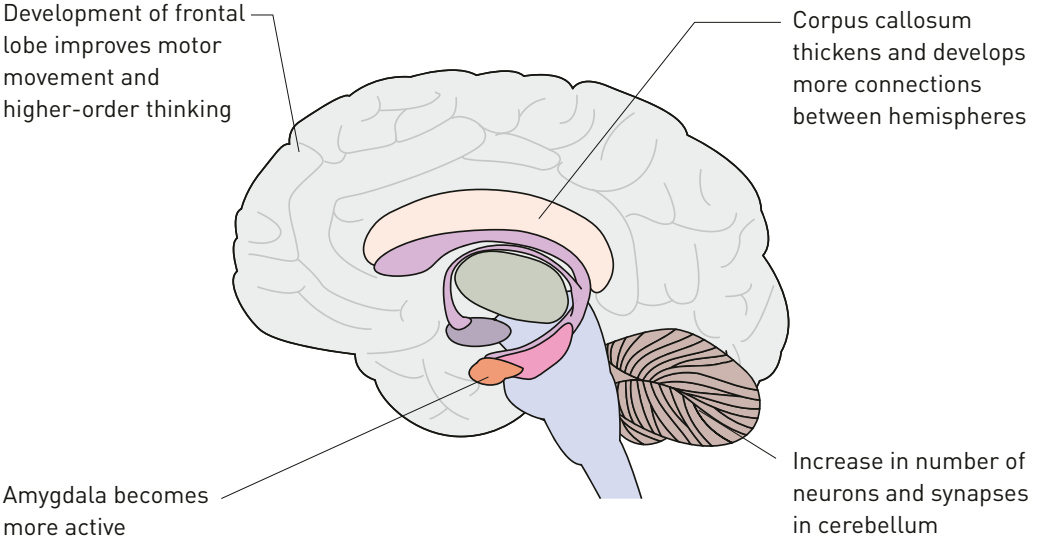


FIGURE 6 A teenage brain during development

Timing of experiences

As children and adolescents grow, their brains become less plastic and their neural pathways become more set. Certain stages in development can be suited to learning particular things. These periods are referred to as **sensitive periods** and are the best or optimum times for a developing individual to learn specific things. During sensitive periods, the growing brain needs specific types of stimulation in order to establish neural pathways. Usually, this stimulation occurs as part of a person's natural development. For instance, infants must be

sensitive period the best or optimum time for an individual to learn new things

exposed to language in the first year of life to allow them to use and understand language. This concept is explored more in Chapter 7.

As outlined in the following case study, some students manage their senior school studies better than others. Without doubt, the Queensland Certificate of Education (QCE) places considerable demands on students. How well students manage the QCE partly depends on their personal demands versus their resources balance. Schools and families need to ensure they provide senior students with adequate support and resources to strengthen their coping skills and help them achieve this important senior school qualification.



FIGURE 7 Human infants need to be exposed to language early in life to allow them to use and understand it.

CASE STUDY 6.1

Strength-based approaches to parenting in late adolescence

Katherine Smith, *The Age*, 4 June 2015

By the age of ten, the human brain has grown to adult size, but it takes another 15 or so years before it is fully operational, and securely under the control of its owner-operator, as any parent whose household is living through the occasional storms of adolescence and emerging adulthood will be well aware.

There are several strategies for survival parents can adopt, however, with the principles of positive psychology being among the best, according to psychologist Lea Waters.

Professor Waters leads the Centre for Positive Psychology at the University of Melbourne, and says 'pos psych' can help everyone build optimism and resilience to help them face life's tests and challenges, especially during the period of adolescence into young adulthood.

Brain development from ages 10–25

'Science has now shown the brain is not fully formed until the mid-20s,' Professor Waters explains. 'After the initial growth period of childhood, the adolescent brain begins to re-organise itself at around age 10, roughly coinciding with the onset of puberty.'

'It builds new systems and creates greater interconnections between the prefrontal cortex (where behaviour and personality are controlled) and the limbic system (where the emotional life and memory is controlled) and keeps doing this until the brain's neural architecture is fully formed at full adulthood around the mid-20s.

'But because of social and environmental effects, we're noticing two things. Puberty is occurring earlier, meaning adolescence is starting in pre-teen years, and the transition from adolescence into adulthood has been elongated into the early 20s. Psychologists are recognising this and are starting to study the possibility of a new life phase they are calling "emerging adulthood", which occurs roughly from the ages of 20–26.'

Professor Waters says psychologists have identified a new model of life pattern development.

Interestingly, most of the neural development occurring through the period of emerging adulthood takes place in areas of the brain that relate to relationships and regulator systems in the brain.

'While the early adolescent brain develops the reward systems (situated in our limbic system) which are responsible for motivation and action – thus explaining the sensation-seeking and risk-taking behaviour of young people this age – in late adolescence to emerging adulthood, brain development moves to focus on the prefrontal cortex,' Professor Waters says.

'The prefrontal cortex is responsible for our higher order, executive functions such as planning, problem-solving and decision-making.

'The development of the pre-frontal cortex, which builds our regulatory system (being rational), allows young people at this age to gain better impulse control over their reward system (being emotional) and this is why we start to see behaviour that is more adult-like by this age.'

Driving the brain

Professor Waters says using the metaphor of how a car works is useful.

'The limbic system is the accelerator and the prefrontal cortex is the brake. By the time a young person matures into adulthood (mid-20s) they know how to drive their brain. They know when to use their emotions to motivate themselves into action, and they know how to use their rationality to plan future actions and curb unhelpful impulses.

'But this ability to "drive their brain" in a mature way really doesn't occur until the mid-20s.'

The psychological process occurring during this time is called 'individuation' and it reflects the process of the young person becoming aware of who they are as separate from their parents and peers, according to Professor Waters.

'They establish their true and unique identity and they distinguish themselves from others. The process of individuation can be exhilarating and liberating, but it can also be fear-provoking, with the young person anxious about stepping into the unknown, and guilt-provoking in families which don't respond well to a young person separating themselves, or when young people feel they are being disloyal to their family as they separate and embrace independence.

'In addition, the trend of young people to live in the family home for longer makes the process of individuation difficult for parents and young people to navigate.'

If young people are participating in senior secondary or tertiary study, they are also likely to be experiencing the further challenges of balancing study commitments with part-time work, social life, romantic partnerships and down-time, the latter of which Professor Waters says is very necessary, and which Year 12 students in particular don't get enough of.

'Stress results from the imbalance of the demands made upon a person from the environment and the resources that person has to meet those demands,' she says.

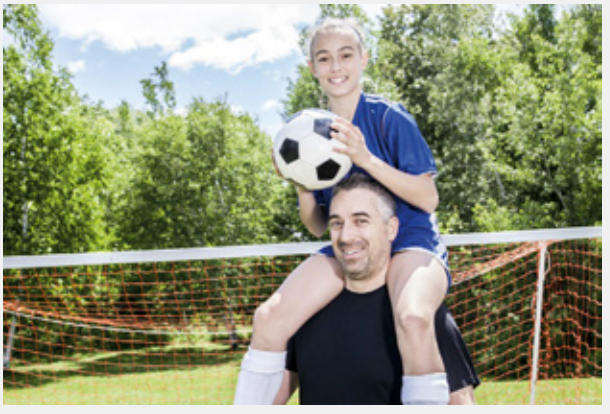




FIGURE 8 Strength-based parenting is built on encouraging children's abilities and qualities to cultivate a positive state.

A strength-based parenting approach

'My own research with final year school students shows that parents who take a strength-based approach with their teenaged sons and daughters have children who report higher levels of life satisfaction.'

Strength-based parenting is a style of parenting that seeks to deliberately identify and cultivate positive states, positive processes and positive qualities in one's children.

'When parents seek to identify and amplify their son or daughter's strengths this build confidence in teenagers and helps to buffer them against the stressors of teenage life.

'These strengths can be personality aspects such as courage, kindness, humour and so forth. They can be process strengths such as your son or daughter being a good communicator and problem-solver. The strengths can be talent-based such as academic ability, sporting ability, artistic ability, music ability, leadership ability and so on.

'Parenting in ways that connect an adolescent/emerging adult with their inherent strengths is energising for both the child and the parent.

'These strengths then form inner resources that a young person can draw upon to get a better balance between the demands/resources equation.'

CHECK YOUR LEARNING 6.1

Describe and explain

1 **Explain** what is meant by the term plasticity.
2 **Construct** a table outlining the stages of developmental plasticity.
3 **Describe** what synaptogenesis is.
4 **Explain** what is meant by the term pruning. In your response, reference the development of neurons in children and adults.
5 **Summarise** the myelination process.
6 **Explain** the term sensitive period.

Apply, analyse and interpret

7 **Consider** the importance of myelination.

Investigate, evaluate and communicate

8 **Evaluate** the changes that take place in the brain during adolescence. Choose one of the following topics: emotional stress, driving and decision making, social interaction and responsibility or critical thinking.
9 **Investigate** why it is so important for the prefrontal cortex to develop properly. **Evaluate** what the risks associated with disrupted development may be.

Check your obook assess for these additional resources and more:

» Student book questions
Check your learning 6.1

» Suggested research
Worksheet: 6.1 The influence of learning on infant brain development

» Weblink
The importance of brain plasticity

6.2 Brain trauma and plasticity

KEY IDEAS

In this section, you will learn about:

- adaptive plasticity
- Broca's aphasia and Wernicke's aphasia
- injury to the frontal and temperal lobes.

In this section we explore case studies of people with injury to the brain. We will explore the impact of the injury, and in some instances, the path to recovery. Investigating how the damaged brain works can help researchers find out how the normal, undamaged brain functions. We will consider the effects on the functioning of people who have had significant injury to specific parts of their brain, such as those who suffer from particular types of language difficulties (including Broca's and Wernicke's aphasia) as a result of brain damage.

Adaptive plasticity

Although the developmental plasticity of a young person's brain will diminish with age, the areas of the cerebral cortices remain plastic throughout life; this is known as adaptive plasticity, where the brain changes and develops as a result of new experiences. In other words, these parts of the brain can be shaped by learning and experience (Kandel & O'Dell, 1992; Katz & Shatz, 1996; Singer, 1995).

Adaptive plasticity enables older brains to be modified through experience or learning (Garrett, 2009). Adults continue to develop synapses as a result of experience; stimulating experiences and environment shape the construction and remodelling of a person's brain throughout life.

This process of reorganisation refers to a shift in connections that might alter the function of a particular area of the brain (Garrett, 2009). Adults continue to develop more synapses as they have new experiences and learn. The brain can also continue to develop and recover from serious injury. Stem cells in some parts of the brain continue to create neurons throughout life, enabling the brain to adapt and cope with new experiences.

The more different cognitive activities a person undertakes and the more active the brain remains, the more plastic it stays throughout life.

aphasia
the impairment of language caused by damage to the brain (usually a stroke)

Broca's aphasia
a result of damage to Broca's area that leads to difficulty in expressing messages in words or sentences, but the ability to comprehend speech is largely unaffected

Injury to the frontal and temporal lobes

Aphasia (pronounced *a-FAZE-yuh*) is the impairment of language caused by damage to the brain (usually by stroke). The Australian Aphasia Association estimates that about 80 000 Australians have aphasia as a result of stroke (2010). Aphasia can affect talking, reading, writing and understanding others, but it does not affect intelligence. It is also likely that a person with aphasia can experience problems with relationships and self-identity.

There are several types of aphasia, with two being the most common. The first, **Broca's aphasia,** is a result of damage to Broca's area (located in the left frontal lobe), and often surrounding areas. It is often referred to as expressive aphasia (a common term that refers to Broca's aphasia) because it leads to difficulty in expressing messages in words or sentences.

The second, **Wernicke's aphasia,** results from damage to Wernicke's area, located in the left temporal lobe near the parietal lobe boundary. Wernicke's aphasia causes difficulty in understanding written and spoken language that makes sense to others.

Wernicke's aphasia results from damage to Wernicke's area that causes difficulty in understanding written and spoken language that makes sense to others

Broca's aphasia

As introduced in Chapter 5, in 1861, Pierre Paul Broca, a young surgeon working in a hospital in Paris, pinpointed a specific location of the brain as being responsible for the function of speech. A person with Broca's aphasia has difficulty expressing messages in words or sentences, but their ability to comprehend speech is largely unaffected. Typically, little speech is produced and what is produced tends to be slow; words are generated with considerable effort and are poorly articulated. Short words are often left out.

Broca's aphasia has the following characteristics:

- Speech is non-fluent. Typically, there are pauses between words, especially those that are not well rehearsed. As a result, speech tends to be broken, with some people managing only a couple of words at a time. Speech involves great effort and is laboured.
- Partial or complete loss of the ability to recall names (**anomia**). The person may have trouble finding and naming the right words.
- Articulation can be difficult and words may be mispronounced.
- Speech lacks grammar (**aggramatism**). Speech does not follow the grammatical rules – it lacks syntax. Speech tends to contain nouns (naming words) and verbs (action words) but lacks other words that give grammar or function. For example, 'Drive car' is spoken instead of 'I want to drive the new car', and 'Send money' instead of 'Can you please send me some money?' Speech is severely limited but not necessarily to just one word – Tan's case, introduced in Chapter 5, showed he lost the ability to speak, which was especially extreme. Depending on the severity of the damage, the meaning of the speech can often still be grasped despite sentences being grammatically incorrect. This is similar to the telegraphic speech used by the average child at 24 months of age – it sounds like basic information given in a short note (for example, 'Give toy').
- Writing can be difficult.
- There may be mild comprehension difficulties. People with Broca's aphasia can usually comprehend spoken and written language. Occasionally, comprehension is impaired and, in these cases, it is usually in relation to complex sentences that depend on grammatical words. For example, the question, 'Is it hot in summer?' is understood, but, 'Brisbane Broncos was beaten by Gold Coast Titans' can present difficulties as only the words 'Brisbane', 'beat' and 'Gold Coast' may be recognised and interpreted as 'Brisbane beat Gold Coast'.

anomia partial or complete loss of the ability to recall names

agrammatism verbal communication that lacks grammar (syntax) – see also Wernicke's aphasia

CHALLENGE 6.2

Dance

Dance is a language of gestures. The area that corresponds to Broca's area in the right frontal lobe is involved in dancing. Propose why a person with damage to Broca's area would find dancing hard.

There is some hope for people with Broca's aphasia. Within the first 12 months after the brain trauma, a few people may get back some words or even recover spontaneously. Until recently, recovery was seen as extremely unlikely if there is no improvement during the

first year following the damage; however, a recent study on patients with long-term Broca's aphasia found some improvement after therapy that focused on relearning the rules (syntax) of language (Pulvermüller, 2005). Despite irreversible damage to Broca's area, there was improvement in these participants' ability to communicate using language because different areas of the brain took over the task of communicating language. This shows that function can develop in a different region of the brain following injury and is known as plasticity of the brain, a concept discussed earlier in this chapter.

Wernicke's aphasia

As discussed in Chapter 5, in 1873, a German physician named Carl Wernicke examined a patient with a different language difficulty that he attributed to damage in a different region of the brain – the area now known as Wernicke's area.

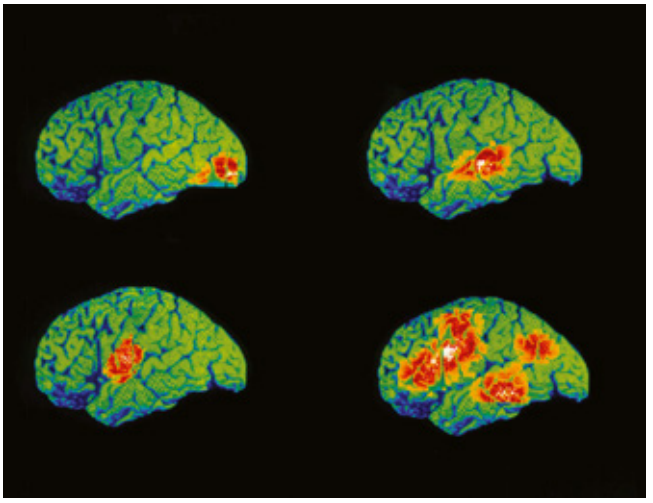


FIGURE 1 This PET scan shows the seeing, hearing, thinking and speaking areas of the brain.

Wernicke's aphasia results from damage to Wernicke's area, located in the left temporal lobe near the parietal lobe boundary. A person with Wernicke's aphasia has difficulty understanding written and spoken language, and in producing written and spoken language that makes sense to others. It is often referred to as **receptive aphasia**, a misleading term because the difficulty is not just limited to understanding language. Speech is fluent, but does not make sense. The words are articulated and flow one after another, but combinations of words are nonsensical. Unlike Broca's aphasia, people with Wernicke's aphasia talk freely and rapidly but, while they utter many words, they say very little that makes sense. They are tragically cut off by language – what they hear is gibberish to them and what they say sounds like gibberish.

receptive aphasia a term for Wernicke's aphasia in which an individual is unable to understand language in its written or spoken form

The following example is taken from a conversation between Howard Gardner, a well-known cognitive psychologist, and a patient with Wernicke's aphasia.

> 'What kind of work have you done, Mr Johnson?' I asked.
>
> 'We, the kids, all of us, and I were working for a long time in the … you know … it's the kind of space, I mean place, rear to the spedwan …'
>
> At this point, I interjected, 'Excuse me, but I wanted to know what work you have been doing.'
>
> 'If you had said that, we had said that, poomerm near the fortunate, forpunate, tamppoo, all around the fourth of martz. Oh, I get all confused,' he replied, looking somewhat puzzled that the stream of language did not appear to satisfy me.
>
> Gardner, 1978

Wernicke's aphasia has the following characteristics:

- Speech is fluent. To a casual listener, someone who is not listening for understanding, the speech flows quite normally.
- There is partial or complete loss of the ability to recall names (anomia). The person may have trouble finding and using the right words.
- Nonsense words are used. While sentences may seem grammatical, the person may use meaningless words and nonsense syllables, or mispronounce words.
- There can be difficulty understanding both written and spoken language.
- There can be difficulty producing both written and spoken language that makes sense to others.

Comparison between Broca's aphasia and Wernicke's aphasia

The typical patterns that characterise Broca's and Wernicke's aphasia are outlined in Table 1.

	Broca's aphasia	Wernicke's aphasia
Location of brain damage	Left frontal lobe near motor cortex	Left temporal lobe near parietal cortex
Language difficulties	Difficultly expressing themselves in words or sentences but their ability to understand written and spoken language is largely unaffected	Difficulty understanding written and spoken language and producing written and spoken language that makes sense to others
Fluency of speech	Non-fluent, slow, deliberate and effortful	Very fluent but makes no sense
Ability to find and use correct names for words	Moderate to severe difficulty	Mild to severe difficulty
Repetition of words	Moderate to severe	Mild to moderate

TABLE 1 Comparison between Broca's aphasia and Wernicke's aphasia

CHECK YOUR LEARNING 6.2

Describe and explain

1 **Explain** what Broca's aphasia and Wernicke's aphasia are and compare both.

Apply, analyse and interpret

2 **Determine** whether each of the following statements relates to Broca's aphasia, Wernicke's aphasia, both or neither:
- **a** It is caused by damage to a specific area usually in the left frontal lobe.
- **b** It is caused by damage to a specific area usually in the right temporal lobe.
- **c** Speech is slow, laboured and fragmented.
- **d** Speech tends to contain nouns and verbs only.
- **e** Speech is fluent.
- **f** A person's ability to write is impaired.
- **g** A person's ability to read is impaired.
- **h** A person cannot understand spoken language.

3 Tan, the subject of Broca's famous case study, was known at times to curse out of frustration. He was able to do this with relative ease, despite usually incapable of saying anything other than 'Tan'. **Consider** what this suggests about Broca's aphasia, with reference to the ability to vocalise sounds.

Investigate, evaluate and communicate

4 **Investigate** the recovery rates from aphasias. With reference to neural plasticity, **evaluate** why recovery, despite being possible, rarely occurs.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 6.2
- » Challenge
  Worksheet: 6.2 Dance
- » Increase your knowledge
  Split-brain procedures and recovery
- » Weblink
  Brain damage and neuroplasticity

6.3 Plasticity and the environment

KEY IDEAS

In this section, you will learn about:

+ how being in an enriched or deprived environment can shape development through plasticity.

Section 6.2 demonstrated how the brain is sometimes able to 'recover' and form new pathways after injury to specific areas, as seen in cases of Broca's aphasia and Wernicke's aphasia. But what happens when the environment is the cause for concern? When we refer to the environment, we are referring to either an **enriched environment** or a **deprived environment**. An enriched environment is one where there is opportunity for stimulation of the brain by social and physical surroundings; a deprived environment is one where there is an absence or depletion of things to encourage development.

enriched environment an environment that provides social and physical brain stimulation

deprived environment an environment that lacks brain stimulation

Several studies have suggested that plasticity can change brain structure depending on the type of environment that development occurs in.

CASE STUDY 6.3

Neuroplasticity in rats

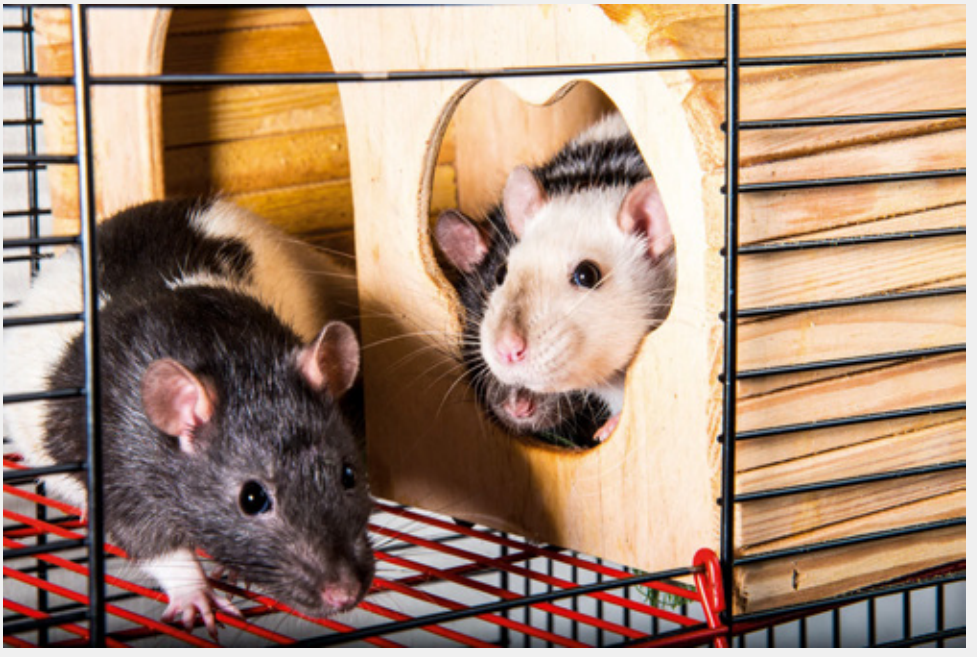


FIGURE 1 This image shows rats with both social and play stimulation.

In 1972, Rosenweig, Bennet and Diamond conducted research to determine if a change in the level of stimuli in the environment could lead to physical changes in the brain. The study was a breakthrough in suggesting that the brain could continue to change after childhood development ended.

The study used rats that were randomly allocated into either an impoverished condition, where each rat was placed in an individual cage, an enriched condition,

SUGGESTED RESEARCH
6.3 Neuroplasticity in enriched and deprived environments
Go to page 456 »

where rats were placed in a cage that contained objects that could be used for exploration, or a control group where there were three rats in a cage. Each group's basic survival needs were met (food and water) and they were typically in their cage for one to two months.

The study found that there was a difference in brain anatomy between the impoverished and enriched groups at the end of the study. The rats that were in the enriched cage showed increased weight of the cortex, and increased neuron activity in the cerebral cortex compared to the impoverished rats.

The study has been criticised for not being able to demonstrate if it was the social stimulation or the toys that led to the difference in brain structure. The results from this study have been generalised to also apply to human brains, which suggests that because of neural plasticity people are able to continue to change depending on what type of environment they find themselves in (i.e. a person in an impoverished environment may find themselves without social interaction or adequate nutrition).

Like many studies in psychology Rosenweig, Bennet and Diamond's (1972) study used rats instead of people for ethical reasons. Whilst it can be difficult to generalise results between rats and people, the 1972 study provided evidence that the human brain can continue to develop and change beyond childhood, and that this change can be facilitated by neural plasticity. The 1972 study also confirmed that exposure to enriched or deprived environments can significantly affect brain development.

CHALLENGE 6.3

The Czech twins

Research the case of the Czech twins, brothers that were locked in a cellar for 5 ½ years who grew up to lead normal lives. Write a brief report that discusses the type of environment they were in (deprived or enriched), focusing on the relationship that they were able to maintain with each other. Do you think this relationship contributed to their recovery?

CHECK YOUR LEARNING 6.3

Describe and explain

1 **Describe** an enriched environment.
2 **Explain** what a deprived environment is.

Apply, analyse and interpret

3 Based on your understanding of plasticity and environments, **consider** if it would be possible to have an environment that is too enriched.

Investigate, evaluate and communicate

4 Read Case study 6.3 and **discuss** the results of the study. In your discussion, refer to the different groups, the sample and the applicability to humans.
5 **Hypothesise** the following statement: 'When people are exposed to negative environments in childhood, they will undergo brain changes'.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 6.3
- » Challenge
  Worksheet: 6.3 The Czech Twins
- » Weblink
  Enriched and deprived environments
- » Weblink
  Neuroplasticity and the environment

6.4 Adolescence and culture

KEY IDEAS

In this section, you will learn about:

+ how adolescence is influenced by critical periods and social and cultural contexts.

As discussed earlier in this chapter, adolescence is a period of rapid developmental changes. During the teenage years, there are many physiological changes that occur within the brain and the body, but there are also many external changes that can define the adolescent period. Earlier in this chapter, sensitive periods were identified as the best time for a developing individual to learn specific skills. During adolescence, abstract thinking becomes more prevalent. While the brain may have reached its full size by the age of 10, the reactions within the brain and the increase in hormones makes the adolescent period susceptible to cultural and social influences. Critical-thinking ability and emotional reasoning increase during adolescence, which can influence the way teenagers approach their lives.

Typical changes in adolescence can include increasing independence; often teenagers start their first part-time job or get their licence. Parents may also begin to allow their children more freedom in their social lives. Teenagers are also likely to start taking on greater responsibility. This can be for their own lives, such as studying harder, as well as accepting responsibility for their family. It can also include accepting responsibility for their actions and choices, which previously may have had little consequence. Perhaps the most notable change is the difference in social structure from childhood to adolescence. Many teenagers will experience changes in the dynamic with their parents as they become more independent, changes with the types of friends they have and the way they interact with those friends, and they will begin romantic relationships. Along with all of these changes, there are certain cultural and societal expectations.

Australian society has clearly defined milestones during the adolescent period. These include the age you can learn to drive and the age that you can try to get your licence. It also includes the age that you start high school, and the age that you are able to leave school. The government determines these ages based on critical periods of cognitive and physiological development. Adolescents experience increased hormones, which can alter their emotions and their perceptions of events. Because of this, their reactions to events can be extreme.



The legal driving age in Australia varies between states; however, typically teenagers can apply for a learners permit around 16 years of age. Adolescents also receive the right to vote at 18 years of age. Both of these age limits are based on stages of cognitive and physiological development.

In addition to parent and guardian influence, adolescents are also strongly influenced by peers. Teenagers are more subject to peer pressure and are more likely to do what their friends are doing as they are often driven by a desire to fit in. They are also likely to seek out activities that increase their **self-esteem**. During all of this, individual adolescents are trying to figure out their place in society and who they want to be. In doing this, some teenagers will take their parents' ideas and beliefs and add to this with their school and friendships. Other teenagers may choose to ignore their parent's values and choose to focus on the values of their social group.



FIGURE 1 Teenagers can start learning to drive at 16 years of age.

self-esteem
a feeling of confidence and comfort in one's abilities and self-worth

CHECK YOUR LEARNING 6.4

Describe and explain

1 **Describe** cultural/societal changes that occur during adolescence.

Apply, analyse and interpret

2 **Consider** some changes in your life over the past six years. **Determine** it these were influenced by cultural and social expectations.

3 **Identify** a time your values and beliefs were different from your parents.

Investigate, evaluate and communicate

4 In Queensland, you can apply for your learners permit at 16 years old. Think about the conditions of this permit: you must display L plates on your car and drive with a supervisor who has a full licence. Young drivers under 25 in Queensland are also prohibited from using a mobile phone at any time, in any way, while in charge of a car. You must be 17 to pass your driver's test and attain a P1 licence.

Investigate and compare these rules with another state. Based on the influence of critical periods, as well as social and cultural influences, **evaluate** the differences between each state's requirements. **Consider** if you think they are fair and realistic, and if you think these restrictions keep young drivers safer.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 6.4
- » Suggested research
  Worksheet: 6.1 The developing brain
- » Weblink
  Driving in Australia
- » Weblink
  The right to vote in Australia

CHAPTER 6

Review

Summary

6.1

- Plasticity of the brain refers to the way the brain can be modified. Developmental plasticity refers to the development and consolidation of neural pathways in babies, children and adolescents, including proliferation, migration, circuit formation, circuit pruning and myelination.
- Proliferation is the multiplication of neurons by division.
- Migration is where neurons travel to their destination.
- Circuit formation is the growth of axons towards target cells and their connection via synapses that form.
- Synaptic pruning is the elimination of excess neurons.
- Myelination is where the axons in the child's brain become covered in myelin. This is the final stage that needs to happen for a brain to become fully mature.
- A young brain has more plasticity because it is packed with a greater number of neurons. Developmental plasticity is thought to enable growing children to readily adapt and learn from their circumstances and environment. It also assists in helping the developing brain to cope with injury by reorganising neural connections and using 'spare' neurons before pruning takes place.
- During puberty, the number of neurons and the complexity of their connections increase in the cerebellum. Unused connections are pruned, while useful connections are strengthened.
- The prefrontal cortex in the frontal lobe is the last to undergo myelination as it is responsible for the highest brain functions (including problem-solving, risk management and critical thinking).
- Myelination continues into early adulthood (approximately our mid-20s), which conflicts with society's notion of adulthood at 18.

6.2

- Adaptive plasticity refers to the plasticity of parts of the adult brain and also the process of reorganisation.
- Broca's aphasia is caused by damage to an area in the left frontal lobe. People with Broca's aphasia have difficulty expressing themselves in words or sentences, but their ability to comprehend speech is largely unaffected.
- Wernicke's aphasia is caused by damage to an area in the left temporal lobe. A person with Wernicke's aphasia has difficulty with understanding and producing written and spoken language.

6.3

- An enriched environment provides social and physical stimulation for the brain.
- A deprived environment lacks brain stimulation and social interaction.
- A study by Rosenweig, Bennet and Diamond (1972) demonstrated that being in an enriched environment could increase cortex size and weight, whilst being in a deprived environment would not. This showed how plasticity of the brain can adapt to the environment.

Key terms

- adaptive plasticity
- adolescence
- amygdala
- aphasia
- Broca's aphasia
- cerebellum
- circuit formation
- commisurotomy
- corpus callosum
- developmental plasticity
- frontal lobe
- infancy
- migration
- myelination
- plasticity
- proliferation
- sensitive period
- synaptic pruning
- synaptogenesis
- Wernicke's aphasia

Revision questions

Multiple choice

1 What does synapse formation during learning involve?

- **a** circuit pruning
- **b** priming
- **c** the process of myelination
- **d** development of neural pathways

2 What does the process of developmental plasticity involve?

- **a** proliferation, experience, pruning and myelination
- **b** proliferation, migration, pruning and myelination
- **c** migration, pruning, learning and experience
- **d** pruning, priming, experience and learning

3 When does plasticity of the brain occur?

- **a** only in childhood
- **b** only in response to medication
- **c** as a result of head injury
- **d** throughout life

4 What happens in the circuit formation stage of development of the nervous system?

- **a** Correct connection of each neuron is necessary.
- **b** Neurons grow to their targets and form connections.
- **c** Neurons continue dividing around a central neuron and form a circuit.
- **d** Neurons that don't make connections die.

5 Jade and her parents moved to Australia from Vietnam when Jade was an infant. Now that she is an adult, Jade speaks English fluently whereas her parents still struggle to speak English. Why might this be?

- **a** Jade's parents were too old for their brains to form any new neurological pathways when they moved to Australia.
- **b** Adult brains display less plasticity for language acquisition than a young child's brain.
- **c** Adult brains display more plasticity for language acquisition than a young child's brain.
- **d** The development of brain plasticity means that it is impossible to learn a new language after childhood.

6 Which statement is true about developmental plasticity?

- **a** It occurs only in people recovering from serious brain injuries.
- **b** It is a typical feature of childhood.
- **c** It is evident in both a child's brain and an adult's brain.
- **d** It is more evident in some areas of the brain than in other areas of the brain.

7 The development of neural pathways in response to new experiences is known as:

- **a** adaptive plasticity, which occurs in episodes of amnesia.

b adaptive plasticity, which occurs only in elderly people.

c adaptive plasticity, which occurs only in early childhood.

d developmental plasticity, which occurs only in early childhood.

8 What happens to the corpus callosum during adolescence?

a It thickens and there is an increase in connections between the two hemispheres.

b It thins out as more synapses are pruned.

c It becomes more active.

d It thickens and there is an increase in connections between the brain and the peripheral nervous system.

9 Kristen is 15 and often becomes very emotional and cries in response to stress. Liana is 25 and can deal with stress calmly and rationally. Which structure of the brain has not yet developed in Kristen's brain, but has in Liana's?

a cerebellum

b amygdala

c corpus callosum

d frontal lobe

10 What does the term 'adaptive plasticity' refer to?

a changes in the brain in response to hormones

b changes in a newborn baby's brain

c changes in the brain in response to learning and experience

d changes in the size of the brain

11 An enriched environment can best be explained as:

a an environment that provides adequate amounts of food and water, and a safe living space.

b an environment that has limited brain stimulation lots of social stimulation.

c an environment with significant opportunities for brain stimulation, limited opportunities for social interaction and few opportunities for safety

d an environment which encourages social interaction and provides significant opportunity for brain stimulation.

12 Yu Yan is recovering from a brain injury caused by a stroke. She now finds it difficult to speak and, when she does talk, her speech is slow and poorly articulated. What is Yu Yan likely to be suffering from?

a synaesthesia

b spatial neglect

c Broca's aphasia

d Wernicke's aphasia

13 Monty suffers from Wernicke's aphasia. As a result, it is likely that:

a he is consciously aware of his inability to communicate.

b he produces speech that contains nouns and verbs only.

c his ability to read is unaffected.

d he is able to speak fluently.

14 Select the independent and dependent variables used in Rosenweig, Bennet, & Diamond's 1972 study:

a the environment the rats were placed in (enriched, deprived or the control); changes in brain size

b being in an enriched environment; being in a deprived environment

c increased brain size; increased neuron activity in the cerebral cortex

d being alone; being with other rats

15 Sally is home-schooled and, on a typical day,interacts mostly with her mother. Sally also finds her days quite repetitive; she is rarely exposed to new information. Sally's brother Romulus attends the local primary school and gets to play with friends each day and is constantly learning about new topics. From this information, select the option below that best describes Sally and Romulus' environments:

a Sally is in an enriched environment and Romulus is in a deprived environment

b Sally and Romulus are both in an enriched environment

c Romulus is in an enriched environment

d Sally and Romulus are in deprived environments

Short answer

Describe and explain

★ **16** **Identify** and **describe** the five stages of developmental plasticity.

★ **17** **Identify** three examples of changes in the brain resulting from experience.

★★ **18** **Describe** the plasticity of the brain during infancy.

★★ **19** Think of a skill that is often learnt during childhood. **Explain** why a child is able to learn this skill with greater ease than an adult.

★ **20** **Summarise** what happens to the cerebellum during adolescence.

★★ **21** **Explain** why someone in their late 20s might make better decisions than someone in their late teens.

★ **22** **Define** synaptogenesis.

★ **23** **Explain** synaptic pruning.

★ **24** Complete the below table to help you **summarise** adolescent development.

Brain structure	Development during adolescence
Cerebellum	
Amygdala	
Corpus callosum	

Apply, analyse and interpret

★★ **25** View Figure 6 on page 130 and **interpret** the information presented in this figure.

★★ **26** Wilson was raised in a deprived environment, at the age of 10 he was found and transferred into a foster family that provided an enriched environment. Using your understanding of plasticity, **consider** how plasticity may help this child recover when they are in a more nourishing environment.

★★ **27** With reference to the ability to speak, **compare** Broca's aphasia and Wernicke's aphasia.

★★★ **28** Refer to Case study 6.1. **Apply** your understanding of development and **analyse** why there are restrictions on driving age.

★★ **29** **Compare** enriched and deprived environments.

Investigate, evaluate and communicate

★★★ **30** Tan, Broca's famous case study, was known to curse with relative ease at times of frustration. Other people with Broca's aphasia have been able to sing as they did before their brain damage. **Propose** why this may be the case.

★★ **31** **Evaluate** Case study 6.3.

Check your obook assess for these additional resources and more:

» **Student book questions**
Chapter 6 Review

» **Revision notes**
Revision notes for Chapter 6

» **assess quiz**
Test your understanding with an auto-correcting multiple-choice quiz

» **Flashcard glossary**
Key terms in Chapter 6

CHAPTER 7

Genetic-environment interactions on psychological development

Are there particular times in our lives when psychological growth is more rapid and prominent? What happens if we experience rich and nurturing environmental factors during this time? Alternatively, what if our environments are poor and deprived? Can such circumstances affect our life from that point onwards?

In this chapter, we continue to consider the ongoing role of 'nature–nurture' (genetic versus environment) interaction on psychological development throughout our lifetime. 'Lifespan' psychology considers the developmental changes that occur at various stages in our lives. These encompass physical, cognitive, and social and emotional changes. These will be examined in conjunction with the notion of critical and sensitive periods, and will explore some of the typical patterns of development and the genetic predisposition we all have in reaching certain milestones, provided the ideal environmental conditions are present.

OBJECTIVES

→ Consider timing of experiences on psychological development with reference to critical and sensitive periods

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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FIGURE 1 Siblings offer insight into the debate regarding genetic or environmental influence on psychological deveopment.



7.1 Stages of development across the lifespan

KEY IDEAS

In this section, you will learn about:

- developmental changes across the lifespan
- critical and sensitive periods in physical, cognitive, and social and emotional development.

This chapter focuses on developmental psychology – the journey through life. This journey is vast and complex, with many individual and cultural influences. Different stages of life can be divided into estimated age groups, typically: prenatal, infancy, childhood, adolescence, early adulthood, middle age and old age. Each stage is a broad category and the age groups are just a guide. Such stages are more a **social construct**, meaning something that is guided by social rules and norms, than a distinct biological age.

social construct something that is guided by social rules and norms

Many milestones within each stage depend on what is acceptable within a society and culture, and how old an individual feels. Marriage, for instance, is a major event for many people; however, the average age of marriage can vary widely between cultures. In some cultures, marriage during adolescence is accepted and encouraged; in others, including Australia, marriage is not legal until 18 years of age and is more likely to occur midway through early adulthood. Retirement, another major milestone in life, is occurring later in life than in previous generations and is also dependent on occupation.

Generally speaking, many developments in a person's lifespan are *predictable*. For instance, most of us smiled for the first time between about 5 and 10 weeks of age. Most of us followed similar patterns as we learnt to walk and talk. Puberty occurs during adolescence, and menopause during middle age. The way we play is also predictable, with older infants partaking in basic pretend play (playing on their own and pretending to be mummy or daddy) and children developing quite sophisticated pretend play (a number of children each taking on a different role, such as when playing shop).

This chapter considers some of these milestones and the genetic predisposition we all have in reaching them, provided the ideal environmental conditions are present. It goes further: if we miss out on these conditions at one part of our life, to what extent does it affect our future development and is it possible to 'catch up' at a later stage?

Psychological changes across our lifespan

For each stage or age group, Table 1 shows typical changes across our lifespan in terms of physical, cognitive, social and emotional development.

Physical development

Physical development affects psychological functioning. Our bodies, including our brains, are continually changing. Think back to when you first started school and think of yourself now. You are bigger and stronger, with finer motor skills – you can hold a pen correctly and tie your shoelaces. These changes have led to your independence.

Body changes at puberty, menopause and old age also affect our psychological development. For instance, they affect the way we think and solve problems, our self-esteem and our relationships with others.

Cognitive development

What were your main fears in primary school? Were you scared of a monster that lived in your closet? The odds are that your fears are more sophisticated these days. But even if your fears now seem 'bigger' and more realistic, the fears you had when you were younger were equally real and scary to you then.

Cognitive development refers to the development of our mental abilities through the course of the lifespan. Our memories, language, thinking and problem-solving abilities change throughout our lives. Were you mature enough in Year 7 to study the different perspectives of psychology in the detail required in your senior years of schooling? Probably not! Your cognitive abilities have come a long way in four years.

cognitive development the development of mental abilities throughout the lifespan

Social and emotional development

In most cases, infants will cry when they want or need something, or when things go wrong. Do you still cry in these situations? Most likely you don't.



FIGURE 1 In our society, when is it acceptable to cry? Does this change with age?

As you grow older, your understanding of social rules and situations changes. Along with cognitive changes, you change socially and emotionally. You develop the ability to regulate your emotions. As infants get older, they become more interested in expanding their social network. This network expands from their main caregivers to include a range of other people, including friends and teachers.

Developmental stages

	Physical development	Cognitive development	Social and emotional development
INFANCY (Approximately 0 to 2 years old)	• Rapid brain and body growth • Remarkable improvement in voluntary muscle control (such as walking)	• Improvement in perceptual abilities, understanding and beginning to communicate through language • Increase in memory and learning abilities	• Development of self-recognition and self-identity, and beginning to understand gender identity • Enjoyment of family-centred social interactions and basic pretend play
CHILDHOOD (Preschool children)	• Continued rapid brain development • Hand preference established	• Large increase in the use and understanding of language • Thoughts generally guided by perceptions rather than logic	• Rapid acquisition of gender roles • More sophisticated pretend play
CHILDHOOD (School-aged children)	• Physical growth slows • Motor skills continue to improve	• Attention span improves dramatically • More logical thinking • Improved memory strategies and problem-solving abilities	• More independent from parents and carers • Friendship groups more stable and close, and mainly with the same sex
ADOLESCENCE (Approximately 12 to 20 years old)	• Dramatic growth spurt, sexual maturity and brain development, especially the prefrontal cortex	• Sophisticated and logical thinking skills • Gains in knowledge and understanding	• A quest for independence • More sophisticated ideas of self: self-image, self-esteem and self-identity • Emotionally closer friendships, usually with one or two others
EARLY ADULTHOOD (Approximately 20 to 40 years old)	• Peak physical functioning	• Sophisticated cognitive skills, particularly in areas of expertise	• Continued work on self-identity • Intimacy and independence are important • Adjustment to new roles such as marriage, parenthood and work
MIDDLE AGE (Approximately 40 to 65 years old)	• Physical declines become noticeable	• More stable cognitive functioning, peak expertise and creative experiences	• More stable self-identity (although possible mid-life crisis) • Career and family life more stable
OLDER AGE (Approximately 65+ years)	• Continued physical decline (but can be slowed by good health and other positive lifestyle factors)	• For many, some cognitive decline (but not inevitable)	• Self-esteem and life satisfaction is generally very good • Close ties to family and friends and involvement in social activities continue

TABLE1 Developmental changes across the lifespan

How we express emotions also changes and is influenced by the environment and society. Think about when it is acceptable to cry. Also think about your emotions: are they becoming more sophisticated as you age? As we get older, we develop a sense of self – a sense of our own identity, which includes gender roles, self-esteem and moral standards.

CHALLENGE 7.1

Emerging adulthood?

The notion of emerging adulthood is currently being discussed among lifespan psychologists. Some definitions state that the end of adolescence occurs when adult roles are taken on, including full-time work or marriage. In contrast, a prolonged transition to adulthood can occur where these roles are postponed until the late 20s (Arnett, 2004). Do you think emerging adulthood should be included as a separate 'stage' of psychological development? Explain why or why not.

CHECK YOUR LEARNING 7.1

Describe and explain

1 **Describe** what is meant by a social construct.
2 **Explain** what is meant by physical development, cognitive development and emotional development.
3 **Identify** in which stage of the lifespan each of the following events will most likely occur:
   - **a** peak expertise of a specialised skill, profession or hobby
   - **b** peak physical fitness
   - **c** adjustment to new roles such as parenthood
   - **d** more stable friendship groups, mainly of the same sex
   - **e** basic pretend play
   - **f** sophisticated pretend play

Apply, analyse and interpret

4 **Compare** a distinct biological age (e.g. 11) with a socially constructed stage (e.g. pre-teen).

Investigate, evaluate and communicate

5 **Evaluate** the influence of social and cultural differences on development.

Check your obook assess for these additional resources and more:

- **Student book questions**
  Check your learning 7.1
- **Challenge**
  Worksheet: 7.1
  Emerging adulthood
- **Increase your knowledge**
  Experiences during development
- **Weblink**
  The invention of the teenager

7.2 Developmental patterns

KEY IDEAS

In this section, you will learn about:

- maturation and learning
- inborn reflexes
- developmental norms and milestones in early development.

maturation
a predetermined biological sequence of behaviours that occur at certain ages

learning
a relatively permanent change in the way an individual behaves due to experience

inborn reflex
an automatic response to certain stimuli that babies are born with

Amazing changes occur during the first few years of life. An infant's body and motor skills develop rapidly, largely due to maturation. **Maturation** is a genetically programmed process that governs growth. It directs physical and biological development, including the development of an infant's muscles and brain. Being able to reach out for a toy, rolling over, walking, talking and toilet training are all under the initial control of maturation.

Learning can be defined as a relatively permanent change in behaviour due to experience. Maturation and learning work together – babies cannot *learn* skills such as walking until their brains and bodies are physically ready (sufficiently *mature*) to carry them out. Learning can be achieved through practice. Although maturation is necessary to reach motor development milestones, practice is required to become proficient at them.

Babies are born with a set of **inborn reflexes** – automatic responses to specific stimuli. These reflexes are not learnt behaviours; they are not a product of the environment as they do not rely on experience or the development of cognitive skills. Essentially, inborn reflexes are entirely due to nature (heredity). Genetic material programs them to occur in newborn babies. Babies do not have to think about inborn reflexes – they occur automatically. The absence of a reflex at birth (for full-term babies) or the persistence of a reflex beyond the age when it is meant to disappear may indicate problems with the functioning of the brain. Further assessment into brain activity is often required. The majority of the inborn reflexes disappear as the baby's nervous system and muscles mature and a baby's movement becomes more voluntary. For example, being able to sit or stand up on their own.

Motor-skill milestones, such as reaching out for a toy, link hand–eye coordination skills with perceptual abilities. Movement, such as crawling, stimulates *cognitive* and *social* engagement. Being able to crawl means that infants are able to investigate their surroundings and play near others. Motor-skill milestones are easily observable and demonstrate how maturation (genetically controlled development) affects psychological development. The



FIGURE 1 A baby grasping a finger is an inborn reflex and disappears within 12 months.

learning of voluntary movements also follows a sequential pattern – they are essentially the same for all infants and are therefore considered to be largely due to maturation.

Developmental norms indicate the average age that a certain behaviour or skill will be achieved. They are based on the mean age of a large sample. Developmental norms provide feedback on whether the infant is progressing normally in relation to the rest of the population. Comparing an infant's progression to developmental norms can be useful. It can alert health professionals to a situation and allow appropriate action.

developmental norms
used to indicate the average age at which individuals reach certain milestones

Developmental norms can also cause unnecessary anxiety because the mean score does not take into account the large variations within the population. An infant who takes longer to reach one milestone may be identified as being 'at risk', even though they are perfectly healthy and normal. Indicating a spread of ages, as in Figure 2, may help alleviate some of this unnecessary concern.

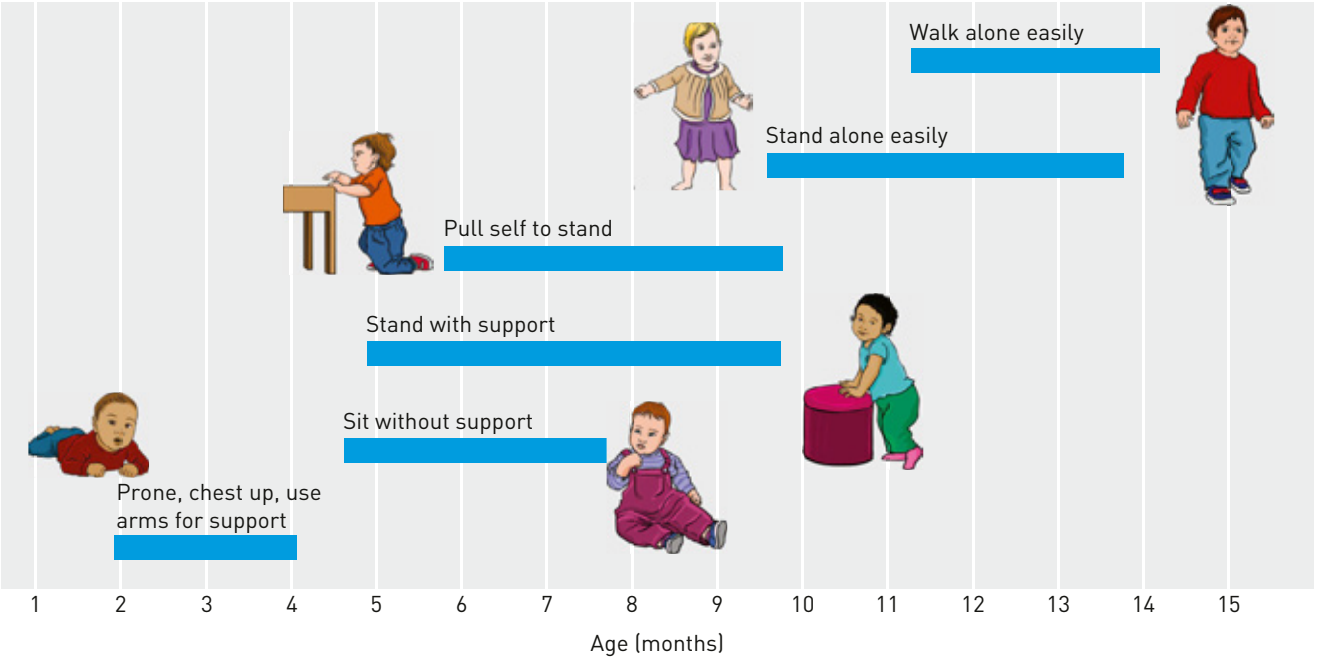


FIGURE 2 Milestones in infant motor development. If you have your baby records, compare these milestones with your own pattern of development.

CHECK YOUR LEARNING 7.2

Describe and explain

1 **Describe** developmental norms.
2 **Explain** what maturation is.

Apply, analyse and interpret

3 **Compare** maturation with learning.
4 **Consider** how the development of motor skills in infants encourages social, cognitive and emotional development.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 7.2
- » Weblink
  Developmental patterns
- » Weblink
  Developmental rates in children
- » Weblink
  Inborn reflexes

7.3 Critical and sensitive periods in development

KEY IDEAS

In this section, you will learn about:

- critical and sensitive periods in development
- the importance of early experiences and enriched and deprived environmental influences.



FIGURE 1 Vaccinations protect us against some of the more deadly diseases in our environment.

So far in this chapter we have considered the patterns of development that are typically followed for most people in our society. But are there times in our lives when we are more vulnerable to environmental influences? Will these alter our typical patterns of development? Are there times when certain conditions or experiences can have devastating lifelong effects?

The influence of the environment begins from conception, or even earlier. There are times during pregnancy when an unborn baby (embryo/foetus) can be highly susceptible to environmental factors. In fact, the effect of the environment can be more obvious during the early stages of life than at any other time. While the unborn child is in the relatively safe and protective environment of the womb, there are still some risks. A mother's healthy diet and lifestyle can be of significant assistance to the development of the unborn child.

CASE STUDY 7.3A

Rubella and birth defects

In 1940 in Australia, there was an outbreak of rubella (German measles). An Australian ophthalmologist, N. Gregg, reported a link between this outbreak and the number of babies born afterwards with eye problems. A rubella outbreak in the United States in 1964–65 resulted in more than 30 000 prenatal and neonatal (newborn) deaths and 20 000 babies born with malformations.

If a pregnant woman is not immunised against rubella and comes into contact with the disease during the first three months of pregnancy, the baby is more likely to be born with a congenital abnormality, such as a heart defect, deafness or intellectual disability. Routine vaccinations for children have helped decrease the incidence of this disease. Women who are planning a pregnancy are often advised to be tested to determine if they are immune to the disease.

Critical periods

critical period a period in life when certain experiences must happen for normal development to proceed

Critical periods in development are times of *special sensitivity* to certain environmental factors that can shape the individual's capacity for future development (see Figure 2). As researchers started to find clear links between toxic substances and the development of the unborn child, the concept of critical periods in development was formed. These toxic substances, known as **teratogens**, are environmental agents capable of harming the embryo

or foetus (Burton *et al.*, 2015). They will affect an unborn child's development if there is exposure at specific times in development. Their effects can be tragic and cause serious lifelong consequences, as seen in the case of rubella and other related birth defects.

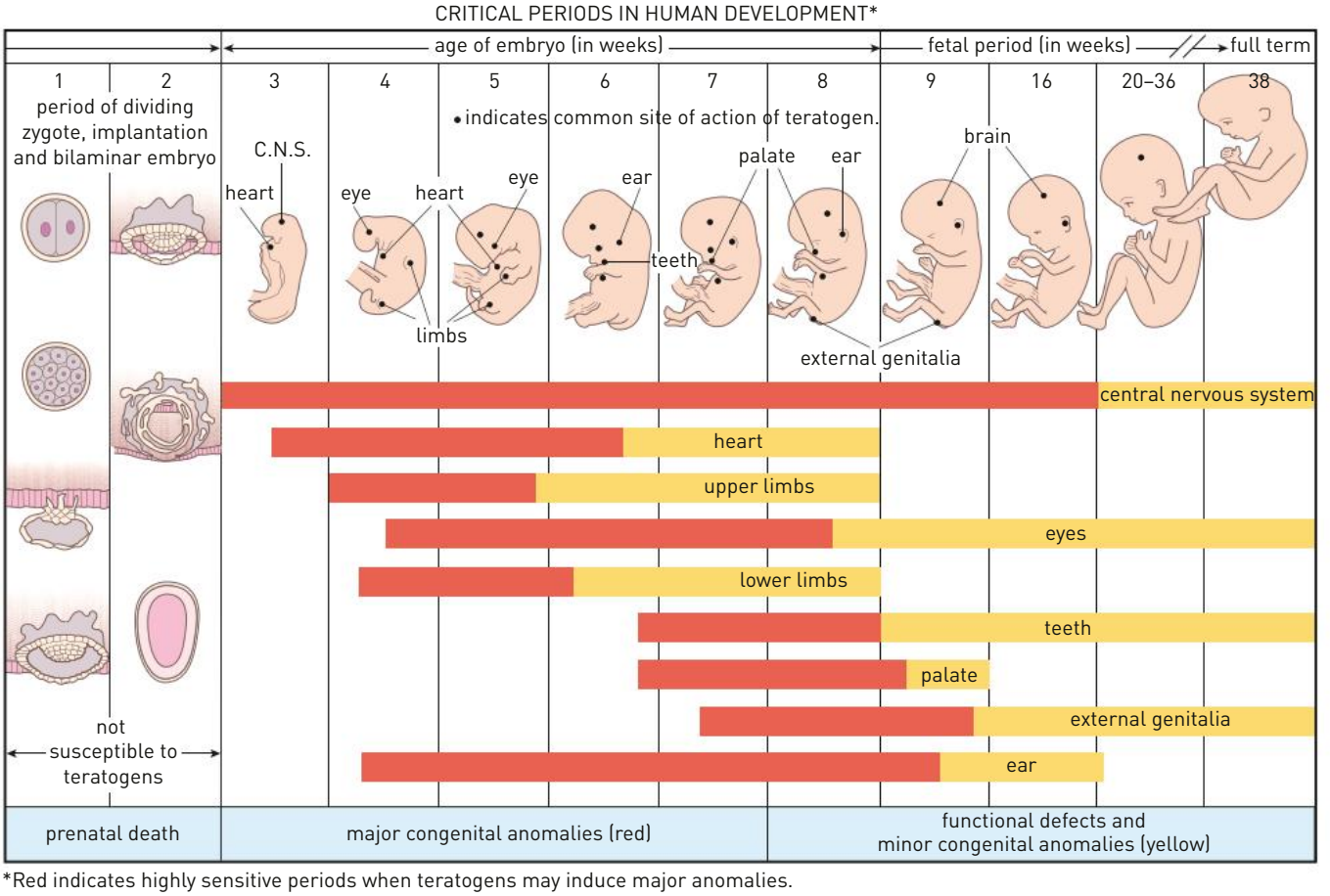
teratogen
environmental agent or toxin that harms the embryo or foetus

In some animals, there is a critical period – a very narrow period of time in an animal's development when it must have a particular experience in order for something very specific to be learnt. Essentially, there is a specific period in a particular species' lifespan in which the animal is pre-programmed to learn something. For example, ethnologist Konrad Lorenz studied how young birds **imprint** (form an immediate attachment) to the first moving object they see after they hatch from the egg. In most cases, this is likely to be the chick's parent. Lorenz found that greylag goose hatchlings imprinted on him and followed him wherever he went. For these goslings, the critical period was the first few moments of life (Lorenz, 1937).

imprint
an immediate attachment that is formed (to the first moving object seen after birth)

Critical periods tend to begin and end abruptly, and beyond this period, the phenomenon will not appear. For instance, if a greylag goose does not imprint to a moving object within the first 36 hours after hatching, it will never imprint. If a chaffinch does not hear an adult singing before it sexually matures, it will never be able to sing the highly intricate song required to attract a mate. A monkey deprived of sight in its first 12 months will have difficultly using vision to explore its environment for the rest of its life.

In humans, there are few critical periods after we are born. One example of a critical period for humans is the development of vision. Human babies must receive exposure to light in the first few days of life so that the sensory neurons in the retina develop. If this does not happen, the baby may be permanently visually impaired.



*Red indicates highly sensitive periods when teratogens may induce major anomalies.

FIGURE 2 Critical periods in development of the unborn child

CHALLENGE 7.3A

Bilingual children

Learning additional languages is much easier in early childhood than in adulthood. Adults can still learn a new language, although they are most likely to speak with an accent unlike those who learnt the language by the age of six. Propose why adults may develop a different accent from the one children develop.

Sensitive periods

sensitive period period in time that is particularly suited to learning things due to the nature of the growing brain

The concept of critical periods in humans is controversial, especially after the child is born. Humans tend to be more flexible in their development than other animals. We tend to have **sensitive periods**, which are optimal times for psychological development in certain areas, such as learning to speak in the first years of life. These periods of maximal sensitivity are seen to begin and end more gradually than critical periods. Sensitive periods coincide with times when the brain's nervous system is undergoing rapid growth, such as forming new synapses between neurons or, equally importantly, pruning neurons that have not been used or activated by the environment.

Sensitive periods allow for the possibility that, given the right circumstances, individuals can still experience psychological development, even if the individual began with deprived conditions. Tragic stories, such as the cases of severely deprived children from Romanian orphanages, have also provided insight into sensitive periods. In a British study, children who were adopted before the age of 2 years improved dramatically once they left the orphanage. However, while great improvement was seen in children adopted later, the longer the time spent in the orphanage (e.g. those older than 2 years of age) the more likely they were to have severe cognitive impairments six years later (O'Connor *et al*, 2000).

As discussed in Chapter 6, brain plasticity relates to the extraordinary ability of the brain to change throughout life as a result of experience. Rapid brain growth occurs in the early years, a time when the brain is very plastic. As children and adolescents grow, their brains become less plastic and their neural pathways become more fixed.

Certain periods in development are particularly suited to learning certain things. At these times, the growing brain needs specific types of stimulation so that neural pathways are established. Usually, this stimulation occurs as part of a person's natural development. However, it is vital that the individual is exposed to the necessary experiences to allow for the



FIGURE 3 These goslings have imprinted on their carer as their substitute mother because she was the first moving thing they saw in the critical period just after they hatched.

changes through learning. This is **experience-expectant learning** (experience-expectant synaptogenesis). These are situations in which a species' typical experience (that all members of a species experience in normal conditions) plays a necessary role in the developmental organisation of the nervous system.

experience-expectant learning experiences necessary for learning to occur, most often during sensitive periods

Normal brain growth relies on these forms of environmental exposure. For example, the visual cortex 'expects' exposure to light and patterned visual information, and is genetically programmed to use these inputs for normal development.

Deprivation of these essential forms of environmental input can have permanent effects, so it is essential to detect and treat sensory deficits in children (visual or hearing problems) to ensure that these expected experiences take place. An example is young children learning to speak in their native tongue. If the opportunity is missed in infancy and early childhood, it is much more difficult to achieve fluency.

deprivation the absence or lack of important things that are needed for development

Experience-expectant learning differs from **experience-dependent learning** (experience-dependent synaptogenesis). Experience-dependent learning is a form of learning that can occur at any time during an individual's life. It refers to adaptive plasticity, encoding new experiences that occur throughout life, fostering new brain growth and refining existing brain structures. These vary for every individual according to their unique set of experiences throughout life. For example, learning to read and write in one's native tongue is a form of experience-dependent learning.

experience-dependent learning learning that occurs at any time during an individual's life as a result of experience

If an individual misses out on the appropriate experience-dependent learning opportunities during a *sensitive period*, it does not necessarily mean that learning will never occur. A person learns throughout life so the missed learning can take place outside of the sensitive period, but it will require more time and cognitive energy and sometimes the learning might not be as efficient or strong.

CHALLENGE 7.3B

Impacts on psychological development

Your psychological development is being shaped by many environmental settings – your family relationships, culture, friendships, school environment, wealth and religion, just to name a few – and heredity factors. Your close friends are important to your wellbeing now, and they will continue to be in later stages of life, including being a key to successful ageing.

Table 1 provides factors that can enhance or restrict our psychological development. Identify additional factors that can impact psychological development.

Factors that may enhance psychological development	Factors that may restrict psychological development
A safe and healthy living environment, including adequate diet and regular sleep	Extreme poverty and poor diet during childhood
Good educational opportunities	Inadequate or very limited educational opportunities
Family and community who talk and actively interact with children and support each other	Little or no basic parent instruction or talking in the home during early childhood, or family or community social support
A pregnancy free of toxins and serious illness	During pregnancy, the mother had an inadequate diet or ingested drugs, alcohol or other toxins or sustained a severe illness that affected the development of her baby
No head injuries or trauma or serious illness	Head injury or trauma, or drug- and alcohol-related brain damage, or serious illness or seizure

TABLE 1 Factors that may affect psychological development.

Enriched and deprived environmental influences

Nature and nurture influences on psychological development have been discussed throughout this chapter. In most cases, the impact of the environment has been discussed in relation to genetic inheritance.

Heredity is very important and, in many cases, it drives developmental change. Be careful though – do not fall into the trap of thinking the environment is less important *or* operates independently from heredity. A traumatic environment does not necessarily limit psychological development for the rest of a person's life. There are many examples of people who grew up in adverse and tragic circumstances, but go on to become fully functional adults with a great sense of wellbeing, and positive and productive relationships with family, friends and the community. The environment and generic inheritance is crucial and there is ongoing interaction between nature and nurture throughout life. Through a range of different research methodologies and techniques, the dynamic and ongoing relationship between nature and nurture and its influence on psychological development can be studied.

Does our genetic material provide a blueprint for developmental change? Under certain environmental conditions – yes! Our genes program patterns for our development and, together with our early experiences, shape our psychological development. Our experiences include environmental conditions, social interactions, parenting styles and cultural customs. A rich, supportive environment can stimulate brain growth, which in turn can influence physical, cognitive, and social and emotional development. These experiences are essential for some development – such as language – during critical and sensitive periods.

If ideal conditions are not present, to what extent is our future development affected, or is it possible to 'catch up' at a later stage? Are there 'windows of opportunity' for development that close after a certain period of time? We continue to develop and change throughout life. Early experiences can play an important role, but the influence of both heredity and environment continues. While being deprived of early life experiences can have a lasting impact on someone, there are people like Izidor Ruckel, an adopted Romanian orphan, who have gone on to lead inspirational lives.



FIGURE 4
Less than ideal conditions can negatively affect an individual and restrict their psychological development. However, this is not necessarily irreversible.

CASE STUDY 7.3B

Layne Beachley – a surfing legend

Layne Beachley grew up in a caring family, with an older brother and a father who loved surfing. She loved the ocean and led a very active lifestyle. Tragically, her mother died when she was 6 years old, and so began a rough period in her life. Three years later, her father told her that she was adopted.

Layne felt instantly isolated and alone, and wondered if she was worthy of love since her birth mother had abandoned her. She says this was the time in her life when she decided she would be the best in the world at something in an attempt to gain love.

Layne won her first professional surfing title at the young age of 20. This instilled the confidence to continue her pursuit and she went on to win seven world surfing titles while battling injuries and chronic fatigue. During this time she met her biological mother and they began a rocky relationship. She also had to deal with the realisation that she was conceived through date rape.

Layne is now raising funds and awareness for her charity, Aim for the Stars, in an attempt to support female athletes. She is also involved with other community work. Layne has struggled with relationships throughout her life, but has finally found a soul mate and overcome the fear of abandonment.



FIGURE 5 Layne Beachley overcame childhood difficulties to win seven world surfing titles and find true love.

CHECK YOUR LEARNING 7.3

Describe and explain

1 **Explain** what a critical period is, using a human and non-human example.
2 **Define** teratogens and **explain** how they relate to critical periods in development using an example.
3 Using an example, **explain** what a sensitive period is.
4 **Identify** when a sensitive period is most likely to occur.
5 **Identify** and **explain** five environmental factors that are likely to influence your psychological development at this stage of your life.

Apply, analyse and interpret

6 **Compare** experience-expectant and experience-dependent learning.
7 **Determine** the limitations with generalising findings from extreme case studies.
8 **Consider** the role of genetic material as a blueprint for developmental change.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 7.3
- » Challenge
  Worksheet: 7.3A Bilingual children
- » Challenge
  Worksheet: 7.3B Impacts on psychological development
- » Weblink
  Impacts of critical and sensitive periods on development

SCIENCE AS A HUMAN ENDEAVOUR

7.4 Wild children

KEY IDEAS

In this unit, you will learn about:

- Genie, the wild child
- the ethical principles psychological scientists adhere to when conducting research into the experiences of children who have suffered from abuse or deprivation.

In 1970, community-care workers in Los Angeles rescued a 13½-year-old girl, Genie, who had been raised in appalling and unimaginable conditions (Curtiss, 1977). Genie had spent much of her life in a dark isolated room, strapped to a child's potty chair for most of the day and fed only baby food. She had virtually no contact with people, apart from minimal contact with her parents, and was punished if she ever made any sounds. When Genie was found, she had the appearance of a 6-year-old girl, was painfully thin, was barely able to walk and made hardly any sounds. Curtiss described her as unsocialised, primitive and hardly human.

Genie had never learnt to talk and had been deprived of social contact, including language. After she was rescued, she spent time with psychologists who both cared for her and studied her behaviour. Genie had to learn her first language at the age of 13½ years. She did learn some aspects, such as vocabulary, but showed very poor understanding of grammatical rules. For instance, she would say, 'Spot chew glove' instead of, 'The dog named Spot chewed the glove'.

Her story after her rescue continued to be tragic. Genie never adjusted socially. She had difficulties with her placement in foster families, including one where she was abused, and was eventually placed in a nursing home.

Genie's story drew parallels with another extraordinary case. In 1800, Victor, 'the wild boy of Aveyron', was found in an isolated place in the south of France at the age of about 12, having apparently been living wild in the woods for most of his life.

Extreme deprivation cases such as those of Genie and Victor suggest that we may be genetically programmed to learn the rules of language within a sensitive period of our lives – we must be exposed to language early in life to be able to learn it properly. Genie and Victor failed to master language after being deprived of exposure to it during childhood. Once the sensitive period has lapsed, we may be able to learn some aspects of language, such as vocabulary, but it is harder to acquire this outside this period.

This highlights the interplay between nature and nurture. Nature allows the development of language during the sensitive period (an innate ability), and nurture allows the development to occur in the right environment. In terms of language development, Genie and Victor were beyond the age of rescue.

There are difficulties in drawing inferences from such tragic cases because there are many complicating factors. Genie's father believed that she was intellectually disabled – if this was so, it could affect language development. Genie also suffered extreme emotional and physical abuse, another factor that would affect language development. Psychological and physiological tests could not determine whether Genie's behaviour was a result of intellectual disability or extreme abuse. Separating such complex issues is impossible.

Victor's case raises similar problems. His early childhood experiences remain a mystery, and it is unclear whether he had an intellectual disability.

Psychologists involved in Genie's case were primarily interested in the information they could gain from her. Given the condition she was found in, a lot of their work involved teaching her to read or speak so that they could test theories of critical and sensitive periods.

Extreme deprivation cases highlight important ethical issues. Should psychologists have been concerned with providing psychological care and linguistic (language) support for Genie as well as collecting research data? Ongoing arguments about who should look after Genie and whether she should be subject to scientific study took place following her discovery. Funding for the research finally stopped due to insufficient research data being published. Interestingly, Genie's mother threatened to sue the psychologists because, in her view, the psychologists and carers were more involved in research and rigorous testing than caring for Genie.

Extreme deprivation cases can provide useful examples of very sensitive areas where it is not ethically or morally correct to undertake experiments. Inferences can be drawn from these extreme cases, but these inferences are limited because it is difficult to understand the complete story. Many complex and interrelated factors, many of these unknown or difficult to pinpoint and study, are at play.

CHALLENGE 7.4

Victor, the wild boy of Aveyron

Victor, the 'wild boy of Aveyron', is a well-documented case from the early 1800s. Investigate his story, and his work with Jean Marc Gaspard Itard, a young medical student, who tried to 'civilise' Victor and help him learn a language.

How does Victor's case compare with Genie's case? What do they suggest about psychological development?

CHECK YOUR LEARNING 7.4

Describe and explain

1 **Describes** Genie's cognitive development.

Apply, analyse and interpret

2 **Consider** Genie's age when she was found. **Identify** the critical periods she is likely to have missed.

Investigate, evaluate and communicate

3 **Investigate** Genie's case further. Based on your understanding of ethics, **evaluate** the treatment of Genie.

4 **Investigate** the story of Romulus and Remus, who were raised by a 'she-wolf' (depicted in the background). **Consider** the impact of tales such as this on psychology's understanding of deprivation in early childhood.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 7.4
- » Challenge
  Worksheet: 7.4 The wild boy of Averyon
- » Weblink
  The development of wild children
- » Weblink
  The ethics of research with children



CHAPTER 7

Review

Summary

7.1
- We undergo changes in physical, cognitive, social and emotional development across our lifespan – from infancy, through to childhood and onwards to late adulthood. Each stage of development is a broad category typically aligned with a specific age group.

7.2
- Maturation is a genetically programmed biological process that governs biological growth. It determines physical and biological development, including the development of an infant's muscles and brain.
- Learning can be defined as a relatively permanent change in behaviour due to experience. Maturation and learning work together – babies cannot learn skills until their brains and bodies are physically ready (sufficiently mature) to carry them out. Learning can be achieved through practice.
- Some developmental characteristics may consist of an innate predisposition to learn, including possible innate constraints to learning (for example, sensitive periods for learning the rules of your first language).

7.3
- Certain periods in development are particularly suited to learning certain things. These periods are referred to as sensitive periods because they are the best or optimum times for a developing individual to learn specific things.
- Extreme case studies may offer important insight into the 'nature–nurture' interactions, including critical and sensitive periods of psychological development. Such case studies can provide a window into this very sensitive area, although the extreme nature of the situation makes generalising the results very difficult.
- Critical and sensitive periods in development are times of special sensitivity to certain environmental factors that can shape the person's capacity for future development.
- Critical periods tend to start and end abruptly and development of the psychological process after this time is unlikely. Sensitive periods begin and end more gradually and are times of maximum sensitivity to certain environmental factors with some possibility that development may occur afterwards given the right conditions.
- Sensitive periods coincide with times when the brain's nervous system is undergoing rapid change, such as forming new synapses between neurons and, equally important, pruning neurons that have not been used or activated by the environment.
- Experience-expectant learning refers to learning that mainly occurs during a specific time for a specific species. Experience-dependent learning can occur throughout the individual's life. If a person misses out on learning opportunities during a sensitive period, they may still be able to learn but may take more effort and time, and learning may not be as efficient or strong.
- Like genetic factors, environmental factors are crucial and can drive developmental change. These factors begin from the time of conception, if not before, and continue throughout life. Family relationships, culture, friendships, school environment, wealth, religion and experience all contribute to psychological development and interact with hereditary factors throughout life.

Key terms

- cognitive development
- critical period
- deprivation
- developmental norms
- experience-dependent learning
- experience-expectant learning
- imprint
- inborn reflex
- learning
- maturation
- sensitive period
- social construct
- teratogen

Revision questions

Multiple choice

1 A newborn's brain:
- **a** is fully developed at birth.
- **b** develops slowly until the onset of puberty.
- **c** develops gradually in the first 2 years of life.
- **d** develops very rapidly from birth to 6 months of age.

2 Which pair of words fills the gaps?

Most people reach their peak physical and perceptual functioning around _____, and a decline in these abilities usually becomes more noticeable around _____.
- **a** mid-teens; early 20s
- **b** mid-teens; early 40s
- **c** mid-20s; early 30s
- **d** mid-20s; early 50s

3 Changes in thinking, language, memories and problem-solving abilities throughout the lifespan are known as:
- **a** cognitive development.
- **b** biological development.
- **c** social development.
- **d** emotional development.

4 Changes throughout the lifespan in terms of the ability to create memories, use language, think and problem-solve, are known as:
- **a** biological and physical development.
- **b** cognitive development.
- **c** social and emotional development.
- **d** perceptual development.

5 Learning can be defined as:
- **a** a genetically programmed process that governs growth.
- **b** automatic responses to specific stimuli that are innate.
- **c** an indication of the average age a certain behaviour or skill will be achieved.
- **d** a relatively permanent change in behaviour due to experience.

6 Critical periods in development are:
- **a** distressing times throughout a person's life.
- **b** times of special sensitivity to certain environmental factors that can shape a person's capacity for future development.
- **c** stages in foetal development when toxic substances can cause lethal harm.
- **d** not related to environmental conditions.

7 In comparison with critical periods, sensitive periods in development tend to:
- **a** begin and end abruptly, and beyond this time, the psychological process will fail to appear or develop.
- **b** begin and end more gradually, but some development of the psychological process may be possible.
- **c** only be found in non-human species.
- **d** coincide with times when the brain is not undergoing rapid growth or pruning unused neurons.

8 Which pair of words fills the gaps?
As children grow, their brains become _____ plastic and neural pathways _____ set.

a less; less
b less, more
c more, more
d more, less

9 Which pair of words fills the gaps?
_____ is a form of learning that can occur at any time during an individual's life, whereas _____ refers to learning that can be most effective only at a particular time in life for each particular species.

a Experience-dependent; experience-expectant
b Experience-expectant; experience-dependent
c Critical period; sensitive period
d Sensitive period; critical period

10 Jeremiah cries when he is tired, and when he is hungry, he also cries if he is missing attention from his mother. Tobin rarely cries in public, and expresses if he is hungry or tired using words. Using this example of their behaviour, suggest what age bracket each child is in

a Infancy; Childhood (school aged)
b Childhood (preschool); Middle age
c Adolescence; infancy
d Infancy; early adulthood

11 Someone who is in the development stage early adulthood would experience

a Peak physical fitness, advanced cognitive skills particular for areas of expertise, continuing to develop self –identity and emphasis placed on intimacy and independence
b Peak physical fitness, stable cognitive functioning, sexual maturity and adjustments to new roles
c Slow in physical growth, advanced cognitive skills, stable self-identity and sophisticated pretend play
d Slow in physical growth, stable cognitive functioning, sexual maturity, and emphasis placed on intimacy and independence

12 Which of the options below best defines the distinction between experience-expectant learning and experiencing-dependent learning?

a Experience-expectant learning involves experiences that are necessary for learning to occur, typically during sensitive periods; experience-dependent learning is learning that occurs as a result of an experience.
b Experience-expectant learning involves experiences that are necessary for learning to occur, typically during critical periods; experience-dependent learning is learning that occurs as a result of an experience.
c Experience-expectant learning is learning that happens as the result of an experience; experience-dependent learning is learning that occurs after a necessary experience.
d Experience-expectant learning happens during critical periods; experience-dependent learning happens during sensitive periods.

13 Imprinting is defined as:

a a period in life when certain experiences must happen for normal development to proceed
b where an immediate attachment is formed (to the first moving object seen after birth)
c a period in time that is particularly suited to learning things due to the nature of the growing brain
d the absence or lack of important things that are needed for development.

14 Sisters Angelique and Frankie are learning to speak Italian. Angeligue has rapidly progressed and is becoming fluent. Frankie, though, is struggling and is getting frustrated that she is not learning as quickly as her younger sister. Select a possible reason why Angelique is progressing faster.

a Angelique has a higher IQ than Frankie.
b Frankie is older, and may have passed the sensitive period that makes it easier for Angelique to learn Italian.
c Angelique experiences a more enriched environment on a daily basis than Frankie.
d Angelique and Frankie's mother spends more time with Angelique to help her learn.

15 Genie and Victor of Aveyron provided insight into both enriched and deprived environments, as well as critical and sensitive developmental periods. It is difficult to apply these findings to the larger population because:

- **a** Genie's father believed that she was intellectually disabled at birth, and she then experienced extreme abuse which would affect her language development
- **b** Victor's early childhood experiences are unknown, and it is hard to determine if he was born with an intellectual disability
- **c** Victor and Genie are not a sample of the whole population, which makes generalising their experiences difficult
- **d** all of the above.

Short answer

Describe and explain

★★**16** Each lifespan stage is given only an approximate age group. **Explain** why it is challenging to assign a distinct biological age to a lifespan stage.

★★**17** **Identify** and **define** the three types of development in terms of the lifespan. Provide at least one example for each type of development to support your explanation.

★**18** **a** **Define** maturation.

b Use an example to **explain** how maturation can encourage psychological development.

★★**19** **Identify** three different developmental stages and **summarise** the physical, cognitive, social and emotional development in each.

★**20** **Explain** the difference between an inborn reflex and a learnt behaviour.

★**21** **Identify** an example of a critical period in development in a non-human species.

Apply, analyse and interpret

★★**22** **Consider** if only 'developmental norms' should be a guide for the development of skills and abilities.

★★**23** **Differentiate** between critical and sensitive periods in learning.

★**24** With reference to sensitive periods in learning a language, **distinguish** between experience-expectant learning and experience-dependent learning.

★★**25** **Contrast** the milestones of adolescence with adulthood.

★★**26** **Consider** Case study 7.3B. **Reflect** on what contributed to Layne Beachley's success both professionally and personally. Refer to developmental stages in your response.

Investigate, evaluate and communicate

★★**27** Extreme case studies, such as Genie the Wild Child, provide information about sensitive and critical periods. **Evaluate** the limitations of generalising findings from these extreme cases.

★★**28** There is a continuous debate between nature and nurture in psychology. Read Case study 7.3B and **comment** on the role of nature and nurture in Layne Beachley's development.

★★**29** **Explain** what deprivation is, then **comment** on the effects this can have on development.

★★**30** **Construct** a timeline that spans 0–100 years. Divide the timeline into the following segments: infancy, childhood, adolescence, early adulthood, middle and old age. In each stage, **identify** three development changes or milestones that usually occur.

Check your obook assess for these additional resources and more:

- » Student book questions
  Chapter 7 Review
- » Revision notes
  Revision notes for Chapter 7
- » assess quiz
  Test your understanding with an auto-correcting multiple-choice quiz
- » Flashcard glossary
  Key terms in Chapter 7

CHAPTER 8

Emotional and cognitive development

Recent years have seen significant advances made in our understanding of the development of the human brain, from infancy through to adolescence and adulthood. We experience periods of rapid development from infancy to adolescence and these inform who we become. Even during the earliest period of development, our experience of our environment along with predetermined genetic factors play an important role in our development across the lifespan.

As we grow, we change in many ways. These changes are rapid and dramatic at first, then more subtle and slower – but development continues over the full lifespan. Some psychologists believe that change is a continuous, gradual process; while others believe that lifespan development occurs as a series of stages, rather like an international flight with rapid movement interspersed with extended stopovers on the way.

In this chapter, we consider different aspects of emotional, cognitive and psychosocial development from infancy to older age. We also learn how early abuse or deprivation can have detrimental effects on emotional and cognitive development.

OBJECTIVES

→ Summarise the role of attachment in psychological development with reference to the work of Konrad Lorenz (1937), Harry Harlow (in Harlow & Zimmermann, 1958), John Bowlby (1969) and Mary Ainsworth (in Ainsworth, Blehar, Waters & Wall, 1978)

→ Discuss cognitive (Jean Piaget, 1936), sociocultural (Lev Vygotsky, 1978) and information processing theories (i.e. processing speed, cognitive strategies and metacognition) of cognitive development

→ Understand that early abuse or deprivation can have detrimental effects on cognitive development (Michael Rutter, 2004)

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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FIGURE 1 People begin to develop their emotional responses or cognitive process at birth and continue to develop these into adulthood.



PRACTICALS AND SUGGESTED RESEARCH

SUGGESTED PRACTICAL	**8.1** Correlational investigation: Technology and cognitive development
SUGGESTED RESEARCH	**8.1** Attachment and psychological development in infancy (e.g. the significance of secure parent/carer bonds for shy infants in University of Waterloo, 2015)
SUGGESTED RESEARCH	**8.2** The potential effects of deprivation (e.g. the English and Romanian adoptees study in Rutter, O'Connor, & English and Romanian Adoptees (ERA) Study Team, 2004)
SUGGESTED RESEARCH	**8.3** Informative processing and metacognition (e.g. the effects of increasing cognitive load in Killeen *et al.*, 2017)
SUGGESTED RESEARCH	**8.3** Sociocultural theory and cognitive development (e.g. the influence of social networks in Christakis, 2010)

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8.1 Attachment

KEY IDEAS

In this section, you will learn about:

+ the importance of attachment on an individual's emotional development.

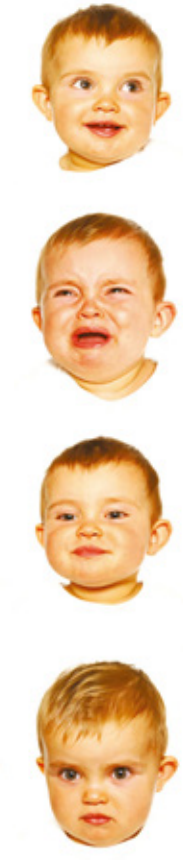


FIGURE 1 Infants display many of the same emotional expressions as adults. Carroll Izard believes such expressions show that distinct emotions appear within the first months of life. Other theorists argue that specific emotions come into focus more gradually, as an infant's nervous system matures.

Think for a moment and try to list as many emotions as you can. What emotion are you feeling right now? What are your emotions like prior to receiving your academic report from school? What emotions do you experience if you argue with your parents? Imagine your life without emotions. You would never feel joy from music or worry about a test result or first date; you would never feel grief or sadness, and you would never laugh again.

Emotions are an important part of our lives. They assist people to develop and maintain relationships. Emotions can be positive: joy, love and enthusiasm. They can also be negative: anger, sadness and anxiety. The study of emotional development includes ascertaining the point in time at which people learn emotions, and how they deal with their emotions.

The traditional view holds that all basic human emotions – such as anger, fear and joy – are learnt by 2 years of age (Bridges, 1931). Some researchers, however, believe that infants can express basic emotions from 10 weeks of age. Psychologist Carroll Izard studied babies' faces and identified many signs of emotions. The most common expression he found was interest, followed by joy, anger and sadness. Over a 2-year period, infants in the study became more active in having emotional relations with their parents (Cicchetti, Ackerman, & Izard, 1995).

Other researchers have suggested that a baby's temperament can affect emotional development. Temperament refers to an infant's reactions emotionally and behaviourally to the environment. A study conducted by Kagan (1989) stated that children who displayed a highly uninhibited temperament tended to be more social and talkative at 7 years of age, and those who were highly inhibited became quiet and shy at 7 years of age.

Infant attachment

During the early part of life, the emotions that infants develop assist them in establishing relationships with their caregiver and other people. Emotional development allows attachment to occur: that is, a strong, close and emotional bond that develops between an infant and their caregiver and lasts for many years. The first few years of life is a sensitive period for forming a bond with caregivers, as it may be more difficult but possible to form strong bonds with caregivers later in life. The mutual love between infant and caregiver is not only crucial in the early years, but also helps people form relationships later in life with friends or lovers (Santrock, 2008). Attachment can be observed when you see children crying as their mothers leave them, or adults making sad farewells.

The attachment formed between child and caregiver is the first close emotional relationship a child has. Infants become attached to people who fulfil their needs for physical care and attention. However, it is not until infants reach 3 to 5 months of age that they demonstrate attachment-like behaviours, such as smiling at familiar faces rather than strange ones. At 6 to 8 months of age, infants begin to cry and hang on to their parents if they try to leave, and become more fearful when they see strangers. If infants become distressed at

SUGGESTED RESEARCH
8.1 Attachment and psychological development in infancy
Go to page 456 »

this age, they usually cannot be comforted by strangers; instead they seek comfort from the caregiver to whom they are attached (Peterson, 2002).

If attachment never occurs – that is, if a child never forms a close relationship with anyone – this is called **privation**. Privation can cause permanent emotional damage (McIlveen & Gross, 1998).

privation when attachment never occurs – that is, if an infant/child never forms a close relationship with anyone

Many theories and studies have been conducted surrounding infant attachment. In this section we will look at the work of Harry Harlow, Konrad Lorenz, John Bowlby and Mary Ainsworth.

Harry Harlow

Many recent theories are focused on the development and quality of attachment in infants, and are based on the influential views and work of Sigmund Freud and Harry Harlow.

Freud proposed that infants become attached to people who provide them with oral satisfaction or nourishment. For most infants, this means that their attachment would be formed with their mothers, as they are the ones most likely to feed the infant. However, Harry Harlow (1958) demonstrated that this may not be the case (Santrock, 2008).

Harlow's work focused on attachment in rhesus monkeys. Initially, he separated infant monkeys from their mothers at birth in order to raise them in a germ-free environment because many of the monkeys were dying from disease. He discovered that the monkeys grew up healthy, but were unable to get along with other monkeys. During the process, Harlow found that when he placed the monkeys in individual cages that contained a blanket, the monkeys became attached to the blanket and got upset if it was taken away. These behaviours indicated to Harlow that attachment may be formed by means other than nourishment.

From these initial observations, Harlow conducted studies to determine if food or close comfort were more important in the formation of attachments. Harlow removed the monkeys from their mothers at birth, and for 6 months placed them with 'surrogate (substitute) mothers'. In one condition, half of the monkeys were raised by surrogate mothers that were made from wire and had a baby bottle attached to them. The other condition also included surrogate mothers, but these were made from soft cloth and did not include a feed bottle.

Harlow found that the infant monkeys that spent the most time with their surrogate mothers were those with the cloth surrogate mothers – even though

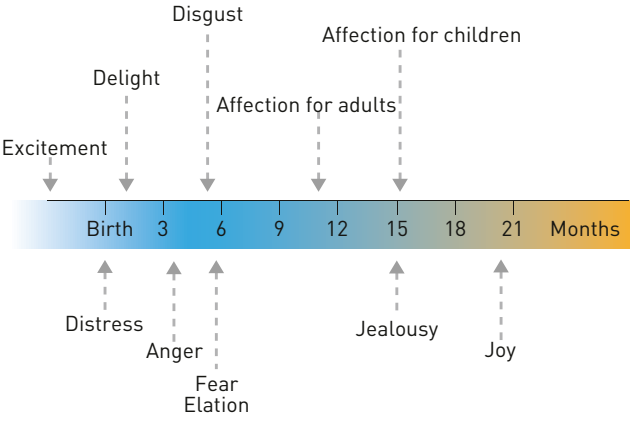


FIGURE 2 The traditional view of infancy holds that emotions are developed at different stages over the first 2 years (based on Bridges, 1931).

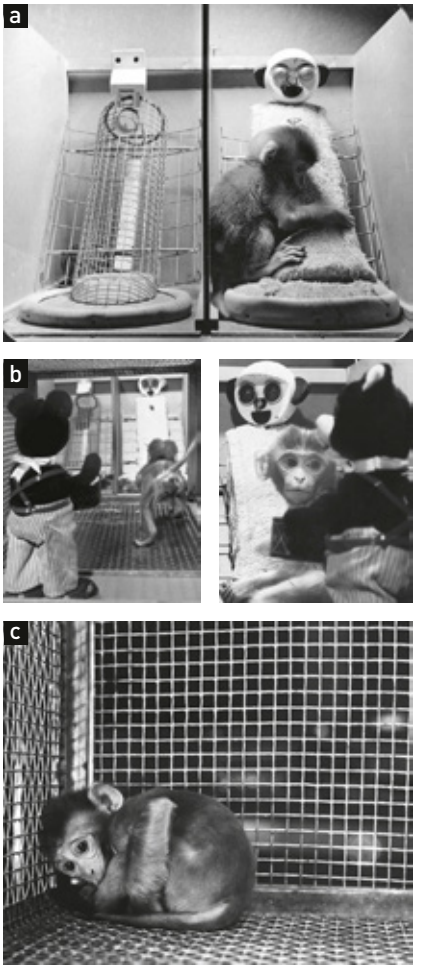


FIGURE 3 (a) Even when the wire monkey is the sole source of nourishment, infant monkeys showed a marked preference for the terry-cloth 'mother'. (b) Infant monkeys frightened by a novel stimulus (in this case a toy teddy bear banging a drum) retreat to the cloth-covered 'mother' rather than to the wire 'mother'. (c) When placed in strange situations without their surrogate mothers, infant monkeys displayed intense fear responses.

the wire surrogate mothers provided food and nourishment. He also discovered that when he frightened the monkeys, those raised with the cloth surrogate mother would run and hold on to it for security, whereas those raised with the wire surrogate mother did not seek comfort from it at all (Santrock, 2008). Harlow stated that the cloth surrogate mother was also a 'secure base' for the monkeys, as they would often move away from the cloth surrogate mother and explore the environment, and then return to the cloth surrogate mother before continuing to explore. In further investigations, Harlow found that when the cloth surrogate mother was able to rock, feed and provide warmth to the infant monkey, then attachments were stronger. Consequently, Harlow demonstrated that feeding and nourishment do not create attachment: contact comfort is more important (McIlveen & Gross, 1998).

While Harlow's research findings indicated that attachment formation requires contact comfort, further studies conducted by Harlow and Suomi (1970) noted that other factors – such as interaction with other monkeys during the first few months of life – also contributed to attachment. The infant monkeys raised by the cloth surrogate mothers did not develop normally; when fully grown, they became aggressive, rarely socialised with other monkeys and found mating very difficult (McIlveen & Gross, 1998).

Research conducted on monkeys has therefore provided us with ample information on the development of attachment and emotional development. It also provided a good foundation for further research and investigation in these areas.

Konrad Lorenz

Konrad Lorenz was an Austrian zoologist, ethologist and ornithologist. He made detailed observations of animal behaviour and was interested in how attachment occurs in young ducklings and goslings (see Section 7.3). In 1935, Lorenz took a large clutch of goose eggs and kept them until they were about to hatch. Lorenz then placed half of the eggs under a goose mother, and kept the other half beside himself.

When the eggs that Lorenz had kept hatched, Lorenz imitated a mother goose's quacking sound. The newly hatched geese then regarded Lorenz as their mother, and continued to follow him as though he were. The eggs that had been placed under the mother goose regarded her as their mother, and followed her accordingly.



FIGURE 4 Konrad Lorenz with his goslings

This led Lorenz to conclude that newly hatched geese will follow the first moving object that they see within the 12- to 17-hour critical period after hatching. This tendency of a young animal to fixate its attention on, and thereafter follow, the first object to which it is exposed is known as imprinting. Imprinting suggests that attachment is an innate instinct and programmed genetically. It reflects a kind of automatic learning that typically occurs early in life, during a sensitive period of development, and is often referred to as phase-sensitive learning. For humans, the first object an infant fixates on is invariably a parent.

According to Lorenz (1937, as cited in Burton *et al.*, 2015), imprinting provides an evolutionary advantage – it ensures that a young gosling will stay close to its parent, thereby increasing the chance of being fed and protected and taught survival skills. Lorenz's concepts therefore helped advance our scientific understanding of how behaviours evolve over time, and provided important insights on the adaptive values of specific kinds of behaviours that are important for the survival of the species (Hess, 2018).

John Bowlby

British researcher John Bowlby (1969) was primarily interested in the development of attachment in children. Bowlby's theory is the most widely accepted view of the development of attachment. He believed that attachment occurs in the first year of a child's life, and that the reactions and behaviours of the caregiver are crucial. Bowlby stated that the development of attachment is biological and genetically inherited and typical of human behaviour. In order to keep caregivers close, which is necessary for their survival, infants cry, coo, smile, crawl, walk and follow their mothers.

Bowlby was both an ethologist and psychoanalyst, and he developed a theory of attachment leveraged from earlier work by both Harlow and Lorenz on human attachment and imprinting. Bowlby believed that human attachment is prewired and that attachment behaviour evolves over time (Burton *et al.*, 2015). For example, in the early stages of emotional development, infants stay close to their parents and cry when they feel threatened or when their parent (i.e. attachment figure) is no longer present (Burton *et al.*, 2015).

Phase	Age	Description
Pre-attachment	0–2 months	Infants interact with humans and cannot discriminate between one person and another. They are likely to smile or cry for parents, siblings and strangers alike. Hence they can be left with an unfamiliar adult without becoming distressed.
Attachment in the making	3–7 months	Attachment to the caregiver begins. The baby learns to distinguish familiar from unfamiliar faces and so recognises its parents, although it may not protest when separated from them.
Clear-cut attachment	8–24 months	Infants seek specific attachments and may display separation anxiety when their caregiver leaves.
Goal-directed partnership	24 months onwards	Children recognise others' needs, feelings and plans, and also understand that their caregivers will come, go and return. Communication skills begin to develop and separation anxiety decreases.

TABLE 1 Bowlby's phases of attachment

Bowlby proposed that attachment develops in a series of phases. These phases demonstrate that initially a baby enjoys contact with any human being, but later prefers a partnership with a primary caregiver (Santrock 2008).

From around 6 months of age, infants begin to demonstrate some emotional bond or attachment with one other person. An infant demonstrates attachment in several ways:

- They want to be close to a caregiver, especially when distressed.
- They show pleasure through smiling or cooing when in the company of their caregiver.
- They protest (for example, by crying) when the caregiver leaves.
- They express joy or relief if the caregiver returns or when reunited with them.
- They use the caregiver as a base from which to explore the environment, so that they can check back with them if they require reassurance (White, Hayes, & Livesay, 2005).

Further research was conducted on the development of infant attachment by Schaffer and Emmerson (1964). They discovered that 'stranger fear' – or an infant's wariness of unfamiliar people and faces – develops at the same time as an infant's first attachment. This is demonstrated in Figure 5.

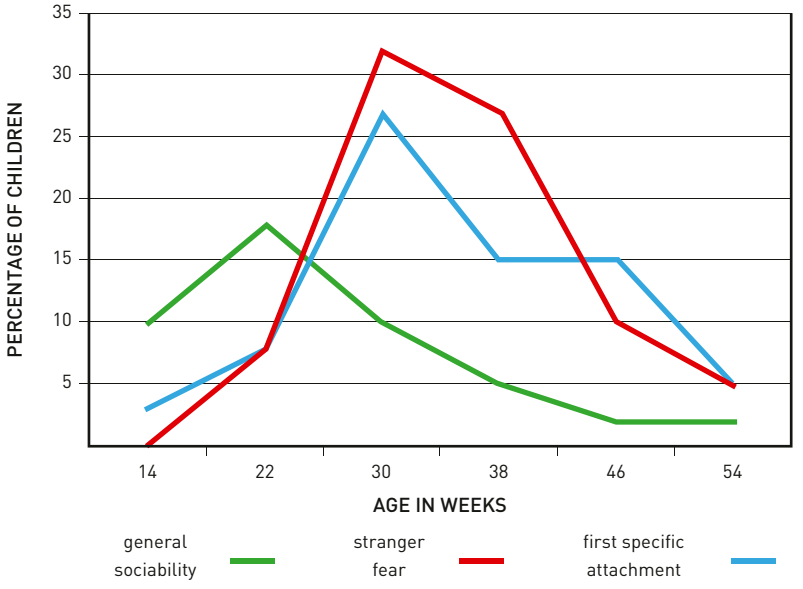


FIGURE 5 Developmental changes in stranger fear and specific attachment to an individual caregiver

Mary Ainsworth

When studying attachment theories, we must consider the *quality* of attachment between infants and their caregivers by observing behaviours.

Mary Ainsworth and her colleagues (1978) were the first researchers to study differences in the quality of attachment. Rather than using naturalistic observation techniques, Ainsworth created a laboratory testing technique known as the **Strange Situation**. Figure 7 shows the layout of the laboratory for the Strange Situation tests.

Strange Situation a method used by Ainsworth to study the differences in quality of attachment between an infant and a caregiver

The Strange Situation allowed Ainsworth to measure infant attachment by having infants experience a sequence of events, including separations and reunions with their mothers, and introductions to an adult stranger. The flow chart in Figure 6 outlines the Strange Situation

procedure. Ainsworth categorised the babies' responses to the Strange Situation into three types of attachment shown in Table 2 (p.174).

Episode 1 (30 seconds)	The researcher directs mother and child into the room (laboratory) where there are toys and leaves them there.
Episode 2 (3 minutes)	Mother sits while the baby explores and plays freely.
Episode 3 (3 minutes)	Stranger enters the room and sits silently for one minute. Stranger talks to the mother for one minute. Then stranger interacts and plays with the baby for the third minute.
Episode 4 (3 minutes or less)	First separation: mother leaves the room discreetly and the stranger responds to any of the baby's needs. For instance, if the baby cries the stranger tries to comfort them.
Episode 5 (3 minutes or more)	First reunion: stranger leaves the room and the mother returns to greet and comfort the child, then tries to reinterest them in playing with the toys.
Episode 6 (3 minutes or less)	Second separation: mother leaves the room and the baby remains alone.
Episode 7 (3 minutes or less)	Stranger returns, and if the infant becomes distressed tries to comfort them.
Episode 8 (3 minutes)	Second reunion: mother returns, greets the baby and picks it up. The stranger leaves the room discreetly.

FIGURE 6 The Strange Situation procedure

The Strange Situation procedure has been particularly useful in measuring the quality of attachment between infants and their caregivers from Australia, New Zealand, the United States and Canada. However, there are cross-cultural variations: when similar research was conducted on infants from other cultures, the results were different. For instance, when the Strange Situation procedure was used on infants from Japan, the percentages in the three categories differed from the results observed with UK infants. As demonstrated in Figure 8 (p.174), a high percentage of Japanese infants were classified as Type C. This means they became distressed when their caregiver left them and could not be calmed down or comforted once the caregiver returned. The reason for this result is that Japanese children are rarely separated from their mothers, so the departure of their mother in the Strange Situation created more stress for the Japanese infants. UK infants, on the other hand, were more likely to be used to separation from their mothers (Miyake, Chen, & Campos, 1985).

Figure 8 also illustrates other cultural differences in attachment that have been observed. These could be due to different cultural practices used in raising infants. However, despite the differences, the most common category of attachment among infants in every culture is Type B: 'securely attached' (Thompson, 2006).

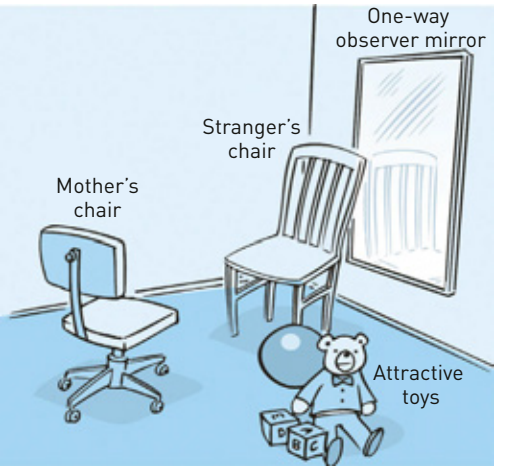
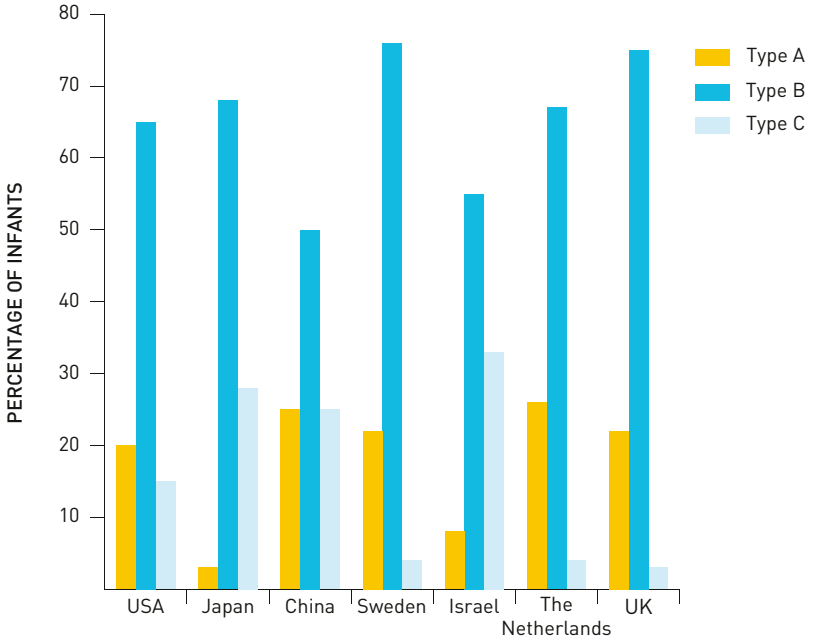


FIGURE 7 The Strange Situation laboratory, used to test the quality of attachment

Category*	Style	Description/typical behaviour	Percentage of 1-year-old infants in category
Type A	Insecure avoidant attachment	These infants rarely get upset when a stranger enters the room. They do not cling to their caregiver at any stage. They show no distress when their caregiver leaves the room and can ignore or avoid them when they return. These infants do become distressed when left alone; however, they can be comforted by either their caregiver or the stranger. Both adults are treated the same way by the infants.	20–25
Type B	Secure attachment	These infants will play happily when their caregiver is present, trusting that their caregiver will be there if they need them. These infants are very attached to their caregiver and will become distressed when their caregiver leaves. A stranger can comfort the infant, but is treated differently from the caregiver. When the caregiver returns, these infants will seek immediate contact and are delighted when they are reunited. In this instance, infants are distressed by the absence of the caregiver, not by being alone.	65
Type C	Insecure resistant attachment	These infants are more clingy, cry more and do not explore or play as much as Type A or B. They become extremely distressed when their caregiver leaves and resist any comfort from the stranger. These infants seek contact with the caregiver when reunited, but will not display joy during this time. Instead they will continue to be distressed, cry and will not play. These infants appear to be anxious and negative.	10

*Note: A small percentage of infants could not be classified using the Strange Situation procedure (Peterson, 2004).

TABLE 2 Ainsworth's attachment styles.



Based on data in Miyake, Chen, & Campos (1985), *Infant temperament, mother's mode of interaction and attachment in Japan.* Monographs of the Society for Research in Child Development, 50, 276–97 and Schaffer. Social Development, Oxford: Blackwell.

FIGURE 8 Attachment classifications of infants from different cultures tested in the Strange Situation (Peterson, 2004)

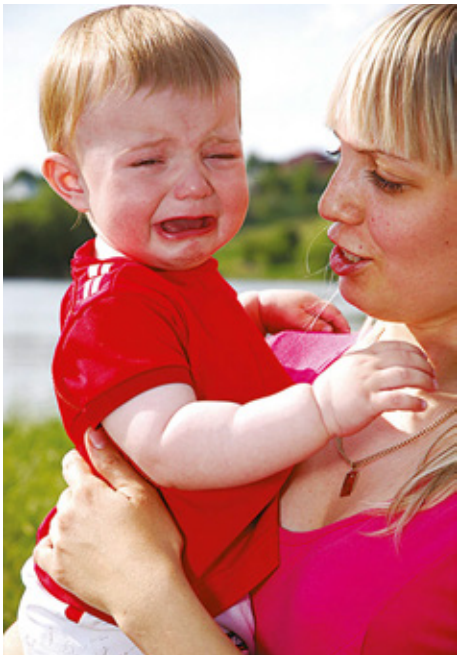


FIGURE 9 Passing an infant over to someone other than their carer may not result in the reaction sought by the stranger.

CHALLENGE 8.1

Changing attitudes to fathers

Society's attitudes to fathers being the primary caregiver to infants is changing. Collect magazine advertisements and/or children's storybooks that show an infant 2 years of age or younger with a caregiver, and count the number of times that the caregiver is the mother, father or another person (such as a grandparent). Consider the following:

1 Do mothers outnumber fathers in these situations?
2 Consider your image sources. Does that make a difference?
3 As a class compare the findings, and discuss possible reasons for the findings.

CHECK YOUR LEARNING 8.1

Describe and explain

1 **Explain** the relationship between emotional development and attachment.
2 **Explain** why emotions are such an important part of our lives.
3 **Describe** Harlow's work and how it contributed to our understanding of attachment.
4 **Describe** Lorenz's attachment research.
5 Bowlby believed that the development of attachment is biological and typical of human behaviour. **Explain**.
6 Sue notices that her 10-month-old son cries every time she leaves him at day care. **Identify** why this might occur with reference to Bowlby's theory of attachment.

Apply, analyse and interpret

7 Three-year-old Ben used to cry every time his mother left him at his grandparents' house. He no longer does this. According to Bowlby's theory of attachment, **determine** the phase Ben is in.
8 Eighteen-month-old Jasper doesn't seem to notice if his mother leaves the room and doesn't react when she returns. **Apply** Ainsworth's theory of attachment to **explain** why this behaviour occurs.
9 **Explain** two attachment behaviours that an infant can demonstrate towards a caregiver.
10 **Distinguish** between privation and deprivation
11 Below are two-year old children's responses to the question, 'How would you cope if your parents went away?' **Classify** each child into one of Ainsworth's categories and discuss your choice.
   a Interviewer: What will you do? Child: Chase them. Interviewer: Chase who? Child: Dad and Mum with my new toy car…toss a bow and arrow and shoot them.
   b Interviewer: What will you do? Child: I am going to stay up…and cry until they come back. Then I will be happy.
   c Interviewer: What will you do? Child: Run away and just play with my toys.

Investigate, evaluate and communicate

12 **Investigate** what Ainsworth was measuring by using the Strange Situation technique.

Check your obook assess for these additional resources and more:

» Student book questions
Check your learning 8.1

» Suggested practical
Worksheet: 8.1 Correlational investigation: technology and cognitive development

» Suggested research
Worksheet: 8.1 Attachment and psychological development

» Challenge
Worksheet: 8.1 Changing attitudes to fathers

8.2 Environmental influences on development

KEY IDEAS

In this section, you will learn about:

+ the effects of early abuse or deprivation on development.

There is an ongoing interaction between nature and nurture throughout life. Unfortunately, many children are not born into loving and caring environments. Early abuse or deprivation has been shown to negatively influence an infant's ability to develop attachments and cognitively process information. It is important to remember that abuse is not restricted to physical violence, and emotional neglect can also have a profound negative effect on an infant's cognitive development.

Romanian adoption study

Michael Rutter was the UK's first professor of child psychiatry. Rutter considered deprivation to be the loss or damage to an existing attachment. He differentiated this from privation, which he saw as when a child fails to develop an attachment at all.

In the 1980s, Romania was in a period of civil unrest, and the Western world learnt of many children being housed institutionally in warehouses: Romania considered these children to be beyond help. This knowledge inspired many families from the UK to adopt Romanian children.

This adoption provided Michael Rutter with an opportunity to conduct longitudinal research into the effects of early deprivation and abuse on infants. Rutter argued that it was not only a lack of attachment to a primary caregiver that influenced development, but a lack of intellectual stimulation and social experiences that attachment would normally provide.

Rutter, O'Connor and the English and Romanian Adoptees research team investigated the effects of early deprivation. According to Rutter (2004), the research team compared 144



FIGURE 1 Romanian orphans from Rutter's adoption program

children reared from infancy in depriving institutions in Romania, who were later adopted into UK families, with 52 children born in the UK and placed in adoptive families before 6 months of age. There were 45 Romanian children who were adopted under 6 months of age, 54 who were adopted between 6 and 24 months, and 45 children who were adopted between 24 and 42 months.

The children adopted from Romania typically experienced ongoing high levels of deprivation, which was recorded at the time of their entrance into the UK. The adopted children, those born in the UK and Romania, were measured at the time of their arrival to the UK and at 4 or 6 years of age, depending on their age at the time of adoption.

Study tip

For further information on deprivation, refer to your obook assess.

At 4 or 6 years of age, the children and their caregivers underwent intensive interviews to determine their cognitive, emotional and intellectual levels.

Rutter's research found that the 'effects of institutional rearing on attachment disinhibition' appear to apply even if profound deprivation is not involved. Rutter found a relationship between the length of the institutional deprivation and attachment disorders in children. For example, infants who entered the UK under the age of 6 months showed no significant deficits, although many children displayed an insecure attachment pattern (Rutter, 2004).

This disinhibited attachment that children showed was characterised by:

- a lack of preference for contact with caregivers versus relative strangers
- lack of checking back with parents in anxiety-inducing situations.

Rutter thus proposed that a reactive attachment disorder develops if a child's needs for comfort, affection and nurturing aren't met. In these circumstances, loving and caring attachments with others are never established and can potentially influence a child's ability to establish future relationships.

Rutter thus found that institutional deprivation in the early years strongly influenced later attachment. Specifically, the duration of institutional deprivation had a strong negative relationship with subsequent attachment and cognitive ability in childhood. These cognitive and emotional deficits continued to persist in Romanian children even after adoption. However, the Rutter study also revealed that the effects of early deprivation could be reversed over time. The Romanian children living with adoptive families showed considerable recovery towards normal levels of social functioning over time (Rutter, 2004).

CHECK YOUR LEARNING 8.2

Describe and explain

1 **Describe** Michael Rutter's theory of deprivation.

Apply, analyse and interpret

2 **Consider** how the orphaned children's adoptive families may have affected their attachment.

Investigate, evaluate and communicate

3 **Investigate** Izidor Ruckel. Once an orphan in a horrific Romanian orphanage, he is now an activist for those who remain in orphanages and an inspiration to all. **Evaluate** his attachment as a child, and **communicate** your findings in a short essay.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 8.2
- » Suggested research
  Worksheet: 8.2 The potential effects of deprivation
- » Weblink
  Privation
- » Weblink
  English and Romanian adoption

8.3 Cognitive development

KEY IDEAS

In this section, you will learn about:

- the development of cognitive abilities from concrete to symbolic thinking
- cognitive, sociocultural and information-processing theories of cognitive development.

The way a child develops attachment is important, but their cognitive development is equally so. In this section, you will learn how cognitive abilities are informed by Piaget's theory of cognitive development. You will also learn about Vygotsky's sociocultural theory of cognitive development and about the information-processing model of cognitive development, including processing speed, cognitive strategies and metacognition.

Jean Piaget

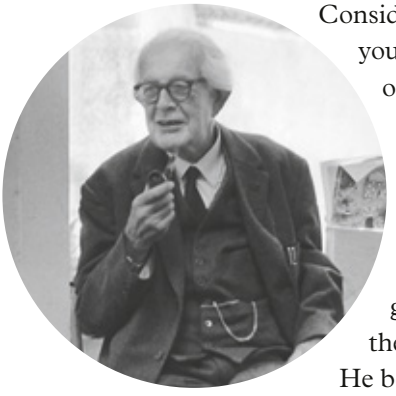


FIGURE 1 Jean Piaget

Consider your childhood for a moment. What were your thought processes like? Were you rational at 6 years of age? Did you understand the concept of honesty at 3 years of age? Could you answer hypothetical questions at the age of 5? The study of cognitive development examines the way in which thinking changes as we grow.

One theory that gained much attention was formulated by Jean Piaget (1896–1980), a Swiss psychologist. Piaget believed that cognitive development depends upon the interaction of the brain's biological maturation with personal experiences. After many years of observations, Piaget proposed that all children go through four different cognitive stages sequentially, without missing any (unless there is some sort of brain damage, meaning a child could regress to earlier stages). He believed that these stages were the same for every child, regardless of their culture.

In order to understand Piaget's four stages of cognitive development, we must first consider a few important aspects. Piaget proposed that during cognitive development, the brain builds **schemata**. These are mental frameworks that organise past experiences and provide an understanding of future experiences. In infants, schemata are simple: they are the basic blocks of knowledge, such as the inborn reflexes of sucking and grasping. As children grow, schemata become more complex in order to incorporate experiences or information that has been gathered.

schemata
a term used by Piaget to describe a cognitive or mental plan that is a guide for related actions and perceptions (singular: schema)

assimilation
according to Piaget, the process where new experiences are combined with existing schemas

accommodation
Piaget's term for when new situations, objects or information are encountered and the person's schema is either modified or a new schema is created

Two processes that are involved in altering existing schemata or developing new schemata are called **assimilation** and **accommodation**. Assimilation is the process whereby new experiences are combined with existing schemata. For instance, when an infant experiences a new toy for the first time, they may put it in their mouth and suck on it. This behaviour demonstrates that the infant is trying to fit information about this new toy into their existing schema (mental framework) of sucking. Similarly, if a child saw a toy truck for the first time they would examine it and fit it into their schema of cars, since the truck has similar qualities to a car. However, if an infant or child discovers that new information does not fit into their schemata, then accommodation occurs. Accommodation is when new experiences cause schemata to change or modify. For instance, if an infant discovers that the object they are trying to suck is too big or tastes awful, or the child discovers that the truck is bigger than a car, then these thoughts cause schemata to change and become more complex. These processes help infants and children understand their world.

Piaget's four stages of cognitive development

According to Piaget, cognitive development involves understanding new experiences in relation to the knowledge children already have (assimilation) and modifying thinking for new experiences (accommodation) that don't fit into current schemata. Piaget proposed four stages that summarise the different schemata a child has at particular times in their life and how the schemata change with experiences as they grow: sensorimotor, preoperational, concrete operational and formal operational. Table 1 explains each stage.

Stage	Age (years)	Explanation	Cognitive developments and limitations
Sensorimotor	0–2	Infants learn about their world through their senses (hearing, seeing) and by actions (motor) such as grasping or pulling.	• **Object permanence**: infants come to understand that an object still exists when it is no longer seen.
Pre-operational	2–7	Children continue to develop, and they use symbols, images and language to represent their world.	• **Symbolic thinking**: Children develop symbols to represent objects or events. This thinking allows the child to participate in pretend or make-believe play. • **Animism:** Children will believe that inanimate objects are alive, for example, talking about toy cars as people. • **Egocentrism:** Children are unable to view the world from someone else's perspective. This was seen in the three mountain experiment (see Figure 3).

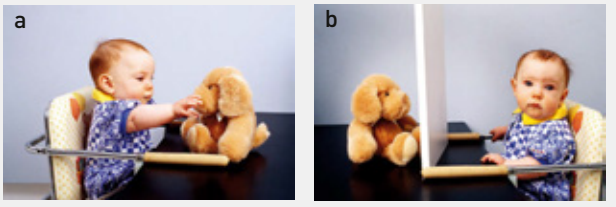


FIGURE 2 Infants develop a sense of object permanence.

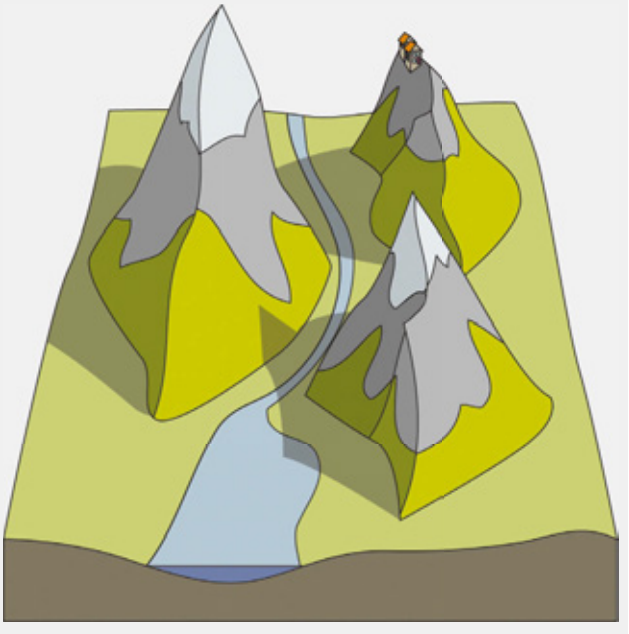


FIGURE 3 Piaget's three mountain experiment for egocentrism. Four-year-old children stood in front of a model of three mountains and were shown 10 pictures of the mountains from other sides of the model.

Most children could pick out their own view. When asked to select a view from another person's perspective, most selected their own or another incorrect option.

object permanence
realising that an object still exists when it is no longer visible

symbolic thinking
development of symbols to represent objects or events

animism
Piaget's term for the pre-operational stage where children will believe that inanimate objects are alive

egocentrism
Piaget's term for when a person does not make distinctions between their own thoughts, feelings and perceptions and those of others

centration
Piaget's term for the pre-operational stage where children can only focus on one aspect of a task at a time

seriation
Piaget's term for the preoperational stage where children will have difficulty arranging objects according to one dimension

conservation
the inability to understand that objects stay the same despite changes in their appearance

irreversibility
children's inability to realise that an action can be done and then undone

reversibility
Piaget's term for understanding that inversion of (reversing) an action will return it to its original state

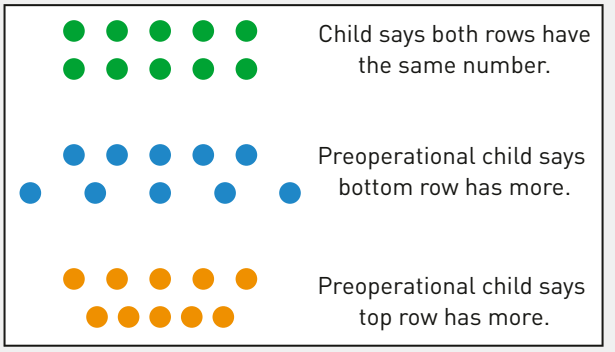
Stage	Age (years)	Explanation	Cognitive developments and limitations
			• **Centration:** Children can only focus on one aspect of a task at a time: for example, if a child is asked to divide blocks according to size and colour, it is likely they will divide the blocks either for size or colour, but not both. • **Seriation:** Children will have difficulty arranging objects according to one dimension, for example, arranging sticks from shortest to longest. • **Conservation:** Children lack conservation; they cannot understand that objects stay the same despite changes in appearance. (See Figure 4.)  **FIGURE 4** A conservation of numbers task – preoperational children are unable to understand that objects stay the same despite changes in their appearance. • **Irreversibility**: Children are unable to realise that an action can be done and then undone.
Concrete operational	7–12	Children can perform basic mental problems that involve physical objects.	Children begin to understand **reversibility** and conservation, and display less centration and egocentrism. Children may struggle to solve problems that require abstract thinking.
Formal operational	12+	Children are able to think logically and methodically about physical and abstract problems.	Children begin to think more flexibly. They can do hypothetical problems, and can form and test hypotheses.

TABLE 1 Piaget's four stages of cognitive development

SUGGESTED RESEARCH
8.3 Sociocultural theory and cognitive development
Go to page 456 »

Evaluation of Piaget's theory

Piaget's theory of cognitive development has had a profound impact on psychology, and has influenced and guided much research on the way children think and learn. Research has supported Piaget's observations on the sequences of cognitive development and the notion that cognitive abilities develop across cultures. However, there have been some criticisms:

- Children can gain cognitive skills at an earlier age than Piaget believed.
- Cognitive abilities can develop inconsistently. A child may perform most tasks at a pre-operational level, but solve some tasks at a concrete operational level.
- Piaget's perspective on cognitive development considered scientific logical thinking, but not how different cultures can influence cognitive development. Some cultures believe that social intelligence and thinking is important and a part of cognitive development.
- Piaget suggested that cognitive development involves children moving from simple to complex thinking, but other research suggests that cognitive development is more complex and that children do not necessarily follow the same developmental path.
- Piaget often conducted cognitive tests and observations on his own children, so the methodology of his experiments has been questioned.

Vygotsky's sociocultural theory of cognition

Russian psychologist Lev Vygotsky (1896–1934) developed a theory of sociocultural development that has since become the foundation for further research into how children learn. His work became increasingly influential after it was translated into English in 1962. Vygotsky emphasised the importance of social interaction in a child's cognitive development. Children learn first by interacting with others who are more skilled, and then integrate that knowledge into their own mental structure. Vygotsky's theory is that the social and cultural context in which learning takes place actively affects a child's cognitive development. He argued, 'learning is a necessary and universal aspect of the process of developing culturally organised, specifically human psychological function' (Vygotsky, 1978, p. 90).

Vygotsky's sociocultural theory of cognition was based around three key themes: the zone of proximal development, the more knowledgeable other and scaffolding.

Zone of proximal development

Probably the most recognised of Vygotsky's concepts is the **zone of proximal development (ZPD)**. This refers to the 'sweet spot', where children are able to learn how to accomplish a task, with guidance from someone else, which they would not be able to do by themselves. An example might be when a young child wants to wrap a Christmas present. Left alone, they would struggle to neatly wrap the present and tie a ribbon on it. However, with guidance from someone more skilled at wrapping presents, the child would learn how to accomplish the task by themselves. In this situation, the skills required are too difficult for a child to acquire independently, but can be learnt with help and guidance from someone else. This continuum of cognitive development, stretching from solo performance to collaborative cooperation, is the zone of proximal development.

zone of proximal development continuum of cognitive development stretching from solo performance to collaborative cooperation

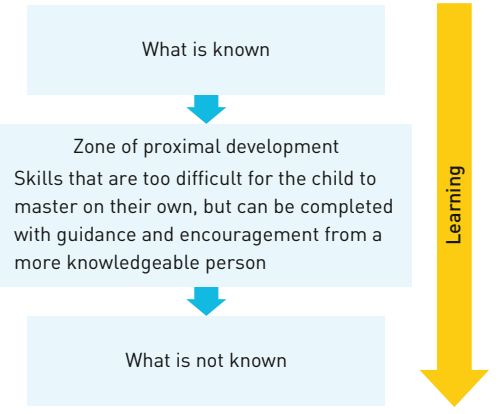


FIGURE 5 The zone of proximal development

More knowledgeable other

more knowledgeable other
another individual with greater knowledge about a particular topic

Closely related to the ZPD is the concept of the **more knowledgeable other**. This theory recognises the importance in a child's cognitive development of interaction with a person who has more understanding or knowledge about a particular topic. That is, we learn from others who know more than we do about a particular subject, task or process. In many cases, particularly when we are quite young, we learn primarily from our parents. For example, regarding the child learning to wrap Christmas presents, this could involve their father sitting down to teach them the task. But it could be anyone else with greater knowledge, such as an older sibling or a friend who has already been taught how to master that skill, or a teacher at school. These days, guidance may even come from a non-human source, such as a voice-activated information service on a smartphone.

Scaffolding

scaffolding
providing support to a child to help them learn and master a task independently

The theory of **scaffolding** is also closely related to the previous two concepts. It refers to the level of temporary support that children need before they learn how to master a task independently. When someone is teaching a child how to accomplish a task, they may originally start by providing a lot of guidance and instruction, and then gradually reduce the level of support as the child masters the skills required. In the previous example, the child learning how to wrap a present may initially need their teacher to be very hands-on when instructing where and how to fold the paper, but eventually the child will be able to do it by themselves. The 'scaffolding' support is reduced bit by bit until it is no longer needed.

Vygotsky's work is influential because it stresses the fundamental role of social interaction in the development of cognition (Vygotsky, 1978) as well as the fact that cultural context is an important contributor to development (McLeod, 2014). The way children develop in one culture may be quite different from another because of differences in the patterns of social interaction within those cultures.

As a result, Vygotsky's theory of cognitive development differs from Piaget's in a number of ways. Piaget theorised that there were universal stages of cognitive development that every child goes through, and this progression was largely universal and independent of cultural context. Vygotsky places much more importance on the impacts of culture (McLeod, 2014). Piaget also indicates that cognitive development is largely a result of children exploring independently and constructing knowledge, whereas Vygotsky emphasises that children co-construct knowledge with guidance from others based on social interactions (Burton *et al.*, 2015).

Information-processing model of cognition

The information-processing model aims to identify the specific processes that account for cognitive development, including how quickly we can process information and how our memories are encoded and retrieved as required.

processing speed
the time it takes for an individual to mentally perform a cognitive (or mental) task

According to the information-processing model of cognition, **processing speed**, or mental quickness, is the key variable that contributes to cognitive development (Burton *et al.*, 2015). This means the older you grow, the more quickly and effectively you can complete a range of cognitive tasks and problems. Our processing time declines exponentially during childhood and adolescence, levelling off around age 15 (Kail, 1991). We are able to complete various complex cognitive tasks quickly due to our enhanced capability in processing information in working memory (Burton *et al.*, 2015).

SUGGESTED RESEARCH
8.3 Informative processing and metacognition
Go to page 456 »

Cognitive strategies

The information-processing model of cognition also recognises that, across our lifespan, we learn new **cognitive strategies** to solve both simple and complex problems. In the early years of life, we typically use rote repetition to remember things. Think of how you continually repeat a phone number over and over until it's locked in your memory; the idea is that you will be able to quickly recall the information the more you repeat it. However, we become increasingly more sophisticated in our application of cognitive strategies throughout childhood – for example, using chunking and categorising strategies to help us remember. We learn what works over time and continually refine our approach by applying successful problem-solving strategies in new environments and gradually evolving new strategies, depending on situational changes (Burton *et al.*, 2015).

cognitive strategies
mental strategies that an individual uses to solve both simple and complex cognitive problems

Metacognition

Finally, **metacognition,** or 'thinking about thinking', is another key factor that influences our cognitive development. Metacognition involves our personal awareness and understanding of our own thought processes. Metacognition enables us to better understand how and when to use particular strategies for learning or problem-solving. It also involves knowledge of our personal approach to solving cognitive tasks, such as strategies that can be used to help improve memory (Burton *et al.*, 2015).

metacognition
a key factor that involves an individual's personal awareness and understanding of their own thought processes

CHECK YOUR LEARNING 8.3

Describe and explain

1 **Explain** methods to test the following cognitive developments of Piaget's theory:
   - **a** object permanence
   - **b** animism
   - **c** seriation
   - **d** centration
   - **e** egocentrism

2 **Explain** the three themes of Vygotsky's theory of sociocultural cognitive development.

3 **Describe** examples of the zone of proximal development.

Apply, analyse and interpret

4 A teacher is instructing children on how to draw a tree. Previously, the children had tried and had been unsuccessful. **Apply** Vygotsky's theory to determine which theme the children are using.

Investigate, evaluate and communicate

5 **Investigate** the impact of increased use of digital technology on children's cognitive development.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 8.3
- » Suggested research
  Worksheet: 8.3
  Sociocultural theory and cognitive development
- » Suggested research
  Worksheet: 8.3
  Information processing and cognitive development
- » Weblink
  Piaget's theory of cognition

CHAPTER 8

Review

Summary

8.1
- Emotional development is the study of emotions, including when people learn emotions and how they deal with their emotions.
- Emotional development allows attachment to occur between infants and their caregivers. The mutual love and close bond is not only crucial in early years but also helps people form relationships later in life with friends or lovers.
- Harry Harlow's work focused on attachment in primates. He discovered that contact comfort is more important in creating attachment than feeding and nourishment.
- Konrad Lorenz proposed that imprinting occurred as an evolutionary advantage.
- John Bowlby (1969) proposed that the development of attachment occurs in the first year of a child's life, and the reactions and behaviours of the caregiver are crucial.
- John Bowlby believed that the development of attachment is biological and genetically inherited, and typical of human behaviour.
- Mary Ainsworth (1978) studied differences in the quality of attachment using a laboratory testing technique known as the Strange Situation.
- Mary Ainsworth described infants' attachment behaviour in three categories or styles of attachment: Type A (insecure avoidant attachment), Type B (secure attachment) and Type C (insecure resistant attachment).

8.2
- Michael Rutter found that disinhibited attachment was characterised by a lack of preference for contact with caregivers versus relative strangers, and a lack of checking back with parents in anxiety-inducing situations.

8.3
- Piaget proposed four stages of cognitive development:
  - the *sensorimotor stage* – The infant knows the world via its immediate senses and the tasks it performs.
  - the *preoperational stage* – The child's internal mental world continues to develop but is still dominated by the external world and how things look.
  - the *concrete operational stage* – The child can carry out mental operations on the world that manipulate the relationships between objects and situations. The child can now handle more than one object or situation at a time.
  - the *formal operational stage* – The child can mentally manipulate ideas, think hypothetically about abstract concepts and approach problems in a systematic way.
- Recent research has suggested that development is influenced by many factors such as culture, language and experience, and is less structured.
- Vygotsky proposed sociocultural cognitive development with three key themes: the zone of proximal development (ZPD), the more knowledgeable other and scaffolding.
- Information-processing theories suggest that processing speed is the key variable in cognitive development, and that cognitive strategies are formed and used throughout the lifespan to solve both simple and complex problems and that metacognition or thinking about thinking is a key factor that influences human cognitive development.

Key terms

- accommodation
- animism
- assimilation
- centration
- cognitive strategies
- conservation
- egocentrism
- imprint
- irreversibility
- metacognition
- more knowledgeable other
- object permanence
- privation
- processing speed
- reversibility
- scaffolding
- schemata
- seriation
- Strange Situation
- symbolic thinking
- zone of proximal development

Revision questions

Multiple choice

1 What is emotional development?

- **a** the study of emotions that includes how infants perceive the world through their senses
- **b** the study of psychosocial emotions that are necessary for survival
- **c** the study of emotions, including the point in time when people learn emotions and how they deal with their emotions
- **d** all of the above

2 What is privation?

- **a** being able to keep all clients' information private and confidential
- **b** a strong, close and emotional bond that develops between infants and their caregivers
- **c** John Bowlby's theory of attachment
- **d** when attachment never occurs and a child never forms a close relationship with anyone

3 What did Harry Harlow's experiments with rhesus monkeys demonstrate?

- **a** Feeding and nourishment do not create attachment; contact comfort is more important.
- **b** Nourishment creates attachment.
- **c** Feeding and contact comfort create attachments.
- **d** Contact comfort is not important at all.

4 According to Ainsworth (1978), what are the categories of infant attachment behaviour?

- **a** insecure avoidant, securely attached and insecure resistant
- **b** avoidance, insecurity and resistance
- **c** avoidance behaviours and happy behaviours
- **d** insecure resistant, insecurely detached and avoidant

5 When does Piaget's concrete operational stage occur?

- **a** between the ages of 5 and 7 years
- **b** between the ages of 7 and 12 years
- **c** between the ages of 3 and 8 years
- **d** between the ages of 5 and 13 years

6 In which of Piaget's stages would a child be expected to pull a blanket towards them in order to reach a desired toy?

- **a** sensorimotor stage
- **b** preoperational stage
- **c** concrete operational stage
- **d** formal operational stage

7 In which of Piaget's stages would a child be expected to be able to manipulate mental images?

- **a** sensorimotor stage
- **b** preoperational stage
- **c** concrete operational stage
- **d** formal operational stage

8 Which of these is not one of John Bowlby's phases of attachment?

- **a** Pre-attachment
- **b** Anxious attachment
- **c** Clear-cut attachment
- **d** Goal-directed partnership

9 Identify Mary Ainsworth's strange situation:

- **a** A strange situation is when someone wears all green clothing all the time and dyes their hair green.
- **b** The strange situation is a method used to observe a child's attachment to their caregiver.
- **c** The strange situation was a method used to observe a child's imprinting.
- **d** A strange situation occurs when children are adopted from deprived environments.

10 Tommy knows that if his mother hides his teddy bear, it will come back, but he struggles to think about his older brother's view of the world when they play together. Tommy also really likes to talk to his toys as though they are alive. Identify which of Piaget's stages Tommy is in.

- **a** sensorimotor
- **b** preoperational
- **c** concrete operational
- **d** formal operational

11 According to Konrad Lorenz, imprinting is important because:

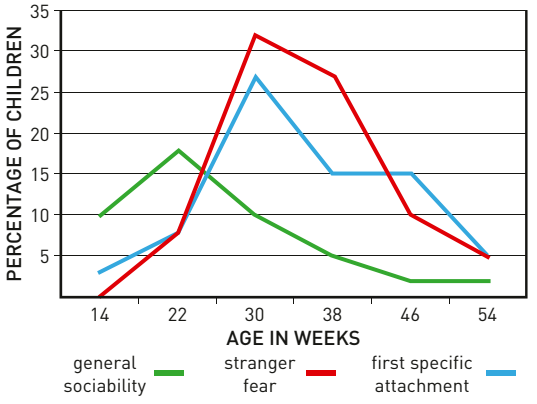
- **a** it ensures that a young gosling will follow their parent
- **b** people like to know what their parents look like
- **c** to survive, babies need to look only at one adult
- **d** young goslings learn how to feed and protect themselves without parental influence.

12 Which of the following best describe a goal-directed partnership?

- **a** babies interact with adults and cannot identify their parents more than any other adult
- **b** children are able to see the needs of others and understand the feelings of others.
- **c** attachment to a caregiver begins to form
- **d** babies experience separation anxiety

13 View the graph below. What does this graph suggest about developmental changes in attachment to a caregiver?

- **a** more children will experience stranger fear at 8 months than at 3 months
- **b** sociability of children will increase with age
- **c** children will experience their first specific attachment at 54 weeks
- **d** stranger fear decreases as sociability increases



14 The experiences of Romanian adoptees demonstrated that:

- **a** reactive attachment disorder develops when a child's comfort, affection and nurturing aren't met
- **b** children will experience normal attachment regardless of their early experiences
- **c** deprivation in early years does not influence attachment later in life
- **d** imprinting was important in developing healthy attachment.

15 Personal awareness and understanding of our own thought processes is known as:

- **a** processing speed
- **b** cognitive strategies
- **c** scaffolding
- **d** metacognition.

Short answer

Describe and explain

★★ **16** **a** **Explain** what is meant by conservation and provide an example.

- **b** **Identify** which of Piaget's stages of cognitive development conservation is achieved in and the age that this occurs.

★★★ **17** Dean and his older sister, Marina, have each been given a ball of play-dough by their mother. When Marina rolls hers into a long 'sausage', Dean looks at both pieces of play-dough and begins to cry, complaining that Marina has more than he does.

- **a** In terms of Piaget's theories, **identify** the process that Marina has achieved but Dean has not.
- **b** **Explain** the meaning of this process.
- **c** If Marina is three years older than Dean, **calculate** a possible age (in years) for each of the children.

★ **18** **Explain** what is meant by centration.

★★ **19** **Summarise** the research of Harry Harlow

★ **20** Using an example, **describe** privation.

★★ **21** **Identify** and **explain** Ainsworth's attachment styles.

★ **22** Explain Konrad Lorenz's theory of attachment.

★ **23** **Describe** the key processes that are important in understanding Piaget's theory.

★★ **24** **Explain** why hypothetical thinking is so important for the formal operational stage of Piaget's theory.

Apply, analyse and interpret

★★★ **25 Compare** Mary Ainsworth's attachment theory with John Bowlby's attachment theory. In your comparison, **consider** the timeline that their theories were developed in.

★★ **26 Distinguish** between the more knowledgeable other, scaffolding and the zone of proximal development in Vygotsky's theory of cognition.

★★ **27 Categorise** the following behaviours into both the stage and the theory of cognitive development they belong to:

- **a** Kaela can't arrange her building blocks from smallest to biggest.
- **b** David can think about hypothetical situations in the future.
- **c** Mas's Dad used to have to help him when he was learning to ride his bike. Recently, Mas rarely gets help from his Dad.

★ **28 Differentiate** between assimilation and accommodation.

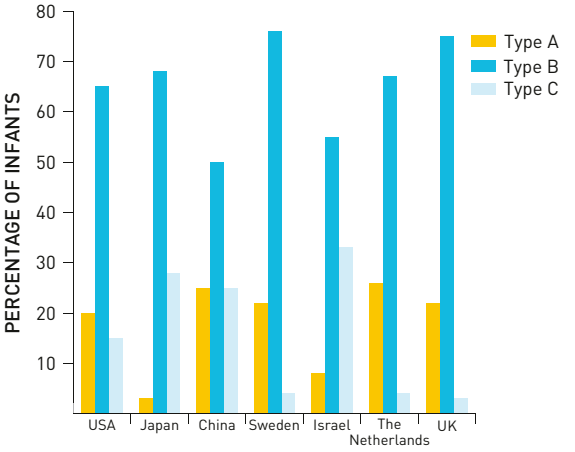
Investigate, evaluate and communicate

★★ **29** Type B, securely attached, is the most common attachment style. **Explore** why this may be the case.

★★ **30** Although case studies are often criticised as a research method, some of the most significant theorists in psychology (including Piaget) have used them as a major source of data. **Discuss** one advantage and disadvantage of using case studies as opposed to other research methods.

★★★ **31** Although Piaget's work was undeniably important, in recent years, his findings have been criticised and questioned. **Comment** on two criticisms of Piaget's work.

★★★ **32** The strange situation has been replicated many different times. In similar cultures, such as Australia, the US, Canada and New Zealand, the results tend to be the same; however, when the strange situation is presented in different cultures, such as Japan, the results are noticeably different compared to infants from the UK. Much of this has to do with cultural differences in separation. **Propose** other reasons for cultural variation, and **consider** factors that may influence attachment in Western culture (e.g. day care, crèche, having a nanny, etc.).



★★ **33 Examine** the information-processing model of cognition. Refer to processing speed and cognitive strategies in your answer.

★★ **34** When thinking about cognitive development, Piaget, Vygotsky and the information processing theory each present different ideas. **Assess** the importance of having different perspectives on cognitive development.

★★ **35 Create** your own example of assimilation and accommodation. After testing conservation on a 5-year-old and a 10-year-old, what differences in responses would you obtain?

★★ **36 Evaluate** the importance of the three mountain experiment.

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  Key terms in Chapter 8

CHAPTER 9

States of consciousness

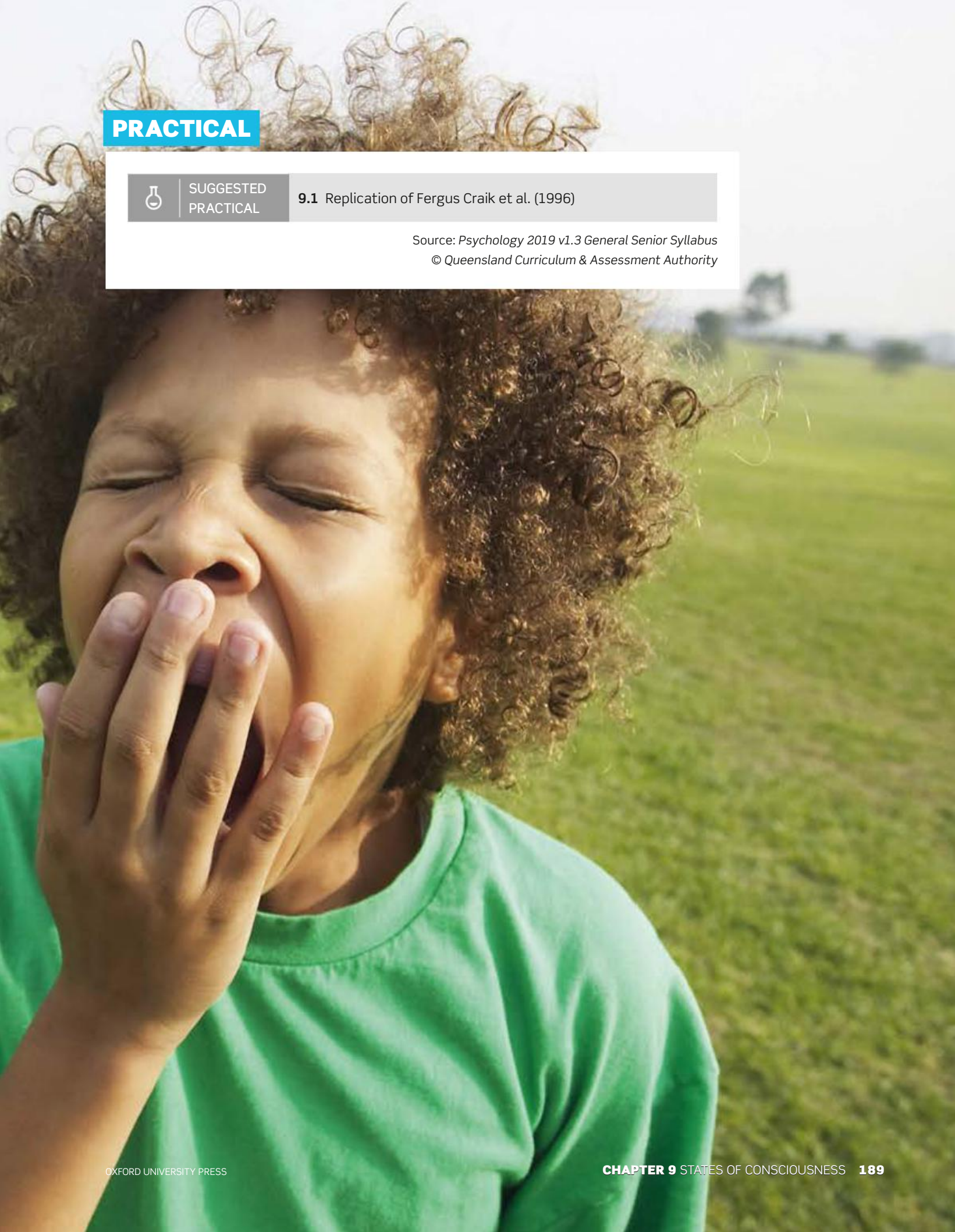
Consciousness relates to our awareness of our thoughts, feelings, perceptions and surroundings at any one moment in time. It creates our reality (what we believe to be real) and our sense of self. This chapter examines the psychological construct of consciousness, including normal waking consciousness and altered states of consciousness. It considers different states of consciousness – from when we are alert, to being not fully aware and even lacking awareness altogether.

OBJECTIVES

→ Construct a continuum of arousal, from sleep through to hyperarousal
→ Distinguish between selective and divided attention

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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FIGURE 1 This young boy is yawning; a sign of being tired. Though, a yawn does not necessarily show a change in consciousness.



PRACTICAL

SUGGESTED PRACTICAL

9.1 Replication of Fergus Craik et al. (1996)

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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9.1 What is consciousness?

KEY IDEAS

In this section, you will learn about:

- defining consciousness as a psychological construct
- consciousness as a continuum
- normal waking consciousness
- altered states of consciousness.

Are you conscious? If you are reading this, the answer is most definitely yes! You probably already have a good idea about the meaning of the word 'conscious' and, indeed, the word 'unconscious'. In everyday conversation, we tend to use 'conscious' interchangeably with the word 'aware'.

For example, how aware are you at this moment? Your answer will be subjective – it depends on what you are experiencing. It is also often difficult to describe to others and for others to completely comprehend.

consciousness our awareness of our own thoughts, feelings and perceptions (internal events) and our surroundings (external events) at any given moment

psychological constructs hypothetical concepts created to explain phenomena that are believed to exist or occur, but cannot be directly observed or measured

daydreaming our private thoughts, feelings and imagined scenarios that occur when we shift our attention internally while ignoring the external world; often visualised thoughts that are positive and pleasurable; they occur naturally and often, and are mostly considered an altered state of consciousness

awareness how conscious (aware) we are of internal and/or external event(s); level of awareness can vary in normal waking consciousness

What is consciousness?

Consciousness can be defined as the awareness of our own thoughts, feelings and perceptions (internal events) and our surroundings (external stimuli) at any given moment. It creates our reality (what we believe to be real and happening at this moment) and is central to our sense of self. Our sense of self is developed through being aware of what we are doing, why we are doing it and the awareness that others are probably observing, evaluating and reacting to it.

Take a look around you. Can you describe your surroundings? Are you aware of what is going on in your environment? How do you feel about it? Others cannot directly know what you are thinking, feeling or perceiving and most of us have some difficulty conveying this to others. Our own conscious experience is personal and private, and it is difficult to measure accurately or compare with other people's consciousness.

Psychological constructs are used to understand or explain things that we believe exist but cannot see, touch or measure in any way. Consciousness is a psychological construct because it is believed to exist, but we are unable to physically measure it, so descriptions are 'constructed' to explain it.

Consciousness as a continuum

Right now you are paying attention to the words on this page, but what were you focusing on a moment ago? Maybe you were **daydreaming** or thinking about an assessment task due today, making plans for the weekend or waking up from sleep. All these different mental activities represent different states of consciousness.

Our level of **awareness** of internal events and external surroundings varies throughout the day. Sometimes you are alert, and other times you feel quite drowsy. Consciousness can be thought of as operating on a continuum from a high level of consciousness or awareness through to the point of being unconscious (being totally unaware), as shown in Figure 1. The more aware we are of our thoughts, feelings, perceptions and surroundings, the higher the level of consciousness. Our level of awareness of internal events and external surroundings is known as a state of consciousness.

States of consciousness can also be divided into two broad categories – normal waking consciousness and altered states of consciousness. We will focus on these in detail in the second half of this chapter. Normal waking consciousness tends to occupy the middle part of the continuum in Figure 1 (the awake to alert zone). Different levels of psychological **arousal** are also part of consciousness.

Arousal is a state of being physically awake and alert. An altered state of consciousness exists both on the lower part of the continuum (during reduced awareness) and the upper part of the continuum (during heightened awareness). This altered state of consciousness and heightened (or hyper) awareness and is also referred to as **hyperarousal.**

Some symptoms of hyperarousal include:

- sleeping problems
- difficulty concentrating
- irritability
- a numbed, lethargic or disinterested emotional state
- an uncharacteristic sense of guilt or shame
- emotional outbursts, including anger
- anxiety, and in extreme cases, panic
- nervousness or fearfulness
- self-destructive behaviours.

For example, people with post-traumatic stress disorder (PTSD) may experience these symptoms of hyperarousal. This typically happens when an individual recalls a traumatic episode they experienced in the past (commonly referred to as a flashback). The body suddenly, and often with volatility, heightens its awareness to the point of introducing a level of stress that is often overwhelming for an individual. The diagram below illustrates the various levels of awareness a person may experience:

states of consciousness
an individual's level of awareness of internal events (thoughts, feelings and perceptions) and external surroundings; an individual experiences a range of different states of consciousness throughout the day

arousal
a psychological state of being physically awake and alert

hyperarousal
an altered state of consciousness and heightened (or hyper) awareness

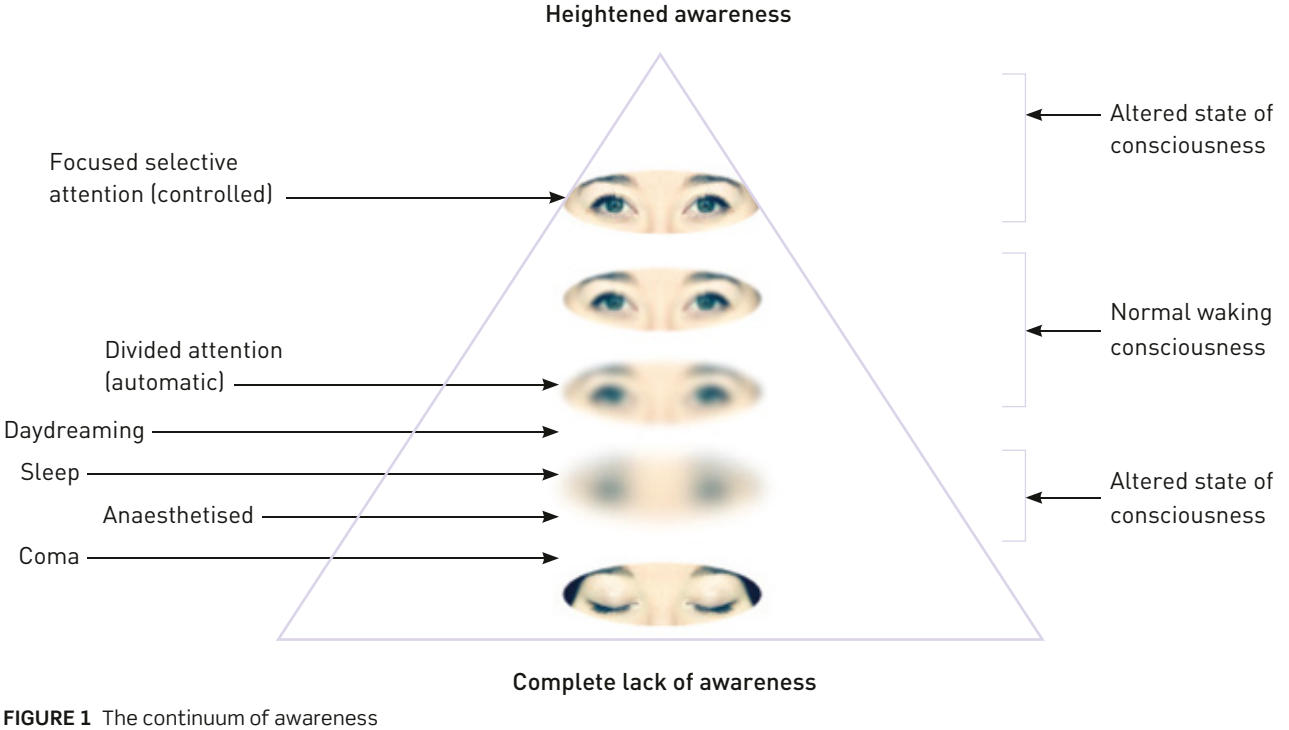


FIGURE 1 The continuum of awareness

stream of consciousness
an analogy, termed by James, that explained consciousness as an ever-changing stream of thoughts that can shift smoothly and effortlessly from one moment to the next, just like water flowing in a stream

continuum of awareness
the levels of awareness that can be experienced, from deep unconsciousness to heightened awareness, on a continuous scale including normal waking states and altered states of consciousness

normal waking consciousness
the states of consciousness we experience when we are awake and aware of our thoughts, feelings and perceptions from internal events and the surrounding environment; we experience a real sense of time and place and create our reality and a baseline to judge all other states of consciousness

altered states of consciousness
any state of consciousness that deviates from normal waking consciousness, in terms of marked differences in level of awareness, perceptions, memories, thinking, emotions, behaviours and one's sense of time, place and self-control; it can be deliberately induced or occur naturally

William James: the stream of consciousness

William James (1842–1910) studied the conscious experience. He coined the phrase **stream of consciousness** as he viewed consciousness as an ever-changing series of thoughts that can shift smoothly and effortlessly from one moment to the next, just like water flowing in a stream. According to James, our conscious experience is:

- continuous: it is never empty; thoughts are not isolated and can flow easily from one topic to another without interruption
- ever-changing: it rarely travels along one line of thought and constantly changes as we become aware of new information
- a highly personal experience: it relies on our own thoughts, feelings and perceptions
- selective: we can usually choose to focus on some things and ignore others; we can focus on internal events (thoughts, feelings and perceptions) and/or external surroundings
- active: consciousness has a purpose to allow us to function in our world.



FIGURE 2 American psychologist William James (1842–1910)

> Consciousness … does not appear to itself chopped up into bits … a 'river' or a 'stream' are the metaphors by which it is most naturally described … as the brain changes are continuous so do all these consciousnesses melt into each other like dissolving views. Properly they are but one protracted consciousness, one unbroken stream.
>
> William James, 1890

Look out the window and imagine that some animals have escaped from the zoo. Think about the consequences of this occurring. Pay attention to your thoughts. As you looked out the window, initially you might have thought about the type of animals, or what they were eating. Your consciousness might then have shifted to wondering what you would have for lunch. Maybe you are going to eat with a friend. Then you might have looked at the other students in your class, to see if they were still looking out the window. In this scenario, your consciousness focused on internal and external events and consisted of an ever-changing stream of thoughts that shifted from one moment to the next with relative ease. It drifted along the stream at different paces.

States of consciousness

States of consciousness are viewed as constantly changing on a **continuum of awareness**. Two broad categories exist on this continuum – **normal waking consciousness** and **altered states of consciousness**.

Normal waking consciousness

Think about how aware you are of your thoughts and feelings and what is happening around you at the moment. You have a real understanding of where you are, what time it is, what you are thinking, how you are feeling and who you are with. That is, you are experiencing normal waking consciousness – a state that is relatively organised, meaningful and clear.

CHALLENGE 9.1

Stream of consciousness

Study these pictures. Place the pictures in an order along a continuum, from total awareness (highly alert) to complete lack of awareness (unconscious or in a coma). Are some easier to place on the continuum than others? Explain.



FIGURE 3 Various states of awareness

Normal waking consciousness can be loosely defined as the state of consciousness you experience when you are awake and aware of your thoughts, feelings and perceptions from internal events and the surrounding environment. Your experience during normal waking consciousness creates your reality and provides a baseline from which to judge other states of consciousness. Throughout the day, and even throughout a lesson, your level of awareness will vary. You may focus intently on reading your textbook but later feel a bit drowsy and find yourself distracted by noise in the corridor outside. These changes are part of normal waking consciousness.

Altered states of consciousness

An altered state of consciousness can be defined as any state of consciousness that deviates from normal waking consciousness, in terms of marked differences in our level of awareness, perceptions, memories, thinking, emotions, behaviours and sense of time, place and self-control.

As such, this could include states produced by the learnt technique of meditation, recreational and illicit drugs (including alcohol and cocaine), fever, psychosis (a serious condition where the sense of reality is lost) and even daydreaming and sleep. Altered states are often culturally significant and can happen through religious experiences. An altered state of consciousness can be induced deliberately or occur naturally.

CASE STUDY 9.1

Illicit drugs in sport

High-profile Queensland sports star Wendell Sailor is one of a number of professional athletes who have paid the penalty for using the illegal drug cocaine. Sailor began his rugby league career with the Brisbane Broncos in 1993 and played until 2001, winning premierships and starring in Queensland State of Origin and Australian teams. In 2002 he made a shock switch to rugby union, playing initially with the Queensland Reds before moving to the NSW Waratahs. During this period he played 37 matches for the Australian rugby union team. However, his professional sports career came crashing down in 2006, when he returned a positive test for cocaine, after a midweek night out with friends. Sailor served a two-year ban from professional sport, then rejoined rugby league with the St George-Illawarra club for a two-year stint to end his career.

The NRL recently introduced the Illicit Drugs Policy to discourage players from using recreational drugs at all times, and Sailor spoke out in favour of the policy. Sailor said professional players have received sufficient warning about the effects of recreational and illicit drugs and believes they should be prepared to face the consequences if caught using them (Santarossa, 2017).



FIGURE 4 Wendell Sailor, former Australian rugby league and union player

CHECK YOUR LEARNING 9.1

Describe and explain

1 **Describe** what consciousness is.
2 **Explain** why consciousness is considered a psychological construct.
3 **Explain** what is meant by a stream of consciousness.
4 **Identify** the two broad categories of states of consciousness.
5 **Identify** three examples of factors or influences that might cause an altered state of consciousness.

Apply, analyse and interpret

6 **Construct** a diagram of the continuum of awareness, from complete lack of awareness to heightened awareness. **Explain** how you can alternate between normal waking consciousness and altered states of consciousness throughout any given day.
7 Consciousness is considered to be varied on a continuum of awareness. **Consider** how this relates to James's idea of the 'stream of consciousness', including his ideas of our conscious experience.
8 **Identify** where normal waking consciousness tends to lie on the continuum of awareness.
9 **Identify** where you are more likely to find an altered state of consciousness on the continuum of awareness.

Investigate, evaluate and communicate

10 Read Case study 9.1. Based on your understanding of states of consciousness, **evaluate** the issue of sports professionals using illicit drugs.

obook assess

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 9.1
- » Suggested practical
  9.1 Replication of Fergus Craik et al (1996)
- » Challenge
  Worksheet: 9.1 Stream of consciousness
- » Weblink
  Consciousness

9.2 Changes in psychological state

KEY IDEAS

In this section, you will learn about:

- levels of awareness, including attention
- controlled and automatic processes
- content limitations

Think of a time when you were sick with a high fever. What did you experience? Did you lose track of where you were and what was happening around you, your sense of time and the ability to think clearly? Now think of a time you were at a party with lots of people, loud music and flashing lights. Did you 'absorb' yourself into the scene? If so, did the time fly? Were you extremely happy and less inhibited than usual? If you answered 'Yes', then you experienced an altered state of consciousness. You don't need drugs to deliberately alter your state of consciousness; an environment such as this one can do it for you.



FIGURE 1 Being sick with a fever is an example of an altered state of consciousness.

Levels of awareness

Awareness relates to how conscious or aware you are of internal (within your body) and/or external (within your environment) events. A number of levels of awareness exist during normal waking consciousness, from having little awareness of internal and external events to being tuned in to specific ones. It is not unusual to swap 'consciousness' with the term 'awareness' since they are linked. Your level of awareness influences the other characteristics of consciousness.

Look back at the continuum of awareness (Figure 1 on page 191). In an altered state of consciousness, your level of awareness either decreases or increases compared to normal waking consciousness. You become more or less aware of your perceptions and/or surroundings. When suffering from a fever, for example, you become less aware of what is happening in your environment. If you are experiencing heightened awareness, you can become more aware of certain events that are happening around you.

Attention

At any given time, an enormous amount of information is available from our senses, memories and other cognitive processes. It is impossible to attend to all of this information at once. Your attention can be focused on events that are taking place in the environment (external) or inside your mind (internal), and attention can shift consciously or unconsciously.

attention (awareness) information you are actively processing, either consciously or unconsciously

Attention relates to the information that you are actively processing, either consciously or even outside your conscious awareness. Attention overlaps with consciousness, as what you are consciously aware of is often also the focus of attention. For example, try recalling what you ate for dinner last night. The answer requires attention in order to reach your conscious awareness. A range of stimuli can attract our attention, including:

- novel stimuli (such as something new or unusual)
- changes in stimulation (such as the volume on a radio suddenly increasing)
- something that is personally meaningful to us (such as our name being mentioned across a crowded room) or important for us to attend to at the time.

Attention may be broadly classified into the following types:

selective attention the ability to focus on only select stimuli or objects in the environment and to filter out other distractions

- **Selective attention** refers to the limitations placed on how much we can focus at any given moment on one stimulus or event to the exclusion of others. Selective attention is the process of focusing on a particular object in the environment for a period of time while simultaneously ignoring or filtering out other irrelevant stimuli in the environment that are also occurring. Using selective attention, we can focus on what really matters and take no notice of unimportant details.

selective inattention the way we attend to (or do not attend to) information that may be relevant but emotionally upsetting

- **Selective inattention** refers to the way we attend to (or do not attend to) information that may be relevant but emotionally upsetting.

divided attention the ability to attend to and perform multiple activities at the same time

- **Divided attention** refers to the capacity to attend to and perform two or more activities at the same time. Divided attention allows us to simultaneously process different information from various sources and to successfully complete multiple tasks at a time. Thus, divided attention allows us to multitask by simultaneously allocating attentional resources to multiple tasks or ideas.

Selective and divided attention

Consciousness is intricately tied to our awareness of ourselves and our environment at any one moment. Therefore selective attention – what we focus our attention on at any one time, to the exclusion of other stimuli – becomes an important link to our state of consciousness.

Controlled processing (conscious) is slower than automatic processing (unconscious) as we need to pay much more attention to what we are doing in order to learn the task. With practice, in most cases we are able to perform the task more quickly and efficiently. It is like going on 'automatic pilot' as we can do the task with very little conscious effort or awareness. Therefore, we can measure the speed and accuracy on performing the task over time, with the idea that as the task becomes more automatic, we become quicker and more accurate. In addition, studies have found that certain parts of the brain involved in conscious processing become less active as the task becomes more familiar.

Divided attention refers to our capacity to attend to and perform more than one activity at the same time. Automatic processing facilitates divided attention. In 1975, Shaffer conducted a well-known experiment that tested divided attention using a process called dichotic listening. We cannot fully attend to two different messages delivered simultaneously



FIGURE 2 We are not very good at attending to two different messages delivered simultaneously through two earphones.

through two earphones. Proficient typists performed a test in which they had to type the information being presented via headphones in one ear while simultaneously performing a second task. This second task included two different conditions:

- condition 1: a shadowing task in which unrelated information was presented via headphones to the other ear; the typist had to say aloud the information presented in this ear
- condition 2: a reading task in which the typist had to read aloud visual information that was presented

In both cases, the typists' performance on the test was poorer compared to their performance when carrying out the two tasks separately. Shaffer suggested that performance was poorer because of the similarity of the tasks. In the rest condition, the material was similar in the way it was presented (a listening task) and thus interfered with the ability to receive the auditory information. The second condition interfered with the typists' ability to produce the typed information as both required verbal and writing skills.

Controlled and automatic processes

When you write a sentence, you pay attention to its meaning or the spelling of a word rather than the process of forming each letter. The act of writing each letter or word is automatic, with little mental effort or conscious awareness. **Automatic processes** require very little awareness or mental effort to be performed well and they generally don't interfere with other automatic or **controlled processes**. In other words, automatic processes require little attention and little thought, and can allow you to do two things at once.

autonomic processes processes that require little attention and thought, and can allow you to do two things at once

controlled processes processes that require mental effort to focus attention on the required task

Another example of an automatic process is texting on a mobile phone. Many people are very fast and efficient at doing this. They are well practised and know exactly where the keys are and so can create the message with ease. For them, texting is a simple task that requires little mental effort.

Compare this to someone who is learning how to write text messages. This could be someone who has a new mobile phone or a person who rarely sends text messages. The person must concentrate on how to create the message – it requires their full attention. For this person, texting is a complex task as it is yet to be learnt or mastered and requires greater mental effort. It is an example of a controlled process. This person needs to be consciously aware of what they are doing and concentrate on how to perform the task. They are unable to complete another controlled process at the same time as both would require their full attention and therefore would interfere with each other. A person sending a text message for the first time is unlikely to be able to listen to an important announcement simultaneously.



FIGURE 3 Learning to drive is a complete process. With practice, the basic skills of driving become automatic.

Learning how to drive provides a very good example of how an activity can become automatic. At first, you can feel awkward and experience difficulties monitoring your hands and feet, especially if you are learning to drive a manual vehicle. At this stage, operating the car requires your full attention because it is a controlled process. You might even find it hard to talk to your instructor or read road signs. As your skills develop, you will find it easier to steer, indicate, check the rear-view mirror and change gears. Finally, you will find yourself doing these things automatically and be able to concentrate on the traffic and other driving conditions.

The basic skills of driving the car are now automatic processes. Attention relates to our ability to undertake controlled and automatic processes.

- **Controlled processes** require selective attention – a person must actively focus attention in order to successfully complete the task.
- **Automatic processes** enable us to have divided attention – if a task requires little mental effort and attention, we can often engage in other tasks at the same time.

In an altered state of consciousness, people usually find it difficult to carry out controlled processes. The ability to perform some automatic processes can also be impaired. In some altered states of consciousness, however, people can be so focused (high level of awareness) that some tasks can become easier.

	Automatic process	Controlled process
Amount of conscious awareness	Requires little, if any, conscious awareness	Requires full conscious awareness
Attention	Requires little attention or mental effort (enables us to have divided attention)	Requires selective attention (must actively focus attention on the task)
Task difficulty	Simple (easy) or mastered tasks	Usually complex (difficult) or novel (new or yet to be mastered) tasks

TABLE 1 The differences between automatic and controlled processes

CHALLENGE 9.2

Mobile phones and driving

Driving a car safely requires your full attention, which is why there are strict laws in Queensland that restrict the use of mobile phones while driving. In the Sunshine State, driving while using a mobile phone in your hand is illegal – even if you're stopped in traffic. That means you are not allowed to:

- hold the phone to your ear
- write, send or read a text message
- turn your phone on or off
- operate any other function on your phone.

There are additional restrictions on some drivers. Learner and P1 provisional drivers under 25 must not use hands-free, wireless headsets or a mobile phone's loudspeaker function. Passengers in a car driven by learner and P1 provisional drivers are also banned from using a mobile phone's loudspeaker function.

Identify other laws that apply only to inexperienced drivers. Justify the use of these laws based on your understanding of attention.

Content limitations



FIGURE 4 During normal waking consciousness, we control what we focus our attention on, such as the words we are reading or writing while doing homework.

During normal waking consciousness, we mainly control what we focus our attention on, and our thoughts tend to be organised and logical. For instance, to read this page you must focus your attention on it to be able to see the print. You need to think logically and limit your attention to what is written in order to fully understand it. The content (type of information) of normal waking consciousness is therefore generally more limited (restricted) than the content of altered states of consciousness. Our thoughts tend not to be as creative, bizarre, unrealistic or impossible as our thoughts can be during an altered state of consciousness.

During an altered state of consciousness, your ability to pay attention to certain tasks can be increased or decreased compared to normal waking consciousness. In normal waking consciousness you can usually prevent yourself from focusing your attention on issues, thoughts or events that are unpleasant. During an altered state of consciousness, whether it is naturally occurring (such as sleep) or artificially induced (such as by drugs), your mental defences are lowered and the content of your thoughts and dreams may be both broader and deeper than in normal waking consciousness. The content of your consciousness when in an altered state of consciousness is often disorganised and senseless, or bizarre and unusual. Or, to the other extent, its content could be extremely narrow (limited) as you concentrate intently on one thing.

Tasks that require selective attention may be impaired during an altered state of consciousness. It can also be very difficult to divide attention, even between automatic processes.

CHECK YOUR LEARNING 9.2

Describe and explain

1 **Describe** some of the characteristics of consciousness that may change as a result of changes in someone's psychological state (changes in states of consciousness).

2 In terms of self-control, **explain** how we tend to behave during normal waking consciousness.

Apply, analyse and interpret

3 In terms of controlled and automatic processes, **consider** why learner drivers in Queensland under the age of 25 must log at least 100 hours of supervised driving time.

Investigate, evaluate and communicate

4 Prepare a supporting document that justifies the laws on banning of mobile phones while driving. **Describe** the laws and the reasons for implementing them. Using psychological terms, **justify** your argument by referencing the relevant characteristics of normal waking consciousness.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 9.2
- » Challenge
  Worksheet: 9.2
  Mobile phones and driving
- » Weblink
  Are you paying attention
- » Weblink
  Selective attention

CHAPTER 9

Review

Summary

9.1

- Consciousness is an awareness of our own thoughts, feelings and perceptions (internal events) and our surroundings (external stimuli) at any given moment.
- Consciousness is a psychological construct because it is believed to exist but cannot be directly observed or measured. Descriptions are 'constructed' to explain it.
- Consciousness can be thought of as operating on a continuum, from a high level of consciousness (awareness) through to a low level and even on to the point of being unconscious (totally unaware).

9.2

- Normal waking consciousness is the state of consciousness we experience when we are awake and aware of our thoughts, feelings and perceptions generated from internal events and the environment.
- If we deviate from this normal baseline of waking consciousness, we experience an altered state of consciousness, which may reflect either heightened or reduced awareness.

9.3

- Differences in psychological states of consciousness can be described in terms of the following characteristics:
  - level of awareness: more or less aware of internal and external events
  - controlled and automatic processes: ability to effectively perform two or more tasks at once, depending on their level of complexity, is more likely to decline and it is more difficult to perform automatic processes
  - content limitations: usually less (though sometimes more) control to limit what you want to attend to.

Key terms

- altered states of consciousness
- arousal
- attention
- automatic processes
- awareness
- cognition
- consciousness
- continuum of awareness
- controlled processes
- daydreaming
- divided attention
- hyperarousal
- normal waking consciousness
- perception
- psychological constructs
- selective attention
- selective inattention
- self-control
- states of consciousness
- stream of consciousness

Revision questions

Multiple choice

1 Johannes is sitting in class, trying to listen to what the teacher is saying, but he is also aware that he is feeling warm in the sunshine, he is looking forward to a game of tennis after school, the new girl in the row in front of him has sparkling highlights in her hair and the chair he's been sitting in for the double lesson has a hard seat! What is Johannes most likely experiencing?

a normal waking consciousness

b an altered state of consciousness showing reduced awareness

c an altered state of consciousness showing heightened awareness

d distortions of cognition and perception

2 Which of the following scenarios displays the highest level of awareness?
   - **a** Emma is bored in class and puts her head down on the desk to fall asleep.
   - **b** Justin is watching his favourite show on TV while eating chips.
   - **c** Cadence is about to jump out of a plane to go tandem skydiving.
   - **d** Will is reading a book while he is on the train.

3 Which of the following is a true statement?
   - **a** Controlled processes require no attention.
   - **b** Automatic processes require little attention.
   - **c** Controlled processes require little attention.
   - **d** Both controlled and automatic processes require full attention.

4 When Erwin was first learning to play the guitar, he found it impossible to change chords and sing at the same time. Now that he has been in a rock band for two years, he finds it easy to play, sing and even perform complex sequences of steps on stage. What is the explanation for this?
   - **a** An automatic process has become a controlled process, requiring little attention.
   - **b** A controlled process has become an automatic process, requiring full attention.
   - **c** An automatic process has become a controlled process, requiring full attention.
   - **d** A controlled process has become an automatic process, requiring little attention.

5 Miranda has been driving a manual car for several years; Hugo has just passed his test for his P-plates. When Victor is a passenger in their cars, he finds that he can have a sensible conversation with Miranda, but Hugo does not seem to pay any attention to him. Which of the following is the most likely explanation for this?
   - **a** For Miranda, driving is a controlled process enabling divided attention.
   - **b** For Miranda, driving is a controlled process requiring selective attention.
   - **c** For Hugo, driving is a controlled process enabling divided attention.
   - **d** For Hugo, driving is a controlled process requiring selective attention.

Short answer

Describe and explain

★ **6** **Define** consciousness.

★ **7** **Describe** the defining difference between normal waking consciousness and altered states of consciousness.

★★★ **8** **a** **Explain** the continuum of awareness.

b **Construct** a line of the continuum of awareness. On this line, **identify** where sleep is situated.

★ **9** **Explain** what is meant by attention.

Apply, analyse and interpret

★★ **10** **Compare** arousal with hyperarousal.

★★ **11** **Differentiate** between selective and divided attention.

★ **12** James's Mum often jokes that he selectively ignores her. **Consider** whether James would actually be ignoring his mother, or if his divided or selective attention would have been involved.

Investigate, evaluate and communicate

★★★ **13** **Consider** if it is possible to experience more than one state of consciousness at a time. **Justify** your response.

★★ **14** **Investigate** how consciousness can be thought of as an adaptive function.

Check your obook assess for these additional resources and more:

- » Student book questions
  Chapter 9 Review
- » Revision notes
  Revision notes for Chapter 9
- » assess quiz
  Test your understanding with an auto-correcting multiple-choice quiz
- » Flashcard glossary
  Key terms in Chapter 9

CHAPTER 10

Measuring states of consciousness

Consciousness is a unique experience. Our thoughts, feelings and perceptions are personal and private and difficult for others to fully comprehend. Most psychologists believe that consciousness is worth studying despite its subjective nature. The difficulty arises with how to do so. Using physiological measurements, cognitive assessment and self-reports, psychologists are able to study consciousness and develop a holistic approach.

OBJECTIVES

→ Recall the techniques used to measure consciousness, including electroencephalography (EEG), electromyography (EMG) and electrooculography (EOG)

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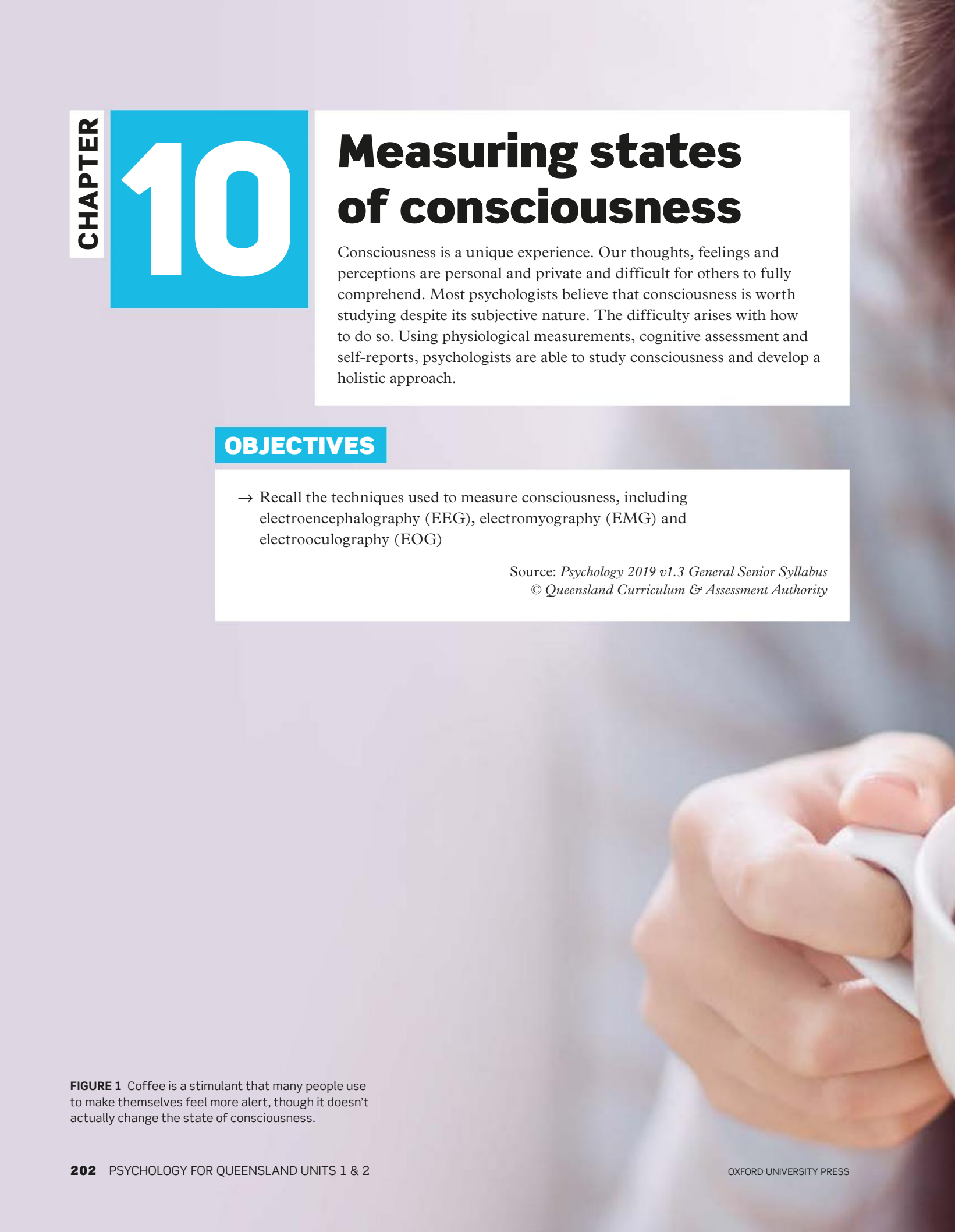


FIGURE 1 Coffee is a stimulant that many people use to make themselves feel more alert, though it doesn't actually change the state of consciousness.



10.1 Measuring physiological responses

KEY IDEAS

In this section, you will learn about:

- physiological measurements including electroencephalograph (EEG), electrooculograph (EOG) and electromyography (EMG)
- brainwave patterns.

Consciousness is a subjective and private experience and is ever-changing (dynamic), self-reflective and central to our sense of self (see Chapter 9). But how do psychologists study consciousness? The methods used can include (but are not limited to):

- measurement of physiological responses, such as electroencepholgraphy (EEG), electrooculography (EOG) and electromyography (EMG)
- behavioural and cognitive measures, such as measurement of speed and accuracy on cognitive tasks and video monitoring
- self-report (subjective) measures, such as sleep diaries.



FIGURE 1 As our state of consciousness or alertness level changes, so do our brainwave patterns.

Measurable changes in physiological responses are probably the most reliable and least subjective means of indicating different states of consciousness during sleep and wakefulness. Typically, the data is consistent and stable and it can be recorded and usually interpreted consistently between researchers and on different occasions.

However, there are weaknesses with using this method alone. First, it is limited in its ability to identify the participant's private and personal conscious experience. Remember: consciousness is our awareness of internal and external stimuli and our thoughts and feelings about them. Researchers may be able to observe physiological changes, but they won't really know about the experience unless they ask the participants! Second, changes in physiological events may be due to other reasons, such as the person having a fever.

Many **physiological measures** provide psychologists with information about how bodily functions change during normal waking consciousness and altered states of consciousness. Such bodily functions include brainwave patterns (caused by changes in the electrical activity of the brain), eye-muscle movement, body-muscle movement, heart rate, body temperature, electrical conductivity of the skin (galvanic skin response), respiration rate and blood pressure.

physiological measures the observation of a measurable bodily (physical or physiological) response (such as heart rate, brainwave activity and galvanic skin response)

The three main devices used to study states of consciousness, especially sleep, are the electroencephalograph, the electrooculograph and the electromyograph.

Electroencephalograph

The **electroencephalograph (EEG)** is a device that detects, amplifies and records electrical activity in the brain in the form of brainwaves. It does this by monitoring the electrical activity of the brain that is detectable on the outside of the skull. Many tiny electrodes are placed on the skull in a symmetrical pattern (see Figure 2). These electrodes

electroencephalograph (EEG) a device that detects, amplifies and records electrical activity in the brain in the form of brainwaves

measure the very small voltages created by the synchronised activity of large numbers of neurons in the cerebral cortex.



FIGURE 2 Many tiny electrodes are placed on the skull in a symmetrical pattern to record brainwave activity.

EEG recordings indicate changes in brainwave activity associated with changes to states of consciousness, such as when a person is drowsy or alert, falls asleep, and the various stages of sleep, including the stage in which we are most likely to experience dreaming.

Brainwave patterns

Brainwave patterns may vary in **frequency** (that is, the number of brainwaves per second). High-frequency brainwave patterns indicate faster brainwaves as demonstrated by more waves per unit of time (usually seconds). Frequency is measured in hertz (Hz: vibrations per second).

Brainwaves may also vary in **amplitude** (i.e. the height of the peaks and troughs of the curved graph that represents brainwave activity). Amplitude is measured in microvolts (μV).

When we are awake and alert, we exhibit fast (high-frequency) and small (low-amplitude) brainwaves, known as **beta waves**. When we are awake but relaxed, we tend to exhibit **alpha waves**. In deep **non-rapid eye movement (NREM) sleep**, we exhibit slow (low-frequency) and big (high-amplitude) brainwaves, known as **delta waves**. During stage 2 of NREM we experience medium-frequency **theta waves**.

Table 1 outlines five broad types of brainwave activity that are associated with certain states of consciousness, especially during normal waking consciousness and sleep. However, the concept of these broad brainwave patterns is somewhat antiquated. We do not produce just one brainwave at any one time, and producing too much or too little can create issues. Our brainwave patterns, as measured by an EEG, consist of a mixture of types at any one time, and the mixture varies from person to person and can vary over time and within and

frequency
the number of brainwaves per second

amplitude
in terms of brainwaves, the height of the peaks and troughs of the curved graph that represents brain wave activity

beta waves
typical brainwave pattern – high frequency (fast) and low amplitude (small) – during normal waking consciousness, associated with being alert, active, anxious and paying (selective) attention

alpha waves
the typical brainwave pattern (reasonably high frequency, but not as high as beta waves, and low amplitude, but slightly higher than beta waves) that occurs when awake but very relaxed

non-rapid eye movement (NREM) sleep
one of two phases of sleep, characterised by little or no rapid eye movement, and often divided into four stages of NREM sleep that are determined mainly by predominant brainwave patterns

delta waves
the typical brainwave pattern – a steady pattern of low frequency (slow) and high amplitude (large) – associated with NREM deep sleep

theta waves
the typical brainwave pattern (medium frequency and mixed amplitude [some high, some low]) during the early stages of sleep

Brainwave pattern	Description	Association with consciousness
Gamma waves	Highest frequency (40–100 Hz per second); very high brain activity	• Hyper-alert • A brainwave pattern involved in cognitive functioning such as memory and learning, 'higher virtues' such as altruism and universal love, and simultaneous processing of information from different areas of the brain • 40 Hz gamma waves associated with perception and learning new material, modulating consciousness and perception • Seen when awake and asleep (REM sleep) but not under anaesthesia • Too much – associated with anxiety and stress • Too little – associated with ADHD and depression
Beta waves	High frequency (12–40 Hz per second) and low amplitude (small); high brain activity	• Awake and alert • Typical brainwave pattern during normal waking consciousness, associated with being alert, attentive, active, anxious and paying (selective) attention • Involved in conscious thought, logical thinking and problem-solving • Eyes are open; person is awake and alert • Too much – associated with anxiety and stress • Too little– associated with ADHD and depression
Alpha waves	Reasonably high frequency (8–12 Hz per second but not as high as beta waves) and low amplitude (slightly higher than beta waves, but not as high as theta); medium–high brain activity	• Relaxed wakefulness • The typical brainwave pattern when awake but very relaxed, such as in a meditative state, having quiet flowing thoughts, very drowsy or when we're about to fall asleep • Associated with relaxation, aiding mental coordination, calmness and learning • May be seen in people in a coma • Too much – associated with inability to focus • Too little – associated with anxiety, insomnia
Theta waves	Medium frequency (4–8 Hz per second) and mixed amplitude (some high, some low); medium brain activity	• Asleep (stage 2 NREM) • Typical brainwave pattern during the early stages of sleep • May be present when daydreaming and associated with experiencing emotions and deep meditation • Also seen in young children and psychopaths, may be caused by frustration • Too much – associated with ADHD, impulsivity, inattentiveness • Too little – associated with anxiety, stress, poor emotional awareness
Delta waves	A steady pattern of low frequency (1–4 Hz per second) and high amplitude (low brain activity)	• Deep sleep • Typical brainwave pattern associated with NREM deep sleep • Associated with very deep relaxing and restorative (rejuvenating) sleep • Very limited, if any, external awareness • May be associated with healing and regeneration • Seen in babies and adults with brain tumours • Too much – associated with brain injuries, inability to think • Too little – associated with poor sleep, inability to revitalise brain or body

TABLE 1 Types of brain wave activities associated with states of consciousness

between tasks and situations. Modern high-resolution EEGs have recognised more than 42 000 individual frequencies and the association between different frequencies and how we think, feel and behave is far more complex. Today, the emphasis is on the relationship between different frequencies within and between specific locations in the brain and the associated psychological processes.

Other patterns or features, usually not very long-lasting, can occur during these brainwaves. For instance, **K-complexes** (sharp rise and fall in amplitude, lasting for about two seconds) and **sleep spindles** (periodic bursts of rapid frequency) are indicative of stage 2 NREM sleep. **Sawtooth waves** are random, fast waves that are slightly bigger than alpha waves. They resemble waves for being awake but occur among the beta-like waves observed during **rapid eye movement (REM) sleep**. Sawtooth waves are associated with dreaming.

In other words, our degree of alertness is associated with a range of different brainwave patterns. These patterns will be discussed further when we look at the effects of drugs on consciousness. A brief summary associating alertness with brainwave pattern is shown in Table 2.

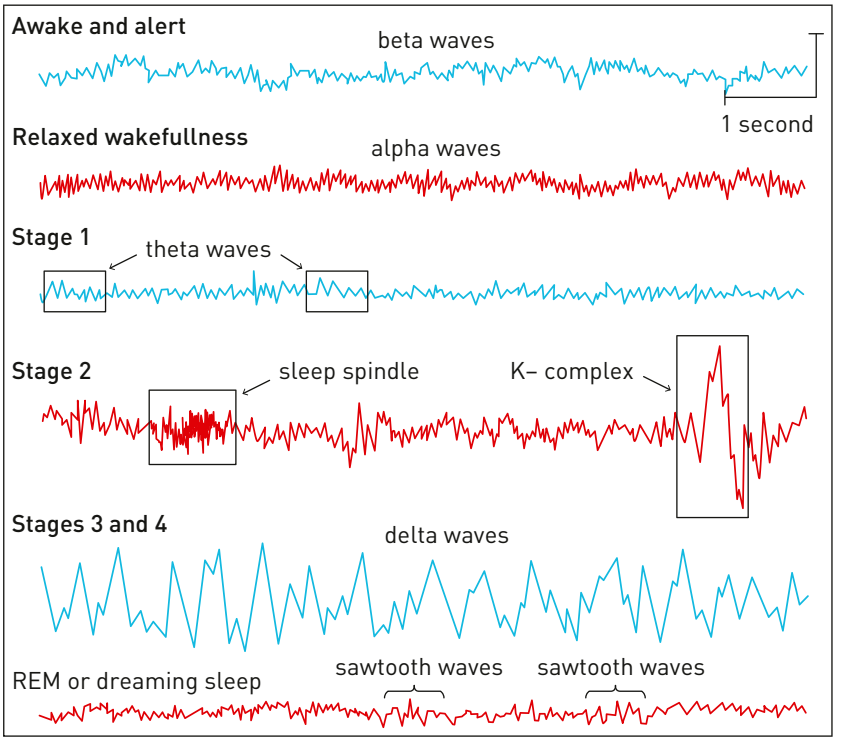


FIGURE 3 Different brainwave patterns are associated with different stages of consciousness.

Alertness	Dominant brainwave pattern	Degree of brainwave activity
Hyper-alert	Gamma and beta waves	Very high
Awake and alert	Beta waves	High
Awake and drowsy	Alpha waves	Medium–high
The flow state (being in 'the zone' – ideal for optimal performance and creative insight; work seems effortless)	Alpha-theta (borderline) waves Some gamma waves	Medium–high
REM sleep (typically dreaming)	Beta-like waves	High
Stages 1 and 2 NREM sleep	Theta waves	Medium (less than in waking and REM sleep)
Stages 3 and 4 NREM sleep (deep sleep)	Delta waves	Low
General anaesthesia	Gamma waves	Reduced
Vegetative state (coma)	Alpha waves	Very reduced

TABLE 2 Alertness and associated brainwave patterns

K-complexes
sharp rise and fall in amplitude, lasting for about two seconds

sleep spindles
periodic bursts of rapid frequency

sawtooth waves
random, fast waves that are slightly bigger than alpha wave

rapid eye movement (REM) sleep
one of two phases of sleep, characterised by rapid eye movement

Electrooculograph

electrooculograph (EOG)
a device that detects, amplifies and records electrical activity in the muscles that allow the eye to move

The **electrooculograph (EOG)** is a device that detects, amplifies and records electrical activity in the muscles that allow the eye to move. It measures changes in voltage as the eyes move and rotate in their sockets. Electrodes are attached to areas on the face around the eyes and the recording procedure is similar to that used for the EEG. The EOG is particularly useful to determine whether a person is in REM or NREM sleep. When we are awake, our eyes may move rapidly depending on what we are doing visually at the time. For instance, if you are staring out a window or thinking deeply about an issue, there will be little eye movement. If you are looking for a friend in a crowd, you would expect more eye movement.

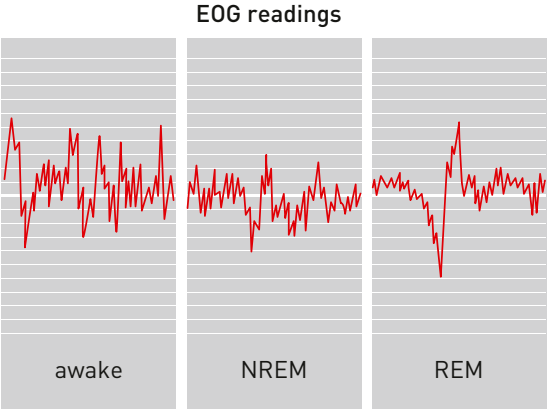


FIGURE 4 EOG recordings for someone who is awake and asleep (REM and NREM sleep).

Electromyograph

electromyograph (EMG)
a device that detects, amplifies and records the electrical activity of heart muscles

Another device commonly used to measure the stages of sleep is the **electromyograph (EMG)**. The electromyograph is a device that detects, amplifies and records the electrical activity of muscles. Electrodes are attached to the skin directly above the muscles (usually the ones located under the chin) and the recording procedure is similar to that of an EEG and EOG. The EMG can be useful to determine whether a person is awake or asleep and, if asleep, whether it is REM or NREM sleep.

polysomnogram
a continuously moving chart that displays data collected simultaneously from EEG, EOG, EMG and any other devices

When someone is awake, activity on the EMG recordings varies between moderate and high, depending on the activity at the time. During sleep, the activity is moderate to low during NREM sleep (with some mild spasms associated with light sleep) and virtually non-existent during REM sleep. Data can be collected simultaneously from the EEG, EOG, EMG and any other devices and displayed on a continuously moving chart, known as a **polysomnogram**. This allows a researcher to compare corresponding data at once and make more informed decisions about the state of consciousness and any underlying problems.

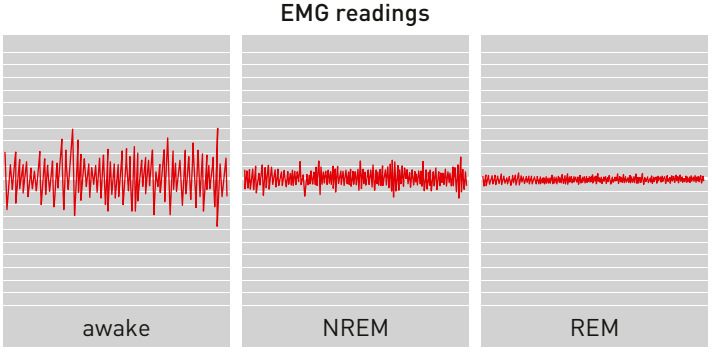


FIGURE 5 EMG recordings for someone who is awake and asleep (REM and NREM sleep).

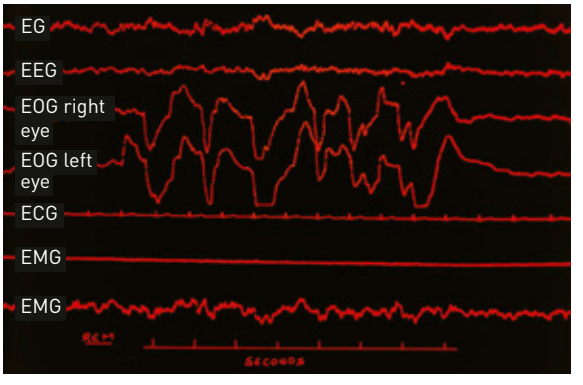


FIGURE 6 Look at this polysomnogram. Can you determine when the participant entered REM sleep? (high amplitude EOG data)

Physiological measurement	What is measured	Normal waking consciousness		Sleep	
		Alert	Drowsy (relaxed)	Non-rapid eye moment (NREM)	Rapid eye movement (REM)
Electroencephalograph (EEG)	Detects, amplifies and records electrical activity in the brain in the form of brainwaves	Beta waves	Alpha waves	Alpha, theta and delta waves, sleep spindles and K-complexes, depending on the stage of NREM sleep	Similar to being awake, including random and fast sawtooth waves
Electrooculograph (EOF)	Detects, amplifies and records electrical activity in the muscles that allow the eye to move	Depends on the activity, rapid if involves eye movement	Little	None or very little	Bursts of rapid movement
Electromyograph (EMG)	Detects, amplifies and records the electrical activity of muscles	Moderate and high depending on the activity at the time	Moderate	Moderate to low	Virtually non-existent

TABLE 3 Physiological measurements used to research states of consciousness

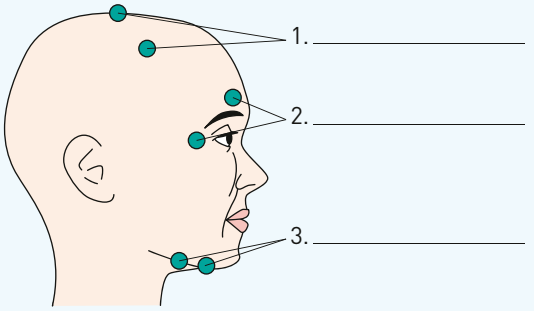
CHECK YOUR LEARNING 10.1

Describe and explain

1 **Describe** the process of electroencephalography (EEG).

2 **Explain** the difference between electromyography (EMG) and electrooculography (EOG).

3 Look carefully at the following illustration of a participant wired up to the EEG, EOG and EMG devices, and decide which electrodes are collecting which data. Label and **define** each device.



Apply, analyse and interpret

4 **Determine** what information cannot be obtained about consciousness from physiological measurements.

5 **Categorise** the following brainwave patterns by their associated level of consciousness.

a theta
b delta
c beta
d K-complex
e alpha

Check your obook assess for these additional resources and more:

» Student book questions
Check your learning 10.1

» Weblink
Sleep patterns

» Weblink
EEG

» Weblink
EOG

10.2 Subjective reporting

KEY IDEAS

In this section, you will learn about:

- self-reporting
- video monitoring.

objective measures methods free from bias, such as measuring cognitive response time

subjective reporting methods used to measure states of consciousness, such as self-reporting or video monitoring

Objective measures and subjective reporting can be used to measure consciousness. **Objective measures** can be more accurate than self-reports, because they are likely to record similar findings over time and between researchers. Objective measures include cognitive tasks where speed and accuracy are measured. These tasks may be based on problem-solving, language or reasoning, and can be performed during different times of the day or different states of consciousness. This can inform us of the characteristics associated with normal waking consciousness. **Subjective reporting** measures, such as self-reporting or video monitoring, are also used to measure states of consciousness. While they may not be as accurate as EEG, EMG and EOG, they can still provide significant insight into our experience of consciousness. In this section we will see how subjective reporting can provide insight into consciousness.

Self-reporting

Rate the quality of your sleep last night on the following scale: 1 (very poor), 2 (poor), 3 (fair), 4 (good) or 5 (very good).

You have just completed a self-report, an example of subjective reporting of consciousness. Self-reports are statements and answers to questions made by the participants concerning their psychological experience (thoughts, feelings and behaviours) in relation to a psychological phenomenon. They can be in the form of questionnaires (with open and/or closed questions), diary entries or interviews. Psychologists may use experience-sampling techniques, in which participants are asked to self-report on consciousness experiences at specific times. For instance, participants may carry electronic devices that 'beep' at certain times to advise them to complete a survey that may ask what they are doing, thinking and feeling at the time of the beep (often called beeper studies).

Self-reports can indicate whether or not a person is experiencing normal waking consciousness. If they are in an altered state of consciousness and are asked to tell a story about something that happened yesterday, it is likely to generate a response that is missing pieces or does not make complete sense.

Sleep diaries are often used when a person is experiencing sleep troubles such as insomnia and these can help sleep experts understand the participant's experience.

Self-reports can provide extremely valuable information about what the participant is experiencing. However, like all research methods, there are drawbacks. It is a measurement, based on personal judgments that may be difficult to communicate and compare with others. Self-reports have other limitations:

- Will the participant remember to complete the report? If the participant is carrying out a self-report sleep study over a week, it is likely that they will have to find ways to remind themselves to complete it.
- Are participants able to describe the experience accurately? For many of us, accurately describing our dreams or what we are thinking and feeling can be difficult.

How did you sleep?

Date	Very poor	Poor	Fair	Good	Very good

FIGURE 1 Self-reports are often used to study consciousness, including a person's sleep experience.



FIGURE 2 Self-reports are a valuable research method, as they attempt to capture the person's psychological experience (thoughts, feelings and behaviours).

- Are participants telling the truth? Sharing your personal and private thoughts or dreams can be challenging.
- Can participants remember? This is unlikely if they were in an altered state of consciousness, such as sleep. Dreams are usually quickly forgotten, if remembered at all.
- Have participants unintentionally left out key information? Sometimes we just forget.
- Can the researcher interpret the descriptions accurately and reliably? It can be very difficult to interpret self-reports objectively.

Video monitoring

Video monitoring can provide an insight into how we behave in different states of consciousness. Researchers can observe participants when they are awake, including differences between their levels of alertness. For example, are you more likely to move around when you are feeling alert or drowsy?

Video monitoring is now a common method that can be used to study sleep. It can be used both in sleep laboratories (an artificial environment) and in the participant's own home. This method uses infrared cameras (or cameras in a room lit with infrared light) that operate silently to allow footage to be seen and taped in the dark without disturbing the participant. The recordings can be observed at any time after the period of sleep and given to other researchers to interpret. Recordings can also be shown to the participant to help them become aware of and understand their behaviour, for example, showing what they do when sleepwalking or even observing the effects of a snoring partner on their sleep.



FIGURE 3 Which sleeping position do you prefer?

Often the data is recorded alongside physiological measurements such as photographs that are taken every few seconds. If done at home, video monitoring allows the participant to sleep in their natural environment. This way, the participant is more likely to sleep as they normally do and the researcher is more likely to collect realistic data.

However, there are limitations with video monitoring. Like other behavioural observations, video monitoring cannot tell us what is going on inside the body or what the participant is experiencing – it relies on the researcher to interpret the behaviour. Therefore, the observations may be subjective (open to bias). In an attempt to overcome this, researchers often devise standard methods of measuring and interpreting behaviour. For instance, what constitutes a major shift in body position? Is it when you change trunk position, major limb position or head position, or a combination? In an attempt to combat subjectivity, researchers might also get two or more colleagues to independently interpret the data.

CASE STUDY 10.2

Do you roll over in your sleep?

Yes, you do! In a pioneering study, Hobson, Spagna and Malenka (1978) used time-lapse photography with EEG recordings and self-reports to investigate sleep. Cameras were installed in a sleep laboratory to take photographs of sleeping participants at regular intervals and the photographs were displayed simultaneously with the EEG recordings. This study demonstrated the association between major body movements (postural shifts), such as rolling over, and particular sleep phases. It showed that we regularly change our body position during the night and also go through periods of immobility. In addition, the researchers found that participants who report a better night's sleep tend to change their body position fewer times than those who don't. So there is now evidence that tossing and turning all night is linked with the feeling of poor quality sleep. This work demonstrated the usefulness of video monitoring and the possibility of recording participants sleeping in their own bed without being 'wired up'.

Comparing different methods of measurement

Research method	Description	Advantages	Disadvantages
Physiological measurements including EEG, EOG and EMG	Recording of physiological (physical body) events	• Most objective and reliable means of indicating different states of consciousness	• Cannot describe the person's private and personal conscious experience (thoughts and feelings) • Changes in physiological events may be due to other reasons besides a change in state of consciousness
Measurement of speed and accuracy on cognitive tasks	Administration of test or a task; monitoring speed and accuracy on this test or task, often over time or within different states of consciousness	• More objective in nature than self-reports, because likely to record similar findings over time and between researchers • May offer closer insight into an individual's conscious experience (thoughts and behaviours) than physiological measurements	• Cannot get inside a person's mind. Such a measure still requires recorded observations (performance) and then interpretation what they mean in terms of consciousness

Comparing different methods of measurement			
Research method	Description	Advantages	Disadvantages
Video monitoring	Using infrared cameras (or cameras in a room lit with infrared light) that operate silently to allow footage to be seen and taped in the dark without disturbing the sleeping participant	• Insight into observable behaviour during sleep • Can be undertaken in sleep laboratory or in natural setting • Researchers can continuously monitor the behaviour, either at the time of collection, at a later stage or both • Data can be recorded alongside the physiological measurements at the time	• Data can be open to interpretation so requires clear definitions for a specific behaviour • May miss important events if only considering still photographs every few seconds/minutes; otherwise lots of information to sift through • Participant's behaviour may be blocked from view of the camera
Self-reports, including subjective measures such as sleep diaries	Statements and answers to questions made by the participants concerning their thoughts, feelings and behaviours	• Gives a rich and important insight into actual thoughts, feelings and behaviours experienced by the participants	• A subjective measure that is open to interpretation and difficult to communicate and compare with others • Onus on participant to be self-aware and able to complete the task honestly and at the times required

TABLE 1 Advantages and disadvantages of some methods used to research sleep

CHECK YOUR LEARNING 10.2

Describe and explain

1 **Explain** what *self-reports* are. What are two disadvantages of using a self-reporting measure?
2 **Explain** why self-reports, such as sleep diaries, are used in sleep research.
3 **Explain** why video monitors are often used in sleep laboratories.

Apply, analyse and interpret

4 **Consider** the information that is likely to be displayed alongside video monitors in a sleep laboratory.

Investigate, evaluate and communicate

5 **Consider** the different types of self-reporting measures: sleep diaries and questionnaires. Write a sleep questionnaire and fill it out. **Evaluate** its effectiveness at assessing the quality of your sleep from the night before. Do you think it truly reflects the way you slept? Communicate the potential flaws in measuring your sleep this way.

Check your obook assess for these additional resources and more:

» Student book questions
Check your learning 10.2

» Weblink
Sleep lab

» Weblink
Using a sleep diary

» Weblink
Sleep diary

CHAPTER 10

Review

Summary

10.1
- States of consciousness can be measured by monitoring physiological responses.
- The electroencephalograph (EEG) detects, amplifies and records the brain's electrical activity in the form of brainwaves.
- The electrooculograph (EOG) detects, amplifies and records the electrical activity in the eye muscles.
- The electromyograph (EMG) detects, amplifies and records the muscles' electrical activity.
- Basic patterns of brainwave activity are associated with certain states of consciousness, especially during normal waking consciousness and sleep; the most common are gamma, beta, alpha, theta and delta waves.
- Behavioural and cognitive measures are often used to study consciousness. This includes speed and accuracy on cognitive tests and observing behaviours via video monitoring.

10.2
- Self-reports, subjective reporting of conscious experiences, are statements and answers made by the participants concerning their psychological experience (thoughts, feelings and behaviours).
- Sleep diaries are an example of a self-report. Participants are usually asked to monitor their sleep and related aspects over a period of time.
- Video monitoring is now a common method used to study consciousness and may occur in natural or artificial environments such as a sleep laboratory.

Key terms

- alpha waves
- amplitude
- beta waves
- delta waves
- electroencephalograph (EEG)
- electromyograph (EMG)
- electrooculograph (EOG)
- frequency
- K-complexes
- non-rapid eye movement (NREM) sleep
- objective measures
- physiological measures
- polysomnogram
- rapid eye movement (REM) sleep
- sawtooth waves
- sleep spindles
- subjective reporting
- theta waves

Revision questions

Multiple choice

1 The _____ is a device that detects, amplifies and records electrical activity in the brain.
   - **a** electroencephalograph
   - **b** electrooculograph
   - **c** electromyograph
   - **d** galvanic skin response

2 Which one of the following is *not* one of the five basic types of brainwave patterns?
   - **a** beta waves
   - **b** alpha waves
   - **c** theta waves
   - **d** sawtooth waves

3 Which of the following brainwave patterns are indicative of being alert and awake?
   - **a** beta waves
   - **b** alpha waves
   - **c** theta waves
   - **d** delta waves

4 An appropriate definition of beta waves could be:
   - **a** waves with a small amplitude and large frequency, associated with sleep
   - **b** waves with a small amplitude and large frequency, associated with being alert and awake
   - **c** a sharp rise and fall in amplitude
   - **d** waves that people experience when in a deep sleep

5 **Identify** the most appropriate measurement for REM sleep:
   - **a** EMG
   - **b** EOG
   - **c** EEG
   - **d** self-report

Short answer

Describe and explain

★6 **Describe** how an EEG can indicate whether a person is awake or has just fallen asleep.

★7 **Identify** one device used by researchers in a sleep laboratory to investigate eye movements. **Explain** how this device could indicate NREM sleep.

★★8 **Identify** the type of brainwaves that would be expected in:
   - **a** an awake and alert state
   - **b** an awake and relaxed state
   - **c** in a deep sleep.

★9 **Explain** what an EOG measures and how it is used by sleep researchers.

Apply, analyse and interpret

★★10 **Consider** the benefits of using video monitoring in reporting on sleep patterns.

Investigate, evaluate and communicate

★★★11 **Describe** a polysomnogram, and **justify** why it is useful for researchers.

★★★12 Self-reporting is a quick and cost-effective way of attaining information. Despite its benefits, self-reporting is subjective and may not always be reliable. **Evaluate** the reliability and validity of self-reporting, and **propose** ways that researchers can increase reliability.

Check your obook assess for these additional resources and more:

- » Student book questions
  Chapter 10 Review
- » Revision notes
  Revision notes for Chapter 10
- » assess quiz
  Test your understanding with an auto-correcting multiple-choice quiz
- » Flashcard glossary
  Key terms in Chapter 10

CHAPTER 11

Purpose and function of sleep

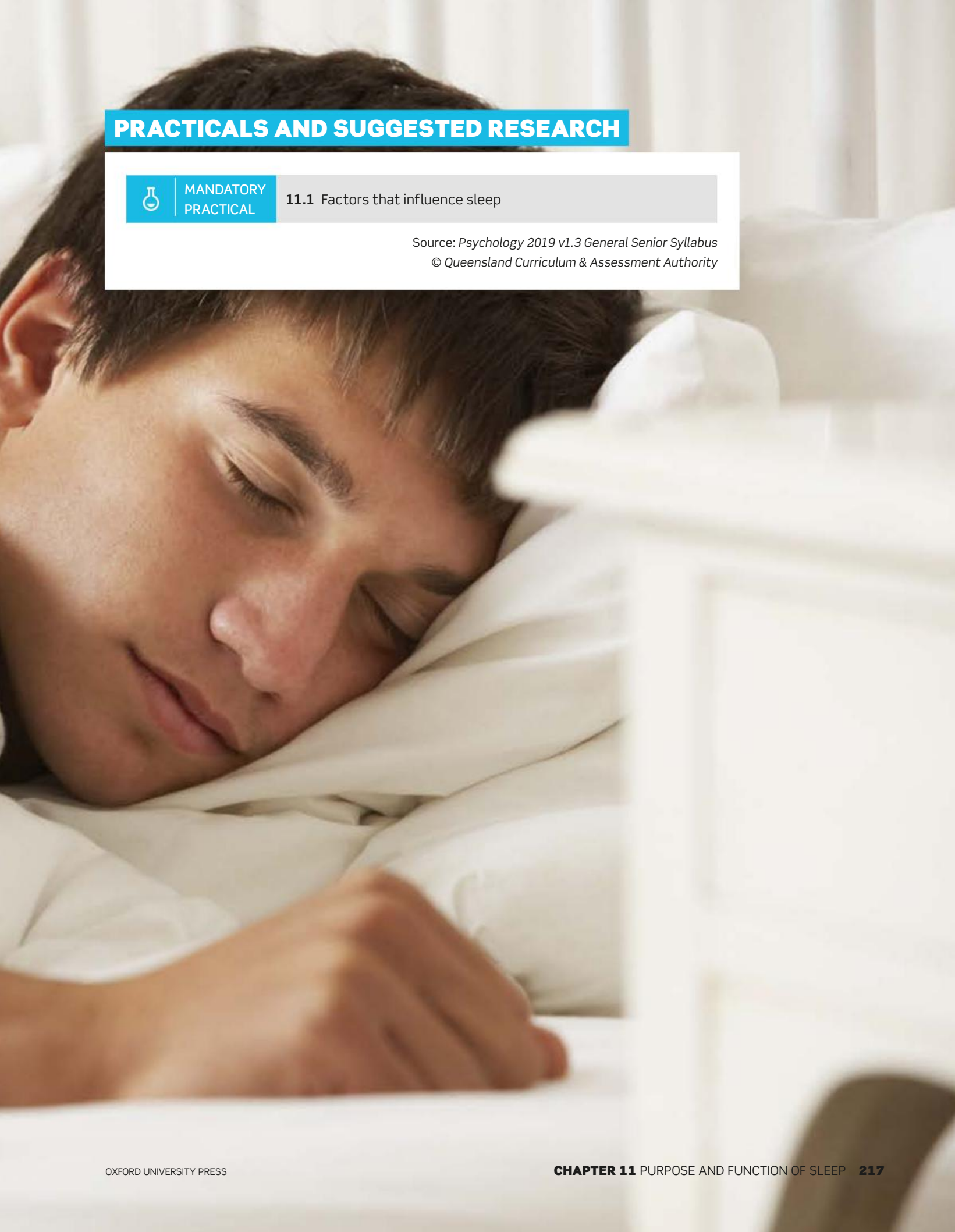
Sleep is simply irresistible. We all need it and, even when we try to stay awake, sleep eventually takes over. Sleep is an example of an altered state of consciousness. During sleep, we are almost – but not totally – unaware of our environment. Much happens to our mind and body when we drift off to sleep. This chapter considers why we sleep and looks at the various different states we are in when asleep: states known as the stages of sleep.

OBJECTIVES

- → Describe the sleep–wake cycle with reference to the stages of sleep including rapid eye movement (REM) and non-rapid eye movement (NREM) sleep
- → Describe the purpose of sleep by comparing the restoration and evolutionary theories
- → Summarise the changes in the sleep–wake cycle across the lifespan, including the sleep–wake shift (Mary Carskadon, 2011) in adolescence
- → Explain how brain structures (i.e. hypothalamus) and hormones (i.e. melatonin) regulate and direct consciousness

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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FIGURE 1 Without sleep, this teenage boy would not function. Whilst we know people need sleep, there are only theories as to why this is the case.



PRACTICALS AND SUGGESTED RESEARCH

MANDATORY PRACTICAL

11.1 Factors that influence sleep

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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11.1 Sleep as an altered state of consciousness

KEY IDEAS

In this section, you will learn about:

+ sleep as a regular and naturally occurring altered state of consciousness.



FIGURE 1 Do you often wake up just as the alarm is about to sound?

deep sleep collectively stage 3 and stage 4 of NREM sleep

On average, we spend about one-third of our lives asleep. If you are 17 years old, you have probably spent more than 5½ years asleep; a person who is 45 years old has spent about 15 years asleep. We spend up to one-third of our waking time daydreaming, or more than 5 hours per day (1 year every 4½ years). Add this up. How many years have you spent sleeping and daydreaming? To nod off to sleep is to temporarily lose normal waking consciousness, including some awareness of yourself and your environment. Below are some characteristics of sleep that define it as an altered state of consciousness.

Level of awareness

Sleep is a unique state of awareness. Each night we fall into this altered state of consciousness. We have little awareness of our environment when we are asleep. At times, we may incorporate what is happening around us into a dream or we may suddenly be woken from a **deep sleep** by something highly personally relevant (such as a parent responding to their baby's crying).

Effects of being in this altered state of consciousness

Content limitations

When we sleep, we relinquish conscious control of our thoughts. Everyone dreams, and the dreams we remember tend to be bizarre. The contents of our dreams tend to be much broader and deeper than our thoughts in normal waking consciousness.

Controlled and automatic processes

Performing other tasks is probably impossible. It is interesting to note that most sleepwalkers, known as somnambulists, usually carry out routine, automatic processes when they sleepwalk.

Perceptual and cognitive distortions

Our attention to sensory stimuli is lowered during sleep, including our perception of pain. Our thoughts are likely to be disorganised and unrealistic during dreams. Although most of us dream four or five times a night (about 2 hours in total), we remember little upon waking.

Emotional awareness

Our emotions can be more or less intense or flattened during sleep. A nightmare can make us feel very scared and a good dream can make us feel terrific. There is some evidence that sleep can help us deal with our emotions (Cartwright, 1998). Have you ever felt very anxious about something late at night, but woken up the next morning after a good night's sleep feeling better?

Self-control

Our ability to maintain self-control, including monitoring our own behaviour, is lowered during sleep. For instance, we may snore, grind our teeth or talk during our sleep.

Time orientation

Our ability to perceive the speed at which time passes may be affected. Time can seem to fly and, on other nights, it can feel as if it takes forever to reach the morning. Despite this, there is growing evidence that suggests we have the ability to estimate the amount of time that has elapsed during sleep (Aritake-Okada *et al.*, 2009). Often, we are able to wake up at a predetermined time without the use of an alarm clock. It appears that the ability to estimate time is associated with our deep sleep (stages 3 and 4 NREM) and is more likely when we follow a regular sleep routine, including going to bed at the same time each night.

CHECK YOUR LEARNING 11.1

Describe and explain

1 Fill in the following table to **describe** normal waking consciousness (NWC) and sleep.

Characteristic	NWC	Sleep
Level of awareness: awareness of internal and external events		
Content limitations: amount of control you have to limit what you attend to		
Controlled and automatic processes: ability to perform two or more tasks at once, depending on complexity		
Perceptual and cognitive distortions: degree of awareness, and efficiency of your perceptions and cognitions		
Emotional awareness: experience of emotions (and feelings)		
Self-control: ability to maintain self-control		
Time orientation: ability to correctly perceive the speed at which time passes		

Apply, analyse and interpret

2 **Consider** your sleep last night and answer the following questions.
- **a** What time did you go to bed?
- **b** How long did you sleep?
- **c** Did you wake up during the night?
- **d** What time did you wake up in the morning to start the day?
- **e** Did you wake up to your alarm clock?
- **f** Did you wake up feeling refreshed and ready to start the day?
- **g** Did you sleepwalk or talk during the night?

Collate the class's answers. **Interpret** any patterns in the data and then **summarise** the findings.

Investigate, evaluate and communicate

3 **Consider** how much sleep you had last night. Refer to the following in your response:
- **a** bedtime
- **b** length of sleep
- **c** how many times you woke during the night
- **d** the time you woke up this morning

Then, as a class **discuss** the answers to these questions. **Hypothesise** any similarities that occurred.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 11.1
- » Mandatory practical
  11.1 Factors that influence sleep
- » Weblink
  The body during sleep
- » Weblink
  Sleep as an altered state of consciousness

11.2 Characteristics and patterns of sleep

KEY IDEAS

In this section, you will learn about:

- sleep and circadian rhythms
- how brain structures and hormones regulate our sleep–wake cycle
- sleep and ultradian rhythms, including NREM and REM sleep cycles.

sleep–wake cycle the biological process of alternating between sleep and wakefulness

circadian rhythm biological rhythms that occur approximately once every 24 hours, for example, the sleep–wake cycle and body temperature

suprachiasmatic nucleus located in the hypothalamus where the left and right optic nerves cross paths, it controls circadian rhythms in response to external stimuli

hypothalamus structure of the forebrain that plays a major role in controlling emotion and motivated behaviours such as eating, drinking and sexual activity

cortisol a hormone released by the adrenal glands

melatonin a sleep hormone that causes sleepiness and is released when it is dark; it is secreted from a small structure in the brain called the pineal gland

adrenalin a type of neurotransmitter

Sleep is not just one state of consciousness; it comprises a number of predictable states and follows a highly organised sequence of events. Throughout sleep, our bodies shift through a number of stages, each with its own unique characteristics. The different stages of sleep are usually identified by measurable changes in physiological responses. Physiological changes include changes in brainwave patterns, muscle tension, eye movement, body temperature, heart rate, blood pressure, respiration and hormone release.

Biological regulation of sleep

Our bodies are attuned to a **sleep–wake cycle** that revolves around night and day. This regular cycle, an example of a **circadian rhythm** (see Table 1), is determined by an internal body clock (the **suprachiasmatic nucleus**) located in the **hypothalamus** in the brain. Levels of arousal, hormone secretions, metabolism, heart rate and body temperature are largely influenced by this clock. For most people, the circadian cycle peaks (awake and alert) during the day (usually the afternoon), with the lowest point being early in the morning (drowsy and sleepy).

The word *circadian* comes from the Latin *circe* (about) *diem* (a day), so a circadian cycle lasts, literally, about one day. Other natural cycles are *infraradian*, which occurs less than once per day (*infra* for below), and *ultraradian*, which occurs more than once per day (*ultra* for beyond).

Hormones including **cortisol** and **melatonin** are regulated by the suprachiasmatic nucleus. Cortisol levels are linked with our level of alertness, with higher levels associated with greater alertness. Melatonin, a sleep hormone, causes sleepiness and is released when it is dark. It is secreted from a small structure in the brain called the pineal gland. Light stops melatonin secretion and therefore light can prevent sleepiness. **Adrenalin** is also involved, influencing such properties as blood pressure and heart rate.

Biological rhythm	Length of cycle	Examples
Circadian rhythms	24 hours	• Sleep–wake cycle • Alertness • Body temperature • Growth hormone secretion
Ultradian rhythms	Less than 24 hours	• REM and NREM sleep cycles
Infradian rhythms	More than 24 hours	• Migration patterns of some animals • Seasonal variations in mood and appetite • Female menstrual cycle

TABLE 1 The body's biological rhythms

CHALLENGE 11.2

Melatonin's involvement

Melatonin is a hormone that causes sleepiness in humans. It is secreted, when it is dark, by the pineal gland, a small structure in the brain. Thus, we naturally feel sleepy at night. This fact cannot be ignored by shift workers; it is not uncommon for them to experience difficulties working in the early hours of the morning and to have difficulties sleeping well in daylight hours. Light stops melatonin secretion and, therefore, helps prevent sleepiness or can assist in helping us to feel awake if needed.

Consider sleep if melatonin was secreted in the light instead of in the dark. Refer to other mechanisms that would govern sleep-wake cycles.

Our internal body clock does not appear to be synchronised with the clock on the wall. The clock runs a 24-hour cycle, whereas our bodies – in the absence of environmental cues about the time – run close to a 24.2-hour cycle (Czeisler *et al.*, 1999) or even longer (up to 25 hours). This small deviation from the 24-hour clock is significant.

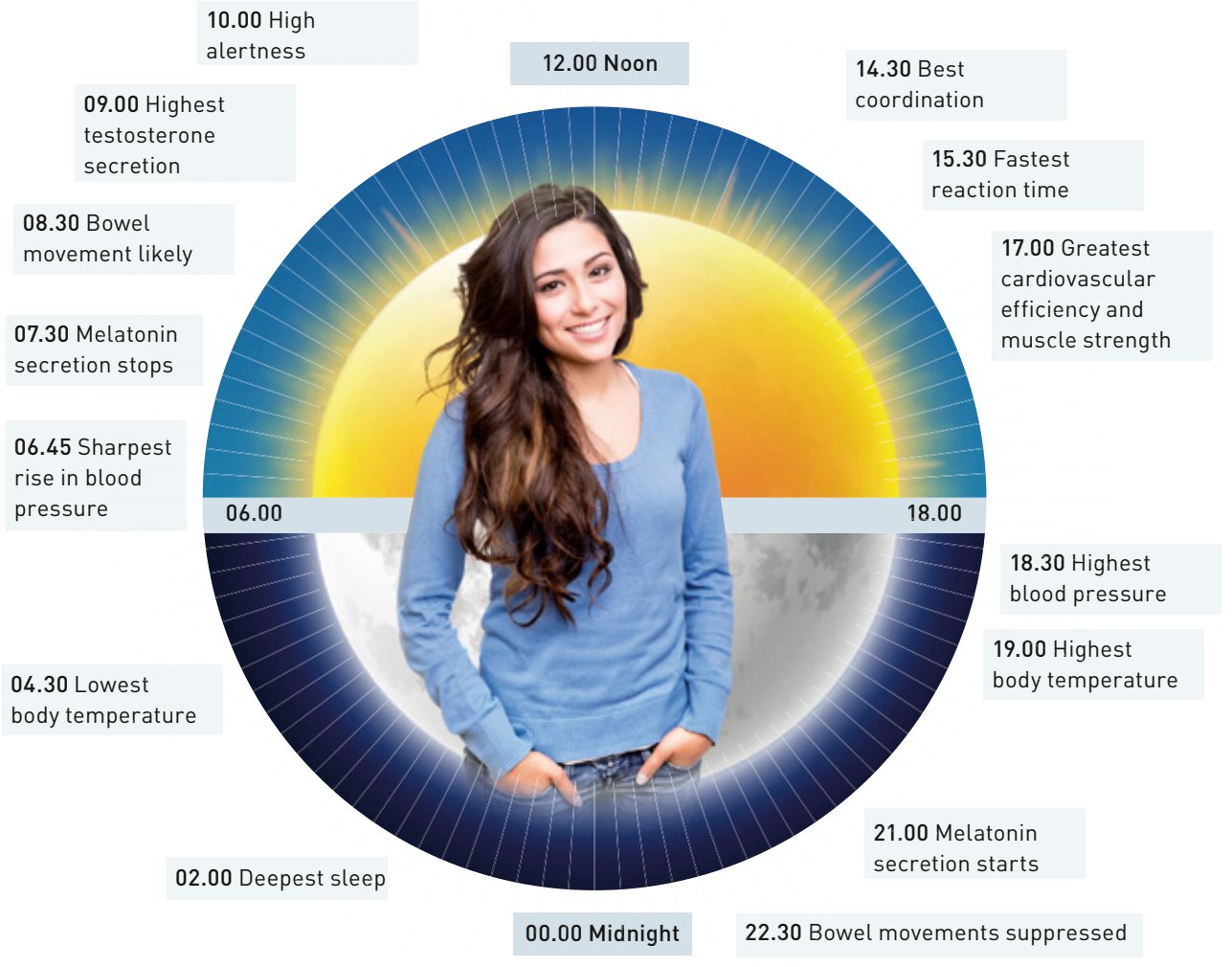


FIGURE 1 Circadian rhythms occur across a period of between 24 and 25 hours.

This means that our natural sleep–wake cycle is slightly longer than 24 hours. If we were able to follow this natural cycle, we would be going to bed at noon and awakening at midnight within a couple of months. This explains why it is often easier to fall asleep slightly later than usual rather than earlier than usual at night. It suggests that our sleep–wake cycle is largely endogenous, meaning it is based on internal biological factors. However, external (environmental) cues, such as light and dark, partially influence the sleep–wake cycle. Such cues are known as **zeitgebers**.

zeitgebers
external or environmental cues that affect the sleep–wake cycle, such as the level of light in a room

The zeitgeber sunlight appears to readjust this small mismatch between day and night and our natural sleep–wake cycle. Light sensors in our eyes (and even the backs of our knees!) inform our brain when it is light, which then adjusts our internal body clock accordingly. This means detection of light is the primary external signal for the suprachiasmatic nucleus. The suprachiasmatic nucleus then signals to the pineal gland to stop the release of melatonin, the hormone responsible for making us sleepy.

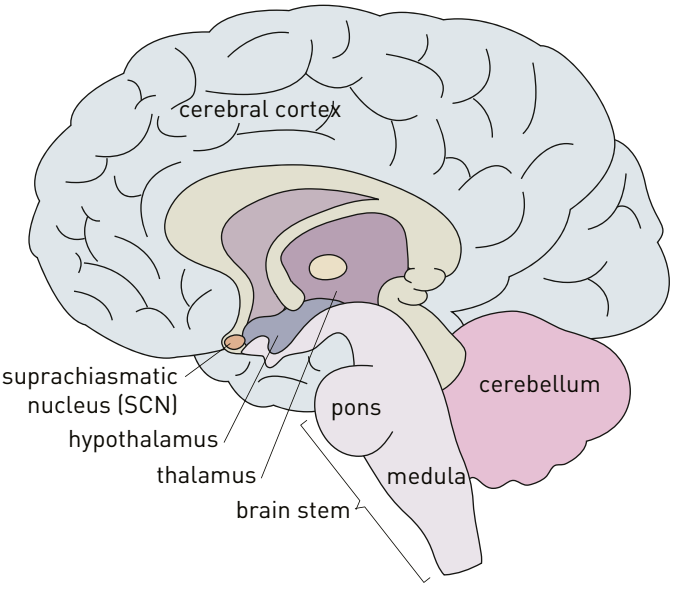


FIGURE 2 The internal body clock, the suprachiasmatic nucleus, is located in the hypothalamus. It governs the release of melatonin from the pineal gland.

Exposure to light at different times in the day has different effects. Early-morning light can cause a phase shift, leading to waking. Light in the middle of the day does not affect us too much. Light in the evening, however, causes a phase delay by keeping us awake (preventing us from sleeping).

non-rapid eye movement (NREM) sleep
one of two phases of sleep, characterised by little or no rapid eye movement, and often divided into four stages of NREM sleep that are determined mainly by predominant brainwave patterns

rapid eye movement (REM) sleep
one of two phases of sleep, characterised by rapid eye movement

ultradian rhythm
a biological rhythm that is shorter than 24 hours, such as the NREM–REM sleep cycle

Sleep and ultradian rhythms

Throughout sleep, we shift between **non-rapid eye movement (NREM) sleep** and **rapid eye movement (REM) sleep**, beginning with NREM sleep. The primary distinguishing feature between NREM and REM sleep is that rapid eye movement occurs in REM sleep. When investigated further, however, there are other physiological and psychological differences between the two.

On average, we go through one cycle of NREM and REM every 90 minutes. The NREM–REM cycle is an example of an **ultradian rhythm** (see Table 1), a biological rhythm that is shorter than 24 hours. Most adults typically experience four to six NREM–REM cycles per night. The amount of time spent in REM sleep increases and NREM sleep decreases as the night progresses. This means that we typically spend more time in REM sleep in the cycle just before we wake in the morning compared to cycles earlier in the night.

Non-rapid eye movement sleep

Once asleep, we enter NREM sleep. NREM sleep consists of four stages and accounts for about 80 per cent of our total sleep time.

Stage 1 NREM sleep

During the transition from being awake to being asleep or falling asleep, we enter a relaxed state known as a hypnogogic state. During this state, we may experience hallucinatory images, such as flashes of light and vivid images. Hypnogogic (hypnic) jerks – involuntary muscle twitches that cause us to jolt – are common. When falling asleep, usually at the beginning of the night as your muscles relax, have you ever felt like you were falling and woken with a jump? The hypnogogic state is often considered to be part of stage 1 NREM sleep.

Stage 1 NREM sleep is brief, lasting around 5 minutes for most people, but it can range from 30 seconds to 10 minutes. It is a very light sleep from which we can be easily awakened. If this happens, we often think we haven't been asleep at all. It is sometimes called the *presleep* stage.

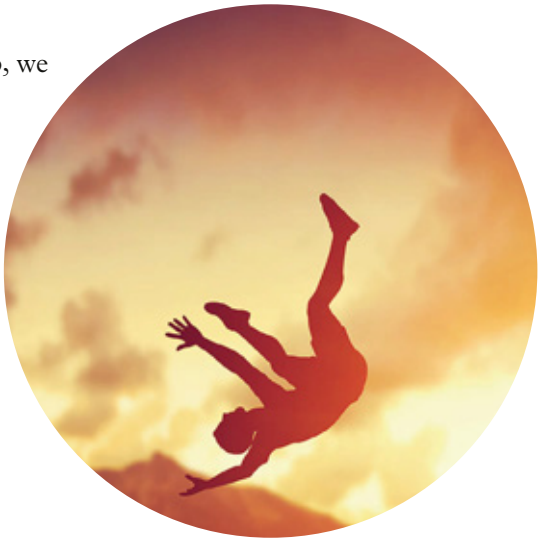


FIGURE 3 You are often jerked awake from dreams about falling before you 'hit' the ground.

Stage 2 NREM sleep

Many consider the start of stage 2 NREM sleep as the point at which true sleep begins. We spend about 20 minutes in stage 2 NREM sleep in our first NREM–REM sleep cycle and it is still fairly easy to be woken up at this stage, despite it being a deeper stage of sleep. If we are woken, it is likely that we still won't believe we were asleep. As we slip further into stage 2 NREM sleep, our eyes stop rolling, our muscles become further relaxed and our breathing and heart rate continue to decrease. Stage 2 NREM sleep accounts for about 50 per cent of our total sleep.

Stage 3 NREM sleep

Stage 3 NREM sleep is a brief transitional stage that marks the start of deep sleep. During stage 3 NREM sleep, we become less responsive to external stimuli and more difficult to awaken. If we are woken from stage 3 NREM sleep, we feel very groggy and disorientated. In stage 3 NREM sleep, our eyes do not move, our muscles are relaxed and heart and breathing rates continue to become slower and more regular.

Stage 4 NREM sleep

Stage 4 NREM sleep is the deepest sleep and, as in stage 3 NREM sleep, it is extremely difficult to wake someone who is in this sleep stage. This is when we are 'fast asleep' or 'sleeping like a log'. Although our level of conscious awareness is very low, we can still be sensitive to certain stimuli, such as a baby crying or a smoke alarm. In the first NREM–REM sleep cycle, we spend about 30 minutes in stage 4 NREM sleep and it has probably been about an hour since we first fell asleep. Rather than remaining in stage 4 NREM sleep, we quickly cycle back through the sleep stages: stage 4 NREM to stage 3 NREM to stage 2 NREM, then skipping stage 1 NREM and going straight into REM sleep.

CASE STUDY 11.2

Smoke alarms

House fires are regularly reported in the media and there have been tragic reports of deaths despite working smoke alarms. Most of these deaths have occurred early in the night, a time when we are likely to be in deep sleep. To what extent can we rely on smoke alarms to wake us in the middle of the night?

Can they rouse us even from our deepest sleep? Is there a better signal to help us wake from our deepest sleep? A team of Melbourne sleep psychologists investigated this critical issue (Bruck *et al*., 2008). They tested a number of different signals, varying in pitch and complexity, for their ability to wake people from the deepest sleep (stage 4 NREM sleep). They believed that a higher pitch and more complex tones were more likely to wake a person during stage 4 NREM sleep than a lower pitch with less complex (more pure) tones. Thirty-nine volunteers (18 male and 21 female) participated in the study. All were healthy young adults (18–27 years old) not on medication, not suffering from a sleep disorder and having normal hearing. They were paid $80 per night with a bonus of $180 on completing the study. The research was approved by the ethics committee of their university.

Most of the participants were tested in their own home, with a few deciding to be tested in the sleep laboratory. For the study, recording devices were attached to the participants and the researcher sat in the hallway monitoring their brainwaves. They were tested one night per week for three weeks, and were allowed to recover from any sleep loss between tests. Conditions were kept similar on each testing night (same diet, exercise, bedtime, door closed, etc.) and all the participants were administered the same test. During the testing, four different signals were tested per night at different times and the order of these signals was counterbalanced between participants. When each participant entered stage 4 sleep, one of the signals was switched on. It became louder until the participant pressed a button by their bedside to turn it off. The length of time it took for beta brainwave patterns to appear was recorded.

Analysis of the results found that a low pitch and a complex tone were significantly more likely to wake people. Standard smoke alarms are currently high pitched with pure tones and are at least seven times less likely to wake an adult in deep sleep. Professor Bruck and her team are calling for changes to Australian smoke-detector signals. You can learn more about Professor Bruck's studies on YouTube.

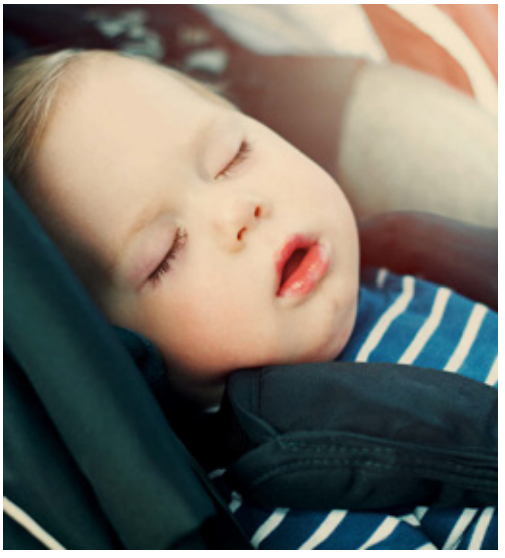


FIGURE 4 Rapid eye movement occurs during REM sleep.

Rapid eye movement sleep

In the middle of last century, two sleep researchers noticed that, at certain times, the eyeballs under a sleeper's eyelids would move rapidly to and fro (Aserinsky & Kleitman, 1953). At the same time, they noted a change in brainwave patterns, decided it was a distinct stage of sleep, and aptly named it 'rapid eye movement sleep'. This simple observation changed the whole course of sleep research.

As the name suggests, rapid eye movement (REM) sleep is a period of sleep when your eyes move rapidly, for short bursts of time. The first cycle of REM sleep lasts for about 10 minutes. REM sleep is a lighter sleep than stages 3 and 4 NREM sleep and therefore easier to wake from. Unlike NREM sleep, if we are woken during REM sleep, we are likely to report that we were dreaming. This is true for everyone, even those who say they don't usually dream.

During REM sleep there are marked physiological changes. There are repetitive bursts of rapid eye movement, and heart rate, blood pressure and respiration increase and fluctuate. Body temperature tends to match the surrounding environment and genitals are aroused. There is, however, no muscle tension – the muscles that move voluntarily, especially those below the neck, are very relaxed to the point of being almost paralysed (except for the occasional twitching). This paralysis is known as muscle atonia or cataplexy. REM sleep is often referred to as paradoxical sleep. This is because the body can appear calm on the exterior (virtually no muscle activity), but other bodily systems and the brain are highly active, having many features that are similar to being awake.

It appears that most dreaming occurs during REM sleep. Dreams during REM sleep tend to follow a storyline (though a bizarre one at times) and the dreamer often feels as if they are experiencing a different world. The final dream of the night tends to be the longest, strangest and most exciting – elements that make it more likely to be remembered. Therefore, the dreams you remember and repeat to other people are most likely to be your last REM dreams in the night. In reality, though, we remember very few of our dreams. Can you remember the four or five dreams you had last night? You probably spent about 2 hours dreaming. That adds up to about 6 years of dreaming in a lifetime.

People who are lighter sleepers and people who are anxious are more likely to dream in NREM sleep. Have you ever felt as if you have been awake all night thinking about a problem? The chances are that you did sleep and some of this thinking occurred during an NREM dream.

Characteristic	NREM sleep				REM sleep
	Stage 1	Stage 2	Stage 3	Stage 4	
Sleep state	Drifting in and out of sleep	Light sleep (real sleep starts)	Moderately deep sleep	Deep sleep	Light sleep
Heart rate	Irregular	Slower and more regular	Slower and more regular	Slow and regular	Increases and fluctuates
Breathing rate	Irregular	Slower and more regular	Slower and more regular	Slow and regular	Increases and fluctuates
Muscle tension	Relatively tense	Lower muscle tension	Lower muscle tension	Relaxed (low tension)	Virtually non-existent
Body temperature	Normal	Lower	Lower	Lowest	Unregulated

TABLE 2 Physiological characteristics of the stages of sleep

CHECK YOUR LEARNING 11.2

Describe and explain

1 **Explain** the circadian rhythm.
2 **Explain** the ultradian rhythm.
3 **Identify** and **describe** the four stages of NREM sleep.

Apply, analyse and interpret

4 **Distinguish** between NREM and REM sleep.
5 **Classify** the following stages of sleep in order: REM, Stage 3 NREM, Stage 4 NREM, Stage 1 NREM, Stage 2 NREM.

Investigate, evaluate and communicate

6 **Investigate** what happens to the muscles that move voluntarily during REM sleep.
7 **Evaluate** the importance of REM sleep.

Check your obook assess for these additional resources and more:

» **Student book questions**
Check your learning 11.2

» **Challenge**
Worksheet:
11.2 Melatonin's involvement

» **Weblink**
The biological regulation of sleep

» **Weblink**
REM sleep

11.3 Sleep patterns across the lifespan

KEY IDEAS

In this section, you will learn about:

- cycles of REM and NREM sleep
- sleep patterns across the lifespan.

Sleep patterns change with age. You probably do not need as much sleep now as you used to and can go to bed later than when you were little.

Newborns spend about 16 hours per day sleeping, with about half of this time in REM sleep. Young children also spend a lot of time in deep NREM sleep, but as they grow up the type of sleep they experience changes. Evidence suggests that REM sleep helps with brain development, particularly in early life. This would explain why infants need so much more.

Adults sleep for about 8 hours, with about a quarter of this in REM sleep. By the age of 60 years, very little time, if any, is spent in stage 4 NREM sleep, with sleep lasting for about 6 hours – still with 20–25 per cent in REM sleep. As we can see in Figure 1, the amount of REM sleep we experience decreases as we get older. Although this does not mean we need less sleep, rather it means our sleep becomes more fragile.

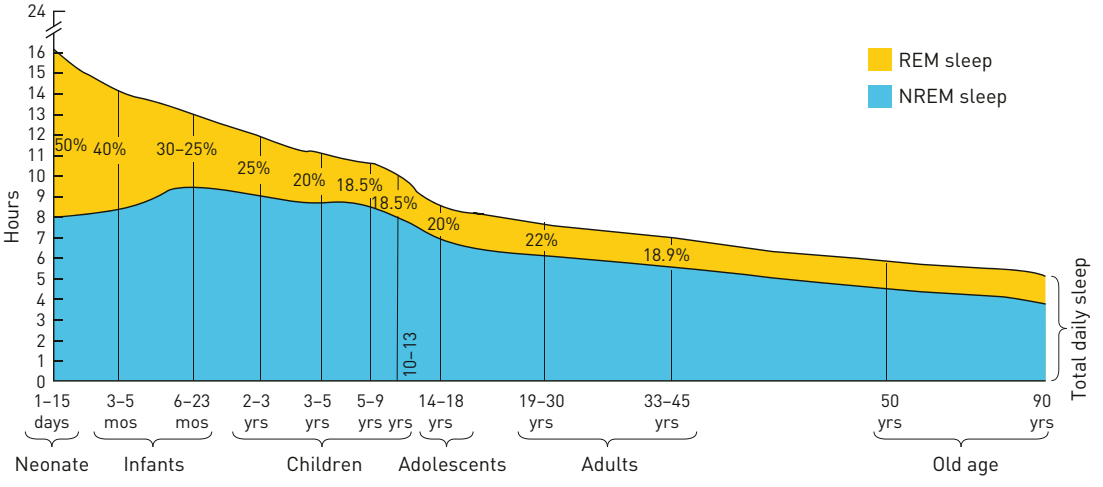


FIGURE 1 Sleep patterns change with age.

Proportion of REM and NREM sleep in a typical pattern of sleep

As discussed, sleep cycles consist of REM sleep and NREM sleep. NREM sleep is broken down into stages 1, 2, 3 and 4. When we first fall asleep, we tend to experience NREM stage 1, then stage 2, stage 3, stage 4, stage 3, stage 2 and finally REM sleep. This is our first NREM–REM cycle and lasts for about 90 minutes.

After the first NREM–REM cycle, we often skip stage 1 NREM sleep and enter stage 2 NREM sleep again. We then descend through stages 3 and 4 NREM sleep before returning via stage 3 to stage 2 to REM sleep. This cycle can be plotted on a graph known as a

hypnogram (refer to Figure 2). Return to stage 2 NREM sleep marks the start of the third cycle and, this time, we stay in this stage for about an hour, often not descending into stages 3 and 4 NREM sleep. We spend a longer period of time in REM sleep and, again, the end of REM sleep marks the end of the cycle.

The fourth, fifth and (sometimes) sixth cycles are similar; we are unlikely to enter stages 3 and 4 NREM sleep and increasingly more time is spent in REM sleep. We have a tendency to wake briefly (usually without conscious awareness) before or after a period of REM sleep (Zepelin, 1986). We might wake up in the fifth sleep cycle, either directly from stage 2 NREM sleep or REM sleep, but often roll over and go back to sleep and start another cycle. While the exact pattern of sleep varies from person to person and from night to night, the following features are the same:

- Stages 3 and 4 NREM sleep typically occur in the first two cycles of the NREM–REM sleep cycle.
- We spend more time in REM sleep as the night progresses.

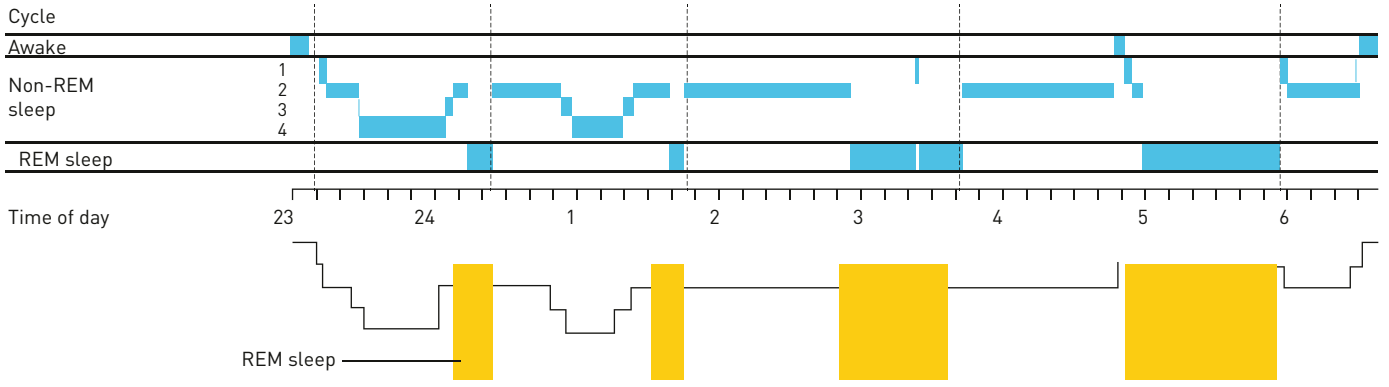


FIGURE 2 A typical hypnogram of a night's sleep

Adolescent sleep–wake cycles

It is not unusual for a teenager to want to go to bed later and sleep in longer in the mornings. While an adult might fall asleep at 10.00 p.m., a teenager may find themselves lying awake, staring at the ceiling, until midnight. It takes longer for a teenager to 'wind down' at the end of the day. Teenagers are not turning into lazy people who want to sleep all morning by choice – there are valid biological reasons for the desire to stay awake late and sleep in the next day! This phenomenon can be categorised as **delayed sleep–wake phase disorder**, a circadian rhythm sleep disorder (see Chapter 13).

delayed sleep–wake phase disorder
a circadian phase disorder that delays sleep patterns, often seen in adolescence



FIGURE 3 Teenagers have valid biological reasons for sleeping longer in the mornings.

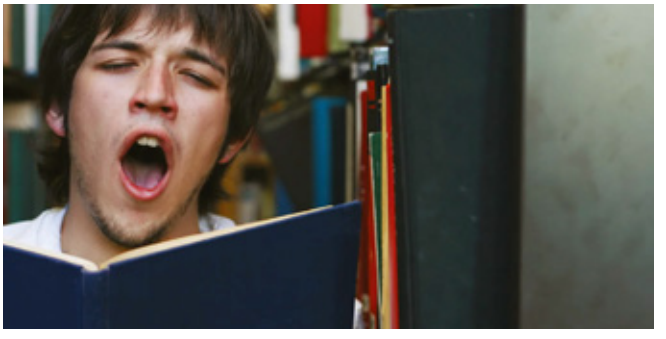


FIGURE 4 Some Year 12 students can suffer from inadequate sleep leading up to exams.

While delayed sleep–wake phase disorder is usually seen in adolescents and young adults, advanced sleep–wake phase disorder is most common in the elderly. People with advanced sleep–wake phase disorder experience sleepiness in the late afternoon or early evening, resulting in an early bedtime (6.00 p.m. to 9.00 p.m.). They usually wake early (2.00 a.m. to 5.00 a.m.), and find it difficult to go back to sleep.

The adolescent sleep–wake cycle occurs only during the teenage years. The sleep patterns tend to shift back to an adult pattern around 19½ years for females and 21 years for males. Most adults need about 8 hours of sleep per night.

Teenagers need 9–10 hours of sleep per night. Not surprisingly, most don't get this much. A hectic schedule of school, homework, part-time jobs, social activities and family commitments leaves many teenagers with too little time to sleep. In addition, myriad electronic devices, social networking sites, television and playing sport late at night keep our brains stimulated and prevent sleep.

In teenagers, the release of sleep–wake hormones such as melatonin at night (inducing sleepiness) and cortisol in the day (encouraging alertness) is often delayed by up to 2 hours. This means that the average bedtime of 9.30–10.30 p.m. is pushed back later and most teens report not being tired at this time. This leads to a behaviour that is seen as typical of teenagers: they prefer to go to bed late (on average around 11.00 p.m.) and, therefore, wake up later. A sleep time of 11.00 p.m. and a wake time of 7.00 a.m. – perhaps typical of the school week – will leave a teenager at least one hour short of the optimal amount of sleep. Over the period of one week, this adds up to a sleep debt of at least 5 hours. If this happens, teenagers can become chronically sleep-deprived.



FIGURE 5 Research has shown that later start times in schools can influence student performance.

Some schools, especially those in the United States that traditionally have a very early start time, are taking this sleep research seriously and are starting school later. Studies are demonstrating that students with a later start time, getting almost one hour more sleep, are less sleepy during the day and are showing improved grades. In addition, there are fewer school absences (Carskadon *et al.*, 1998; Wahlstrom, 2002; Wolfson *et al.*, 2007). These improvements were found to be almost immediate, highlighting the dramatic effect that good sleep can have on a teenager's life. Being a night owl is less than ideal in our school environment. Further research has found that night owls (those who go to bed late and are late to rise) tend to experience more emotional stress than early birds (Ong *et al.*, 2007). In this study, night owls held more negative and rigid beliefs about the need for sleep and what their sleep should be like. They felt less in control of their sleep and did not go to bed or wake up at regular times. Consequently, they felt sleepier during the day and were more at risk of depression and insomnia.

CHECK YOUR LEARNING 11.3

Describe and explain

1 **Explain** how the duration of sleep changes over the lifespan.

2 The sleep–wake cycle is often delayed during adolescence.
   - **a** **Describe** why a teenager is more likely to want to go to bed late at night.
   - **b** **Summarise** how the length of required sleep changes during adolescence.
   - **c** **Identify** when the delay in teenage sleep–wake cycles is likely to shift back to an adult sleep–wake cycle.

3 **Explain** how the proportion of time spent in NREM and REM sleep changes:
   - **a** during the night
   - **b** over the lifespan.

Apply, analyse and interpret

4 **Consider** why people need less REM sleep as they get older.

Investigate, evaluate and communicate

5 **Assess** how much sleep is needed by one-year-old babies, five-year-old children and people in middle adulthood.

6 The question 'Should school start later?' is a politically charged and extremely complex one. Many aspects of school, including family, student and teacher requirements, need to be considered before making your decision. **Evaluate** if this is a realistic solution, and refer to your understanding of sleep–wake cycles in your answer.

Definitely yes | Unsure | Definitely no

Check your obook assess for these additional resources and more:

» Student book questions
Check your learning 11.3

» Weblink
Health and sleep

» Weblink
Teenage sleep needs

11.4 Purpose and function of sleep

KEY IDEAS

In this section, you will learn about:

- the evolutionary theory of sleep
- restoration theories of sleep.

Picture this scenario between a parent and child: preschool-aged Emily 'snaps' at her mother when told to pick up her toys. Her mother says to her visitor, 'Oh, she is just tired. She stayed up late last night.'

Have you ever been told your behaviour indicates that you need more sleep? Or have you ever justified your poor behaviour by blaming a lack of sleep? If so, it shows that you, like most of us, have some understanding of the need for sleep and know what can happen if you don't get enough.

While the quality or quantity of sleep should not justify bad behaviour (for example, 'I didn't mean to hurt your feelings. I'm just tired'), it can highlight the importance of sleep. Feeling grumpy, tired, irritable, antisocial and unmotivated are just some of the consequences – you can probably think of more. On the other hand, you have probably noticed that too much sleep can also make you feel sluggish and irritable.

Sleep is a necessity, not a luxury. While sleep is essential to being healthy, alert and happy, the overriding purpose of sleep is much debated. We know we need sleep, but we are still unclear about exactly why. The amount of sleep we need also varies markedly from one person to another.

There are several theories of sleep function, including the evolutionary (circadian) theory of sleep and restorative (restore and recover) theories of sleep.

Evolutionary theory of sleep

evolutionary (circadian) theory of sleep a theory stating that sleep serves as a means to increase an animal's or human's chance of survival in its environment

According to the **evolutionary (circadian) theory of sleep**, sleep is a means of increasing an animal's chances of survival in its environment. Animals' sleep patterns, periods of activity and inactivity have evolved around the circadian day–night period to match periods of light and darkness.

Sleep allows us to change to meet the demands of our environment and it depends on how much food we need, how available it is (we may need to conserve energy) and our safety when we sleep. These sleep requirements have evolved over time in order for the species to hunt food, hide and conserve energy. The periods of wakefulness occur when it is safer to do so and sleeping when it is more hazardous to be awake.

Sleep patterns have adapted in terms of whether the animal in question is predator or prey, their food requirements and methods of defence from attack. Within a population of a certain animal species, individuals with certain sleep patterns (traits) have survived over time. They have offspring who are likely to inherit these sleep traits and survive and reproduce.

Therefore, the species have adapted their sleep patterns to their environmental conditions over time and their chances of survival have increased.

Consider the different sleep needs for different animals (refer to Figure 1). The evolutionary theory posits several hypotheses:

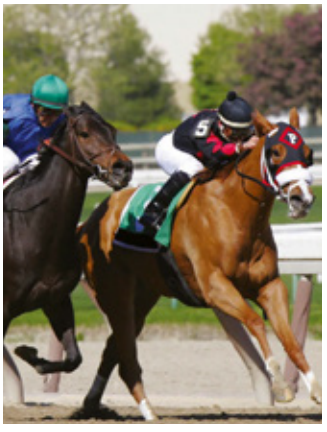
- Sleep depends on an animal's vulnerability to predators. Small animals that are very vulnerable to predators, such as mice, sleep more so that they can hide safely from carnivores that will eat them. Larger prey animals, such as deer, sleep less because they are more exposed in their environment and need to be ready to escape from predators. Those with few natural predators, such as bears and lions, often sleep for long periods (12 to 15 hours) each day. From an evolutionary stance, our prehistoric ancestors were more vulnerable to predators at night. They relied heavily on vision, a sense that is not very good in the dark. To avoid predators, they carried out duties (hunting and gathering food) during the safe daylight hours and slept quietly and safely at night, a time when their vision was poor.
- Sleep depends on the need to find food. Animals that need to graze for hours, such as cows, sleep less. They sleep less because they need more food to survive.
- Sleep conserves energy. When an animal sleeps, its metabolism slows, thus reducing the need for food – a human's metabolic rate during sleep is about 10 per cent less than when awake (Wouters-Adriaens & Westerterp, 2006). Sleeping is a means of conserving energy in hibernating animals, such as squirrels or grizzly bears, which sleep during winter months when food is scarce and the weather conditions are harsh.


Human: 8.0 hours

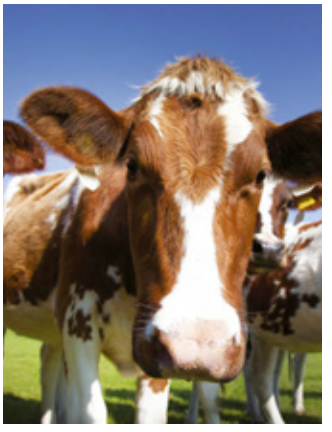

Koala: 19.0 hours


Bat: 19.9 hours


Kangaroo: 1.5 hours


Horse: 2.5 hours


Red fox: 9.8 hours


Cow: 3.9 hours


Cat: 13.2 hours

FIGURE 1 Different animals need different amounts of sleep. Which animals need to work harder to get enough food? Which are vulnerable to predators? Which have a higher metabolic rate?

Criticisms of the evolutionary theory

The evolutionary theory has attracted criticism because:

- it assumes sleep is very useful but not essential. This theory does not explain why we must have sleep. All species sleep, despite the amount of food (abundant or scarce) or danger they are in.
- it assumes sleep is a way to hide safely from predators. For animals that are highly preyed upon, sleeping can be dangerous. The loss of awareness during sleep makes the animal very vulnerable to predators and unlikely to be able to respond to danger.

Restoration theories of sleep

restoration (restore and recover) theories of sleep
a theory stating that sleep allows us to recharge our bodies, and recover from the physical and psychological work during the day; it also allows our body's growth processes to occur

According to **restoration (restore and recover) theories of sleep**, sleep allows us to recharge our bodies: to grow and recover from the physical and psychological work during the day. Think about how you feel when you wake up after a good night's sleep: refreshed, re-energised and ready to start the day. It is like undergoing a routine check-up and maintenance every time we sleep!



FIGURE 2 Research shows that activities that are more physically demanding should increase the need for sleep.

According to the restoration theories:

- Sleep repairs and replenishes the body and prepares it for action the next day. Sleep looks after the health of the physical body. Activities that are more physically demanding should increase the need for sleep. A study of marathon runners supports this view (Shapiro *et al.*,

1981). They slept 90 minutes longer and doubled their deep sleep (stages 3 and 4 NREM) for the two nights after running a 107.8 kilometre marathon.

- The neurotransmitter **adenosine** may provide further evidence for the restorative theory. Adenosine is produced when our cells use energy – it is suspected to be a cellular waste product that accumulates when we are awake. The more energy we spend, the more adenosine is produced. Adenosine is linked to making us feel sleepy and the longer we are awake, the sleepier we get. When asleep, adenosine levels decrease and we wake feeling refreshed and alert (Rainnie *et al.*, 1994; Alanko *et al.*, 2004). It is a bit like taking out the rubbish – sleep gets rid of the waste products! Lack of sleep will affect our energy levels and make us feel drowsy and fatigued. Caffeine increases alertness and also blocks adenosine, further adding support to the theory of adenosine's role in making us feel sleepy.

adenosine
a neurotransmitter produced when our cells use energy and accumulates when we are awake

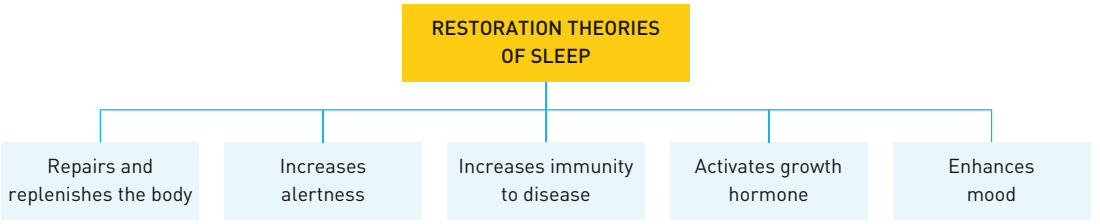


FIGURE 3 Some sleep benefits, according to the restoration theories of sleep

- Sleep increases alertness. Sleep keeps our minds alert and assists our psychological state. When we are not getting enough sleep, we tend to be inattentive and more easily distracted (Jennings *et al.*, 2003; Kendall *et al.*, 2006). Neurotransmitters, including **norepinephrine**, play a major role in keeping us alert during the day. It has been found that our bodies are more sensitive to norepinephrine when our sleep is adequate (Steriade & McCarley, 1990). Therefore, less norepinephrine is required to make us feel alert after a good night's sleep compared to a poor night's sleep. Other neurotransmitters such as adenosine (mentioned previously) are also involved in determining our alertness after sleep.

norepinephrine
a neurotransmitter involved in regulating arousal that helps keep us alert during the day

- Sleep enhances mood. Are you grumpy, short-tempered or miserable? Perhaps you need more sleep! Many hormones and neurotransmitters influence your mood and emotions. A number of these are activated during sleep. As a consequence, not getting enough sleep can lead to negative thoughts, feelings and behaviours, making us cranky, irritable and unhappy (Boivin *et al.*, 1997; Durmer & Dinges, 2005).
- It has been found that mammals with higher metabolic rates, such as dogs and cats, are likely to spend more time sleeping, especially in deep sleep (stages 3 and 4 NREM sleep), than mammals with lower metabolic rates, such as cows and kangaroos (Allison & Cicchetti, 1976). This finding may suggest that animals with a higher metabolic rate need more sleep to recover. Look at Figure 1 again. Which animals have a high metabolic rate and spend more time asleep?
- Sleep activates growth hormone. Growth hormone is responsible for physical growth. It has been linked with sleep, especially during the early years and adolescence, and the more you sleep (especially stages 3 and 4 NREM sleep), the more likely you are going to grow and meet your potential growth (Gais *et al.*, 2006).



FIGURE 4 Getting adequate sleep increases our level of alertness when we are awake.

- Growth hormone is also involved in controlling our metabolism. This means that sleep increases growth hormone levels and therefore helps control metabolism, including our energy levels (Pekkanen, 1982).
- Sleep increases immunity to disease. For good reasons, we are often told to rest and sleep when we are ill. Sleep is a natural medicine as it appears to help our immune system become stronger. Immune cells that fight disease and infections are produced during sleep (Motivala & Irwin, 2007). If we go without sleep, our immune system will often reduce its natural response, causing us to be more susceptible to disease and infection (Irwin *et al.*, 2003). We are more prone to heart disease if we sleep either too much or too little.

Criticisms of the restoration theories

Not all research has supported restoration theories, and there are criticisms of some of the underlying assumptions:

- The theories assume that more sleep is needed to recover when we are physically active. Unless we partake in extreme physical activities (such as a 100 kilometre marathon), there is little evidence that we need more sleep when we exercise. A review of research in this area concluded that we tend to sleep longer – by about 10 minutes – on days we have exercised (Youngtedt, 1997), which is a small difference from the days we don't exercise.
- If this assumption is true, we might expect that those who do little exercise, including people who are disabled or confined to bed, would sleep less, but there is no evidence to support this statement: bedridden people show sleep patterns that are similar to those of normally active individuals. The need for sleep is not reduced with lack of exercise.
- The theories assume that the body rests during sleep. The brain is active during sleep. There is increased blood flow and energy expenditure during REM sleep and this slows down the synthesis of proteins, assisting the body in getting ready for the next day.

The evolutionary and restoration theories address different issues about the purpose of sleep. The evolutionary theory focuses on when and why different species sleep, whereas the restoration theories help to explain why sleep is important. While the two sets of theories give different views of the purpose of sleep, they are complementary and both contribute to our understanding of why we sleep. Other sleep theories also work in a complementary manner (see Table 1). There is certainly a need for further research to better understand the purpose of sleep.

Theory of sleep	Purpose	Function
Evolutionary theory	• To increase chances of survival • Explains when and why different species sleep	Sleep allows creatures to hide and conserve energy, and wake to safely find food.
Restoration theories	• To recharge, grow and recover from the physical and psychological work during the day • Explains why sleep is important	Sleep repairs and replenishes the body and prepares it for action the next day.
Memory consolidation theory	• To create new and lasting memories from the day	Sleep allows time for the brain to process and transfer information into long-term memory.
Sleep to dream	• To experience dreaming	Dreaming fills our psychological needs.

TABLE 1 Summary of the main theories on purpose and function of sleep

CHECK YOUR LEARNING 11.4

Describe and explain

1 **Describe** the main purpose and function of the different theories of sleep.

2 For each of the following statements, **identify** whether it supports the evolutionary theory or restoration theory of sleep:

- **a** Sleep increase alertness.
- **b** Sleep enhances mood.
- **c** Sleep conserves energy.
- **d** Sleep depends on the need for food.
- **e** Sleep increases immunity to disease.
- **f** Sleep activates growth hormones.
- **g** Sleep depends on an animal's vulnerability to predators.
- **h** Sleep repairs and replenishes the body and prepares it for the next day.

Apply, analyse and interpret

3 **Compare** the restoration and evolutionary theories of sleep.

Investigate, evaluate and communicate

4 **Assess** the evolutionary and restoration theories of sleep. Outline the arguments that support and limit the usefulness of each theory.

5 **Investigate** an athlete who competes in extreme endurance events, such as a marathon, iron man challenge or the Iditarod trail. Using the restorative theories of sleep, **evaluate** why these events may trigger a greater need for sleep. Make sure to account for the fact that normal exercise does not increase the need for sleep.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 11.4
- » Weblink
  Why do our brains need sleep?
- » Weblink
  Healing through sleep
- » Weblink
  Safety in sleep

SCIENCE AS A HUMAN ENDEAVOUR

11.5 Animals need sleep too

KEY IDEAS

In this section, you will learn about:

+ whether sleep serves a different purpose for humans than for animals.

Section 11.4 discusses the evolutionary theory of sleep and proposes that humans evolved to sleep at night because there were less predators at that time, meaning it made more sense to hunt and work during daylight. Section 11.4 also presented the average sleep levels of several animals. In this section, we will explore the idea that humans have a different need for sleep when compared with other animals.

It is hard to state definitively that humans have a different purpose for sleep than other animals. We know that people need sleep. We know that they can become irritable and increase their likelihood of illness if they do not sleep. And we know that eventually people die if they are deprived of sleep for too long. While we know that sleep is important to human survival, it is not clear why it is so important. Several potential reasons why people need sleep have been discussed throughout this chapter:

- Evolutionary theory suggests it is to keep us safe from predators.
- Restorative theories suggest it helps us repair and rebuild after daily activities.
- Several theories state that memory and learning are consolidated during sleep, particularly during REM sleep.



FIGURE 1
A mantled howler monkey sleeps in a tree.

Of course, there are many other reasons that people may need sleep. For this section, we will consider the reasons listed.

All animals have different requirements to survive. Sharks can eat one large meal that may sustain them for an extended period of time; bears eat large amounts during warmer months so they can hibernate in the winter; cows graze constantly throughout the day to stay nourished; and people ideally eat three meals a day. All require different levels of sleep to survive.

When comparing humans and other animals, people are usually compared to their closest relative: the primate. Primates sleep for longer than humans. Despite sleeping longer, they do not achieve the same level of depth in their sleep as humans. Humans enter REM sleep more frequently and for longer periods. This increase in REM sleep does not show that REM serves a different purpose as such, but rather that the amount of REM achieved is a potential reason why humans need sleep.

Humans and other animals all need to maintain energy. People are able to cook and prepare food, which makes it easier to digest and absorb nutrition. Animals are unable to do this, and many animals need to eat constantly during the day. Some also take longer to digest their food; animal digestion times can influence the amount of sleep that is required. For example, a cow must constantly keep eating, as they burn through energy quickly. If they do not graze, cows become quickly fatigued.

It has also been shown that cows need REM sleep. Despite sleeping less, and spending less time in REM, if cows are unable to lie down, they cannot enter REM. Cows that fail to achieve REM sleep may become irritable and struggle to produce milk. Therefore, the

importance of REM sleep is not restricted to humans. All species require REM sleep, but humans spend more time in REM sleep than any other species.

When investigating sleep beyond primates, it becomes less clear why people have different requirements from other animals. It is widely acknowledged that dolphins are intelligent and that they are capable of higher order cognition. Sleep research into dolphins shows that one half of their brain sleeps at a time (one hemisphere at a time), leaving the other half awake. This further complicates the purpose humans have for sleep.

To consider that sleep serves a different purpose in humans than in other animals would require a clear understanding of why humans need sleep at all. It is clear that all animals, including humans, sleep for different reasons. The amount of time humans spend in REM sleep suggests that human cognition may be related to sleep.

CHECK YOUR LEARNING 11.5

Describe and explain

1 **Describe** the evolutionary theory of sleep and **explain** how it relates to human society today.

Apply, analyse and interpret

2 **Consider** the way dolphins sleep. Why do you think it is important for their survival for one half of their brains to sleep at a time? Apply the evolutionary theory to your answer.

Investigate, communicate and evaluate

3 **Investigate** how long a pet dog sleeps for. **Evaluate** its need for sleep considering evolutionary and restoration theories of intelligence, as well as comparing cognition with humans.

4 **Consider** what other reasons there may be for sleep. **Evaluate** these reasons and apply them to animals. Would it make sense for animal sleep to serve the same purpose as human sleep?

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 11.5
- » Weblink
  Differentiating between human and other animals sleep needs
- » Weblink
  What sleeps more?
- » Weblink
  Why do animals sleep?



CHAPTER 11

Review

Summary

11.1
- Sleep is an altered state of consciousness.

11.2
- The sleep–wake cycle is an example of a circadian rhythm.
- The regular sleep–wake cycle is controlled by the suprachiasmatic nucleus, located in the hypothalamus in the brain.
- Melatonin is a hormone released from the pineal gland that induces sleep, and is secreted in dark conditions. Upon light, melatonin ceases to be released.

11.3
- Humans shift between non-rapid eye movement (NREM) sleep and rapid eye movement (REM) sleep, beginning with NREM sleep. There are four stages of NREM sleep, which together account for about 80 per cent of our total sleep time.
- We go through one cycle of NREM and REM sleep every 90 minutes on average. This cycle is an example of an ultradian rhythm. Typically, most adults have four to six NREM–REM cycles per night. The percentage of time spent in REM sleep increases and NREM sleep decreases as the night progresses.
- Sleep patterns change with age, including the total time spent sleeping and the proportion of REM and NREM sleep.
- During their teenage years, most people experience a delayed onset of sleep (going to sleep later) and the need for more sleep (9–10 hours per night). An increased need for sleep during these years tends to be found in all cultures, suggesting that it is biological and a normal part of life.
- Stage 4 NREM sleep is the deepest of sleeps. In the first NREM–REM sleep cycle, we spend about 30 minutes in stage 4 NREM sleep, usually from about an hour since we first fell asleep. In the last two or three cycles of NREM–REM sleep, we often do not descend into stages 3 or 4 NREM sleep.
- The first cycle of REM sleep is about 10 minutes in duration. REM sleep is easier to wake from than stages 3 and 4 NREM sleep. Unlike NREM sleep, if we wake during REM sleep, we are likely to report that we were dreaming.

11.4
- There are a number of theories of sleep function, including the evolutionary (circadian) theory of sleep and the restoration theories of sleep. Evolutionary theory focuses on when and why different species sleep, whereas the restoration theories focus on why sleep is important.
- The evolutionary theory of sleep focuses on when and why different species sleep, with regards to survival.
- The restoration theories of sleep focus on why sleep is important for daily functioning.

Key terms

- adenosine
- adrenalin
- circadian rhythm
- cortisol
- deep sleep
- delayed sleep–wake phase disorder
- evolutionary (circadian) theory of sleep
- hypothalamus

- melatonin
- non-rapid eye movement (NREM) sleep
- norepinephrine
- rapid eye movement (REM) sleep
- restorative (restore and recover) theory of sleep
- sleep–wake cycle
- suprachiasmatic nucleus
- ultradian rhythm
- zeitgebers

Revision questions

Multiple choice

1 The amount of time we spend in NREM sleep _____ throughout a night's sleep.
- **a** remains stable
- **b** increases
- **c** decreases
- **d** fluctuates

2 What is sleep?
- **a** a deliberately induced altered state of consciousness
- **b** a natural altered state of consciousness
- **c** part of normal waking consciousness
- **d** an unconscious state

3 In a normal night's sleep, an adult will go through one cycle, from stage 1 to stage 4 NREM sleep and through the first REM sleep period in approximately how many minutes?
- **a** 20
- **b** 50
- **c** 90
- **d** 200

4 The sleep–wake cycle is an example of a(n) _____ rhythm, and the NREM–REM cycle is a(n) _____ rhythm.
- **a** infradian; ultradian
- **b** circadian; infradian
- **c** ultradian; circadian
- **d** circadian; ultradian

5 What is the name given to the mechanism that controls our sleep–wake cycle and where in the brain is it located?
- **a** suprachiasmatic nucleus; hypothalamus
- **b** Broca's area; frontal lobe
- **c** medulla; hindbrain
- **d** amygdala; temporal lobe

6 Which of the following statements is true of our internal body clock?
- **a** Our internal body clock has a slightly shorter cycle than the clock on the wall.
- **b** Our internal body clock has a significantly shorter cycle than the clock on the wall.
- **c** Our internal body clock has a slightly longer cycle than the clock on the wall.
- **d** Our internal body clock synchronises perfectly with the clock on the wall.

7 Which of the following statements is true?
- **a** A zeitgeber is an internal cue that affects our sleep–wake cycle.
- **b** A zeitgeber is an external cue that affects our sleep–wake cycle.
- **c** A zeitgeber is either an internal or an external cue that affects our sleep–wake cycle.
- **d** A zeitgeber is an external cue that affects the quality of our sleep.

8 Which of the following is true of stages 3 and 4 NREM sleep?
- **a** They usually occur in only the first two cycles of NREM–REM sleep.
- **b** They are collectively known as light-wave sleep.
- **c** It is relatively easy to wake a person during these stages of sleep.
- **d** They increase in length throughout a night's sleep.

9 When compared to sleep needs in late childhood, an adolescent tends to need _____ sleep and sleep time tends to be _____.
- **a** less; delayed
- **b** less; earlier

c more; delayed
d more; earlier

10 Which theory argues that sleep serves to restore energy to our bodies after the physical and emotional fatigue that occurs when we are awake?

a evolutionary theory
b restoration theories
c restoration and evolutionary theories
d dream theories

11 Which of the following statements supports the evolutionary theory of sleep?

a Animals that are more susceptible to predators tend to sleep for longer periods than those that are less susceptible.
b Animals with higher metabolic rates need more sleep than those with lower ones.
c Growth hormone is released during stages 3 and 4 NREM sleep and this aids growth.
d Sleeping enhances mood and can aid memory.

12 Hormones influence human circadian rhythms. Which of the following options cause sleepiness when released in the dark?

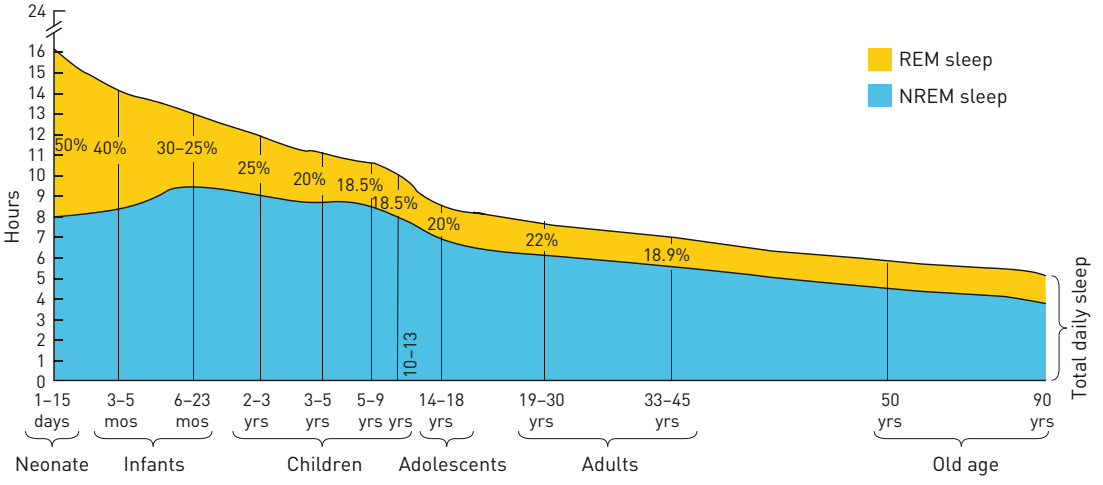
a adrenalin
b cortisol
c adenosine
d melatonin

13 Which of the following can be referred to as an 'internal body clock'?

a suprachiasmatic nucleus
b hypothalamus
c zeitgebers
d circadian rhythm

14 Look at the graph below and determine which is true:

a infants spend more time in REM than adolescents.
b adults need more sleep than neonates.
c those in old age experience more NREM sleep than children.
d children need the same amount of REM sleep as infants.



15 One of the limits to the restoration theories of sleep is:

a it assumes that sleep is useful but not essential
b it assumes that sleep is a way that species can hide from predators
c sleep enhances mood
d the theories assume that more sleep is required when people are physically active.

Short answer

Describe and explain

★**16** **Explain** why sleep is considered to be an altered state of consciousness.
★**17** **Identify** and describe the four stages of NREM sleep
★**18** **Identify** and **summarise** the role of brain structures in the sleep–wake cycle
19 **Describe** each of the five stages of sleep.

Apply, analyse and interpret

★★ **20** Liat is a healthy 1-year-old baby, Nancy is a healthy 30-year-old adult, and Arthur is a healthy 82-year-old adult. **Consider** how you would expect their sleep patterns to differ. Refer to the total sleep time and proportions of time spent in REM and NREM sleep.

★★ **21** **Compare** the ultradian and circadian rhythm.

★★ **22** **Contrast** NREM and REM sleep.

★ **23** **Determine** the amount of sleep a teenager needs and consider why teenagers rarely get the amount of sleep they require.

★★★ **24** **Differentiate** adolescent sleep–wake cycles from adult sleep–wake cycles. You may want to **construct** a diagram to illustrate this.

★★ **25** Mohammad is currently 26 and sleeps for about seven hours each night. Referring to the proportion of REM and NREM sleep, **determine** what is expected to happen to Mohammad's sleep patterns as he approaches old age.

Investigate, evaluate and communicate

★ **26** 'Our perception of time is distorted during sleep'. **Discuss** this statement.

★★★ **27** Patricia was sleeping soundly, and had been asleep for about two hours when there was a loud noise outside her house. **Decide** how likely it is that Patricia would have woken up instantly and easily. **Justify** your answer with reference to the REM and NREM sleep cycles.

★★★ **28** Alice is 3 months old and spends about 14 hours a day sleeping.

- **a** **Determine** the proportion of Alice's sleep that is spent in REM.
- **b** **Hypothesise** how Alice's sleep patterns will change when she is a teenager.
- **c** **Propose** what Alice's sleep patterns will be when she reaches adulthood.

★★ **29** **Discuss** how brain structures (e.g. hypothalamus) and hormones (e.g. melatonin) regulate our consciousness

★★★ **30** Despite much sleep research, the exact purpose of sleep is still unclear.

- **a** **Identify** two theories that attempt to explain the purpose and function of sleep.
- **b** For each theory, **evaluate** one piece of evidence that supports the theory and one criticism of each theory.
- **c** **Consider** if it is possible that both of these theories can be used to help explain the purpose of sleep. **Justify** your answer.

★★ **31** There is no doubt that sleep is important. **Evaluate** the following statement 'REM sleep is more important than any of the NREM stages'.

★★★ **32** **Consider** the results of case Study 11.2 (page 223–224). **Create** a methodology to retest this study.

★★ **33** The restorative theories of sleep pose that sleep can enhance mood and increase immunity to disease. **Create** a methodology to investigate this. In your methodology, you will need to **consider** ethical concerns.

Check your obook assess for these additional resources and more:

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  Chapter 11 Review
- » Revision notes
  Revision notes for Chapter 11
- » assess quiz
  Test your understanding with an auto-correcting multiple-choice quiz
- » Flashcard glossary
  Key terms in Chapter 11

CHAPTER 12

Sleep deprivation

Our society doesn't switch off at night – we can work, shop, email, text, blog, post, go to a venue and be entertained by the media 24/7. Our society promotes this flexible lifestyle as being convenient, efficient and exciting. But it is one that seems to overlook the need for sleep. Is a lifestyle that seems to devalue sleep good for us? Is there room in our busy lives for good quality sleep? In this chapter, we will investigate the effects of sleep deprivation.

OBJECTIVES

→ Recognise the physical and psychological consequences of total and partial sleep deprivation, including effects on concentration and mood

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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SUGGESTED RESEARCH

SUGGESTED RESEARCH

12.2 Review the case study on disc jockey Peter Tripp and explain the physical and psychological effects of sleep deprivation in Thomas Bartlett, 2010; *Secrets of sleep deprivation Peter Tripp Pt 1 of 2; Secrets of sleep deprivation Peter Tripp Pt 2 of 2*

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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FIGURE 1 This young woman may have had a lack of sleep at night, which caused her to doze off while studying.



12.1 How much sleep do people need?

KEY IDEA

In this section, you will learn about:

+ factors that affect how much sleep a person needs, including age, lifestyle and genetics.

William Dement, a pioneer in sleep research, decided to test himself and see if he could stay awake for a long period of time (Goleman, 1982). As much as he tried, he could not fight off sleep. He found that, just as we cannot hold our breath until we die, neither can we stay awake indefinitely. In the end, sleep sets in and saves us.

Dement's experience of sleeplessness probably does not surprise you. Take a moment to think about how you think, feel and behave when you are tired. We all know the groggy feeling that lack of sleep can cause and how it affects our ability to concentrate. We dislike being forced to stay awake when we are very tired; this is because we are well aware of how much better we function when well rested. However, how do we know much sleep we need? And does the amount of sleep required differ among individuals?

The media sometimes portrays examples of well-known people who function well on very little sleep. Political figures such as Kevin Rudd, Barack Obama, Margaret Thatcher, Winston Churchill and Bill Clinton are often noted for only needing (or claiming to need) four hours of sleep per night. But these are rare examples and most of us need much more sleep.

> The amount of sleep we require is what we need not to be sleepy in the daytime.
>
> Jim Horne, sleep researcher

There are no hard and fast rules about the exact amount of sleep we need. Sleep needs vary between individuals and depend on a number of factors such as age, lifestyle and genetics. The following page discusses each of these factors, as well as how each affects the quality of sleep we experience.



FIGURE 1 Babies require more sleep than adults.

Factors that influence sleep

Age

As a guide, most teenagers need 9–10 hours of sleep per night. A young child needs more and an adult needs less to perform at their best. Mason (2005) found that 80 per cent of teenagers in the United States wish they slept more on school nights. This echoes the love–hate relationship some of us have with sleep. We love the feeling of being well rested but dislike sleep interfering with things we enjoy or our time completing work.

Lifestyle

Our lifestyle influences the amount of sleep we need. For instance, working day or night shifts, sleeping in quiet or noisy places, leading an active versus inactive lifestyle, and having a stressful versus low-key way of life all influence our individual need for sleep (Bronzaft *et al.*, 1998). People tend to alter their sleep routines as responsibilities, relationships and stressors change with age. However, good sleepers are more likely to have a regular bedtime and rise time than poor sleepers (Carney *et al.*, 2006).

Genetics

Our genes also may influence our sleep–wake cycle. Surveys of twins in Australia and Finland found that identical twins tend to have more similar sleep patterns (going to bed at the same time and sleeping the same length of time) than fraternal (non-identical twins; Heath *et al.*, 1990). Some studies suggest that females tend to need more sleep than males and therefore are more likely to be sleep deprived (Wever, 1984).



FIGURE 2 Afternoon naps are popular in some cultures.

CHECK YOUR LEARNING 12.1

Describe and explain

1 **Describe** how the following factors might influence an individual's need for sleep. Give an example of each:
   - **a** age
   - **b** lifestyle
   - **c** genetics

2 **Explain** how lifestyle choices can affect the amount of sleep you get each night. Think about work, social life, school, sport and other activities such as reading or using the internet.

Apply, analyse and interpret

3 **Analyse** your sleep needs. Try going to bed 15 minutes earlier each night this week. Add another 15 minutes the following week and continue each week until you can wake without an alarm clock and feel alert all day.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 12.1
- » Weblink
  Sleep deprivation
- » Weblink
  More or less sleep?
- » Weblink
  Factors that influence the need for sleep

12.2 What happens when we don't get enough sleep?

KEY IDEAS

In this section, you will learn about:

- partial sleep deprivation
- chronic sleep deprivation.

Do you like to sleep in on the weekends? Do you find it hard to wake up on Monday morning? Do you often press the 'snooze' button on your alarm clock? Do you feel sleepy during the day?



FIGURE 1 Empty kindergarten in Chernobyl after the nuclear accident, which was possibly the result of sleep deprivation

If you answered 'yes' to any of these questions, then you are probably not getting enough sleep. While the exact reasons for sleep are unclear, what we do know is that it is crucial that we sleep. Sleep deprivation (not getting the amount of sleep you need) involves partial or total loss of sleep. Both partial and total sleep deprivation can have serious consequences.

Sleep deprivation has been associated with personnel involved in a number of international disasters, including the oil spill of the Exxon Valdez, the destruction of the space shuttle *Challenger* and the nuclear accident at Chernobyl, which cost more than 50 000 lives (Coren, 1996).

partial sleep deprivation having some sleep in a 24-hour period but not getting enough to meet your needs; may occur for just one night or for several nights and can have serious consequences

total sleep deprivation going without sleep for an entire 24-hour period; may occur for just one night or for several nights and can lead to serious consequences

Partial, total and chronic sleep deprivation

People who do not get enough sleep are likely to suffer the effects of **partial sleep deprivation**. **Total sleep deprivation**, which may last for one or two nights, is rare. Partial sleep deprivation is experienced when a person does not get the amount of sleep they need (poor quantity sleep) or are deprived of one particular stage of sleep (poor quality sleep).

We need good quality sleep to survive, to recover both mentally and physically from the day's activities, and to grow. When we don't get enough sleep, we tend to get bored more easily. Activities we usually enjoy can seem dull. We are likely to feel unmotivated in class. Even the simplest of tasks can become difficult. Paying attention and concentrating on routine, simple,

SUGGESTED RESEARCH
12.2 Physical and psychological effects of sleep deprivation on disc jockey Peter Tripp
Go to page 456 »

boring, repetitive and self-motivated tasks is difficult. There may be memory problems, emotional issues and poor motor coordination. Our feelings of self-worth, our relationships with family and friends and our schoolwork can suffer. Interestingly, however, short performances on more physically or intellectually challenging tasks are usually not affected.

Effects of partial sleep deprivation

The effects of partial sleep deprivation can vary from one person to the next.

Psychological effects

- affective (emotional) disturbances
  - mood disturbances: amplified emotional responses, confusion and irritability, feelings of sadness
  - previously enjoyed activities seem boring
  - lack of motivation
  - feelings of fatigue
- behavioural difficulties
  - slowed performance
  - clumsiness, injuries
  - risk-taking behaviour
  - problems performing tasks, especially *simple monotonous* tasks and ones requiring *sustained* attention or concentration
- cognitive difficulties
  - difficulty paying attention and concentrating
  - difficulty processing information
  - difficulty thinking and reasoning, poor decision-making
  - memory problems
  - impaired creativity
  - distorted perceptions

Physiological effects

- slower physical reflexes
- hand tremors
- droopy eyelids
- difficulty in focusing eyes
- a heightened sensitivity to pain
- headaches
- lower energy levels

Note: there is little change, if any, in heart rate, respiration, blood pressure and body temperature.



FIGURE 2
Sleep deprivation can affect your ability to concentrate.

Effects of chronic sleep deprivation

At first, the effects of sleep deprivation appear to be more psychological than physiological. However, **chronic sleep deprivation** (not having enough sleep over an extended period of time) is associated with several psychological and physiological conditions.

chronic sleep deprivation
not getting enough sleep over an extended period of time; long-term sleep deprivation

There is increasing evidence that chronic sleep deprivation is linked to various health problems:

- depression
- hypertension
- heart disease
- diabetes
- heartburn
- obesity
- some forms of cancer
- anxiety disorders
- sleep disorders such as insomnia
- accelerated ageing

These conditions also suggest a link between sleep loss and stress-related conditions, including cardiovascular diseases, mood disorders and immune deficiencies (Meerlo *et al.*, 2008). Lack of sleep increases the levels of cortisol, a stress-related hormone (related to alertness and discussed in more detail in Chapter 11) that interferes with immune functioning. After several days of partial sleep deprivation, there will be an effect on immunity (Irwin, 2002). This may explain why we are more susceptible to colds in the lead-up to exams, a time when we are more likely to be sleep deprived. In addition, increased levels of cortisol have been linked to damage of the brain cells responsible for learning and memory (Leproult *et al.*, 1997).



FIGURE 3 Students may find they are increasingly susceptible to colds if they are sleep deprived prior to exams.

CASE STUDY 12.2

Case studies of total sleep deprivation

Human studies

Total sleep deprivation for an extended period of time is likely to lead to death. Obviously, for ethical reasons, investigating total sleep deprivation and its link to death with human participants is impossible. There are, however, reported cases that highlight the need of sleep. For instance, a 52-year-old man suddenly began to lose the ability to sleep (Lugaressi *et al.*, 1986). Not surprisingly, he quickly became totally exhausted and could not function normally. He developed a lung infection that eventually led to his death. An autopsy revealed that his suprachiasmatic nucleus, the area of the brain that governs the internal biological clock, had been destroyed. Whether the sleep loss itself was fatal or other aspects of the brain damage were to blame is not clear. Distinguishing the effects of sleep loss from the effects of stress that the man experienced during his horrific ordeal is also impossible.

In 1964, Randy Gardner, a 17-year-old student, entered the Guinness Book of Records for staying awake for 264 consecutive hours (11 days) without the use of any stimulants (even coffee). His physical health and thoughts, feelings and behaviours were scientifically monitored (Gulevich *et al*., 1966). He underwent significant and uncharacteristic mood changes, had difficulties concentrating and short-term memory problems. He also suffered delusions (such as believing he was a famous sportsperson) and hallucinations (he once thought a street sign was a person). He was often disorientated and developed finger tremors and slurred speech. However, he was still able to play pinball on day 11 (winning 100 consecutive times against one of the researchers) but had difficulty with some other simple tasks. After giving a press conference, Randy collapsed into a deep sleep and slept for almost 15 hours. Within a few days his sleep patterns returned to normal. Randy slept longer than usual for the next few nights (Horne, 1988). While he missed out on about 85 hours of sleep during the 11 days, he only recovered about 20 hours (25 per cent) of the loss during the subsequent nights. So it does not appear to be essential that a person catches up with the entire amount of sleep lost. We can be sure, however, that Randy would have experienced microsleeps during the experiment (see pages 250 & 254). What is also interesting is that Randy Gardner's sleep after the experiment consisted of more REM and stages 3 and 4 NREM sleep. In the end, he recovered about 70 per cent and 50 per cent of these respectively, but there were only very small increases in the other stages of sleep. This suggests that REM and stages 3 and 4 NREM sleep are of significant importance.

Non-human studies

Non-human studies offer a window into the effects of total sleep deprivation. A study on rats showed that those who were not allowed to sleep died within 33 days, while those allowed to sleep remained in good health (Rechtschaffen *et al*., 1983). The rats were placed on a disk above a water container and their brainwaves were monitored via an EEG. When sleep was detected, the disk started to rotate causing the rat to fall in the water and wake. The rats' physical health declined throughout this time and their deaths were probably due to overheating of the body. Again, it is very hard to distinguish between stress-related illnesses and those due to sleep loss, as the rats were living under extremely stressful conditions. Interestingly, non-human studies have shown that the animals usually die faster from lack of sleep than they do if totally deprived of food but allowed to sleep normally.



FIGURE 4 Non-human studies often involve mice or rats.

Sleep debt

The accumulated amount of sleep loss from insufficient sleep is known as sleep debt. Not getting enough sleep night after night adds to this sleep debt. The good news is that sleep debt, like other debt, can be repaid. Even better news is that, unlike other debt, it does not accumulate in a direct fashion or attract interest. In other words, if you have been missing out on one hour of sleep for seven nights in a row, you definitely need extra sleep, but not an extra seven hours.

Unfortunately, there is no sleep bank – we cannot open a sleep savings account! Sleeping longer than we need on one day will not counteract the late nights that follow. The best we can do is go to bed early the night before to make sure we are not sleep deprived to begin with.

Usually, a good night's sleep and being able to sleep in is enough to recover from sleep deprivation. Depending on the amount of sleep deprivation, a few more nights of slightly longer sleep than usual may be required. Most effects of sleep deprivation are temporary and we are likely to fully recover without any long-term psychological and physiological problems.

The difficulty arises when a person may be suffering from a sleep disorder (such as insomnia) or another condition that is affecting their quality of sleep over an extended period of time. Lack of sleep is also often linked with other conditions such as depression and anxiety disorders, and recovering from sleep loss may improve the condition or make it worse. In these cases, people often need professional intervention to help deal with these conditions and recover lost sleep. If a few good sleeps do not help you recover from the effects of sleep deprivation, please seek professional help.

Total sleep deprivation

It is likely that you have thought about staying up all night to study before an exam, believing that this will help your performance. But will it? In one study, college students were either deprived of sleep or allowed to sleep the night before a critical-thinking task (Pilcher & Walters, 1997). Those forced to forego sleep ended up performing poorly on the task compared to the sleepers. More interestingly, those who were sleep deprived thought they had performed better than they actually did, a result not seen in the group that slept.

The good news is that, in the event that we have to stay up all night, we can do so with no serious side effects other than those associated with feeling extremely sleepy at the time (trusting we don't drive a vehicle or have any other accident). We would probably struggle to stay awake for a second night, however, and find it almost impossible after four days. At this time, we are likely to be irritable and confused and suffer from the 'hat phenomenon', a feeling of tightening around the head as though a hat that is too small is being worn. Further days without sleep can cause 'sleep deprivation psychosis', where the person experiences a loss of sense of personal identity and has increased difficulty in coping with other people and the environment. A long night's sleep followed by a few good nights' sleep tends to overcome most, if not all, the effects of sleep deprivation. Hüber-Weidman (1976) reviewed a large number of studies and summarised the effects of total sleep deprivation (refer to Table 1).

CHALLENGE 12.2

Sleep deprivation as torture

Total sleep deprivation has been used in warfare throughout history. The ancient Romans used *tormentum vigilae* (the waking torture) as a method to extract secretive information from their enemies. In the Korean War of 1950–53, North Koreans 'brainwashed' captured American pilots by depriving them of sleep. Discuss why this may lead to the 'torturers' receiving false or incorrect information.

Nights without sleep	Symptoms
1	• Discomfort felt but is tolerable
2	• Urge to sleep, especially between 2:00 am and 4:00 am (when body temperature is at its lowest)
3	• Tasks requiring concentration (sustained attention) are seriously impaired, especially if they are simple, repetitive or boring
4	• Periods of microsleep (about 3 seconds of staring blankly into space and losing awareness) are unavoidable • Irritable and confused • The 'hat phenomenon' is experienced (a feeling of tightening around the head as though a hat that is too small is being worn)
5	• Still irritable and confused • May become delusional
6	• Possible depersonalisation, with a loss of sense of personal identity and increased difficulty in coping with other people and the environment: sleep deprivation psychosis

TABLE 1 The effects of total sleep deprivation

Loss of REM and NREM sleep

Both REM and stages 3 and 4 NREM sleep play crucial roles in allowing us to function properly. Depriving someone of these sleep stages can have alarming consequences. Speak to new parents and they will probably tell you about the difficulties of coping with inadequate sleep. They are likely to be REM-sleep deprived, as their sleep is consistently interrupted throughout the night for months on end. When their baby settles into a sleep routine, many parents experience a marked improvement in their psychological and physical wellbeing with no long-lasting ill effects.

It has been suggested that REM sleep is more critical for psychological wellbeing, and NREM sleep (especially stages 3 and 4 NREM) for physiological wellbeing. Other psychologists argue against this idea (Siegel, 2003). Some of the questions that have been raised in the debate are discussed below.

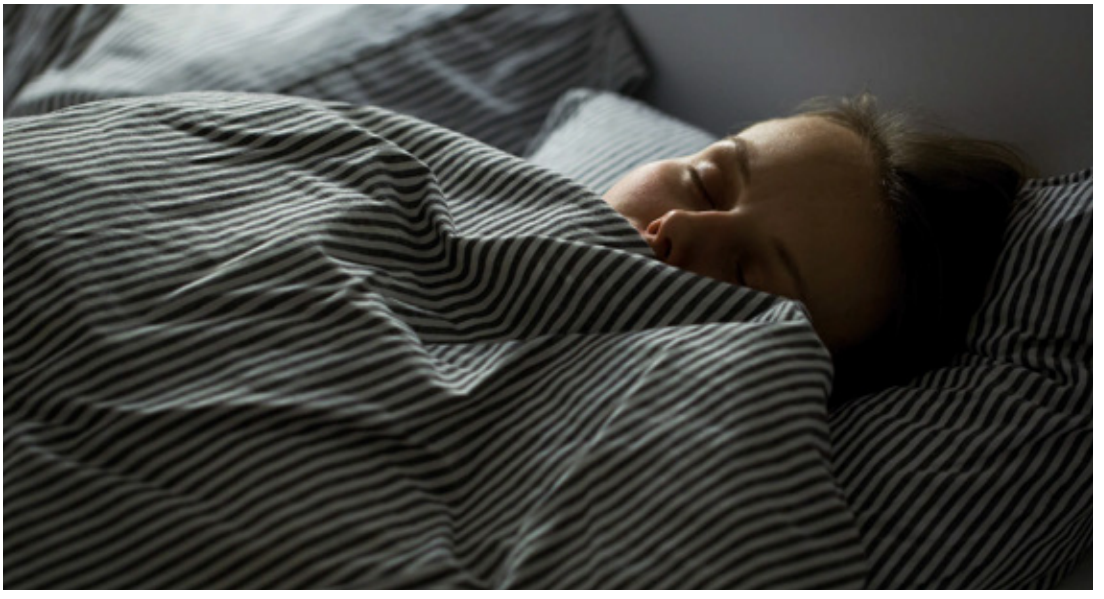


FIGURE 5 Good quality and quantity sleep helps you fully recover from sleep deprivation.

REM sleep and the link with memory and learning

Many psychologists believe that the high level of brain activity during REM sleep helps newly learnt information to be consolidated (transferred) into long-term memory. This leads to the idea that not getting enough REM sleep will cause memory problems. Such an idea is not without controversy, however, it has been demonstrated that performance on some tasks improves after a marked increase in both REM sleep and stages 3 and 4 NREM sleep (Walker & Stickgold, 2006). Other research has failed to find a link between loss of REM sleep and memory problems (Siegel, 2001). People who have brain damage that prevents REM sleep or who are on medication that prevents REM sleep do not experience more memory problems than usual. Animals such as dolphins and whales do not appear to have REM sleep but are considered to be intelligent and able to learn.

Lack of REM sleep and the link with mood disturbances

norepinephrine a neurotransmitter that is released by the sympathetic nervous system

REM sleep interrupts the release of some neurotransmitters (such as **norepinephrine**, also known as noradrenalin) and this might allow the brain receptors to recover and become more sensitive to their release (that is, more likely to react) after a break. Interruptions to the release of these neurotransmitters are likely to affect mood and learning. Being deprived of REM sleep may lead to mood disturbances such as grumpiness, irritability and sadness.

Compensating for loss of REM sleep

REM rebound the significantly larger amount of time spent in REM sleep than usual that follows a period of being deprived of REM sleep

REM sleep is essential, as demonstrated by **REM rebound**, an effect that follows a loss of REM sleep. When we sleep after being deprived of REM sleep, we experience a significantly larger amount of time in REM sleep – more frequent and longer episodes. It is as if our bodies need to catch up on this loss of REM sleep. Dement (1960) first noticed REM rebound. For five nights, he woke participants each time they entered REM sleep. He found many of the participants experienced significant difficulties, including trouble with their memory, motor coordination and perception of time, and a tendency to hallucinate. Many also reported feeling irritable and anxious. These findings support the value of REM sleep as discussed earlier. When participants were allowed to have REM sleep on the sixth night, they engaged in much more REM sleep than usual, creating a rebound effect.



FIGURE 6 A lack of sleep affects your mood.

The effects of loss of NREM sleep

During NREM sleep, the body replenishes itself physically and restores body tissues. It does this in several ways, including via the release of growth hormones. Being deprived of NREM sleep, especially stages 3 and 4, may interfere with this process.

CHECK YOUR LEARNING 12.2

Describe and explain

1 **Explain** how sleep deprivation affects our performance on:
   - **a** repetitive, simple and boring tasks
   - **b** short complex tasks.

2 **Describe** REM rebound.

Apply, analyse and interpret

3 **Distinguish** between chronic sleep deprivation and partial sleep deprivation.

4 Sas has been staying up late with friends recently, and sometimes hasn't slept at all. Sas is more irritable than usual and is frequently confused. He feels that he is wearing a hat, despite having checked that he is not. **Apply** your understanding of sleep deprivation to suggest how many nights of sleep Sas has missed.

5 REM sleep has been linked with memory and learning. **Consider** what the effects of decreased REM sleep may be.

Investigate, evaluate and communicate

6 **Assess** how much sleep is needed to recover from sleep deprivation.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 12.2
- » Suggested research
  Worksheet: 11.2 Disc Jockey Peter Tripp
- » Challenge
  Worksheet: 12.2 Sleep deprivation as torture
- » Weblink
  The effects of sleep deprivation on Peter Tripp

SCIENCE AS A HUMAN ENDEAVOUR

12.3 Effects of sleep deprivation on consciousness

KEY IDEAS

In this section, you will learn about:

- how understanding the role of sleep in human functioning can be used to develop and evaluate policy and laws.

It is easy to see that our behaviour changes when we don't get enough sleep. Partial sleep deprivation means having inadequate sleep, either in quality or quality, and can have serious effects on a person's emotional, behavioural and cognitive functioning.

Sleep deprivation changes a person's mood and concentration. They become irritable and dysfunctional. In other words, mental or psychological wellbeing is negatively impacted.

In this section, we explore the effects of interrupted sleep and lack of sleep on our psychological health, using contributions that classical and contemporary psychology research have made to the understanding of consciousness. For example, we will consider research evidence that shows people are more likely to have an accident if they are sleep deprived. We also compare the effects of one night of sleep deprivation with the effects of legal blood-alcohol concentrations.

Driving while sleep deprived

When going without sleep, we are at more risk of accidents. The effects of partial sleep deprivation impede driving ability in many ways. An investigation into Australian train drivers found that fatigue interfered with their ability to plan ahead, causing them to use the brakes more heavily, use less throttle and use up to 9 per cent more fuel (Dorrian *et al.*, 2007). They were also more likely to exceed speed limits.



FIGURE 1
Driving while sleep deprived is extremely dangerous.

Daylight saving and car accidents

A Canadian study investigated the effects of changing times due to daylight saving on the incidence of car accidents. The number of car accidents on the Monday following the change into and out of daylight saving was monitored over two years. It was found that there were about 7 per cent more accidents on the Monday following the start of daylight saving. It appears that more drivers are suffering from partial sleep deprivation after losing an extra hour of sleep. On the other hand, car accidents decreased by about 7 per cent on the Monday following the end of daylight saving. The extra hour of sleep appears to help drivers to overcome partial sleep deprivation.

Sleep deprivation compared with blood-alcohol concentration

Driving while sleep deprived is extremely dangerous and has led to many tragic outcomes. The same is equally and harrowingly true for driving while under the influence of alcohol. While police report that most drivers (more than 99 per cent) breath-tested on our roads

do not exceed the legal blood-alcohol concentration (BAC) limit, almost one in four drivers that are killed on our roads exceed this legal BAC limit. This statistic is not including the number of drivers injured, plus other passengers and pedestrians killed or injured as a result of drink-driving.

These research findings support the Queensland Police's Fatal Five campaign, which lists driving while fatigued as one of the five biggest risk factors for people on our roads. The campaign warns that a driver who has been awake for 17 hours has a driving ability similar to that of a driver with a BAC of 0.05, and after 21 hours, their ability is similar to a driver with a BAC of 0.15. If you are driving at 100 kilometres per hour and fall into a microsleep for just 10 seconds, the car will travel 278 metres in the time you are asleep.



FIGURE 2 Sleepiness has a comparable effect to driving under the influence of alcohol.

As described earlier in this chapter, not only can sleep deprivation for a full night affect our cognitive abilities, being deprived of REM sleep for a full night can also lead to mood disturbances such as grumpiness, irritability and sadness due to interruptions in the release of neurotransmitters.

Alcohol is a psychoactive drug that slows down the nervous system. In doing so, it decreases alertness, reflexes and decision-making ability. Many impairments start while a fully licensed driver is under the BAC limit of 0.05. As the risks of driving while sleep deprived are similar to those of being under the influence of alcohol, both types of drivers are a significant danger on our roads.

Time without sleep (hours)	Risk of accident equivalent to BAC of:
17	0.05
24	0.1

TABLE 1 Comparing risks of accident when driving while sleep deprived with blood-alcohol concentration (BAC).

CHECK YOUR LEARNING 12.3

Describe and explain

1 **Explain** how sleep is related to BAC levels.

2 Missing a full night's sleep can have an impact on concentration, mood and cognition. **Explain** how this may impair someone's ability to drive.

Apply, analyse and interpret

3 **Compare** the effects of a BAC of 0.05 with sleep deprivation in regard to driving.

Investigate, evaluate and communicate

4 **Assess** how understanding the function and purpose of sleep, as well as the effects of sleep deprivation, can be used to make and enforce laws.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 12.3
- » Weblink
  BAC and sleep
- » Weblink
  Effects of drink driving
- » Weblink
  Laws around drink driving

CHAPTER 12

Review

Summary

12.1
- Sleep needs vary between individuals and depend on factors such as age, lifestyle and genetics.

12.2
- Partial sleep deprivation (having some sleep in a 24-hour period but not getting enough to meet your needs) and total sleep deprivation (going without sleep for an entire 24-hour period) may occur for one night or for several nights.
- Partial sleep deprivation can lead to psychological (affective, cognitive and behavioural) effects and physiological effects.
- Chronic sleep deprivation (not having enough sleep over an extended period of time) is linked with several serious conditions such as cardiovascular disease, mood disorders and immune deficiencies including cancer.
- Sleep deprivation, partial or full, has a serious impact on our consciousness. Our ability to drive is seriously affected and can be comparable to the risks of driving under the influence of alcohol, even at very low BAC levels (legal limits for fully licensed drivers). Both can be deadly when driving on our roads.
- REM sleep deprivation has been linked with memory and learning problems and mood disturbances such as grumpiness, irritability and sadness.
- Sleep deprivation can usually be addressed by having a little more sleep than is usually needed over the subsequent nights. Full recovery from most sleep-deprivation effects is likely, without sustaining any long-term psychological or physiological problems.

Key terms

- chronic sleep deprivation
- norepinephrine (nordrenalin)
- partial sleep deprivation
- REM rebound
- sleep debt
- total sleep deprivation

Revision questions

Multiple choice

1 On average, a teenager needs _____ of sleep per night.
- **a** 7–8 hours
- **b** 8–9 hours
- **c** 9–10 hours
- **d** 10–11 hours

2 Having some but not enough sleep in a 24-hour period is called _____ sleep deprivation and going without sleep for an entire 24-hour period is called _____ sleep deprivation.
- **a** partial; total
- **b** total; partial
- **c** partial; partial
- **d** total; total

3 Performance on _____ and _____ tasks tends not to be greatly affected by sleep deprivation.
- **a** short; complex
- **b** lengthy; complex
- **c** simple; monotonous
- **d** short; simple

4 The amount of sleep a person needs:
- **a** remains stable throughout life.
- **b** varies depending on age, lifestyle and genetics.
- **c** is greatest during late adulthood.
- **d** increases with an inactive lifestyle.

Questions 5–6 relate to the following statement:
Sasha has not been sleeping well for the past week. As a result, she is sleep deprived and experiencing a number of psychological and physiological effects.

5 What cognitive effect is Sasha likely to be experiencing?
- **a** irritability
- **b** droopy eyelids
- **c** increased creativity
- **d** poor decision-making

6 What behavioural difficulty is Sasha likely to be experiencing?
- **a** clumsiness
- **b** memory problems
- **c** feelings of alertness
- **d** previously enjoyed activities seem dull and boring

Short answer

Describe and explain

★★★ **7** Sleep deprivation can affect a student's performance at school. In terms of schoolwork, **describe**:
- **a** two likely cognitive effects due to sleep deprivation
- **b** two likely affective effects due to sleep deprivation
- **c** two likely behavioural effects due to sleep deprivation
- **d** two likely physiological effects due to sleep deprivation.

★ **8** **Explain** sleep debt and how it can be overcome?

★★ **9** **Explain** how partial sleep deprivation can impact our cognitive, affective (emotional) and behavioural functioning. Give an example of each.

Apply, analyse and interpet

★★ **10** **Consider** why it is an over-generalisation to state that REM sleep is just for psychological wellbeing and NREM sleep is only for physiological wellbeing?

Investigate, evaluate and communicate

★★★ **11** **Identify** and **discuss** three factors that influence the amount of sleep that an individual needs.

★★ **12** **Discuss** the ethical issues associated with research investigating the effects of sleep deprivation (partial and total).

Check your obook assess for these additional resources and more:

- » Student book questions
  Chapter 12 Review
- » Revision notes
  Revision notes for Chapter 12
- » assess quiz
  Test your understanding with an auto-correcting multiple-choice quiz
- » Flashcard glossary
  Key terms in Chapter 12

CHAPTER 13

Sleep disorders

While many of us experience difficulty sleeping from time to time, some suffer it on a continual basis. Understanding ways to minimise the effects of sleep disruptions and knowing when to seek help are important. In this chapter, we consider a range of sleep disorders and look at possible interventions to treat them. Tips are included that focus on improving sleep quality.

OBJECTIVES

→ Compare common sleep disorders, including narcolepsy, sleep-onset insomnia, sleep apnoea and sleepwalking

→ Evaluate treatment interventions for sleep disorders, including cognitive behavioural therapy for insomnia and bright light therapy for circadian phase disorders

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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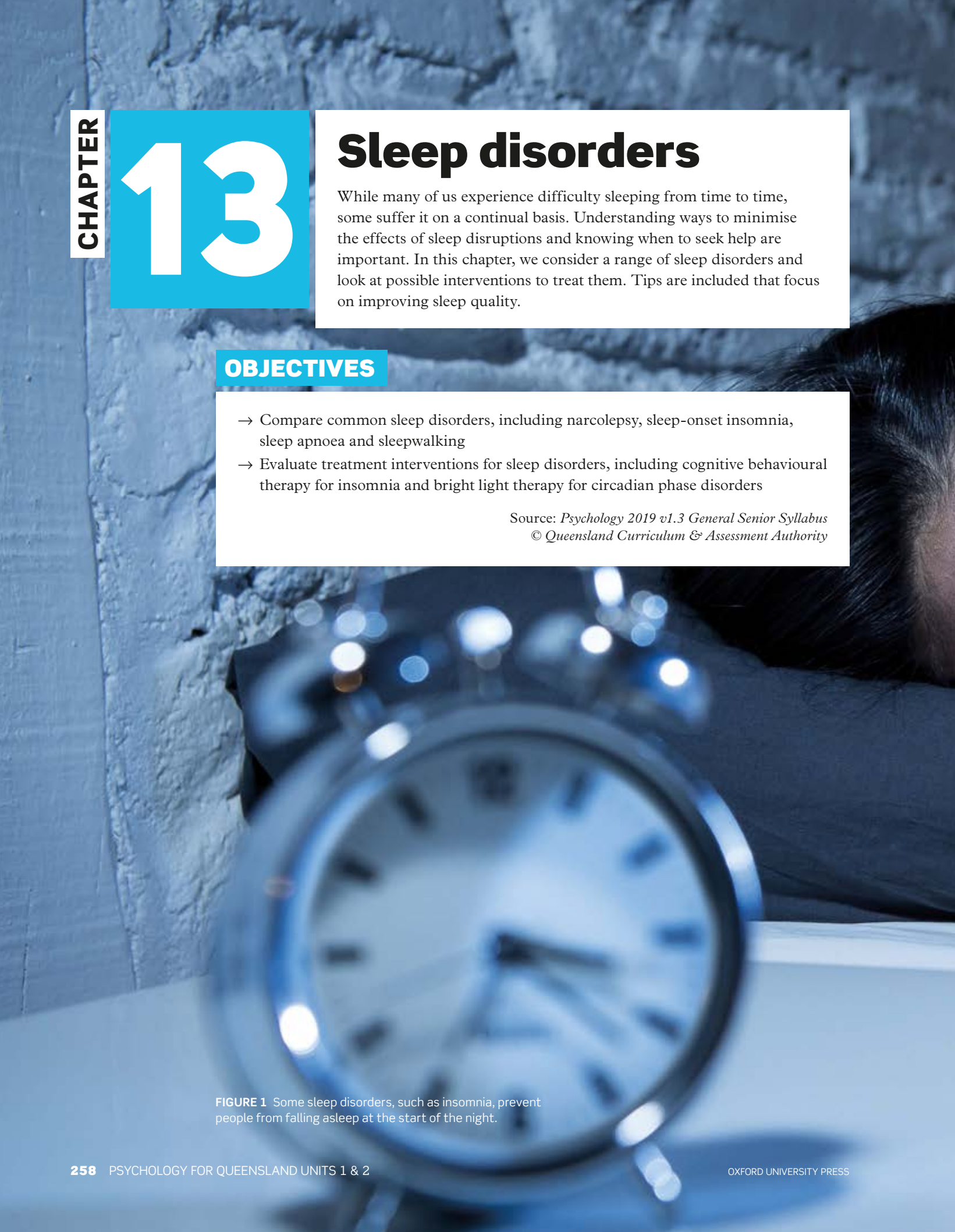


FIGURE 1 Some sleep disorders, such as insomnia, prevent people from falling asleep at the start of the night.



13.1 Circadian phase disorders

KEY IDEAS

In this section, you will learn about:

+ circadian phase disorders, such as shift work and jet lag.

'How did you sleep?' This common question indicates that most people understand the importance of good sleep and that poor sleep can lead to problems. There are more than 80 different types of sleep disorders, some quite widespread and others rare. It is not uncommon for a person to suffer from more than one sleep problem.

What happens when our sleep–wake cycles goes 'out of whack' – when we find ourselves having to be awake at night and asleep during the day? In this section we discuss **circadian phase disorders**, sleep disorders in which a person's circadian rhythms (internal sleep–wake clock) are disrupted. Circadian phase disorders result in disturbed sleep and consequential daytime sleepiness and, therefore, negatively affect a range of personal, work, school, social and safety aspects of life.

circadian phase disorders
a sleep disorder that affects a person's internal sleep–wake clock, resulting in disturbed sleep

For example, we learned in Chapter 11 about the adolescent sleep–wake cycle (delayed sleep–wake phase disorder shifts) and the clear biological explanations for a teenager's desire to stay awake late at night and sleep all morning. This delayed sleep–wake phase disorder in adolescents is one example of a circadian rhythm sleep disorder.

In this section, we explore two key factors that can disrupt our circadian rhythms and lead to a circadian phase disorder: shift work and jet lag.

Shift work

In our 24/7 society, working night shifts is increasingly common and plays an important role in certain occupations and industries. Shift work refers to only working night shifts; only working early morning shifts; or working rotating shifts, for example, rotating through morning shift, afternoon shift and night shift – typically in a forward 'staying awake later' direction. Most people who do shift work experience sleep deprivation. For some shift workers, these effects are an ongoing problem that interferes with work, family and/or other aspects of life.



FIGURE 1
Maintaining a routine sleep schedule helps shift workers ensure they get enough sleep.

Shift work disorders are probably the most problematic in terms of circadian phase disorders. While the disruption to adolescent sleep patterns is largely due to internal (biological, endogenous) factors, night-shift disruptions



FIGURE 2 Shift workers, such as doctors, often experience the effects of sleep deprivation.

are mainly caused by external (environmental, zeitgeber) factors. Working at night conflicts with our natural body clock, forcing people to be awake when they should be sleeping. If the shift worker's body clock cannot adjust sufficiently, sleep is interrupted, which can result in chronic sleep deprivation, leading to excessive sleepiness, insomnia or a host of other serious issues. This can become very dangerous, not only for the individual but for the community, especially where shift workers are in demanding roles that require quick and important decision-making, such as transport, medical and emergency responses.

For shift workers, keeping the bedroom dark and quiet to help daytime sleep (e.g. using daylight-blocking blinds, wearing a blackout mask, turning the phone off and wearing earplugs) and maintaining a sleep schedule of daytime sleep, even during days off, may help. On days off, if they undertake standard daytime activities, they may need to wear dark sunglasses.

Findings to date highlight the need to monitor shift workers' health and wellbeing on a regular basis, especially if they have been doing it for a number of years. Rotating shift work has particular challenges. Studies on the best way to rotate shift work are inconclusive. Current research is investigating the role of the duration and length of rotating shifts, the interplay between shift work and individual characteristics, and recovery patterns once shift work has ceased. The effects on psychological (cognition, affective and behavioural) and physiological aspects continue to be explored as well as other possible risk factor variables, such as vitamin D deficiency.

Jet lag

Travel is increasingly common in our society. People travel great distances for holidays, business, sport and other activities. This travel can include crossing one or several different time zones.

We can experience **jet lag** when travelling across time zones. Our sleep–wake cycle is disrupted and we can find it difficult to adjust and function at our best in the new time zone.

jet lag
the disruption of the sleep–wake cycle when travelling across time zones

This is particularly true when we travel in an easterly direction. With a natural body clock of just over 24 hours, we find it easier to stay up (delay sleep) than to sleep earlier (advance sleep).

For example, if we hop on a plane in Brisbane at 4.00 p.m. (1.00 p.m. Perth time), we should arrive in Perth around 6.40 p.m. (9.40 p.m. Brisbane time). While the trip takes approximately 5 hours and 40 minutes, it looks shorter because of the different time zones. We are likely to adjust to this new time zone quickly, as staying awake for longer is easier than going to bed earlier. In other words, this change is more compatible with our natural circadian rhythm.

Going home is a different story! Leaving Perth at 4.00 p.m. (7.00 p.m. Brisbane non-daylight savings time) lands you in Brisbane around 8.20 p.m. (11.20 p.m. Perth time). While the flight is quicker at 4 hours 20 minutes – due to favourable wind (jetstream) currents – the likelihood of being able to fall asleep quickly is reduced. We may experience some jet lag and take a bit longer to adjust.

Perth to Brisbane is a reasonably short flight compared to many international flights from Australia. Flying further, across many time zones, creates a bigger circadian rhythm disruption and more pronounced jet lag.

It can take days for our body clocks to align (resynchronise) to the new day/night time zone, especially after longer international flights. Jet lag causes fatigue and grumpiness, difficulty sleeping, being awake and being tired at the wrong times, and many other sleep-deprivation effects (as discussed in the previous chapter). Someone experiencing jet lag is therefore more prone to accidents, making it something pilots must work hard to avoid! There are ways to attempt to minimise jet lag:

- Try to schedule your arrival in the late afternoon and stay up until 10 pm
- Start adjusting to the new time zone before you leave, by waking and sleeping closer to the times of your destination.
- Avoid stimulants such as coffee.
- Resist the desire to sleep during the day; if you must take a nap, make it a short one and set an alarm or get someone to wake you.
- Create a dark and quiet sleep zone, and bring a sleep mask and earphones.
- Go outside and/or sit under bright light to help your body detect the light and wake.
- When you go to bed, set an alarm to wake you up in the morning. This may help you to stay calm and not worry that you will oversleep.

If jet lag persists, seek professional help. Medications, such as melatonin, are now available and are particularly effective in treating jet lag.

CHALLENGE 13.1

Plan a holiday

Imagine you are planning a holiday that requires travelling on a plane across several time zones. Pick a place to visit, and work out the time differences. Check the flight departure and arrival times. Will travelling to or travelling from the destination (or both) be more disruptive to your body's natural circadian rhythm?

Select a flight to depart and another to return that may help minimise the effects of jet lag.

What else can you do to help minimise the effects of jet lag, before, during and after the flight?



FIGURE 3 We experience jet lag when travelling across time zones.

CHECK YOUR LEARNING 13.1

Describe and explain

1 **Describe** the effect of jetlag on circadian rhythms.

2 **Explain** what a circadian phase disorder is.

Apply, analyse and interpret

3 Toni is a nurse and often has to work between midnight and 6 am. Recently Toni's shift has changed to 8 am until 5 pm. Toni is struggling to sleep between 6 pm and 7 am. **Consider** how Toni could adjust her sleep routine.

Investigate, evaluate and communicate

4 Imagine that you have friends or family visiting from England. **Design** a methodology to help them avoid jetlag.

5 **Investigate** a particular kind of shift work. You could research medical (e.g. nurse), emergency services (e.g. firefighter), or pilots and cabin crew. In your investigation, **determine**:

- **a** typical shift length (including start and end times)
- **b** if the environment accommodates sleep/naps
- **c** if there is a typical shift length.

Based on your findings, **evaluate** the circadian sleep patterns.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 13.1
- » Challenge
  Worksheet: 13.1 Plan a holiday
- » Weblink
  Jet lag
- » Weblink
  Shift work

13.2 Common sleep disorders

KEY IDEAS

In this section, you will learn about:

- narcolepsy
- sleep-onset insomnia
- sleep apnoea
- sleepwalking.

sleep disorders
changes in sleep–wake cycles that typically have negative effects

Sleep disorders, such as circadian phase disorders, relate to shifts in our sleep–wake cycles. Other sleep disorders relate to issues around falling asleep and staying asleep and abnormal behaviours during sleep. Many sleep disorders can be co-morbid, meaning that they can occur with another psychological condition. In this section, we will introduce narcolepsy, insomnia, sleep apnoea and sleepwalking.

Narcolepsy

narcolepsy
a sleep disorder that causes sudden and unexpected sleeping

Imagine suddenly falling asleep, without warning, during the day. This is not just drifting off to sleep when you are bored in class, but falling completely asleep at a time when you are alert and in the middle of doing something such as talking with friends. This condition is called **narcolepsy**. Narcolepsy is a debilitating sleep disorder that causes sudden sleep attacks during the day. It does not matter how long the person has slept the night before, the sleep attacks still occur. Sufferers suddenly lapse into REM sleep, and usually experience loss of muscle control and may have REM (dreamlike) hallucinations. As part of their narcolepsy, some people experience cataplexy, in which they remain conscious but physically paralysed. Cataplexy is often triggered by strong emotional responses and must be incredibly frightening. On top of this, the dreamlike hallucinations are usually very vivid and affecting.

Narcolepsy is not just related to sudden REM sleep attacks in the day. When people with narcolepsy go to sleep at night, their night sleep begins with REM sleep, rather than going through the traditional NREM stages prior to the first REM sleep. They often sleep around the same amount as the average person, but still experience extreme sleepiness during the day. Narcolepsy can be devastating for personal and work relationships, and the fact that the condition leaves sufferers quite accident-prone prevents them from doing many everyday activities, such as driving a vehicle.

There is no widely accepted treatment for narcolepsy, but people with the condition can adopt a number of behavioural measures, such as sticking to routine sleep schedules, carrying out regular exercise and following a healthy diet. People with narcolepsy often schedule naps during the day, and avoid alcohol, caffeine and heavy meals, and other conditions that may encourage sleep, such as working in a hot, stuffy room. It can be difficult to avoid the strong emotional responses that may trigger sleep attacks, but learning about these triggers and ways to monitor responses may help.

insomnia
a sleep disorder characterised by difficulties falling asleep, staying asleep and waking up at the right time

Sleep-onset insomnia

Insomnia does not relate to the occasional sleeping problems that we may all experience from time to time. It refers to persistent trouble with sleep. People with insomnia can have trouble falling asleep or maintaining sleep, even when they have the opportunity to do so.

When they sleep, they often feel dissatisfied with the experience. They are likely to suffer sleep-deprivation effects such as fatigue, low energy, moodiness and trouble concentrating. Insomnia can negatively affect school and work and other activities. There are different types of insomnia that people may experience including:

- **sleep-onset insomnia**: trouble falling asleep at the beginning of the night
- **sleep-maintaining insomnia**: difficulty staying asleep
- **early-morning awakening insomnia**: trouble with waking up too early and not being able to go back to sleep.

sleep-onset insomnia
a form of insomnia characterised by difficulty falling asleep at the beginning of the night

sleep-maintaining insomnia
a form of insomnia characterised by difficulty staying asleep throughout the night

early-morning awakening insomnia
a form of insomnia characterised by problems with waking up too early and not being able to go back to sleep

We can have *acute* episodes of insomnia, which may coincide with a stressful or emotional period, such as exam time or being told some bad news. However, insomnia can also be a *chronic* condition, meaning periods of sleeping difficulty occur at least three times a week over three months or longer. Chronic insomnia can arise for a number of reasons, including persistent stress, pain, shift work, or changes in habits, medications or the sleep environment. Often insomnia, including sleep-onset insomnia, is co-morbid (exists alongside) other physiological and/or psychological conditions.

Insomnia is the most common sleep disorder, with 10 to 40 per cent of the population suffering at any one time. While both males and females can suffer from insomnia, there is an increased risk for females, the elderly and new parents. Adolescents and young adults are more likely to experience sleep-onset insomnia, while sleep maintenance and early-morning awakening insomnia are more common in the elderly.

Diagnosis of insomnia usually involves use of a sleep diary, a sleep inventory (questionnaire about sleep), blood tests and perhaps a sleep laboratory study. Chronic sleep-onset insomnia may be diagnosed as a delayed circadian phase disorder if the person also has great difficulty waking up in the morning.

There can be multiple approaches to the treatment of insomnia, including sleep-onset insomnia, and we will discuss cognitive behavioural therapy (CBT) in relation to this, later in this chapter. Some treatments are behavioural, such as improving sleep routine and environment and learning relaxation techniques and other ways to cope with stress. Cognitive strategies can include learning to deal with negative thoughts and feelings towards sleeping. Medical intervention can be used, although only for a short time due to the need to limit and monitor the use of such drugs.



FIGURE 1 Sleep-onset insomnia can cause significant stress and impairment.

Sleep apnoea

Sleep apnoea, a sleep-related breathing disorder, refers to the interruption of breathing during sleep. Breathing stops briefly, but repeatedly, for periods of 10 seconds to up to a minute or more. Typically, the person then wakes, gasping for breath, and resumes breathing.

There are different forms of sleep apnoea, with obstructive sleep apnoea being the most common. In this case, the blockage is physical, with the airways failing to open. Another form, central sleep apnoea, is caused by the brain failing to adequately control breathing.

sleep apnoea
a type of sleep disorder characterised by periods of the cessation of breathing during sleep

Sleep apnoea is linked to chronic snoring, and the constant disruption to sleep due to stopped breathing leads to low blood-oxygen levels. In turn, if it is left untreated, hypertension, heart disease, and mood and memory problems can become major issues. Sleepiness during the day, and other sleep-deprivation effects, are also experienced and insomnia may result. Excessive sleepiness can make a person prone to accidents and affect work, recreation and relationships. It is estimated that about 10 per cent of people with sleep apnoea also experience other sleep disorders, such as sleepwalking.

It is estimated that about 2–3 per cent of the population has sleep apnoea, which affects all ages and both sexes. Children who snore habitually are likely to have obstructive sleep apnoea – and doctors may recommend the removal of enlarged tonsils and adenoids to open the airways. Those at risk of developing sleep apnoea include people with small upper airways or a large tongue or tonsils, people over 40 years of age, and people who are overweight and/or from certain ethnic backgrounds such as Hispanic and Pacific Islanders. Sleep apnoea can also run in families.

When diagnosing sleep apnoea, key issues to consider include a person's fatigue levels during the day, the quality and quantity of their sleep and, importantly, whether or not their partner or family members think they snore. Sleep diaries are also important and a visit to a sleep laboratory may be involved.

One of the most common and effective treatments for sleep apnoea is a CPAP device. To help relieve symptoms of sleep apnoea, some behavioural changes are recommended. Losing weight, avoiding alcohol, and not sleeping on one's back can help. Some medications can make symptoms worse and all should be checked with a specialist.

Sleepwalking

sleepwalking
a type of sleep disorder characterised by walking or completing routine activities during the night

Sleepwalking, or somnambulism, is a sleep disorder that seems to capture the interest of a lot of people. Sleepwalking occurs during stages 3 and 4 NREM sleep. About 7 per cent of children sleepwalk and 2 per cent of adults (Neveus *et al.*, 2001; Ohaon *et al.*, 1999), which suggests many 'grow out' of sleepwalking. Sleepwalking can run in families, suggesting a genetic link.

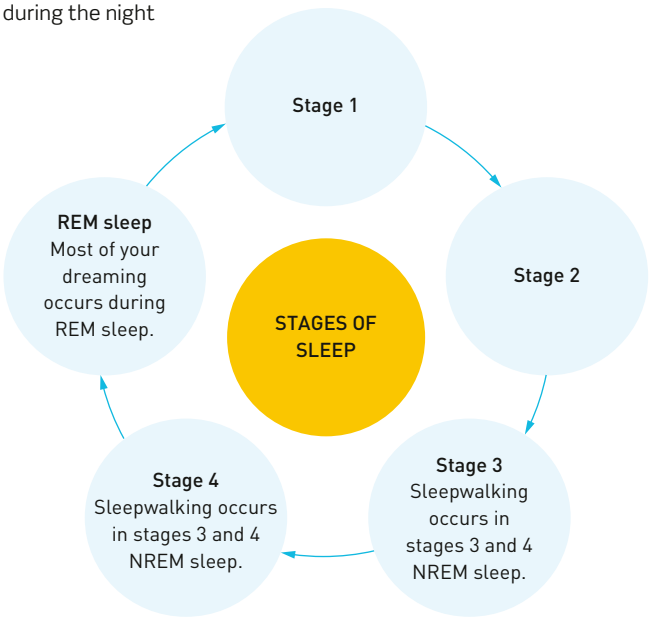


FIGURE 2 The stages of sleep in which sleepwalking occurs

Most sleepwalkers follow routine activities that are automatic and require very little conscious awareness, such as walking down a corridor, brushing their teeth or going to the toilet. Most often stare blankly as they sleepwalk and do not respond to other people. Contrary to popular belief, sleepwalkers are not acting out their dreams as there is very little, if any, dreaming during these stages of sleep. Sometimes during a sleepwalking episode, people may behave in ways that could be considered unacceptable. More commonly, this can include children going to the toilet in a cupboard, and less commonly, it can include people driving while sleepwalking.

It is a common misconception that it is dangerous to wake sleepwalkers. However, it can actually be dangerous not to wake a sleepwalker as they may harm themselves while walking. They are likely to be startled and disoriented if woken because they are in stages 3 and 4 NREM sleep. Typically, a sleepwalker will return

to bed after their episode and will be unlikely to remember their sleepwalking activities when they wake.

A sleepwalking episode is sometimes tied to a strong emotional event, illness, stress, alcohol or medication. There is not a lot that can be done to prevent sleepwalking. A review of medications, diet and lifestyle, and counselling to address any stressful events or

CASE STUDY 13.2

Sleepwalker, age 15, found curled up on crane

Olinka Koster and Tahira Yaqoob

She was more of a steep walker than a sleepwalker.

A passer-by could barely believe his eyes when he saw a body curled up on the counterweight of a 130-foot crane at 2.00 a.m.

The rescue operation his 999 call set in play revealed that the body belonged to a 15-year-old girl … who was fast asleep and blissfully unaware of her perilous predicament.

A fireman scaled the structure, on a building site in South-East London, and sat with the snoozing teenager while he anxiously discussed with colleagues below what to do next.

Fearful of waking her in case she should panic and fall, he attempted to secure her in position and conducted a cursory body search, finding a mobile phone. It is understood he found a number for her parents in the phone's memory. They were told the astonishing story, and then rang her on the mobile themselves to wake her.

A specialist fire rescue team, based at Battersea, arrived at the site and used a hydraulic ladder to carry the girl down. She was delivered safely to the ground and her parents came to collect her.

No one knows how she managed to climb up the crane. But Dr Irshaad Ebrahim, of the London Sleep Centre, said he was not surprised. Anything you can do while awake, you can do while sleepwalking, he said. And, of course, without the fear factor. 'I treat people who have driven cars, ridden horses and even attempted to fly a helicopter while asleep,' he said.

'However, this is one of the more unusual cases I've come across. Up to 10 per cent of adolescents sleepwalk, so her age is a common factor. Sleepwalking is nothing to do with dreaming because it occurs in a non-dreaming sleep state.'

Dr Ebrahim was recently an expert witness in a court case in Manchester where Jules Lowe was acquitted of murdering his father Eddie after he convinced the jury he had been sleepwalking.

The girl apparently walked unnoticed out of her home in Dulwich to the building site nearby. The crane was switched off and in a stationary position.

A security guard was on duty but did not see the girl.

After reaching the top she somehow crawled around 40 feet horizontally to the end of the counterweight section of the crane.

Responding to the emergency call, police initially thought she might be attempting suicide. But when the fireman reached her the innocent, but terrifying, truth became clear.

A source, who was involved in the rescue operation, said: 'The fireman had to be very careful because he realised the girl was asleep and he knew it might cause a serious problem if he woke her suddenly.

'He gently tried to wake the girl while talking to her and reassuring her that she was safe and well.

'Police then took the decision to scroll through her mobile phone electronic contacts book to find a number for her mum or dad and they contacted them to explain what was going on. Whoever the police called, they explained to the officers that the girl was a frequent sleepwalker.

'They came down to the building site straight away to take her home.'

A London Fire Brigade spokesman, who attended the incident, said: 'It was tense for a while.

'One of our guys had to wait up there with her, making sure she was all right and couldn't fall.

'She was fast asleep until we got one of her relatives to phone her. That woke her.'

The girl did not need medical treatment and her name has not been released by emergency services.

The incident happened in the early hours of Saturday, June 25. The medical term for sleepwalking is somnambulism. Experts say it is common for sleepwalkers to go outside or up stairs.

But it is a myth that waking a sleepwalker will seriously harm them, they say, though they might become confused or hysterical.

Dr Neil Stanley, of Surrey University's psychopharmacology research unit, said: 'It is certainly feasible for the girl to climb up a crane.

'People do all manner of odd things when they are sleepwalking, including driving 20 kilometres and killing their parents.

'Anything short of that I'm prepared to believe.'

Daily Mail, Wednesday, 6 July 2005

circumstances may help reduce triggers. The most important thing is to keep the sleep environment safe. Parents of children who sleepwalk and people who sleepwalk should ensure that they put any dangerous kitchen items away, and lock all doors and windows before sleep so that they are unlikely to leave their home if they sleepwalk.

Comparing common sleep disorders

Sleep disorders have a range of fascinating signs and symptoms and present complex challenges for the sufferer. There is a broad range of sleep disorders, each affecting the person in different ways and requiring its own treatments. Table 1 summarises the comparisons between the four common sleep disorders covered in this section; narcolepsy, sleep-onset insomnia, sleep apnoea and sleep walking.

For example, when comparing sleep-onset insomnia with sleepwalking, both can involve sleepiness during the daytime. Both of these sleep disorders can run in families, and can be triggered by stressful life events. Sleep-onset insomnia is more common in females, and sleepwalking is more common among children, with 7 per cent having had a sleepwalking episode.

	Narcolepsy	Sleep-onset insomnia	Sleep-apnoea	Sleepwalking
Definition	A sleep disorder that causes sudden and unexpected sleeping	Type of insomnia that causes difficulty falling asleep	A sleep disorder that involves periods of the cessation of breathing during sleep	The act of walking or completing routine activities whilst asleep
Effects/ Symptoms	• Sleepiness during the daytime • Loss of muscle control • REM hallucinations • Can experience cataplexy • Beginning night time sleep with REM	• Inability or excessive time to fall asleep at the start of the night • Unsatisfactory sleep • Excessive daytime sleepiness • Fatigue • Low energy • Moodiness	• Cessation of breathing for periods of the night • Gasping for breath during the night • Excessive daytime sleepiness • Chronic snoring • Can lead to hypertension, heart disease, mood and memory problems	• Walking during the night • Competing routine acts during the night, e.g. brushing one's teeth, going to the toilet • Excessive daytime sleepiness

Cause	• Can run in families • Can be triggered by highly emotional events • Could be triggered by medications or illnesses	• Stressful or highly emotional events • Can run in families • Can be triggered by medications or illnesses	• Obstructive sleep apnoea – caused by a physical obstruction to breathing (could be weight, or the inability of the airways to open) • Central sleep apnoea – caused by the brain failing to adequately control breathing	• Triggered by a highly emotional event • Stress • Alcohol • Medications • Diet and lifestyle
Treatment	• Maintaining a routine sleep schedule • Regular exercise • Healthy diet • Scheduling naps during the day • Avoid alcohol and caffeine	• Cognitive behavioural therapy (CBT) • Maintaining a sleep routine • Relaxation techniques • Learning to deal with negative thoughts and emotions • Medical intervention	• CPAP device • Diet changes • Exercise • Weight loss • Avoiding alcohol • Medication	• Keeping a safe sleep environment • Maintaining a sleep routine • Avoiding alcohol • Diet and lifestyle reviews

TABLE 1 Comparing sleep disorders

It is important to remember that all sleep disorders can cause effects of sleep-deprivation which can impact school, work, relationships, social problems, health issues and safety risks.

CHECK YOUR LEARNING 13.2

Describe and explain

1 **Identify** when sleepwalking is likely to occur (age, emotional state, stage of sleep, etc.).
2 **Explain** the kinds of routine behaviour that a sleepwalker is likely to participate in.
3 **Describe** each of the following: narcolepsy, sleep-onset insomnia, sleep apnoea and sleepwalking.
4 **Describe** the symptoms that someone with sleep-onset insomnia is likely to experience.

Apply, analyse and interpret

5 **Contrast** sleepwalking with narcolepsy.
6 **Differentiate** between sleep apnoea and sleep-onset insomnia.

Investigate, evaluate and communicate

7 Read Case study 13.2. **Propose** the steps that the girl's parents may want to take to avoid a similar situation.
8 **Assess** the causes of the four common sleep disorders discussed in this section.

Check your obook assess for these additional resources and more:

» Student book questions
Check your learning 13.2

» Weblink
Sleepwalking triggers

» Weblink
Sleep Apnoea

» Weblink
Narcolepsy

13.3 Treatments for sleep disorders

KEY IDEAS

In this section, you will learn about interventions for sleep disorders, including:

- cognitive behavioural therapy for insomnia
- bright light therapy for circadian phase disorders
- tips for a better night's sleep.

There are a number of interventions that can be attempted to manage sleep disorders, and a sleep psychologist and other health professionals are likely to take a multipronged approach. In this section, we will focus on cognitive behavioural therapy to treat insomnia, bright light therapy to treat circadian phase disorders, and tips we can all follow to improve our sleep.

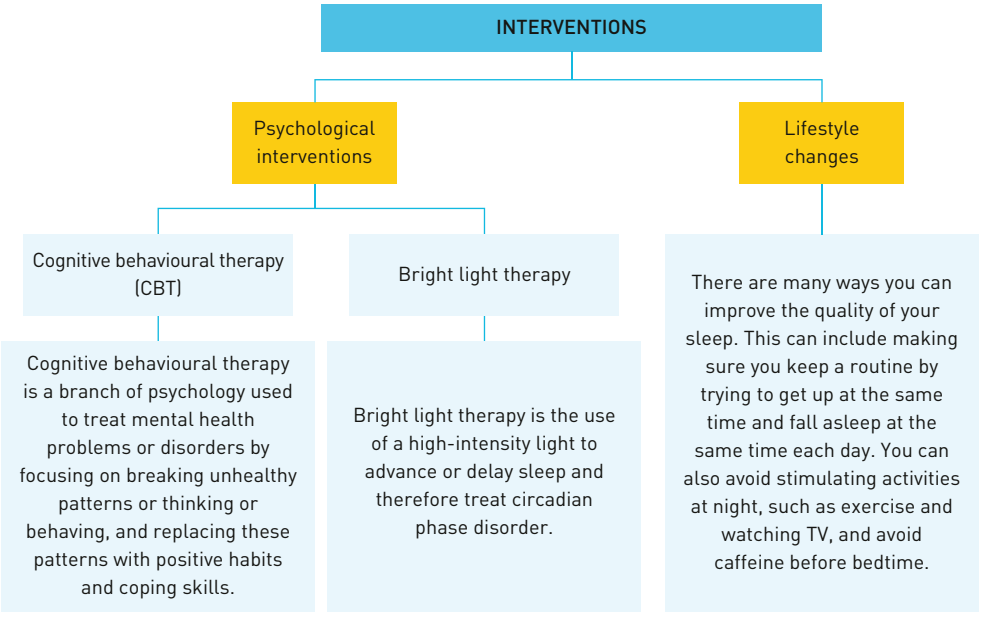


FIGURE 1 This diagram shows some of the interventions that can help people get a good night's sleep.

Cognitive behavioural therapy: treating sleep-onset insomnia

cognitive behavioural therapy (CBT) a branch of psychology used to treat mental health or disorders by focusing on breaking unhealthy patterns of thinking or behaving and replacing these patterns with positive habits and coping skills

Using **cognitive behavioural therapy (CBT)** to treat insomnia assumes that our behaviours and cognitions (thoughts and feelings) with regard to sleep influence each other strongly. It recognises, for example, that we can get into a nasty cycle where our poor sleep behaviours lead to negative thoughts and emotions about sleep, which then influence the poor sleep behaviours further. CBT seeks to establish an alternative *healthy* sleep cycle so that sleep can become automatic, natural and restful.

A sleep psychologist is likely to ask their client to complete a sleep questionnaire to assess their sleep and lifestyle habits, along with their attitudes (thoughts and feelings) towards sleep. They will then devise an individualised program to change these habits and attitudes for the better. The client may also be asked to keep a sleep diary to record their behaviours and cognitions about sleep. In their sessions with the psychologist, clients may also be

taught specific behaviours to facilitate good sleep, such as maintaining regular sleep–wake times, avoiding long naps in the day, following a healthy diet and exercise program, and avoiding stimulating activities such as exercise, coffee and electronic screens in the couple of hours before going to bed. The psychologist might also recommend that the insomnia sufferer ensures that their bedroom environment is conducive to good sleep, such as having window dressings that block out the light and a good pillow. The sleep psychologist is also likely to want to monitor and reassess the effectiveness of the CBT program on a regular basis.

It usually takes six to eight weekly sessions of CBT for the client to learn new cognitions and behaviours to support their sleep in the long term. The effectiveness of the program lies in the psychologist's ability to target the problematic behaviours and cognitions and the client's commitment to change. The results of CBT to date have been very positive and it is typically the preferred option for treating insomnia.

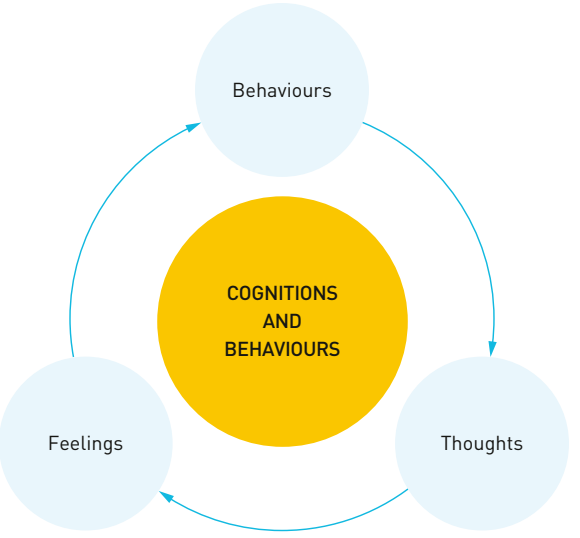


FIGURE 2 Cognitions influence behaviours, which in turn influence cognitions.

CASE STUDY 13.3A

Glandular fever and Sleep

Wendy is a secondary-school teacher. Ever since she had a bad dose of glandular fever and was bedridden for three months, she has not slept well. In fact, her ability to sleep has spiralled out of control and, five years later, she dreads the nightly battle to get to sleep. Each night she fights against the clock, lying awake and worrying about how tired she will feel the next day.

A friend suggests she sees a sleep psychologist who uses cognitive behavioural therapy to treat insomnia. Over a period of six weeks, Wendy works with the psychologist to address her problematic thoughts, emotions and behaviours bound up with sleep. She also modifies her sleep environment (bedroom), and changes some of her habits such as reading her iPad before going to sleep and drinking coffee after midday. Her sleep improves dramatically.

Bright light therapy to treat circadian phase disorders

Bright light therapy is used to treat people suffering from circadian phase disorders. In other words, it is used to advance or delay sleep, depending on the type of circadian phase disorder. People with delayed sleep–wake phase disorder have bright light therapy administered to them in the morning, when the body wants to sleep. People experiencing advanced sleep–wake phase disorder are likely to have bright light therapy in the evening, in an attempt to delay sleep. The bright light therapy signals to the brain's suprachiasmatic nucleus that it is daylight, effectively acting as a zeitgeber. In turn, the suprachiasmatic nucleus can adjust the body clock, including ceasing the release of melatonin from the pineal gland.

bright light therapy
the use of a high-intensity light to advance or delay sleep and therefore treat circadian phase disorders



FIGURE 3 Bright light therapy is used to treat circadian phase disorders.

People with jet lag may benefit from bright light therapy in the *morning* when they travel west to east, or in the *evening* when they travel from east to west.

Shift workers often need to sleep during daylight hours. It can be very hard to correct the body's response to a shift-work schedule, especially if it changes regularly or the worker wants to revert to standard daytime activities on their days off. However, bright light therapy may help to keep them awake during their night shift if they use it in the evenings as they go off to work.

Although the side effects of bright light therapy are minimal, a specialist is required to ensure that the exposure is safe and consistent. It is not uncommon for the person to sustain eye irritations, dry skin, headaches and nausea, especially at the start of treatment. There should be limits to the intensity of and time in front of the bright light. The therapy should begin slowly, with exposure gradually increasing as the body gets used to it.

Bright light therapy requires a high-intensity light (approximately 10 000 lux). There are different types of lights that can be used. Light boxes are the most common. The light box contains many light tubes and sits on a table that plugs into the wall. A person just needs to be near the box. They don't need to look at it, and they can often complete everyday activities at the same time. Other types of high-intensity lights include desk lamps that look like a typical lamp or light visors that can be worn like a normal visor and shine light on the person's forehead. Dawn simulators may also be used. These lights gradually increase the light within a room, in an attempt to mimic sunrise, or gradually decrease it to mimic sunset.

CASE STUDY 13.3B

Natural sleep and school time

Louis is 18 years old and studying for the QCE. He has developed a chronic case of circadian phase disorder in which his circadian rhythm has become delayed. His natural sleep time overlapped with school time and consequently interfered with his ability to do school work and enjoy his time at school and with friends.

Under the guidance of a sleep psychologist, Louis changed some of his sleep behaviours and now uses bright light therapy to set his circadian sleep–wake clock. This involves sitting in front of a high-intensity light box for 20 minutes each morning. Louis still likes to sleep in, but it is not an overwhelming desire that interferes with his ability to stay awake and alert during the day.

seasonal affective disorder (SAD) a depressive disorder that develops during winter

Have you ever wondered why you feel gloomy during the winter months? **Seasonal affective disorder (SAD)** is a debilitating disorder where sufferers experience severe depression during winter. It is more prevalent in places that experience very short daylight hours in the winter months, especially Scandinavia. Bright light therapy is commonly used as part of the treatment for severe cases of SAD.

Tips for a better night's sleep

Sleep is important and, whether or not we have a sleep disorder, all of us can take steps to improve our sleep quality. Understanding sleep–wake cycle shifts and the need for adequate sleep can help teenagers avoid sleep deprivation. Just an extra 30 minutes of sleep each night can make a significant difference. You need to be patient and persistent because it takes about four weeks to set up an earlier sleep time, but the potential benefits are worth it. Read the tips for a better night's sleep below and start improving the quality of your sleep today.

- Follow a regular routine. Go to bed at the same time and get up at the same time each day.
- Have a relaxing bedtime routine such as a bath followed by a warm milk drink.
- Avoid staying up too late on weekends.
- Try to limit your weekend sleep-ins to Saturday morning only. Staying up late and sleeping in too much is likely to shift your sleep–wake cycle. You will go to bed later on Sunday and find it hard to get up on Monday morning.
- It is best to go to bed early on Sunday night to avoid being sleep deprived at the start of the school week. Avoid 'Monday morningitis'.
- Avoid stimulating activities just before bedtime, such as computer games, arguments, physical exercise, loud music, homework and television. Turn off all screens well before bedtime.
- Avoid caffeinated products, especially after 3.00 p.m. (skip that can of Coke, hot chocolate or late-night coffee).
- Don't worry if you can't sleep straight away. It is normal to take 15 minutes or more to fall asleep at night. Also remember that sleeping poorly one night is not the end of the world – you will probably find you sleep better the following night.
- Keep your room dark at night and brighten it when you want to wake up in the morning, for example, by opening curtains or turning on lights.

It is important to take sleep as seriously as the other aspects of your health and wellbeing. If you are having persistent trouble sleeping then it is time to seek professional help. Your family doctor, psychologist or school counsellor is a good starting point.

CHECK YOUR LEARNING 13.3

Describe and explain

1 **Describe** bright light therapy.
2 **Explain** cognitive behavioural therapy (CBT).

Apply, analyse and interpret

3 **Consider** how bright light therapy assists those with insomnia or circadian phase disorders.

Investigate, evaluate and communicate

4 **Assess** the success of cognitive behavioural therapy (CBT) in helping those with sleep disorders.
5 **Evaluate** the use of bright light therapy.
6 Rose has been struggling to fall asleep for the past two months. Typically, Rose arrives at school early to train for basketball, but recently she has been too tired. **Propose** a treatment strategy that may assist Rose.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 13.3
- » Video
  CPAP devices for sleep apnoea
- » Video Worksheet
  Cognitive behavioural therapy for sleep disorders
- » Weblink
  CPAP devices

SCIENCE AS A HUMAN ENDEAVOUR

13.4 Modern society and sleep

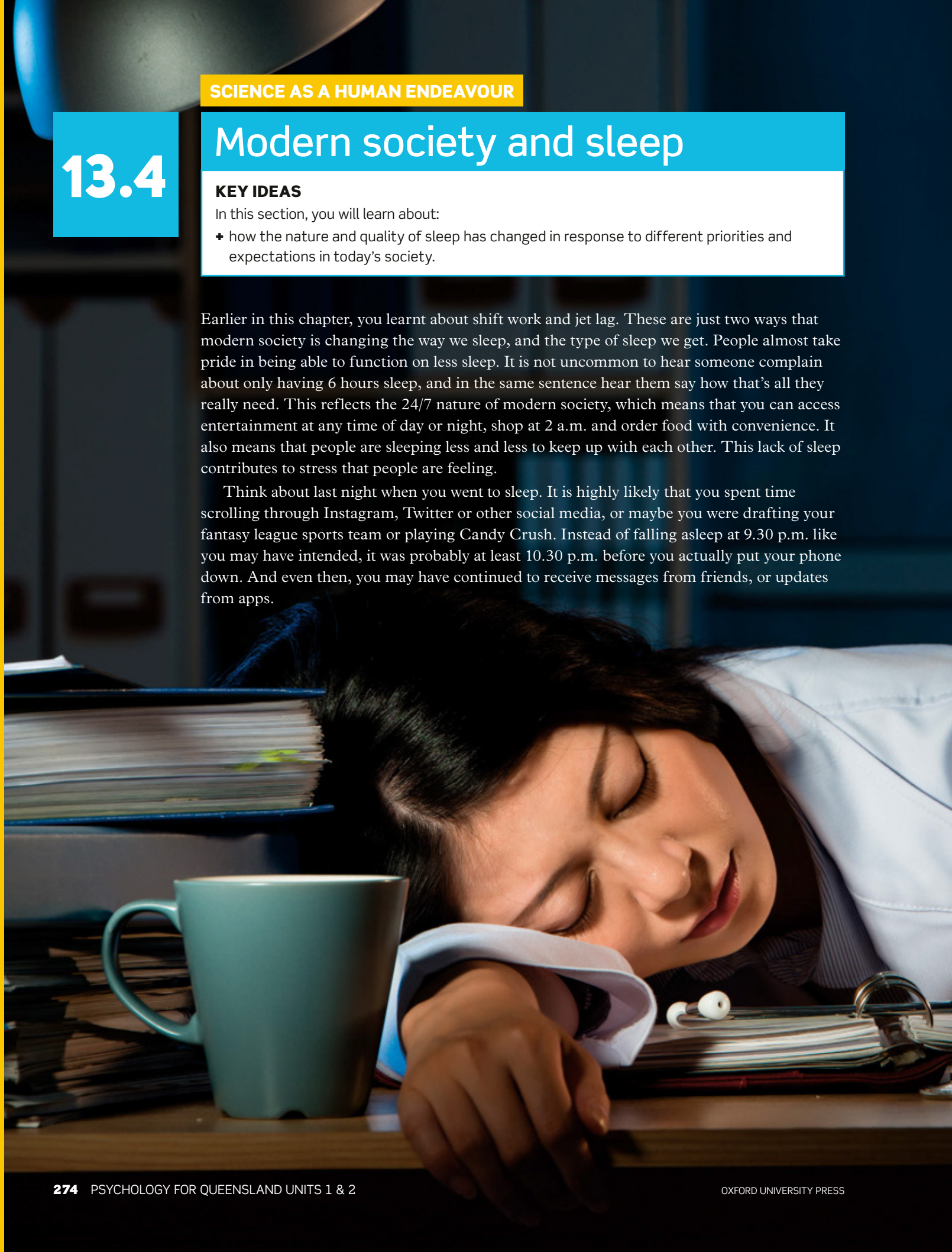
KEY IDEAS

In this section, you will learn about:

+ how the nature and quality of sleep has changed in response to different priorities and expectations in today's society.

Earlier in this chapter, you learnt about shift work and jet lag. These are just two ways that modern society is changing the way we sleep, and the type of sleep we get. People almost take pride in being able to function on less sleep. It is not uncommon to hear someone complain about only having 6 hours sleep, and in the same sentence hear them say how that's all they really need. This reflects the 24/7 nature of modern society, which means that you can access entertainment at any time of day or night, shop at 2 a.m. and order food with convenience. It also means that people are sleeping less and less to keep up with each other. This lack of sleep contributes to stress that people are feeling.

Think about last night when you went to sleep. It is highly likely that you spent time scrolling through Instagram, Twitter or other social media, or maybe you were drafting your fantasy league sports team or playing Candy Crush. Instead of falling asleep at 9.30 p.m. like you may have intended, it was probably at least 10.30 p.m. before you actually put your phone down. And even then, you may have continued to receive messages from friends, or updates from apps.



All of these are contributing to disrupted and adjusted sleep. Many people sleep less during the working week (Monday to Friday) and then try to catch up by 'sleeping in' on weekends. World Sleep Day happens each year on the Friday before the spring equinox. This day and the organisation behind it, World Sleep Society, try to encourage people to assess their sleep needs and sleep health. World Sleep Day tries to draw attention to the lack of sleep in society, and the lack of awareness of how this can damage us, more than assist us.

As discussed in this chapter and Chapter 12, sleep plays a vital role in maintaining mental and physical health. Without enough sleep, people are at risk of becoming unproductive at school and work, their immune system may be weakened and they are likely to be moodier than usual. With the prevalence of coffee, other stimulants and sleeping tablets, people are able to regulate their sleep. By drinking caffeine in the morning, we can mask the fact that we haven't slept properly, and by taking sleeping tablets when we want to sleep, we can force our body to sleep if it is not ready.

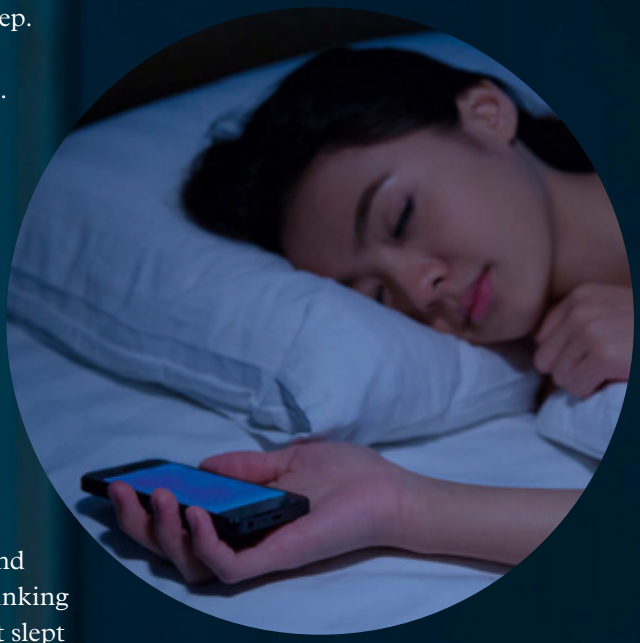


FIGURE 1 It is not uncommon for people to fall asleep while using their phone.

CHECK YOUR LEARNING 13.4

Describe and explain

1 **Identify** three reasons why people are losing sleep, and how these can be avoided.

2 **Explain** the impact of a 24/7 society on sleep.

Apply, analyse and interpret

3 Society as a whole is moving towards less and less sleep. List three possible impacts of a lack of sleep on society as a whole. **Consider** laws, health, safety, the economy and relationships in your analysis.

Investigate, evaluate and communicate

4 **Investigate** one particular aspect of modern society from this list that is interrupting sleep:

- Increased technology – social media, online shopping and entertainment
- Increased communication – not being able to escape from work or school
- Shift work – demands for people who are not working in the emergency services to be available 24/7, including security, hospitality staff, cinema staff

Evaluate the effects of your selected aspect of modern society.

Check your obook assess for these additional resources and more:

» Student book questions
Check your learning 13.4

» Weblink
The history of sleep

» Weblink
Do people sleep less?

» Weblink
Is technology affecting sleep?

CHAPTER 13

Review

Summary

13.1
- Circadian phase disorders are sleep disorders in which a person's circadian sleep–wake rhythm is disrupted. Examples include delayed (often seen in adolescence; see Chapter 11) and advanced sleep–wake phase disorders, shift work and jet lag.
- People who perform shift work, particularly at night or on a rotating basis, may also experience a circadian phase disorder.
- Travelling to a distant location, across time zones, can produce 'jet lag', one of the most common sleep disorders.

13.2
- Some sleep disorders relate to issues around falling and staying asleep. Others refer to abnormal behaviours during sleep. Both types of disorder result in sleep-deprivation effects, sometimes chronic, which can negatively affect a person's personal, social, work and school lives.
- Sleep-onset insomnia is a sleep disorder in which the person has trouble falling asleep at the beginning of the night.
- Sleepwalking is a sleep disorder in which the person sleepwalks or carries out other automatic activities during stages 3 and 4 NREM sleep.

13.3
- Cognitive behavioural therapy is commonly and effectively used to treat insomnia. Therapy sessions usually occur on a weekly basis for six to eight sessions, in which the person learns strategies and is given homework to improve their thoughts, feelings and behaviours surrounding sleep.
- Bright light therapy can be used to treat circadian phase disorders.
- Adequate, high-quality sleep is important for everybody. There are a number of strategies that can be adopted to ensure this, such as keeping a regular sleep–wake time, avoiding sleeping in and avoiding stimulating activities before bed.

Key terms

- bright light therapy
- circadian phase disorders
- cognitive behavioural therapy (CBT)
- delayed sleep–wake phase disorder
- early-morning awakening insomnia
- insomnia
- jet lag
- narcolepsy
- sleep apnoea
- sleep-maintaining insomnia
- sleep-onset insomnia
- sleepwalking

Revision questions

Multiple choice

1 Which of the following is not linked to a circadian phase disorder?
- **a** adolescent sleep–wake cycles
- **b** sleepwalking
- **c** shift work
- **d** jet lag

2 The release of sleep–wake hormones, such as _____, which induces sleepiness, and _____, which encourages alertness, tends to be delayed for up to _____ during adolescence.
- **a** melatonin; cortisol; 2 hours
- **b** cortisol; melatonin; 2 hours
- **c** melatonin; cortisol; 4 hours
- **d** cortisol; melatonin; 4 hours

3 Which of the following is classified as a sleep disorder?
- **a** jet lag
- **b** shift work
- **c** sleep apnoea
- **d** delayed sleep-wake cycles

4 Jim sometimes gets out of bed during the night and walks through the house. He appears to be asleep and does not respond when his sisters speaks to him. Jim is experiencing _____ which usually occurs during _____ sleep.
- **a** sleepwalking; REM
- **b** narcolepsy; Stage 4 NREM
- **c** sleepwalking; Stage 3 and 4 NREM
- **d** narcolepsy; REM

5 Renata finds it very difficult to fall asleep at the beginning of the night. She sees a sleep psychologist, who determines that she is suffering from _____ and suggests she starts a _____ treatment program.
- **a** hypersomnia; bright light therapy
- **b** hypersomnia; cognitive behavioural therapy
- **c** sleep-onset insomnia; bright light therapy
- **d** sleep-onset insomnia; cognitive behavioural therapy

6 Which of the following brain structures is primarily responsible for controlling our internal body clock?
- **a** the frontal lobe
- **b** the pineal gland
- **c** the hippocampus
- **d** the suprachiasmatic nucleus

7 Early-morning awakening insomnia can be defined as:
- **a** trouble falling asleep at the beginning of the night.
- **b** difficulty maintaining sleep.
- **c** sleeping a lot and still experiencing sleepiness.
- **d** trouble with waking up too early and not being able to go back to sleep.

8 A person diagnosed with sleep-onset insomnia is likely to:
- **a** go straight to sleep upon going to bed.
- **b** take at least 30 minutes to fall asleep.
- **c** function normally on very few hours of sleep.
- **d** suddenly collapse into REM sleep in the middle of the day.

9 Which is the most common of the sleep disorders?
- **a** sleepwalking
- **b** hypersomnia
- **c** insomnia
- **d** night terrors

10 A circadian phase disorder is best described as:
- **a** a sleep disorder that effects a person's internal sleep-wake clock
- **b** a sleep disorder that maintains a person's internal sleep-wake clock
- **c** a sleep disorder that affects someone's ultradian rhythm
- **d** a sleep disorder that causes someone to struggle to fall asleep.

11 Sleep apnoea can be best treated using:
- **a** bright light therapy
- **b** cognitive behavioural therapy
- **c** CPAP devices
- **d** setting a consistent bed time.

12 Which of the following are all sleep disorders responsible for causing?

- **a** excessive daytime sleepiness and waking during the night
- **b** excessive daytime sleepiness and REM hallucinations
- **c** excessive daytime sleepiness and Chronic snoring
- **d** excessive daytime sleepiness and sleep-deprivation

13 Cognitive behavioural therapy:

- **a** focuses on changing unhealthy thoughts and behaviour to positive and healthy thoughts and behaviour
- **b** focuses on how the brain thinks
- **c** involves the use of a bright light to advance or delay sleep
- **d** wearing a device to assist breathing.

14 Select the most appropriate definition of insomnia below:

- **a** when someone struggles to stay awake in the middle of the day
- **b** an individual has difficulty falling, maintaining or staying asleep
- **c** when an individual cannot fall asleep at the start of the night
- **d** when an individual cannot stay asleep throughout the night

15 A sleepwalker should:

- **a** be woken when found
- **b** keep the environment around them safe and secure
- **c** review their diet and lifestyle
- **d** all of the above.

Short answer

Describe and explain

★ **16** **Describe** sleepwalking.

★ **17** **Explain** what someone with sleep apnoea experiences.

★★ **18** In the following list, **identify** what someone with narcolepsy may experience, then select one and **describe** this event:

- **a** falling asleep at random, unpredictable times
- **b** cataplexy
- **c** cessation of breathing during sleep
- **d** brushing their teeth while standing

★ **19** **Summarise** sleep-onset insomnia.

★★ **20** If a teenager's sleep is severely affected, bright light therapy may be used as part of the treatment plan. **Explain** bright light therapy and how likely it is to help this circadian sleep phase disorder.

★★ **21** Cognitive behavioural therapy is often successfully used to treat insomnia.

- **a** **Describe** cognitive behavioural therapy.
- **b** **Explain** how long cognitive behavioural therapy is likely to last.

★ **22** **Explain** why bright light therapy is used to treat circadian phase disorders. Refer to the sleep–wake cycle in your answer.

★★ **23** **Describe** how bright light therapy is usually administered. Relate the timing of the bright light therapy to delayed circadian phase disorder, advanced circadian phase disorder, shift work and jet lag.

Apply, analyse and interpret

★★ **24** **Compare** sleepwalking and insomnia.

★★ **25** Bright light therapy is likely to be only one part of the treatment plan for circadian shift disorders. **Consider** what else may be part of a treatment plan.

Investigate, evaluate and communicate

★★ **26** **Discuss** the influence light has on our sleep–wake cycle, including the role of the suprachiasmatic nucleus and melatonin.

★★★ **27** Alejandro is a 9-year-old boy. In the middle of the night, Alejandro's mother has seen him going to the fridge, and also brushing his teeth. Alejandro always appears to be asleep while completing these actions. His mother is concerned about him moving around without being awake.

- **a** **Identify** what Alejandro is likely to be experiencing.
- **b** **Explain** the stage of sleep this typically occurs in.
- **c** **Propose** what Alejandro and his mother can do to ensure that he sleeps safely.

★★★ **28** Tina, a 25-year-old female, suffers from a sleep disorder. The disorder makes it difficult for Tina to fall asleep at night. She is often tired the next day, and can spend hours at night lying in bed staring at her ceiling.

a **Identify** the sleep disorder that Tina is likely to be suffering from.

b **Describe** the stage of sleep in which Tina is likely to experience this in.

c **Identify** possible symptoms Tina is likely to display.

d **Discuss** some ways that may help Tina fall asleep more easily.

★★ **29** You have now learnt about the importance of sleep. **Consider** how our way of life is affecting our sleeping habits. **Assess** whether a higher incidence of sleep problems may be diagnosed in the future. **Justify** your answer.

Check your obook assess for these additional resources and more:

» Student book questions
Chapter 13 Review

» Revision notes
Revision notes for Chapter 13

» assess quiz
Test your understanding with an auto-correcting multiple-choice quiz

» Flashcard glossary
Key terms in Chapter 13

UNIT 1

Practice exam questions

Individual development

Multiple choice

1 Psychology is considered a science because:
   - **a** knowledge is gained through studying the mind
   - **b** research in this field uses scientific processes
   - **c** psychologists have a science degree
   - **d** scientific instruments such as brain scans are used in research.

The following information relates to questions 2-4.

Psychology teacher Ms. Smart decided to test a new 'smart pill' on her students. She gave one psychology class (Class A) a smart pill, while her other class (Class B) received a sugar pill. Both groups were then given a 20-item intelligence test. Class A scored on average 82% while Class B scored on average 67%.

2 What would be a suitable hypothesis for the above experiment?
   - **a** Subjects receiving a sugar pill will be smarter than subjects receiving the smart pill.
   - **b** Subjects receiving the smart pill performed on average better than other subjects.
   - **c** Subjects receiving a smart pill will be smarter than subjects receiving the sugar pill.
   - **d** Will subjects receiving the smart pill perform better on the intelligence test?

3 The independent variable is:
   - **a** the type of pill received
   - **b** performance on the intelligence test
   - **c** IQ
   - **d** which group the subjects were allocated to.

4 Ms. Smart should have followed ethical guidelines prior to conducting the experiment. One such guideline would be ensuring 'informed consent'. What does this mean?
   - **a** subjects sign a consent form
   - **b** if the subjects are under 18 years of age, their parents must give written consent
   - **c** subjects are informed of the results at the end of the experiment
   - **d** subjects can leave the experiment at any time

5 Which neuroimaging technique shows activity patterns within the brain while performing an activity (such as reading)?
   - **a** MRI
   - **b** fMRI
   - **c** EEG
   - **d** DBS

6 The key components of the peripheral nervous system are:
   - **a** sympathetic and parasympathetic nervous systems
   - **b** brain and spinal cord
   - **c** somatic and autonomic nervous systems
   - **d** sensory and motor nerves.

7 Changes in the brain that occur as a result of environmental influences, such as learning, are due to a process called:
   - **a** developmental plasticity
   - **b** adaptive plasticity
   - **c** sensitive periods
   - **d** myelination.

8 At 15 months of age, Henry does not get upset when a stranger approaches. When he is upset, he can be comforted by either a stranger or his mother. According to Ainsworth, Harry is showing:

a secure avoidant attachment
b secure attachment
c insecure avoidant attachment
d insecure resistant attachment.

9 Piaget's stages of cognitive development proceed in which order?
a sensorimotor; preoperational; concrete operational; formal operational
b preoperational; sensorimotor; concrete operational; formal operational
c preoperational; concrete operational; sensorimotor; formal operational
d sensorimotor; preoperational; formal operational; concrete operational

10 Dr. Lee finishes his shift and goes to sleep. His sleep pattern is likely to reflect a normal ultradian rhythm, which will show:
a less time spent in NREM sleep at the start of the night
b more time spent in REM sleep at the start of the night
c an increasing amount of time in NREM sleep as the night progresses
d NREM/REM sleep cycles of approximately 90 minutes.

Short answer

11 Describe the role of the following neuron structures: dendrite, axon and soma.

12 Jaydn was doing some activities with his younger brother for a Psychology investigation for school. For one test, he created 2 lines of 5 lollies so that each line was equal in length. Jaydn asked the following questions: 'Does line A or line B have more lollies? Or are they both the same?' He then spread one line of smarties so that it created a longer line, and repeated the same question.
Describe what a child in the preoperational stage would be likely to answer for both questions, and explain why they would give this answer.

13 Differentiate between enriched and deprived environments.

14 Assess the importance of experiencing critical and sensitive periods in development.

15 Consider the impact of sleep apnoea on someone experiencing critical and sensitive periods in development, and then identify a treatment option.

Extended response

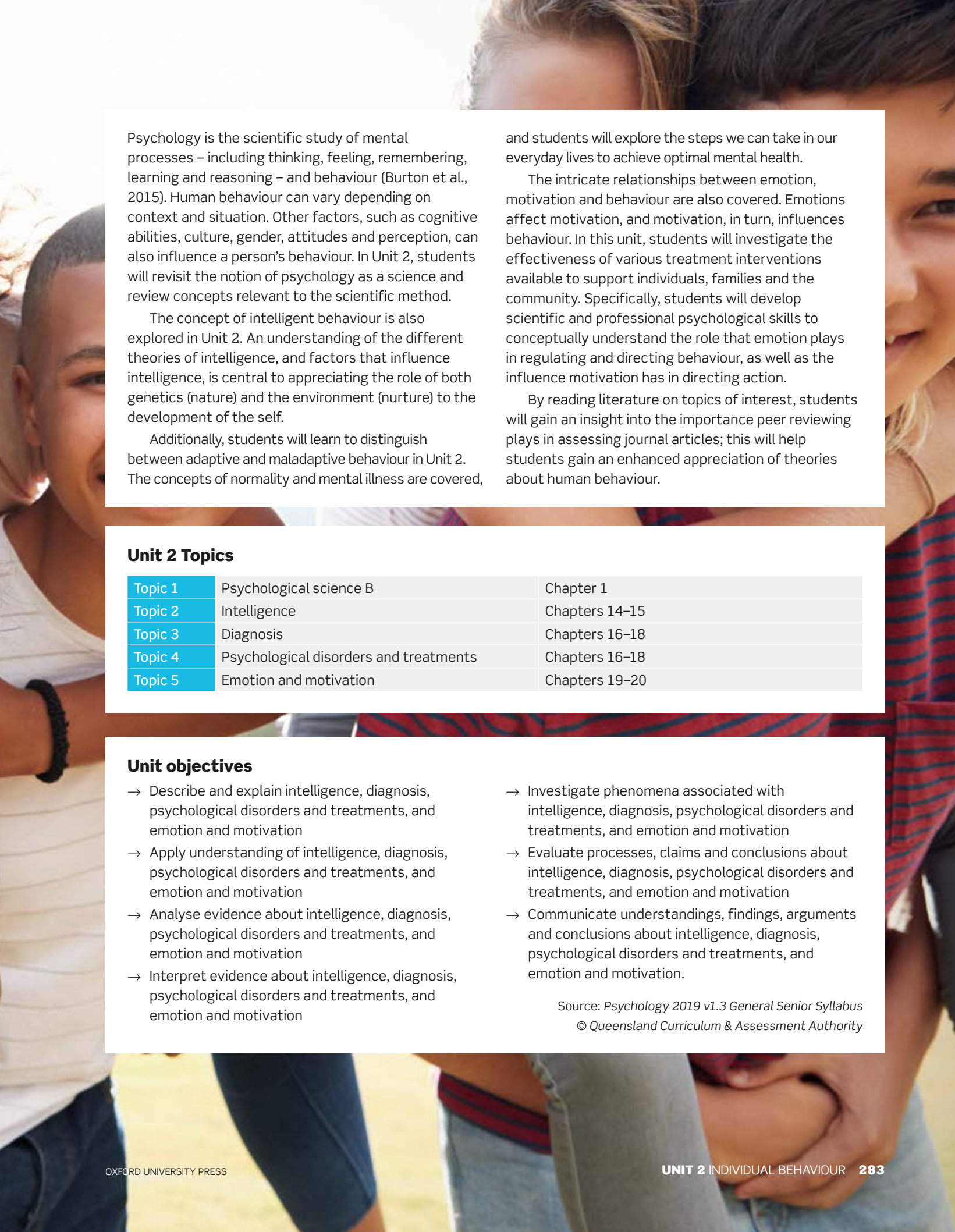
16 Ciaran was interested in how long it would take people to fall asleep after going for a run. Ciaran used a sample from his high school. The sample included students who were aged 13-17. Ciaran set three conditions: students that are runners (A), students that never run (B) and a control condition, students who did not run for the study (C). Ciaran found that group A did not experience any difference in sleep after running for the study, group A had a p value >0.05. Ciaran also found that students who did not run for the study had no difference in sleep with a p vale >0.05. Ciaran found that students who did not normally run, but participated in running for the study, had a significant increase in time spent in REM sleep that night $p<0.05$.
a Identify the type of sampling that Ciaran used.
b Explain what the different p values mean for Ciaran's study.
c Evaluate the sampling method used by Ciaran, and discuss the implications for results.



UNIT 2

INDIVIDUAL BEHAVIOUR

FIGURE 1 Our behaviour, thoughts and emotions are influenced by genetics and the people in our lives.



Psychology is the scientific study of mental processes – including thinking, feeling, remembering, learning and reasoning – and behaviour (Burton et al., 2015). Human behaviour can vary depending on context and situation. Other factors, such as cognitive abilities, culture, gender, attitudes and perception, can also influence a person's behaviour. In Unit 2, students will revisit the notion of psychology as a science and review concepts relevant to the scientific method.

The concept of intelligent behaviour is also explored in Unit 2. An understanding of the different theories of intelligence, and factors that influence intelligence, is central to appreciating the role of both genetics (nature) and the environment (nurture) to the development of the self.

Additionally, students will learn to distinguish between adaptive and maladaptive behaviour in Unit 2. The concepts of normality and mental illness are covered, and students will explore the steps we can take in our everyday lives to achieve optimal mental health.

The intricate relationships between emotion, motivation and behaviour are also covered. Emotions affect motivation, and motivation, in turn, influences behaviour. In this unit, students will investigate the effectiveness of various treatment interventions available to support individuals, families and the community. Specifically, students will develop scientific and professional psychological skills to conceptually understand the role that emotion plays in regulating and directing behaviour, as well as the influence motivation has in directing action.

By reading literature on topics of interest, students will gain an insight into the importance peer reviewing plays in assessing journal articles; this will help students gain an enhanced appreciation of theories about human behaviour.

Unit 2 Topics

Topic 1	Psychological science B	Chapter 1
Topic 2	Intelligence	Chapters 14–15
Topic 3	Diagnosis	Chapters 16–18
Topic 4	Psychological disorders and treatments	Chapters 16–18
Topic 5	Emotion and motivation	Chapters 19–20

Unit objectives

→ Describe and explain intelligence, diagnosis, psychological disorders and treatments, and emotion and motivation

→ Apply understanding of intelligence, diagnosis, psychological disorders and treatments, and emotion and motivation

→ Analyse evidence about intelligence, diagnosis, psychological disorders and treatments, and emotion and motivation

→ Interpret evidence about intelligence, diagnosis, psychological disorders and treatments, and emotion and motivation

→ Investigate phenomena associated with intelligence, diagnosis, psychological disorders and treatments, and emotion and motivation

→ Evaluate processes, claims and conclusions about intelligence, diagnosis, psychological disorders and treatments, and emotion and motivation

→ Communicate understandings, findings, arguments and conclusions about intelligence, diagnosis, psychological disorders and treatments, and emotion and motivation.

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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CHAPTER 14

Understanding intelligence and factors that influence it

How to define intelligence has been an ongoing topic of debate among psychologists since the early 1900s, and the debate continues today.

Because 'intelligence' is a hypothetical construct, there is no single description of it on which all psychologists agree. The challenge to describe intelligence has been tackled through a range of approaches. Some descriptions are derived from knowledge of the anatomical structure and functioning of the brain. Other descriptions suggest that intelligence comes in several forms, while others take into account cultural contexts when describing intelligence. For example, in some non-Western cultures, the concept of intelligence includes the ability to relate to others and demonstrate social responsibility.

In this chapter, we explore the concept of intelligence and factors that influence intelligence, including the interaction of genetic and environmental factors.

OBJECTIVES

→ Assess the extent intelligence is inherited, with reference to twin, family and adoption studies (e.g. the Minnesota study of twins reared apart in Bouchard, Lykken, McGue, Segal & Tellegen, 1990)

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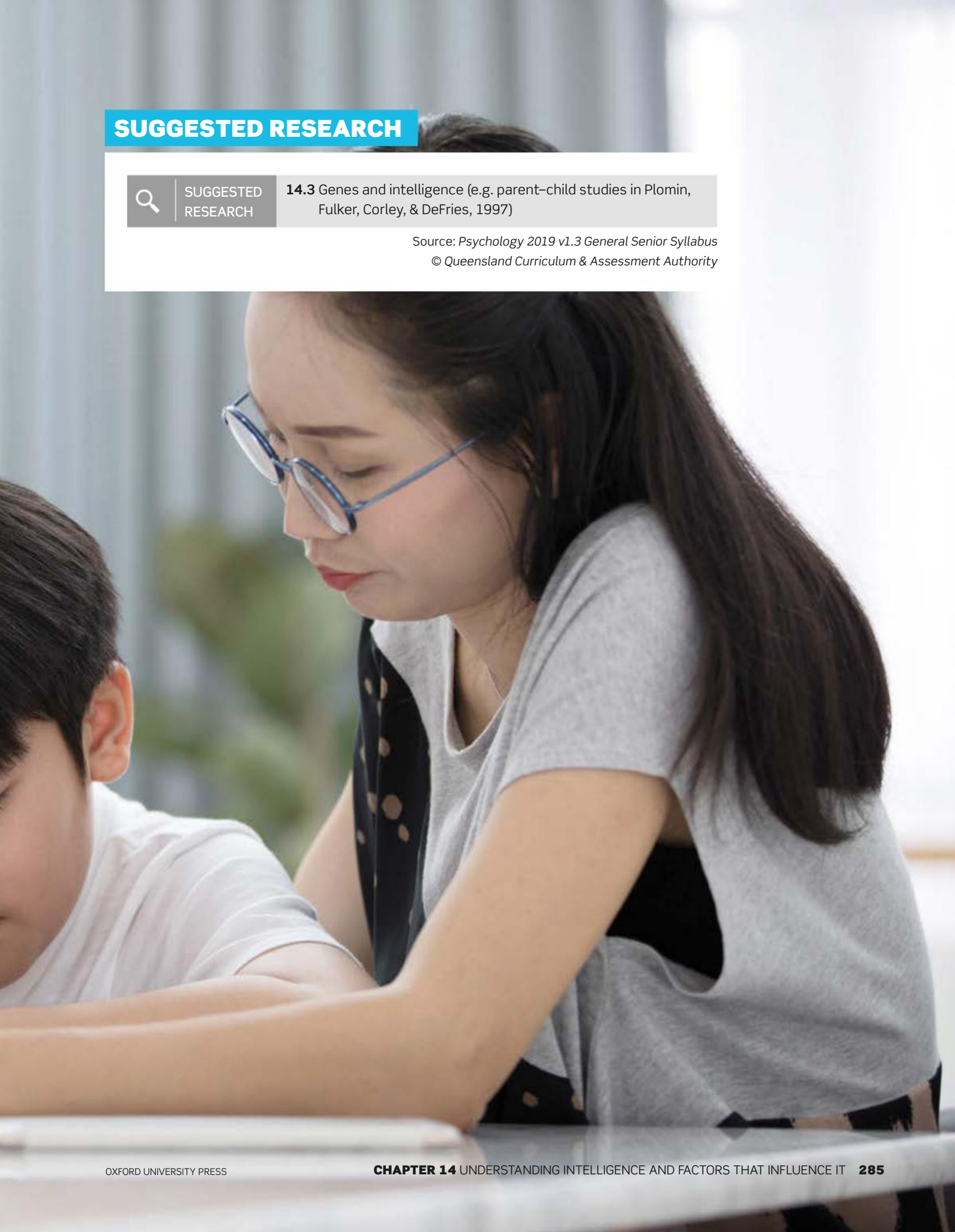


FIGURE 1 There are several factors that influence intelligence, including heritability.

SUGGESTED RESEARCH

SUGGESTED RESEARCH	**14.3** Genes and intelligence (e.g. parent–child studies in Plomin, Fulker, Corley, & DeFries, 1997)

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14.1 What is intelligence?

KEY IDEAS

In this section, you will learn about:

+ the concepts of intelligence, IQ and metacognition.

What is intelligent behaviour? How do you know if someone is intelligent? What is intelligence? What makes one person more able to do some things than others? Why are some people capable of doing one task but incapable of completing another, different kind of task?

The search for the meaning of intelligence has long been a challenge, not only for psychologists, but also for members of different communities.

Your definition of intelligence probably includes terms such as 'smart' and 'clever'. Words like these are only a starting point in defining the concept of intelligence, however. Beyond this, they are as meaningless as the term 'intelligence'. For example, if each member of your class tried to define 'smart' or 'clever', it is likely that there would be many different definitions, just as there would be many different definitions of intelligence.

In most communities, people have an idea of the concept of intelligence, but there is variation from person to person about what exactly it is. Popular ideas about intelligence usually imply human characteristics that are desirable. For example, many parents in Western countries exert much time and effort trying to enhance their children's intelligence so that the children might be better placed to succeed as adults.

intelligence quotient (IQ) standardised score for an individual's intelligence as measured by a specific intelligence test; IQ scores are based on how much an individual's test score deviates from the mean score for the standardisation group

The concept of intelligence should not be confused with the **intelligence quotient (IQ)**, which is a measure of one aspect of intelligence by means of an IQ test. The IQ is a score computed to enable comparison among individuals. Lewis Terman of Stanford University computed the IQ by dividing the mental age (average age at which an individual achieves a particular score) by chronological age (actual age of the individual) and multiplying by 100 (see Burton *et al.*, 2015).

Despite popular ideas about intelligence, psychologists consider the concept of intelligence to be a *hypothetical construct*: a concept that is not directly measurable or observable, and yet gives rise to measurable phenomena and patterns of data. For this reason, psychologists have tried to develop an 'operational definition' of the hypothetical construct of intelligence. An operational definition of intelligence describes, as specifically as possible, the precise elements of intelligence and the procedures involved in researching it; for example, psychologists might infer the existence of the hypothetical construct of intelligence based on test scores and particular kinds of behaviour.

For research on intelligence to progress, it is important that the concept is given an operational definition. This enables intelligence to be measured. It also helps research towards the validation of the construct of intelligence, allowing psychologists to gain a better understanding of the factors that influence intelligence.

intelligence can be defined in many ways, including one's capacity for learning, problem-solving, and applying knowledge and skills to adapt to unfamiliar situations

In most Western cultures, intelligence usually refers to a person's capacity to learn, remember (memory), problem-solve and comprehend.

Intelligent people are those who are most likely able to: make mistakes, yet learn and avoid them in future; adjust to a new job; plan; get along with people in a new social setting; find answers to problems and understand new concepts.

Intelligence can therefore be defined as involving the application of cognitive skills and knowledge to learn and solve problems (Burton *et al.*, 2015). It is the ability to acquire and apply knowledge and skills in ways that enable one to adapt to new situations.

Intelligent people are usually seen as possessing a high level of **metacognition**: that is, they have an understanding of the way they think when attempting to solve problems, reason, plan or make decisions (Sternberg & Detterman, 1986). For example, some people know that, for them, the strategy of talking through a task is the best way to help them to learn, whereas less intelligent people might simply guess the answer.

metacognition an understanding and use of the way a person thinks when solving problems, reasoning, planning and decision-making

CHALLENGE 14.1

Different intelligences

The people pictured here have been identified as possessing a particular ability or intelligence that exceeds most other individuals their age. Their specialised talents are not identical. Conduct quick and brief research on one of these people. In your notes, include details of their family background, childhood and achievements. However, it is possible that you have some preconceived notions of intelligence. Based on your brief research of one of the individuals, describe the factors that you think might have influenced their level of intelligence.



FIGURE 1 Arianne Caoili



FIGURE 2 Michael Kelly



FIGURE 3 Simon Tedeschi



FIGURE 4 Lydia Ko

CHECK YOUR LEARNING 14.1

Describe and explain

1 **Explain** the difference between the concept of intelligence and the intelligence quotient (IQ).
2 **Identify** why intelligence is so difficult to define.

Apply, analyse and interpret

3 **Differentiate** between the concept of intelligence and IQ.
4 **Compare** 'smart' and 'intelligence'.

Investigate, evaluate and communicate

5 Think about Challenge 14.1. **Hypothesise** why certain people may have enhanced intelligence in certain areas.
6 **Discuss** the need for sensitivity when defining intelligence.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 14.1
- » Challenge
  Worksheet:
  14.1 Different intelligences
- » Weblink
  Prodigies
- » Weblink 2
  Superior intelligence

14.2 Models of intelligence

KEY IDEAS

In this section, you will learn about:

- early intelligence testing
- different models of intelligence.

There are several models of intelligence. Each considers intelligence from a different perspective. The psychometric model of intelligence views intelligence as a system; the biological approach of intelligence suggests that intelligence is directly connected with the structure of the brain; and the contextual model of intelligence focuses on the culture that an individual is from.

The psychometric model of intelligence

psychometric model of intelligence explains intelligence through the use of factor analysis of the results of many different intelligence tests that have been completed by many different people

The most commonly applied approach to describing intelligence is the **psychometric model of intelligence**, which views intelligence as a map of the mind. Factor analysis was the statistical method used to separate different aspects of the broad hypothetical construct of intelligence into several distinct or specific *abilities* that researchers believed to be the reason for individual differences in intelligence. Spearman proposed that intelligence comprises general intelligence (*g*), which is made up of a cluster of specific abilities (*s*).

This hypothesis helped to explain why there are individual differences in intelligence. Some high-achieving people can be very literate but less able in mathematics, and vice versa.

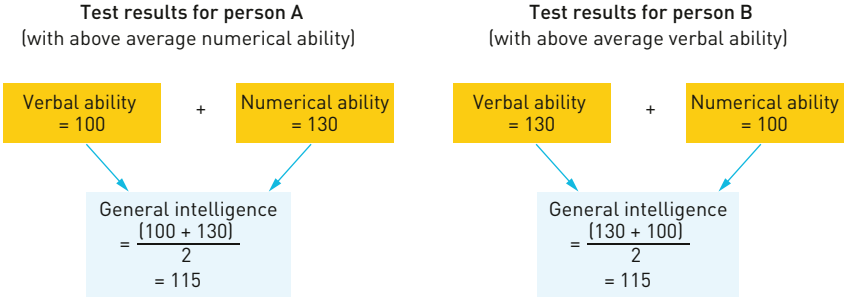


FIGURE 1 In this hypothetical case, person A's and person B's general intelligence scores are composed largely of verbal and numerical abilities. However, the same general intelligence scores may have come from very different scores for verbal and numerical ability.

The psychometric approach to describing intelligence using models that are based on factor analysis is useful in helping us to understand the structure of intelligence. However, these models do not help us to understand the actual processes of intelligence.

Also, it is interesting to note that people who do well in one psychometrically based intelligence test usually do well in others. This has led researchers to believe that all the tests depend on a single underlying ability or intelligence.

The biological model of intelligence

biological model of intelligence explains intelligence through the structure and functioning of the brain

Biological models have attempted to describe intelligence as a physiological phenomenon. They have focused on studying the brain using two different methods:

- case studies of patients with brain damage
- neuroimaging of patients with either damaged or intact brains.

Researchers believe that there is much to be learnt about how the brain works through the use of newly emerging and highly sophisticated neuroimaging devices.

Intelligence and brain structure

Examination of patients with brain damage over the past 125 years has enabled researchers to investigate which particular parts of the brain are associated with intelligent behaviour. For example, there have been many reported cases where patients with damaged frontal lobes have experienced a decline in intellectual functioning (Gray & Thompson, 2004). The most famous case would be that of Phineas Gage, a railroad worker who had a metal rod enter through his eye and pass out his frontal lobe (see page 118).

Neuroimaging research into intelligence and brain structure

Magnetic resonance imaging (MRI) studies have estimated a moderate correlation of 0.4 to 0.51 between IQ level scores and brain size (especially grey matter). This research suggests that the larger a person's brain, the higher the level of intelligence (McDaniel & Nguyen, 2002).

An MRI study of the brains of twins has shown that there is a relationship between brain size, intelligence and genes. This suggests that brain structure (size) is heritable, which also helps to explain why identical twins have the strongest heritability coefficients (Hulshoff Pol *et al.*, 2002). Brain size is not, however, totally determined by heredity. Research has also shown that learning difficult skills can increase the volume of grey matter (Draganski *et al.*, 2004).

Neuroimaging research into intelligence and brain function

This research involves measuring brain activity while participants are performing an intelligence test. Generally, this has shown that particular regions of the brain are active during intelligent behaviour. For example, positron emission tomography (PET) scans have revealed greater activity in several areas of the brain for intellectually challenging tasks, and less brain activity for easy tasks (Duncan *et al.*, 2000).

PET scans have shown that during problem-solving tasks, such as playing Tetris, the brains of people with higher levels of intelligence consumed lower levels of glucose than the



FIGURE 2 A researcher checks an MRI image.

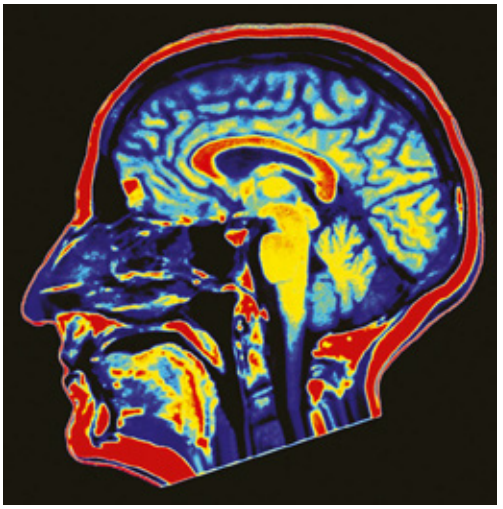


FIGURE 3 A PET image of a working brain

brains of less intelligent people. It seems that more intelligent people may have learnt to use their brains more efficiently and therefore do not require the same amount of energy (glucose) to solve difficult problems (Haier *et al.*, 1988).

The biological approach to describing intelligence is rapidly growing as a field of inquiry due to the availability of recent technology that has enabled sophisticated research; however, caution must be taken and it is clear that this should be part of an integrated approach. The concern is that evidence from this type of research might be misunderstood or misused to make judgments about an individual's or group's intelligence.

Current research techniques are increasingly shedding light on the physiological and cognitive structures and processes of intelligence. Many psychologists, however, do not believe it is as simple as this and feel that consideration must be given to the environment in which different people live and with which their brain interacts. The health of the individual must also be considered. For instance, recent research suggests that it is more appropriate to avoid using the biological model in isolation. Instead, it must be studied in terms of the brain's interaction with the environment.

Contextualising our understanding of intelligence

contextual model of intelligence explains intelligence as forming according to the culture of the individual

In contrast to the other approaches to intelligence, some researchers have adopted a view that intelligence can only be understood within the society that it comes from: the **contextual model of intelligence**. Contextualists argue that intelligence is inextricably linked to culture and that intelligence is something that describes the way people adapt to the demands of surviving within particular cultures and environments.

In other words, intelligence is relevant to the culture in which it is defined and measured. People in different cultures have different ideas about what it means to be 'smart' or 'clever' or adapt to one's environment.

The contextual approach takes into account the different notions of cleverness in different communities, and the effects of the culture in which a child is raised. It does not, however, take into account the fact that, within any single community, some individuals are naturally better able to respond to various intellectual challenges than others.

Examples of cultural influences

Indigenous Australians

The culture of Indigenous Australians living a traditional lifestyle might place great value on hunting and fishing skills, whereas the culture of inhabitants of metropolitan or urban Australia might place greater importance on academic performance at school. For this reason, many standard intelligence tests are culturally biased because they are based on Western schooling and knowledge paradigms (Kearins, 1976; 1986).

Kearins's research found that Aboriginal adolescents performed lower than non-Indigenous Australians on standard intelligence tests, but outperformed their non-Indigenous counterparts in all conditions of a visual-spatial memory task.

Street kids in Brazil

In the 1980s, researchers found that Brazilian children born and raised in poverty and with no formal education were highly competent at performing complex arithmetic in relation to selling items in the street (Carraher, Carraher, & Schliemann, 1985). However, they were unable to complete formal arithmetic tasks in a school setting. In other words, these children had the intellectual capability to understand arithmetic, but this would not appear to be the case if they were to sit a formal arithmetic test in a school (Sternberg, 1995).

CHALLENGE 14.2

Culturally fair intelligence tests

Conduct some research and write a paragraph to show your understanding of what each of the types of intelligence testing demonstrates about the use and misuse of intelligence tests.

Find an intelligence test that is readily available on the internet. Demonstrate your understanding of the strengths and weakness of intelligence tests by evaluating this test, and explaining why such tests are inappropriate measures of IQ.





FIGURE 4 Intelligence describes how people adapt to and survive in a particular culture and environment.

CHECK YOUR LEARNING 14.2

Describe and explain

1 **Describe** the biological approach to intelligence.

Apply, analyse and interpret

2 **Compare** the biological and contextual approaches to intelligence.

Investigate, evaluate and communicate

3 **Evaluate** the following statement: 'The biological approach supports the role of nature in intelligence'.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 14.2
- Challenge
  Worksheet: 14.2 Culturally fair intelligence tests
- » Weblink
  Child geniuses
- » Weblink
  Models of intelligence

14.3 Factors that influence intelligence

KEY IDEAS

In this section, you will learn about:

- nature and nurture influences on intelligence
- the reaction range of intelligence
- enriched and deprived environmental influences on intelligence.

What makes one person more intelligent than another? How can there be so much variation in the intellectual ability of a population of humans? Are people from one culture or ethnicity more intelligent than those from another? Can intelligence be improved or weakened?

Much of the research on the factors that influence intelligence has been on the extent to which intelligence is inherited and remains unchanged from birth (nature), and the influence of the environment on the development of intelligence (nurture). Research has also focused on the interaction of nature and nurture.

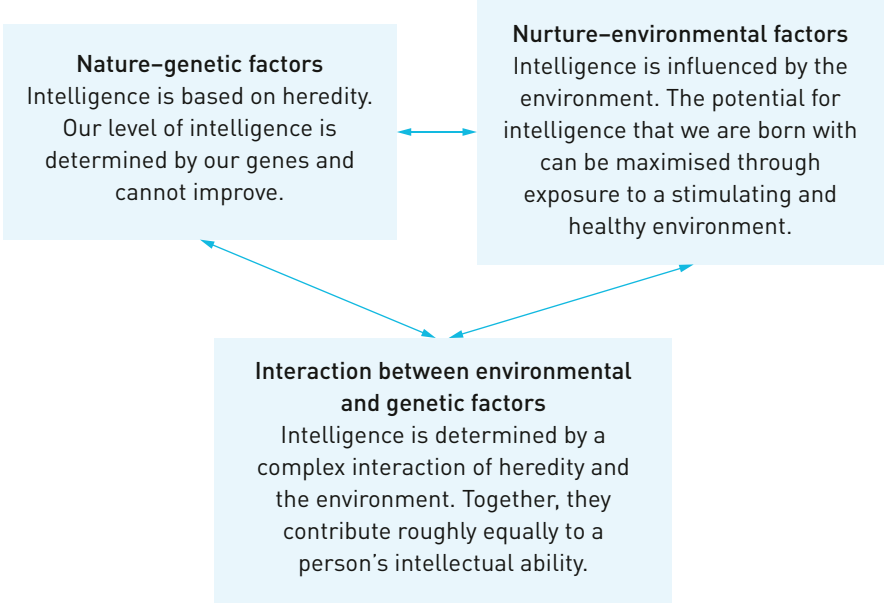


FIGURE 1 Influences on intelligence

Identification of the influences on intelligence has been controversial because of the enormous social and political implications. In Western societies it is generally desirable to have a 'high level' of intelligence, often because it is equated with success, and is a source of esteem and social standing. If heredity is found to be a strong contributor to a person's intelligence, then it provides the opportunity for racial and ethnic discrimination. If the environment is the strongest contributor, then those people born into socioeconomic deprivation may be disadvantaged in their opportunity for intellectual development.

Nature: biological influences

It is still unclear exactly how heredity influences intelligence. Research has made progress over the past century, especially through the study of twins and adopted children, and is accelerating with the Human Genome Project.

Much of the research on the factors that influence intelligence has been conducted using a cognitive approach to the concept of intelligence, where intelligence tests that give IQ scores (see Chapter 15) are used to obtain a measure of a person's intelligence.

SUGGESTED RESEARCH
14.3 Genes and intelligence
Go to page 457 »

Genes

Some genetic syndromes can limit intelligence; for example, Down syndrome, which results from the presence of an extra chromosome (Sternberg, 1995). Children born with this genetic syndrome generally have below-average intelligence levels as measured by conventional IQ tests.

Identifying specific 'intelligence genes'

The Human Genome Project is providing evidence that different forms of particular genes are related to variation in scores on IQ tests between different people. It is possible that inherited intelligence depends on a combination of a variety of genes, but that it also depends on the interaction of these genes with influences from the environment.

To date, positive **heritability** of IQ scores simply suggests that, for children born and raised in an identical environment, those with a positive IQ heritability may do better on IQ tests than those who are born with a negative IQ heritability, and this difference can be explained by genes (Kalat, 2008). It is also important to remember that IQ tests measure only some forms of intelligence (see Chapter 15).

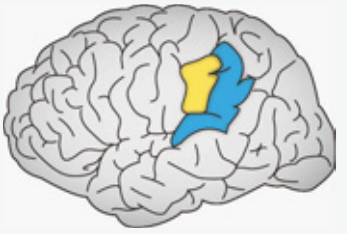
heritability
how much heredity contributes to intelligence; expressed as a coefficient from 0 to 1 where 0 means heredity has no influence and 1 means heredity has 100 percent influence on intelligence

CASE STUDY 14.3

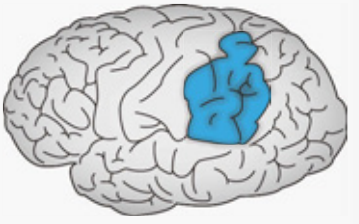
Einstein's brain

When genius Albert Einstein died of heart failure in 1955 at the age of 76, his brain was kept at Princeton University after the autopsy. In 1996, his brain characteristics were compared with those of people of normal intelligence who had agreed to donate their bodies to medical research. Einstein's brain (bottom) was different from that of people of normal intelligence (top) (Witelson et al., 1999).

The yellow and blue areas on the normal brain are parts of the parietal lobe. The blue area, the inferior parietal lobe, is used for visual-spatial thinking, mathematical thought and for imagining how things move in space. The blue area was much larger in Einstein's brain than in a normal brain, and researchers hypothesised that this increased his ability to imagine objects in space (Witelson et al., 1999).



Normal brain



Einstein's brain

FIGURE 2 Comparison of normal brain characteristics with Einstein's brain

Neuroanatomy

Recent research in neuroanatomy suggests that mathematically gifted adolescents might possess a specific functional organisation ability compared to adolescents with average mathematical ability (O'Boyle, 2005). The research data suggests that gifted adolescents may have stronger processing in the right cerebral hemisphere, and greater communication and brain activation between cerebral hemispheres (see Figure 3).

Family, twin and adoption studies

Studies of twins, siblings and adopted children have been helpful in shedding light on the extent to which heredity influences intelligence. Families who live together often share the same genes and environment. If a family has children whose parents and grandparents all have high intelligence, then it is possible that either their genes or their family environment or the

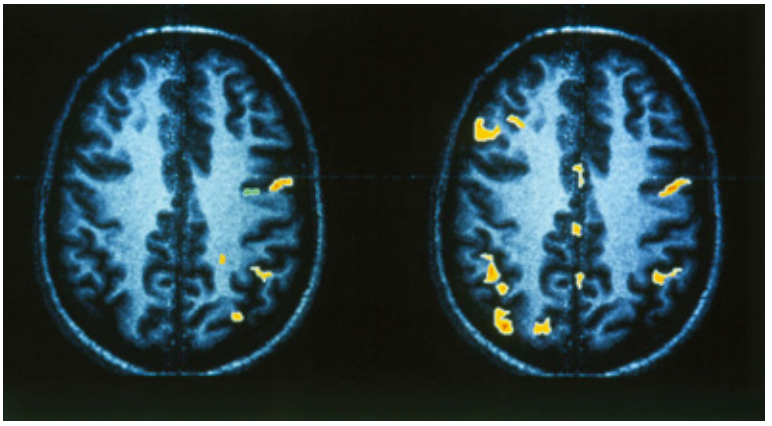


FIGURE 3 Brains of a normal adolescent (left) and a gifted adolescent (right) when undertaking a complex mathematical problem

interaction between the two is responsible for their high intellectual ability. However, it is not possible to establish how much their genes or their environment influenced their intelligence.

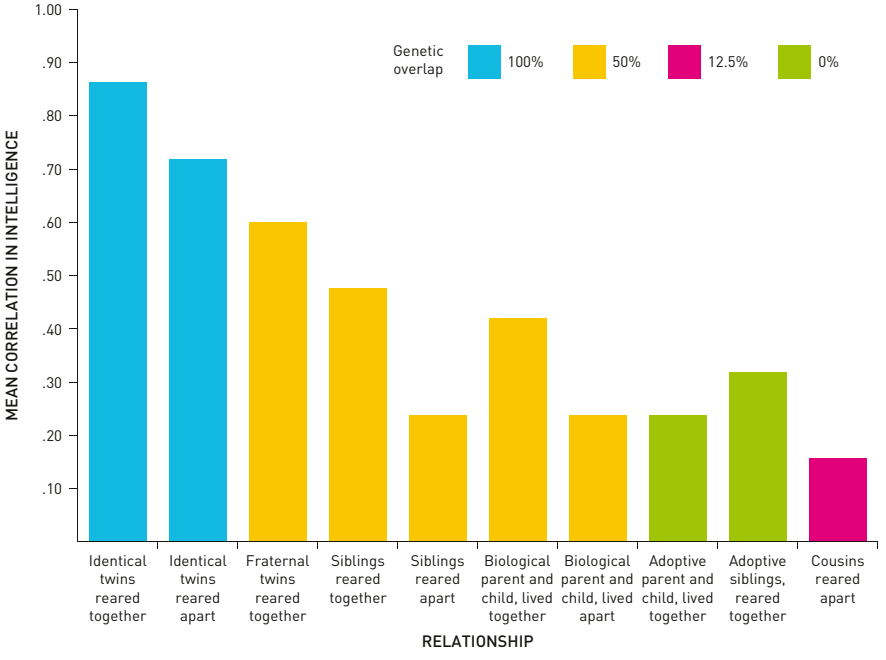
Twin, sibling and adoption studies have been useful in researching the factors that influence intelligence because twins share the same genetic make-up and usually grow up in the same family environment. Family studies can compare the intellectual abilities of twins and siblings who have been reared together or apart in separate environments.

Thomas Bouchard and Matthew McGue (1981; 1993) reviewed the results of more than 100 family and intelligence studies (a meta-analysis) in an attempt to provide an overview of the data that has been collected on heredity and intelligence. Their research reported the correlations of IQ scores for people with different genetic relationships and who grew up in different environments. A brief outline of some of their findings is presented in Figure 4. Higher correlation coefficients indicate greater similarity in IQ scores.

The average heritability correlation is 0.86 for identical twins who were raised together and 0.72 for identical twins raised apart. This suggests that heredity is a strong influence on intelligence. However, the results for siblings reared together and those reared apart suggest that living together in the same environment is also an influence on intelligence.

Although this type of research is useful, it is not without its criticisms:

- Most twin studies are based on data from middle-class families. Less research has been done with low socioeconomic families, but available data suggests that there is less evidence of heredity influencing intelligence. In other words, in a deprived environment heredity does not help much, whereas a positive IQ heritability can be accentuated by a good environment. Therefore, the data from this research must be interpreted in context.
- Identical twins might also be similar in IQ because their family and friends treat them similarly, whereas fraternal siblings may be treated differently by family and friends.



Source: Based on Bouchard & McGue, 1981; 1993

FIGURE 4 Mean IQ score similarity and genetic relationship

Heritability coefficients

The influence of heredity on intelligence is an estimate that is expressed by a heritability coefficient (see Chapter 1). Like all coefficients, the heritability coefficient is a number from 0 to 1. Typical heritability estimates for intelligence range between 0.5 and 0.7 (or between 50 and 70 per cent).

In a hypothetical situation where all individuals are raised in exactly the same environment, the heritability coefficient can be interpreted thus:

- 0 indicates that heredity has no influence on individuals' mean IQ scores.
- 1.0 indicates that heredity has 100 per cent influence on IQ.
- 0.5 indicates that heredity and the environment each has 50 per cent influence on IQ.

It is important to remember:

- These figures are hypothetical only; it is known that neither heredity nor the environment alone is 100 per cent responsible for intellectual ability.
- A heritability coefficient is an estimate only.
- A heritability coefficient is a group statistic only; it is not an indication of the heritability of a single individual and should never be meaningfully applied to an individual.
- Most heritability studies have been done in white middle-class communities, and therefore any findings should only be applied to such groups.

Nurture: environmental influences

Heredity certainly influences intelligence, but as we have seen, there is plenty of evidence to show that the environment in which a child is raised will also influence intelligence.

Enriched and deprived environmental influences

The development of an individual's intellectual ability may be enhanced by an environment where there are any of the following factors:

- a healthy living environment, including an adequate diet and regular sleep
- good educational opportunities
- family and community who talk and actively interact with children
- a pregnancy free of toxins
- a pregnancy free of serious illness
- no head injuries or trauma
- no serious illness.

However, the reverse is also true. The development of an individual's intellectual ability may be restricted in circumstances where any of the following factors have been present:

- extreme poverty and poor diet during childhood
- inadequate or very limited educational opportunities
- little or no basic parent instruction or talking in the home during early childhood

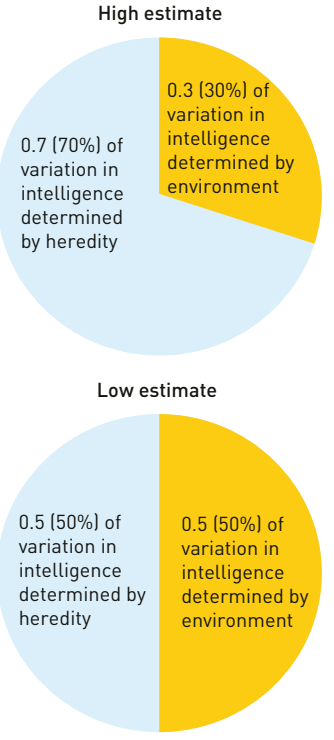


FIGURE 5
Heritability coefficients as estimates of heritability

Heritability coefficient	Amount of influence on intelligence (%)	
	Heredity	Environment
0	0	100
.2	20	80
.5	50	50
.8	80	20
1.0	100	0

TABLE 1 The heritability coefficient and the influence of heredity and the environment



FIGURE 6 Family studies on hereditability of intelligence explore twins, siblings and adopted children raised in the same family environment.

- during pregnancy, the mother had an inadequate diet or ingested drugs, alcohol or other toxins
- during pregnancy, the mother sustained a severe illness that affected the development of her baby
- head injury or brain trauma
- serious illness or seizure.

Adoption studies

You may have noted in Figure 4 that adopted children's intelligence is 'to a degree' related to that of their adoptive parents. Also, biologically unrelated children raised apart have greater variation in intelligence than biologically unrelated children raised together (Locurto, 1990). This suggests that the environment provided by the parents contributes to the intelligence of the children.

Studies of deprived environments

Social and environmental conditions can influence intelligence (Burton *et al.*, 2015). Researchers studying children raised in orphanages and/or in poverty found that a deprived environment adversely affected the predicted IQ scores of these children (Sherman & Key, 1932; Stoddard, 1943). However, longitudinal research further shows that children who are removed from deprived circumstances and placed into more beneficial situations may have their intelligence enhanced (Scarr & Weinberg, 1977; 1983; Weinberg, Scarr, & Waldman, 1992).

Research suggests that interventions to assist intellectual development are the most beneficial if they are introduced very early in a child's life. It has been found that children who leave deprived orphanages to live in adoptive families show improved intellectual development, especially if the children were under the age of 6 months when the adoption occurred (Beckett *et al.*, 2006; van Ijzendoorn, Juffer, & Poelhuis, 2005)

Nature and nurture: the interaction of heredity and the environment

Heredity and the environment both influence intelligence. It is unclear, however, exactly which aspect of the environment and which particular genes have the greatest influence on intelligence. Rather than looking at each in isolation, researchers have now moved to examining how these factors interact.

There are some clear examples of how heredity and the environment interact to influence the intellectual potential of a child. For example, when a baby is born with the hereditary disease phenylketonuria (PKU), the baby's body is unable to break down the amino acid phenylalanine (a substance in food). If left untreated, this can change cells inside the brain, causing intellectual disability. However, this disease can be treated at birth so that its potentially damaging effects are prevented. This is a clear illustration of an immediate effect of the interaction between heredity (the hereditary disease PKU) and the environment (the medical treatment) influencing intelligence.

The interaction can also take place in more subtle ways, such as the effects of poor diet or a long-term illness, which may restrict an individual from reaching their intellectual potential. Similarly, the opportunity for a good education and growing up in a supportive community can increase the opportunity for intellectual improvement.

The reaction range

It is possible that genes provide a set of potential abilities, but that interaction with the environment is what fosters, shapes and maximises (or minimises) intellectual potential. In other words, heredity provides the limits to an individual's intellectual potential, whereas the environment provides the opportunity or otherwise to reach the potential within the genetic range.

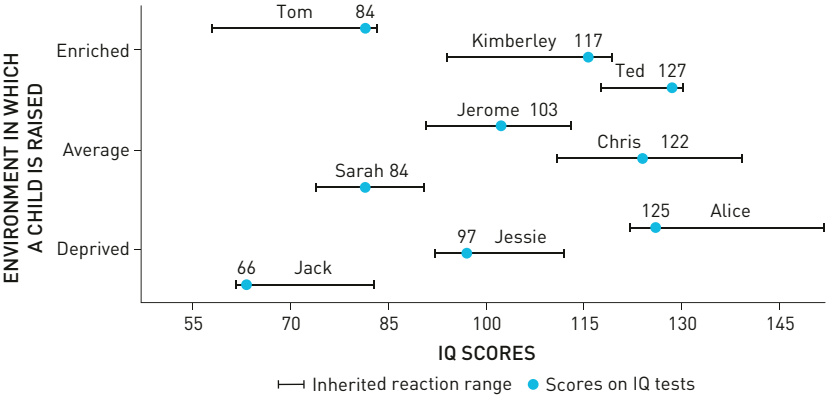


FIGURE 7 The IQ reaction range for the interaction between heredity and environment. Note how a deprived environment influences IQ scores to nudge towards the lower end of the inherited reaction range line.

This suggests that genes place a ceiling on a person's intellectual potential that cannot be exceeded, even in ideal environmental circumstances. This genetic potential is called the **reaction range of intelligence**. The reaction range refers to the amount by which the interaction between heredity and the environment can increase or decrease IQ scores. Research has suggested that depending on the interaction, an IQ may decrease or increase by 10 to 15 IQ points (Zigler & Seitz, 1982), or by as much as 20 to 25 IQ points (Bouchard, 1997). This implies that a child born into a deprived environment may have a reduced intellectual potential compared to a child born into an enriched environment.

reaction range of intelligence the amount by which IQ scores may vary depending on the interaction of heredity and the environment

The reaction range for most people is estimated at 0 to 25 IQ points (Weinberg, 1989).

CHECK YOUR LEARNING 14.3

Describe and explain

1 **Construct** a table and **summarise** the evidence that suggests intelligence is inherited.
2 **Explain** the term 'reaction range'.
3 **Identify** two potential nature and two potential nurture influences on intelligence.
4 **Summarise** the meaning of a heritability coefficient of 0.54.
5 **Identify** factors other than level of intelligence that contribute to someone's achievements.

Apply, analyse and interpret

6 **Consider** the implications of Einstein's brain on the nature-versus-nurture debate.
7 **Distinguish** between heritability and heritability coefficients.

Investigate, evaluate and communicate

8 **Assess** how the reaction range estimate helps explain the effect of the interaction between heredity and the environment in regard to intelligence.
9 **Evaluate** the social and political influences on identifying intelligence.
10 Some researchers are critical of twin studies. **Assess** why.
11 Using the information provided in Figure 4 by the Bouchard and McGue study, **argue** reasons that support genetic influences on intelligence.
12 **Appraise** the arguments for and against knowing the exact contribution of heredity to intelligence.

Check your obook assess for these additional resources and more:

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Check your learning 14.3

» Suggested research
Worksheet: 14.3 Genes and intelligence

» Weblink
Are genetics important

» Weblink
Nature or nurture?

SCIENCE AS A HUMAN ENDEAVOUR

14.4 Intelligence in the army

KEY IDEAS

In this section, you will learn about:

+ the applicability of theories of intelligence in social and cultural contexts.

In the early part of the twentieth century, Lewis Terman, head of the Department of Psychology at Stanford University, was one of the researchers involved in the development of intelligence tests. His theory was that intelligence is inherited. He also believed that it was possible to classify people according to their intellectual ability; for example, employment for people with IQ scores less than 75 should only be unskilled labour; people with scores 75–85 should do semi-skilled labour only; and only people with scores above 100 should be permitted to work in highly skilled jobs.

During the First World War, Robert Yerkes, a professor from Harvard University, was asked to develop an intelligence test that could be used on army recruits. Yerkes and his colleagues tested 1.75 million recruits using three intelligence tests:

- Army Alpha: a written examination for literate recruits
- Army Beta: an examination for illiterate recruits and recruits who had failed Army Alpha
- an individual exam for recruits who had failed Army Beta.

Yerkes classified the recruits according to their performance on these tests and also analysed the results from all of the data. He came to the following conclusions:

1. White American adult males who were tested had, on average, a mental age of 13 years. Yerkes speculated that the reasons for the low level of intelligence for this group included the high incidence of children with a mixture of black and white American ancestry, and the high incidence of children whose parents were either poor or of limited intelligence, or both.
2. People from different countries could be classified according to their intelligence. Yerkes made this assertion on the basis of the test scores of the recruits who were immigrants. He ranked people from Nordic countries as more intelligent than people from Latin and Slavic countries. He ranked black Americans lowest.

Yerkes' testing of intelligence was reviewed by Stephen Jay Gould in the late twentieth century (Gould, 1996). Gould was highly critical of Yerkes' findings for the following reasons:

1. There were problems with the validity of the army tests because many of the questions were based on general knowledge about the United States, or they were about aspects of white middle-class American life that immigrants and poor white and black Americans may never have experienced. Gould also found that the tests were not reliable because the testing procedures were not standardised.
2. Yerkes believed that intelligence was inherited and ignored the fact that white and black Americans from impoverished socioeconomic circumstances usually had very little education that might have assisted their ability to complete the tests. Yerkes also overlooked the fact that immigrants had a reduced chance of performing well because of the cultural and linguistic bias in the army tests.



Yerkes' findings and his spurious conclusion that different nationalities and races could be ranked according to their intelligence created another issue. Some members of the US Congress expressed concern that people of lower intelligence were permitted to immigrate to the United States. As a result, the US Congress wrote the 1924 Immigration Law, which set down tough limits on the numbers of immigrants from 'lesser' European races, such as Slavic and Latin people. Yerkes' report also gave rise to racial bigotry towards black Americans from some sections of the white American community.

When Gould (1996) reviewed the work by Yerkes, he came to the conclusion that Yerkes' research was so flawed that it was not possible to use it to draw any valid conclusions about the intelligence of First World War army recruits, social classes, race or the heritability of intelligence.

Attempts to describe and understand the differences between humans have gone on for centuries. For example, Plato (427–347 BCE) tried to classify people according to ability, and Aristotle (384–322 BCE) tried to do the same according to mental characteristics.

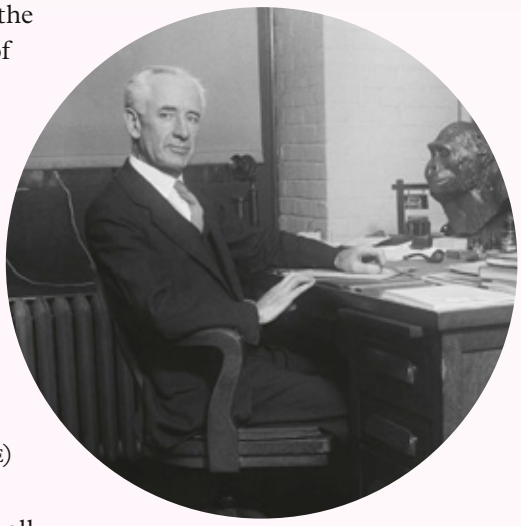


FIGURE 1 Robert Yerkes' research on testing the intelligence of army recruits was influential, but has been largely discredited.

In the end, these early studies illustrated the undeniable reality that all people are individuals. Just as there are individual differences in human characteristics such as weight, height, hair and eye colour, social skills and temperament, the same applies to human intelligence.

Unlike height or weight, however, it is difficult to accurately classify intelligence because scholars and the wider community all have different notions of what constitutes intelligence. This is the reason that intelligence is a hypothetical construct; we know it exists, but we cannot specifically define it.

CHECK YOUR LEARNING 14.4

Describe and explain

1 **Explain** why Yerkes' intelligence work is considered flawed.

2 Based on Yerkes' research into intelligence, **describe** how the cultural contexts were ignored.

Apply, analyse and interpret

3 Apply Lewis Terman's IQ scores to Australian society today. **Consider** the issues that are associated with the scores he assigned to employment.

Investigate, evaluate and communicate

4 Yerkes based his intelligence tests on American middle-class knowledge. **Consider** how an Australian would have performed on these tests. Create three questions that American's would be able to answer that are specific to Australia. Create an additional three questions that they may not be able to answer.

5 Gould questioned the reliability and validity of Yerkes' intelligence tests beyond white middle-class Americans. **Assess** why these tests were considered to have low validity and reliability.

Check your obook assess for these additional resources and more:

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  Check your learning 14.4
- » Weblink
  Applying intelligence tests
- » Weblink
  The research of Robert Yerkes
- » Weblink
  Significance of culture in intelligence tests

CHAPTER 14

Review

Summary

14.1

- Intelligence is a hypothetical construct. Different cultures and social contexts can have different ideas about what intelligence is.
- The term 'intelligence' should not be confused with 'intelligence quotient' (IQ).
- Intelligence tests that give IQ scores are just one of a range of ways of measuring and describing the construct of intelligence.

14.2

- There are a variety of approaches to describing the concept of intelligence. These include psychometric and biological models of intelligences and contextual approaches that focus on the culture in which intelligence is defined and measured.
- Research techniques on intelligence are beginning to merge. Psychometric, genetic, cognitive and neuroimaging studies are combining to open opportunities for new approaches to describing intelligence.
- The psychometric model of intelligence uses statistical methods to try to identify particular abilities that are related to intelligence.
- The biological model of intelligence uses modern technology to understand the structure and functioning of the brain.
- Biological influences on intelligence include genes and the anatomy of the brain itself (neuroanatomy).
- The contextual approach to describing intelligence suggests that intelligence is largely determined by the culture in which it is measured, and that different cultures have different concepts of intelligence.
- Research suggests that IQ as measured by traditional intelligence tests is influenced by the interaction of biology (nature) and the environment in which we live (nurture).

14.3

- It is known that variations in intelligence are partly heritable, as is brain structure. Both these factors are influenced by the context in which a person develops, including education, the family environment, and personal and environmental health.
- Family, twin and adoption studies provide clues to the roles of nature and nurture in intelligence.
- Research on twins (twin studies) shows that identical twins are more similar in IQ than fraternal twins. This evidence suggests that intelligence is partly inherited.
- Environmental influences on intelligence include factors such as socioeconomic background (including educational opportunities, educational level of parents, family income, rural/urban environment), the physical health and diet of individuals and also of their mothers during pregnancy, and the presence or absence of head injury.
- Adoption studies provide researchers with knowledge about the influence of the environment on the development of intelligence.
- The genetic potential of a person's intelligence is referred to as the reaction range. The reaction range is influenced by the quality of the environment to which an individual is exposed.

Key terms

- biological model of intelligence
- contextual model of intelligence
- heritability
- intelligence
- intelligence quotient (IQ)
- metacognition
- psychometric model of intelligence
- reaction range of intelligence

Revision questions

Multiple choice

1 Intelligence could be defined as:
- **a** the ability to score well on an intelligence test.
- **b** to not repeat past mistakes.
- **c** the ability to solve problems.
- **d** all of the above.

2 What is an example of intelligent behaviour?
- **a** making mistakes but ignoring them
- **b** creating problems but ignoring them
- **c** remembering mistakes and avoiding them in future
- **d** making mistakes and learning to avoid them in future.

3 Which is a key question in the study of intelligence?
- **a** how to define it
- **b** how much it is influenced by environmental factors
- **c** how much it is influenced by heredity
- **d** all of the above

4 The _____ is an estimate of the amount by which IQ scores may increase or decrease as a result of the interaction of heredity and the environment.
- **a** heritability coefficient
- **b** reaction range
- **c** intelligence quotient
- **d** reliability coefficient

5 Research suggests that differences in intelligence result from:
- **a** environmental factors.
- **b** genetic factors.
- **c** heritability coefficients.
- **d** a combination of environmental and genetic factors.

6 What is the name of the number expressing the proportion that heredity contributes to intelligence?
- **a** intelligence quotient
- **b** heritability coefficient
- **c** reliability coefficient
- **d** mental age

7 Adoption studies suggest that intelligence:
- **a** may be positively influenced by improved environmental circumstances.
- **b** is determined by genes and cannot be changed.
- **c** does not change, regardless of one's environment.
- **d** **b** and **c**.

Short answer

Describe and explain

★★ 8 **a** **Identify** two reasons why twin studies are helpful in studying intelligence.

b **Identify** and **describe** two reasons why the results of twin studies of intelligence must be interpreted with caution?

Apply, analyse and interpret

★ 9 **Compare** two ethical issues that must be considered when conducting research on intelligence.

Investigate, evaluate and communicate

★★ 10 **Describe** why intelligence is so difficult to define.

★★★ 11 **Assess** why psychologists consider intelligence to be a hypothetical construct.

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  Revision notes for Chapter 14
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  Test your understanding with an auto-correcting multiple-choice quiz
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  Key terms in Chapter 14

CHAPTER 15

Approaches to describing and measuring intelligence

Many people in Western societies tend to regard intelligence as the possession of a high intelligence quotient (IQ). A person's IQ is typically measured by traditional intelligence tests that emphasise cognitive abilities.

This chapter will outline key theoretical approaches to understanding intelligence and describe some of the tests commonly used for measuring intelligence. The question of the reliability and validity of intelligence tests is also considered.

If you conduct an online search, you will find a variety of readily available IQ or intelligence tests. You may also have seen some in magazines or other print media. It can be fun to take these tests out of curiosity; however, it is important to remember that they cannot be taken seriously and the results are just for interest. Genuine psychological tests can only be administered and interpreted by qualified psychologists.

OBJECTIVES

→ Compare the multiple intelligences (Howard Gardner, 2017), information-processing, and emotional intelligence (EQ) theories of intelligence
→ Recognise common methods by which intelligence is assessed with reference to intelligence tests and scales:
  – intelligence quotient (IQ)
  – Stanford–Binet scale
  – Wechsler's intelligence scales for adults (WAIS-IV) and children (WISC-IV)
→ Describe whether intelligence tests are valid and reliable

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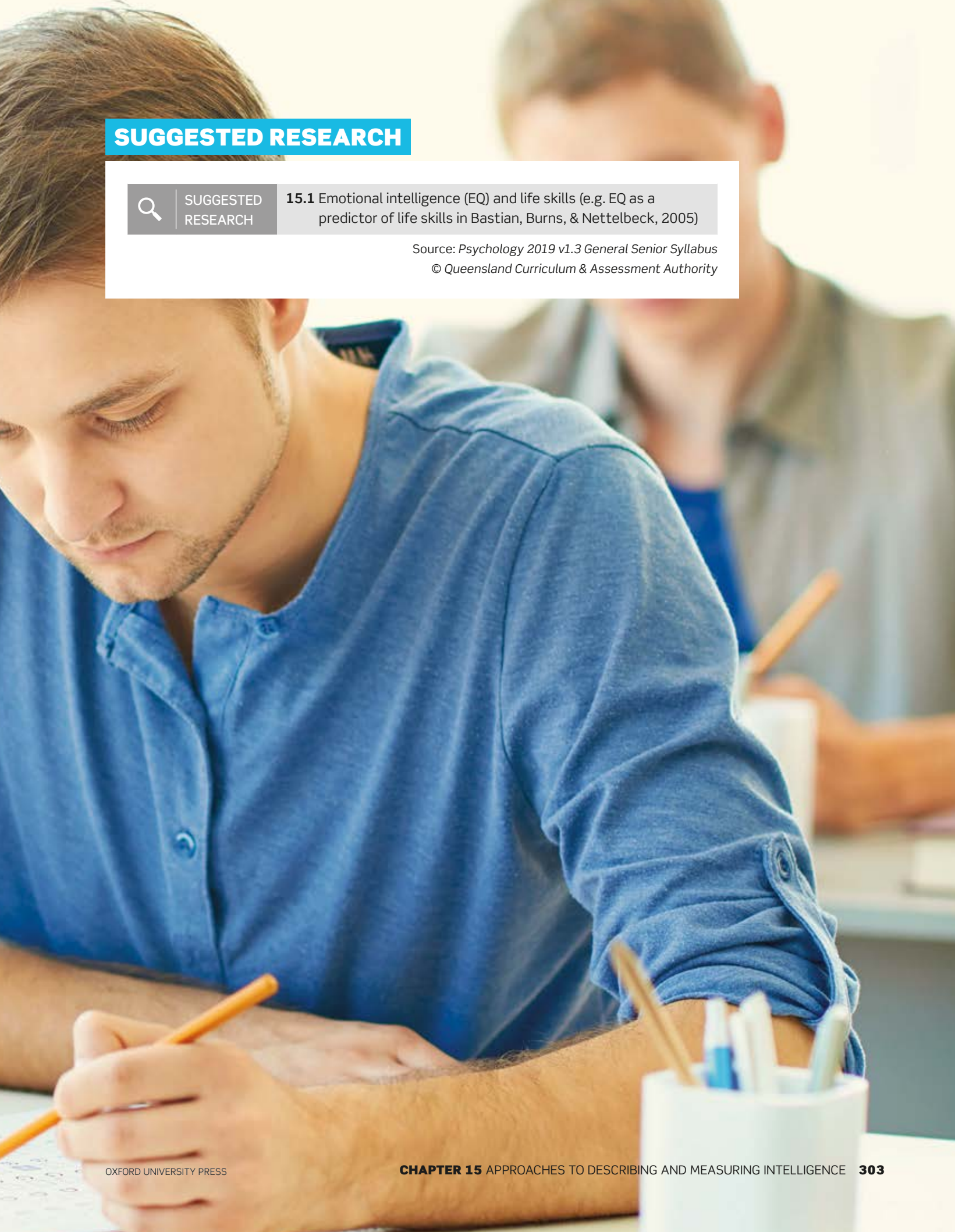
FIGURE 1 An intelligence test is one method of measuring someone's IQ.

SUGGESTED RESEARCH

SUGGESTED RESEARCH

15.1 Emotional intelligence (EQ) and life skills (e.g. EQ as a predictor of life skills in Bastian, Burns, & Nettelbeck, 2005)

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15.1 Approaches to describing intelligence

KEY IDEAS

In this section, you will learn about:

- Howard Gardner's theory of multiple intelligences
- the information-processing approach to intelligence
- emotional intelligence (EQ).

There are several approaches to intelligence. This section will look at Gardner's theory of multiple intelligences, the information-processing approach to intelligence and emotional intelligence (EQ). The **systems model of intelligence** attempts to combine the psychometric, biological and contextual approaches (see Chapter 14) to develop a model that embraces all aspects of intelligence.

systems model of intelligence explains intelligence as including a range of types of abilities that function as a system

Gardner's theory of multiple intelligences

In contrast to the psychometric and biological approaches, the systems approach does not emphasise cognitive abilities, which it regards as being very dependent upon language use and understanding. Instead, the systems approach broadens the definition of intelligence to include a range of types of abilities, and attempts to help understand how intelligence functions as a system (Sternberg, 2005). Critics of this approach point out that it is difficult to develop tests to identify all of the different aspects of intelligence. They also note that the different forms of intelligence in each model overlap and may be different aspects of the same thing. Gardner's theory of multiple intelligences is based on the systems model.

Howard Gardner (1985; 1999) suggests that instead of a single form of intelligence, there is a range of different types of intelligence that are all unrelated to each other: the **theory of multiple intelligences**. To date, Gardner has identified eight individual intelligences and two 'possible' extra intelligences.

theory of multiple intelligences proposes that people possess many independent types of intelligence

Gardner suggests that people can be very strong in some areas of intelligence, but less so in others. This theory accepts the wide range of individual human strengths and weaknesses. 'It is not a question of "How smart we are" but "How we are smart"', he said.

In his research, Gardner examined the evidence on the cognitive abilities of average people, those with brain damage, and also special populations such as prodigies and savants. This research led him to suggest that humans have a greater number



FIGURE 1 Howard Gardner developed the theory of multiple intelligences.

of abilities than just the mathematical and linguistic that are emphasised by traditional intelligence tests in the psychometric approach.

In addition to his original (1985) model, Gardner also proposed the inclusion of two additional intelligences (1999):

- *spiritual intelligence:* the ability to master a set of diffuse and abstract concepts about consciousness and state of being
- *existential intelligence:* the ability to think about oneself in relation to the meaning of life, death and love within the physical and psychological worlds.

Critics have argued that some of these abilities are better interpreted as special talents, rather than aspects of intelligence (Mayer, 2000); however, it appears that 'existential intelligence' is achieving acceptance.

Type of intelligence	Description	Examples
Linguistic	Ability to perceive and generate spoken or written language	Reading, writing, poetry, understanding and communicating in the spoken word
Logical–mathematical	Ability to appreciate and use numerical, abstract, and logical reasoning to solve problems	Accounting, managing bank accounts, mathematics, science
Musical	Ability to create, communicate and understand meanings made with sound	Singing, playing or composing music
Spatial	Ability to perceive, modify, transform and create visual or spatial images	Architecture, sculpture, reading a map, packing a suitcase or a car, jigsaw puzzles, getting from one place to another
Bodily–kinaesthetic	Ability to use all or part of one's body to solve problems or make something	Athletes, dancers, craftspeople
Naturalistic	Ability to recognise and classify objects in the natural environment	Knowledge of plants and the environment, archaeology
Interpersonal	Ability to recognise, appreciate and dispute feelings, beliefs and intentions of other people	Relating to other people and their behaviour, motives or emotions; necessary for teachers and leaders
Intrapersonal	Ability to understand oneself – emotions, desires, strengths, weaknesses	Self-control, self-understanding, ability to accurately describe oneself to those who know one well

Adapted from Chen & Gardner (2005)

TABLE 1 Gardner's multiple intelligences

Critique of Gardner's theory

Gardner's approach is appealing in some ways, but more research is needed to strengthen his theory and to ensure that these multiple intelligences are in fact unique and separate from one another. Some researchers have attempted to test Gardner's theory and have found that, with the exception of the bodily–kinaesthetic type, the types of intelligence he identified tend to correlate with each other; meaning that to a great extent they may be just different aspects of the same thing (Kalat, 2008). This suggests that perhaps Spearman's notion of general intelligence (*g*; see Chapter 14) might still have value as a simple means of describing intelligence.

An advantage of Gardner's theory is that it credits people with having different kinds of intelligence. A disadvantage is that Gardner has not yet developed standard measuring techniques for assessing the different kinds of intelligence.

Challenge 15.1

Multiple intelligences

1 Select one of Gardner's intelligences and research it in more detail. Devise a brief task that might be used to test people's ability for this type of intelligence.

2 Consider your own key strengths in terms of intelligence. Find an online test for multiple intelligences. It is important to remember, however, that no valid and reliable tests for Gardner's multiple intelligences have been developed to date; therefore, the tests that you find must not be interpreted with too much meaning.

Information-processing theory of intelligence

information-processing theory of intelligence focuses on understanding the cognitive processes that underlie intelligence

The **information-processing theory of intelligence**, or cognitive approach to intelligence, was developed to explain *how* the human mind works. The information-processing approach focuses on understanding the specific cognitive processes that underlie intelligent behaviour. This includes describing and measuring how we process information by examining speed of processing, knowledge base, and the ability to learn and apply mental strategies (Burton *et al.*, 2015).

According to the information-processing model, intelligence is a process rather than a measurable quantity, and individual differences in intelligence reflect differences in the cognitive skills that underpin our thinking. Intelligence therefore includes our ability to attend to and remember new information or our speed of processing new information (Burton *et al.*, 2015).

Speed of processing

Mental speed is therefore considered a component of intelligence according to the information-processing approach to intelligence. Research suggests that the speed at which you can complete cognitive or academic tasks is related to your level of intelligence as measured by standard IQ tests (see Burton *et al.*, 2015). For example, the faster you process scholastic information, the higher your level of intelligence. Speed of processing positively correlates with measures of academic achievement in both children and university students. Individuals with above-average academic abilities perform cognitive tasks more quickly than their peers (Campione, Brown, & Ferrara, 1982). Conversely, individuals with an intellectual disability respond more slowly than their peers on a variety of cognitive tasks (Nettlebeck & Wilson, 1997).

Research further suggests that speed of processing improves during childhood, but slows during the later years of adulthood (Nettlebeck & Burns, 2010). On a positive note, staying mentally active and engaging in various computer training programs has been shown to strengthen speed of processing on some cognitive tasks (Simpson, Camfield, Pipingas, Macpherson, & Stough, 2012).

Knowledge base

According to information-processing theory, the amount of information stored in working memory and long-term memory is also related to our intelligence. Differences in our knowledge base – including the volume of information and how it is organised and can be accessed for retrieval– influences our intellectual functioning (Burton *et al.*, 2015). We store and process information in particular knowledge domains. This enables us to encode,

SUGGESTED RESEARCH
15.1 Emotional intelligence (EQ) and life skills
Go to page 457 »

retrieve, and mentally manipulate relevant information to solve problems (Schauble & Glaser, 1990). This broad knowledge base is also why people appear intelligent when talking about a topic in their area of expertise.

Ability to learn and apply mental strategies

The ability to acquire and apply cognitive strategies to solve problems or adapt to new situations is also a component of intelligence, according to the information-processing theory of intelligence (Burton *et al*., 2015). We use cognitive strategies every day, from mentally calculating the cost of our groceries at the supermarket to splitting the bill when at dinner with friends. According to the information-processing theory of intelligence, we become more efficient in using different mental strategies across our lifespan. For example, mnemonic strategies are more likely to be used by adults than children, however, with practice, children can be taught a range of cognitive strategies to remember information and improve their academic performance (Best, 1993).

Critique of information-processing approach

The information-processing approach focuses on how people process (acquire, use and store) information. From this perspective, intelligent behaviour reflects the ability to process information with increased speed and complexity. Intelligence is influenced by the mental speed with which we can retrieve information from working memory and bring it into our awareness. According to the information-processing model, intelligence can be enhanced by the ways we perceive, understand, and remember information. Therefore, an advantage of this approach is that hypotheses can be tested under controlled experimental conditions. However, it is less focused than other contextual theories on understanding the influence of culture on intelligence.

Emotional intelligence

The notion of **emotional intelligence (EQ)** has been put forward recently as an aspect of intelligent behaviour that is overlooked by most definitions of intelligence. Similar to Gardner's interpersonal and intrapersonal intelligences, the emotional intelligence model suggests that emotions are valuable sources of information that can help people operate in a social context. This includes the ability to perceive, use, understand and manage emotions in both ourselves and others.

emotional intelligence (EQ) the ability to perceive, use, understand and manage emotions in oneself and in others

Aspect of emotions	Description
Perceiving emotions	The ability to perceive emotions in oneself and others, as well as in objects, art, stories, music and other stimuli
Facilitating thought	The ability to generate, use and feel emotion as necessary to communicate feelings or employ them in other cognitive processes
Understanding emotions	The ability to understand emotional information and how emotions combine and progress through relationship transitions, and to appreciate such emotional meanings
Managing emotions	The ability to be open to feelings, and to modulate them in oneself and others so as to promote personal understanding and growth

TABLE 2 Salovey and Mayer's emotional intelligence model

There are several different models of EQ that have been proposed by different researchers. A well-known one is the Salovey and Mayer model, which describes emotional intelligence as the ability to perceive emotions, integrate emotions to facilitate thought, understand emotions, and regulate emotions to promote personal growth (Salovey & Mayer, 1994). Their model includes aspects of emotion that, they suggest, make up emotional intelligence.

Salovey and Mayer have developed a test of emotional intelligence called the Mayer–Salovey–Caruso Emotional Intelligence Test, or MSCEIT (Mayer, Salovey, & Caruso, 2002). Visit the MSCEIT page of the Emotional Intelligence Consortium website to view the details of this text (link available via the obook).

Emotional intelligence is an aspect of research into intelligence that is in its infancy. There are several views on its definition and measurement, and these views are constantly being amended.

Critique of the emotional intelligence approach

There are questions about the existence of emotional intelligence. It has been argued that emotional intelligence is simply a part of general intelligence, which includes the ability to deal with life situations and emotions, and that it is a skill rather than an intelligence (Locke, 2005). There are also criticisms that the emotional intelligence tests that have been developed are mainly *self-report* measures. A notable concern of these models is that they do not have rigorous operational definitions. This has made it difficult for researchers to validate them in quantitative research.

CHECK YOUR LEARNING 15.1

Describe and explain

1 **Explain** Gardner's model of multiple intelligences.
2 **Describe** the information-processing model of intelligence.
3 **Summarise** what emotional intelligence (EQ) is.

Apply, analyse and interpret

4 **Apply** Gardner's multiple intelligences to the following tasks:
   - **a** studying for a mathematics exam
   - **b** constructing a shed
   - **c** running an effective meeting

5 **Identify** problems with the information-processing model of intelligence.
6 **Compare** EQ and information-processing.
7 **Differentiate** between the information processing model and multiple intelligences model.
8 **Contrast** EQ, information-processing and the multiple intelligences.

Investigate, evaluate and communicate

9 **Critique** the information-processing theory of intelligence and **evaluate** its usefulness and limitations.
10 **Discuss** the idea that EQ is different from Gardner's multiple intelligences.
11 **Construct** a table to summarise Gardner's multiple intelligences, and provide your own examples for each type of intelligence. For each, **investigate** online and identify a person who has a strength or weakness in this area.

Check your obook assess for these additional resources and more:

» Student book questions
Check your learning 15.1

» Suggested research
Worksheet: 15.1
Emotional Intelligence (EQ) and life skills

» Challenge
Worksheet: 15.1
Multiple Intelligences

» Weblink
Emotional intelligence

15.2 Measuring intelligence

KEY IDEAS

In this section, you will learn about:

- the intelligence quotient (IQ)
- psychometric tests of intelligence, including the Stanford–Binet scales and Wechsler intelligence scales.

Measuring intelligence is not straightforward. Psychologists use psychometric tests to quantify intellectual abilities and to compare an individual's level of cognitive abilities with others in a given population.

psychometric test a standardised measure of a selected aspect of an individual's behaviour, used to identify individual differences in psychological functioning among people

A **psychometric test** is a standardised measure of a selected aspect of an individual's behaviour. It is an instrument used to identify individual differences in psychological functioning among people. They perform several functions:

- They measure one selected aspect of an individual's psychological functioning.
- They provide a score to allow an individual to be compared with other people.
- They allow predictions to be made about an individual's future performance or behaviour.
- They are used by psychologists as part of an assessment process, either for a group of people or for individuals.

Psychometric tests generally fall into one of the categories listed in Table 1. They can either be group tests or individual tests.

Type of tests	What they measure
Intelligence tests	Intellectual ability of an individual
Aptitude tests	Specialised skills such as hand–eye coordination
Personality tests	Traits, qualities or behaviours that make up a person's individuality
Achievement tests	A person's learning, success or accomplishment in a subject or task, such as school achievement
Creativity tests	Original thinking and the person's capacity to problem-solve in novel situations
Motivational tests	Interest and drive of an individual
Diagnostic tests	Psychopathology (psychological disorders) and learning deficits
Interest inventories	A person's preference for certain activities or subjects to help in career guidance
Neuropsychological tests	Brain functioning and damage

TABLE 1 Psychometric test categories and what they measure

intelligence quotient (IQ) standardised score for an individual's intelligence as measured by specific intelligence test; IQ scores are based on how much an individual's test score deviates from the mean score for the standardisation group

There is a variety of individual tests for measuring intelligence available to psychologists. Intelligence tests are standardised measures of a person's general mental ability. These tests are designed to measure an individual's level of intelligence in comparison with other people in a population.

Intelligence quotient

Scores for intelligence tests are usually standardised so that the median score is 100, with 68 per cent of the population obtaining **intelligence quotient (IQ)** scores between 85 and 115, and 95 per cent of the population obtaining scores between 70 and 130. So if an individual has an IQ score of 115, it does not mean that this person answered 115 questions correctly. It means

percentile
a score that indicates the percentage of people who have obtained the same raw score as a particular examinee on a psychometric text

that the individual's scores were standardised to an IQ score that is 15 IQ points above the average score (100) for people of the same age, and that this score is at the 84th **percentile**.

IQ scores are based on deviations from the average score; that is, how far an individual's score on an intelligence test falls from the average intelligence score for the population. Average IQ is within one standard deviation (15 IQ points) from the mean IQ score (100 IQ points).

Figure 1 sets out the distribution of IQ scores for a population. Notice that 68 per cent of the population has an average IQ score (between 85 and 115). These scores are all within one standard deviation of the mean IQ score for the population.

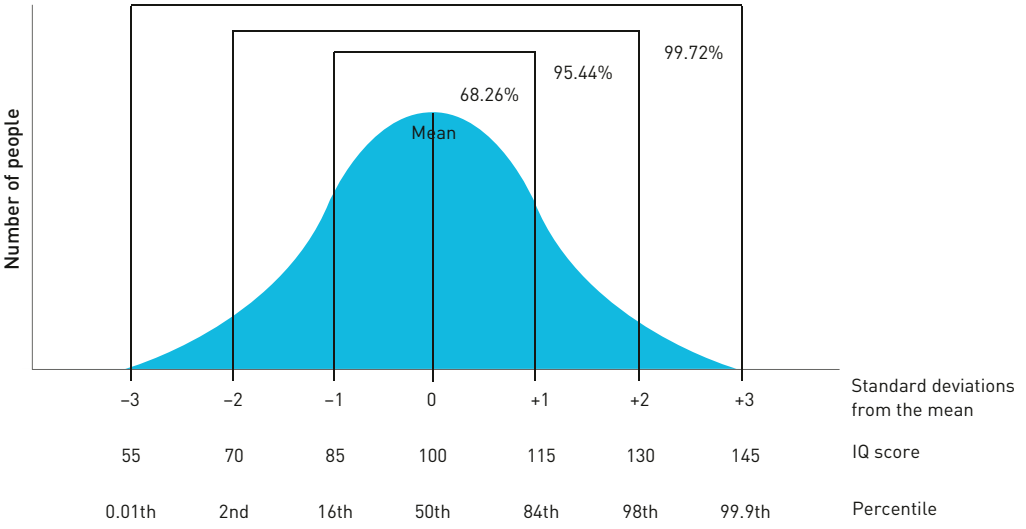


FIGURE 1 Distribution of IQ scores within the general population

IQ is so called because originally it was calculated as a division problem:

$$\left(\frac{\text{mental age}}{\text{chronological age}}\right) \times 100$$

The answer to a division problem is called a *quotient*, and although this method is no longer used, the term 'intelligence quotient' remains.

Two of the most commonly used intelligence tests are the Stanford–Binet intelligence scales and the Wechsler intelligence scales for adults (WAIS-IV) and children (WISC-IV). These tests are carefully designed and must be administered and scored by qualified psychologists.



FIGURE 2
Alfred Binet (1857–1911)

Stanford–Binet intelligence scales

The Stanford–Binet intelligence scales test was originally designed in 1905 by French psychologist Alfred Binet. It was later revised in 1916 by Lewis Terman, a professor of psychology at Stanford University. It has been revised several times since then, and the current version is the fifth edition.

This test is designed to assess individuals according to age. A psychologist who is testing a 10-year-old child will start by asking the test questions for 9-year-olds. If the child is able to answer these questions, the psychologist proceeds to the questions for 10-year-olds. If these are answered correctly, then the child is asked the questions for 11-year-olds and so on until the child reaches a set of age-related questions that he or she is unable to answer.

The psychologist then computes the intelligence quotient (IQ) score by comparing the child's scores with the **norms** for 10-year-olds set out in the tables provided by the test designers. The mean IQ for each age is 100. Children who answered questions intended for an older age group will generally score a higher-than-average IQ, whereas children who were unable to answer the relevant questions for their age group would score a lower-than-average IQ.

norms
standardised scores representing the conversion of test raw scores into scores that can be compared with the performance of the wider population

The most recent version of the Stanford–Binet scale (SB-V) provides a single IQ score and also provides scores for various aspects of intelligence:

- fluid reasoning
- knowledge
- qualitative processing
- visual–spatial processing
- working memory.

Wechsler's intelligence scales

Wechsler's intelligence scales were designed in 1939 by David Wechsler, chief psychologist at New York's Bellevue Hospital, and many new versions have since been developed. Like the Stanford–Binet intelligence scales, this test provides a general IQ score plus scores for four separate aspects of intelligence (see Table 2).

The Wechsler scales are broken into three separate tests according to age:

- Wechsler Adult Intelligence Scales (WAIS-IV) for 16+ years
- Wechsler Intelligence Scales for Children (WISC-IV) for 6–17 years
- Wechsler Preschool and Primary Scale of Intelligence (WPPSI-III) for 2.5–7 years.



FIGURE 3 A student takes a Wechsler Intelligence Scale for Children (WISC) test. There are age-appropriate Wechsler tests from 2-years-6-months to late adulthood.

The advantage of the Wechsler tests being broken into different aspects of intelligence is that it makes it possible for people to demonstrate their cognitive strengths and limitations. For example, a child whose first language isn't English might perform poorly on the verbal comprehension tasks but perform well on the other tasks. This might signal to the psychologist that the child does not necessarily have a low IQ, but has instead found the verbal comprehension tasks to be difficult because of the language in which they are written.

CHALLENGE 15.2

Binet and Wechsler

Briefly research the backgrounds of Alfred Binet and David Wechsler. Consider what aspects of their upbringings might have influenced their interest in, and approach to, the measurement of intelligence.

Aspect of intelligence	Tasks
Verbal Comprehension Index: ability to process verbal information, think and reason with words and previously learned information	• Describe how two words that represent common objects or concepts are similar • Name pictures or provide definitions for words • Answer a series of questions based on understanding of general principles and social situations
Perceptual Reasoning Index: ability to think in visual images, to reason without the use of words, and to interpret visual material	• Copy a set of printed 2D geometric patterns using red and white blocks within a time limit • Choose one picture from each of two or three rows of pictures presented, to form a group of pictures with a common characteristic • Complete the missing portion of a picture matrix by selecting one of five options
Working Memory Index: short-term memory and attention	• Repeat numbers verbatim as they were stated by the examiner, and then repeat a second series of numbers in reverse order as they were stated by the examiner • Listen to a sequence of numbers and letters presented orally and recall the letters in alphabetical order and the numbers in the correct sequence
Processing Speed Index: mental efficiency, including attention, concentration, short-term visual memory and the ability to perform simple, clerical-type tasks quickly	• Copy symbols that are paired with either geometric shapes or numbers using a key within a specified time limit • Scan a research group of symbols and indicate the presence or absence of a target symbol or symbols within a specified time limit

TABLE 2 Wechsler Intelligence Scales for Children, Fourth Edition (WISC-IV)

CHECK YOUR LEARNING 15.2

Describe and explain

1 **Define** *psychometric tests*.
2 **Describe** the different methods by which intelligence is measured.
3 **Define** *IQ* and explain how it is measured.
4 **Explain** the differences between the Stanford–Binet scales and the WISC-IV and the WAIS-IV.

Apply, analyse and interpret

5 **Determine** why it might be helpful for psychologists to use percentiles rather than IQ scores when reporting the results of a psychometric test.
6 Normal distribution curves are used in determining IQ Scores. **Consider** why this is the case.

Investigate, evaluate and communicate

7 Based on your understanding of the Wechsler intelligence tests, **evaluate** why it might be important to have separate intelligence tests designed for children and adults. Do you think that there should be a separate test for adolescents?
8 Find an intelligence test that is readily available online or in a magazine. It need not be an official test.
   a **Examine** the test for evidence of technical detail, such as validity, reliability, norms and standardised procedures.
   b Write a brief report to **evaluate** some consequences of using an intelligence test, such as the one you have found.

Check your obook assess for these additional resources and more:

» Student book questions
Check your learning 15.2

» Challenge
Worksheet: 15.2
Binet and Weschler

» Weblink
Intelligence tests

» Weblink
History of intelligence tests

15.3 Reliability and validity of intelligence tests

KEY IDEAS

In this section, you will learn about:

- issues in psychometric testing, including reliability and validity
- non-cognitive factors that influence performance on intelligence tests
- advantages and disadvantages of intelligence tests.

Psychometric tests of intelligence can be quick and inexpensive ways of obtaining information about the psychological functioning of one or many people. There are, however, some drawbacks with these tests that psychologists must always consider when using them for assessment, as they may influence an individual's performance on an intelligence test.

reliability the extent to which a measure could be expected to produce the same result with the same subject(s) under the same conditions on other occasions

validity the extent to which an instrument measures what it is supposed to measure

Issues in psychometric testing

Various factors can contribute to incorrect measurements of a person's true psychological functioning. These are shown in Figure 1.

It is very important that psychometric tests are designed and carried out in a way that ensures high quality and fair measurement. To do this, several areas must be dealt with:

- Properties of the tests must be checked for **reliability** (consistently accurate measurements) and **validity** (results accurately measure what was intended; see Chapter 1).

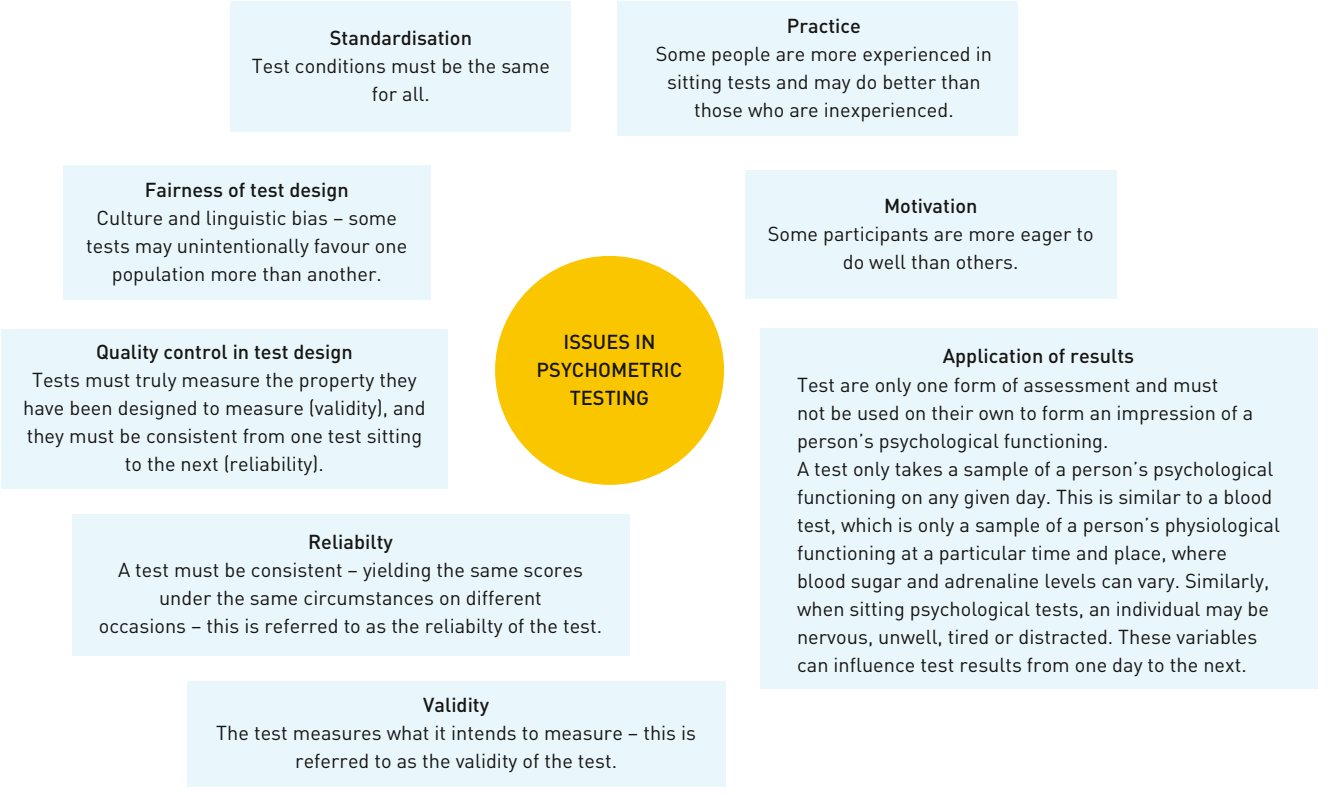


FIGURE 1 Issues in psychometric testing

- Conditions for examinees taking the tests must be standardised (same test conditions for all; see Chapter 1).
- Test scoring must include the use of test norms (comparing an individual's result with scores of a large group of people of the same age).

Global IQ score versus multiple intelligences

Even intelligence tests that are well designed are not perfect, although they are reasonably reliable and valid measures of academic potential. They are useful in clinical settings to identify specific learning strengths or weaknesses and, in some cases, to identify issues related to intellectual decline as a result of an illness or brain damage.

There is a trend away from using global IQ scores that are provided in intelligence tests because this is only one measure of 'general intellectual functioning'. An IQ score is computed to provide one's global or overall level of intelligence, with higher IQ scores assumed to equate to higher levels of intellectual functioning. However, this single score does not explain why an individual may have special skills or talents in different areas such as art or music, or why a child may have difficulty in specific cognitive areas.

Greater understanding about the intellectual functioning of individuals can be ascertained from scores for a range of cognitive abilities rather than from a single, overall IQ score. Performance on an individual intelligence test provides a useful starting point for understanding an individual's cognitive skills and needs, however, it needs to be combined with other sources of information on an individual's intellectual capability (Ortiz, Lella, & Canter, 2010). Modern theories, such as Gardner's theory of multiple intelligences, suggest that intelligence consists of many different abilities. This concept of multiple intelligences or cognitive abilities appears to better explain why some individuals excel on some tasks and struggle on others (Ortiz *et al.*, 2010).

IQ tests and school performance

IQ tests that are formally recognised and administered by qualified psychologists can make reasonably accurate predictions about an individual's potential for learning in school, including the ability to understand, remember, follow instructions, use language and solve problems. It must be emphasised, however, that an IQ score does not explain or predict actual school performance. It is possible for an individual with a high IQ score to perform poorly at school for various reasons; for example, sickness and absence from school, or an unsettled family or social life. It is important to remember that intelligence tests and IQs are measurements and scores, not explanations for how students actually perform at school.

Group versus individual tests

Tests of intelligence are available to psychologists for assessing large groups of people (group tests), or for assessing individuals on a one-to-one basis (individual tests).

In group tests, paper-and-pencil tests are given to a group of people at the same time. For example, the Differential Aptitude Test (DAT) is a test of school achievement that is often given to students in Year 10 for the purpose of course selection and vocational guidance.

Individual tests are administered by a psychologist in a one-on-one situation with a client. These tests may involve paper-and-pencil tests, oral (spoken) and aural (listening) tests, as well as manipulation of objects such as blocks and puzzle pieces.

Individual and group tests both have advantages and disadvantages, as summarised in Table 1.

	Advantages	Disadvantages
Group test	• Less time-consuming for the psychologist because many examinees can be assessed at one sitting • Usually quicker to mark	• Assessment is less personal and there are likely to be aspects of an examinee's ability that go undetected by the test • Tests are often computer-scored and individual errors may go unnoticed • Usually restricted to paper-and-pencil tests that do not enable as many aspects of mental ability to be measured
Individual test	• Psychologist works face-to-face with the examinee to secure detailed information • Not restricted to written tests: may involve verbal responses and tactile objects to test different aspects of intelligence	• Time-consuming • Expensive to administer to many people on an individual basis • IQ tests tend to 'classify' examinees rather than diagnose and identify specific issues

TABLE 1 Advantages and disadvantages of group and individual tests

Cultural and linguistic bias

A criticism of intelligence tests is that they are culturally and linguistically biased against examinees that do not come from a Western, middle-class, English-speaking background. For this reason, there are ethical concerns when intelligence tests are used to classify people according to intellectual ability. This is because the tests might record a lower IQ for the individual than what the 'true' IQ would be if the tests were in the individual's native language and culture. This **cultural bias** occurs when examinees may have a normal or higher intellectual ability, but perform poorly on an intelligence test because some of the questions are about things that are unfamiliar to their culture. Intelligence testing is mostly used in Western cultures and tests have been developed in Western settings.

cultural bias when an examinee may have a normal or higher intellectual ability, but performs poorly on an intelligence test because some of the questions are about things that are culturally unfamiliar

linguistic bias the words in a test are more familiar to examinees who speak one language than those who speak another

Imagine growing up using only chopsticks (or only a knife and fork) to eat meals, then having a test where you were expected to use a knife and fork (or chopsticks), with which you have no familiarity. It is highly likely that you will perform poorly on such a test because the eating utensils would be strange to you. The same applies when people from non-Western cultures sit intelligence tests that have been designed and developed in a Western context.

It is possible for people of cultural minorities to be scored as having a lower IQ than they really do have. These people might then be treated inappropriately by their education system or agencies. They might be placed into education programs for those who have been classified as being intellectually disabled when, in reality, they have normal intelligence but simply did not understand the questions on the test. Psychologists have been trained to ensure this does not happen.

Linguistic bias occurs when examinees score poorly on an intelligence test because their first language is different from the language used in the test. For example, the major intelligence tests in Australia are in the English language. Words and expressions used in these tests may be unfamiliar to an examinee of non-English-speaking background. This will be obvious where the examinee has limited use of English; however, it might be less evident in other instances, for example, English-speaking children whose parents are non-English-speaking.



FIGURE 2 Some intelligence tests can be culturally and linguistically biased against people from non-English-speaking backgrounds.

Consider the case of two children who have the same level of intellectual ability; one is native English-speaking, with native English-speaking parents. The second child was also born in Australia, but has parents who were born overseas and who speak very little English at home. It is likely that the second child might not have the same depth of vocabulary as the first child. Despite these children having the same intellectual ability, the first child is likely to score a higher IQ on most tests of intelligence than the second child, because the intelligence tests have several subtests that require familiarity with English.

To illustrate the way in which Western intelligence tests are biased against ethnic minorities, some mock intelligence tests that are biased in favour of minority groups have been developed. These tests are readily available online.

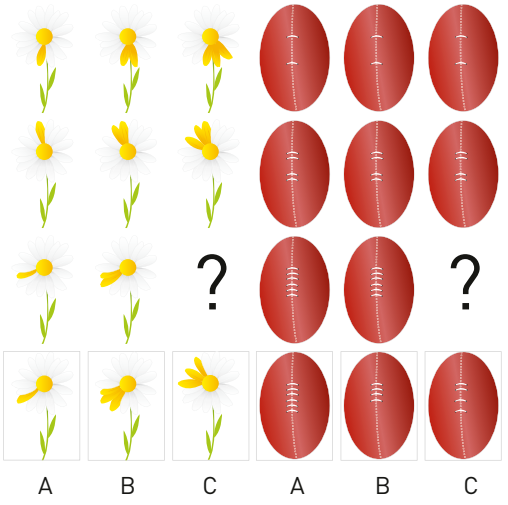


FIGURE 3 Psychologists have tried to overcome bias in tests by developing tests that do not rely on culture or language. Above, participants are asked to select the most appropriate symbol to replace the question mark.

Non-cognitive factors that influence intelligence tests

Performance on intelligence tests can be influenced by non-intellectual factors, which are things that might reduce or improve an individual's performance:

- **Physical impairment:** Sight or hearing disability might prevent examinees from performing to the best of their ability. Motor impairment might restrict an individual's ability to use a pencil or to manipulate blocks. Physical impairments must be taken into account by the psychologist because they have the potential to cause the examinee's true intellectual ability to be misrepresented by the scores obtained.
- **Test anxiety or shyness:** Some individuals may be shy with the examiner or very nervous about their performance on the test and this could hinder them from doing their best. In this instance, obtained scores would not be truly representative of their ability.
- **Test familiarity:** Some individuals might have sat the very same test within the previous two years. If the psychologist is aware of this, then an alternative test can be used. If not, the examinee might obtain a score that is higher than they might have otherwise achieved.



FIGURE 4 Physical impairments can influence performance on IQ tests.

Advantages and disadvantages of intelligence tests

There are advantages and disadvantages in using psychometric tests to attempt to establish the level of an individual's intellectual ability.

Advantages

- Intelligence tests provide a standardised IQ score.
- They are easy, quick and cheap to administer and score.

- If the tests have been properly constructed, they may be more objective and fairer than an interview or face-to-face assessment.
- They enable individuals to be compared against other people their age.
- They are helpful in making predictions about academic performance.
- They can be useful for selection purposes for people best suited to certain tasks, careers or particular intervention, such as those with intellectual disability or giftedness.

Disadvantages

- Intelligence tests are rarely perfect and may disadvantage individuals if they are used inappropriately.
- They must not be used unless there is evidence that they have strong reliability, validity, and standardised testing and scoring procedures.
- They do not take into account individual differences, such as nervousness, personality characteristics, experience in testing and motivation.
- Most intelligence tests tend to measure cognitive abilities and do not include other forms of intelligence, such as those suggested by Gardner and Sternberg.
- Intelligence tests tend to be culturally and linguistically biased.
- There is the potential for intelligence test results to be used to label people unfairly, either positively or negatively.

CHECK YOUR LEARNING 15.3

Describe and explain

1 **Explain** the importance of each of the following in relation to intelligence tests:
   - **a** test norms
   - **b** validity
   - **c** reliability

2 **Describe** the consequences of using a test that has:
   - **a** low reliability
   - **b** low validity
   - **c** not been administered using standardised procedures.

3 **Explain** what cultural bias in an intelligence test is.

Apply, analyse and interpret

4 **Consider** the influence that linguistic ability would have on the test results of children with the same level of intellectual ability.

Investigate, evaluate and communicate

5 Think about your year level at school. Your year level would know things that other year levels may not. **Create** an 'intelligence test' designed for your school. **Predict** if the test would be biased towards your year level. Would every student in the school have an equal chance of answering the questions correctly?

6 Based on the test you wrote for Question **5**, **comment** on what could be done to control the bias in your test.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 15.3
- » Video
  Valid and reliable psychological research
- » Weblink
  Culturally fair intelligence tests
- » Weblink
  Problems with intelligence tests

CHAPTER 15

Review

Summary

15.1
- Howard Gardner developed the theory of multiple intelligences. The theory suggests that people have many independent types of intelligence.
- The theory of multiple intelligences is criticised because more research is needed. Some researchers suggest that each 'intelligence' is not necessarily distinct, and there may be multiple names for one type of 'intelligence' in the theory.
- The information processing theory of intelligence focuses on understanding cognitive processes that influence intelligence.
- The information processing theory has three main components: speed of processing, knowledge base, and the ability to learn and apply mental strategies.
- The information processing theory has been criticised for being less focused than other theories, though it receives praise as it suggests that intelligence can be enhanced by the ways we perceive, understand and remember information.
- Emotional intelligence is the ability to perceive, use, understand, and manage emotions in oneself and in others.
- Emotional intelligence is criticised for being tested via self-reporting, and for being part of general intelligence and not an independent intelligence.

15.2
- A psychometric test of intelligence is a standardised measure of an operational definition of intelligence.
- Intelligence can be measured via the intelligence quotient (IQ). The intelligence quotient is a standardised score that is measured by specific tests that measure cognitive ability; the IQ score is based on how much an individual's test score deviates from the mean.
- Stanford-Binet intelligence scales (SB-V) are designed to assess people according to age. An individual's test score is compared with the norms of others in their age group.
- Wechsler intelligence scales are the WAIS-IV and the WISC-IV. The WAIS-IV is for adults, and the WISC-IV is designed for children aged between 6–17 years. The Weschler scales assess several areas of intelligence which can help with language barriers.

15.3
- There are issues with the way psychometric intelligence tests are conducted; these include standardisation, practice, motivation, application of results, fairness of test design, quality control, reliability and validity.
- A test is reliable when the same results can be expected with the same subjects under the same conditions on other occasions.
- An intelligence test is valid if it measures what it was designed to measure (i.e. intelligence and not familiarity with the English language).
- Intelligence testing can be susceptible to cultural and linguistic bias. Cultural bias is when a participant may have a normal or high intellectual ability but performs poorly on an intelligence test because some of the questions concern things they are not familiar with due to cultural differences.
- Some intelligence tests are based on Western society and culture, including the use of the English language. Linguistic bias occurs when the words in an intelligence test are more familiar to people who speak one language than those who speak another.

Key terms

- cultural bias
- emotional intelligence
- information-processing theory of intelligence
- intelligence quotient (IQ)
- linguistic bias
- norms
- percentile
- psychometric test
- reliability
- standard deviation
- standardised
- systems model of intelligence
- multiple intelligences theory
- triarchic theory of intelligence
- validity

Revision questions

Multiple choice

1 What is the name of the model that uses factor analysis to separate intelligence into a number of specific abilities?
- **a** the operations model
- **b** the systems model
- **c** the psychometric model
- **d** the multiple intelligences model

2 What is a criticism of the systems model of intelligence?
- **a** It is too broad and difficult to measure.
- **b** It is too narrow and excludes some forms of intelligence.
- **c** Some of the intelligences included overlap with each other.
- **d** both **a** and **c**

3 How does Gardner's theory of multiple intelligences differ from other approaches to intelligence?
- **a** It involves many different forms of intelligence, not just one.
- **b** Gardner believes that all forms of intelligence are related to different parts of the brain.
- **c** Gardner has developed suitable tests of all the different types of intelligence.
- **d** all of the above

4 What are the three components of Sternberg's triarchic theory of intelligence?
- **a** internal, external and experiential
- **b** practical, analytic and experiential
- **c** adaptive, analytic and creative
- **d** practical, analytic and creative

5 Gardner's model of intelligence suggests that the form of intelligence that is associated with academic work includes _____ and _____ intelligences.
- **a** linguistic; musical
- **b** spatial; musical
- **c** logical–mathematical; musical
- **d** logical–mathematical; linguistic

6 What do critics of the emotional intelligence model argue?
- **a** Emotional intelligence is simply an aspect of general intelligence and should not be separated from it as a unique form of intelligence.
- **b** It is difficult to develop tests of emotional intelligence.
- **c** Emotional intelligence tests that are available are self-report measures and may not be accurate for this reason.
- **d** all of the above

7 According to the information-processing model of intelligence, which of the following is *not* an aspect of how we process information?
- **a** knowledge base
- **b** the ability to learn and apply mental strategies
- **c** the unlimited capacity of working memory
- **d** speed of processing

8 On most intelligence tests today, a score of 120 would be:
   a above the mean score.
   b below the mean score.
   c the mean score.
   d none of the above.

9 What are IQ tests useful for?
   a measuring emotional intelligence
   b predicting academic performance
   c measuring multiple intelligences
   d all of the above

10 Which is a concern with IQ tests?
   a They are unable to predict academic potential.
   b They are not linguistically biased.
   c They are not culturally biased.
   d They have the potential to be used to label and classify people.

11 In intelligence testing, what is cultural bias?
   a the validity of a test
   b the reliability of a test
   c where the content of a test reflects the culture in which the test was developed
   d where the test contains questions about art

12 What are IQ scores based on?
   a the culture of a person sitting an intelligence test
   b how far a person's intelligence test raw score is from the mean score for the norm group
   c a fixed measure of intelligence
   d none of the above

13 Which of the following is a limitation of well-known measures of intelligence such as the Wechsler and Stanford–Binet tests?
   a They do not assess all types of intelligence.
   b They take into account different cultures.
   c They produce scores that cannot be compared between individuals.
   d They lack validity and reliability.

14 Which are criticisms of psychometric measures of intelligence?
   a They are too confusing for people.
   b They do not have reliability.
   c They do not have validity.
   d none of the above

15 When a person's performance is measured by working out the proportion of scores below that person's intelligence test score, the result is:
   a a reaction score.
   b an IQ score.
   c a derived IQ score.
   d both **a** and **b**.

16 What do the Wechsler intelligence scales measure?
   a nonverbal ability
   b verbal ability
   c neither verbal nor nonverbal ability
   d both **a** and **b**.

17 What does designing an intelligence test involve?
   a developing a theory of intelligence
   b designing a test based on that theory
   c devising a set of tasks that assess that theory
   d all of the above

18 IQ is typically computed to have a median (middle score) of _____, and a standard deviation (which measures dispersion of scores) of _____.
   a 15; 100
   b 100; 15
   c 100; 100
   d 15; 15

Short answer

Describe and explain

★ **19** **Explain** how an intelligence test is designed.

★★ **20** **Identify** and **describe** the four aspects of intelligence measure by the Wechsler intelligence scale.

★ **21** **Describe** two factors that can influence a person's individual performance on an intelligence test.

★★ **22** **Identify** two ethical considerations for any psychologist using an IQ test. **Describe** why these are important considerations.

★★ **23** **Identify** and **describe** three forms of intelligence from Gardner's multiple intelligences model

★★ **24** **Identify** and **describe** two aspects of Salovey and Mayer's model of emotional intelligence.

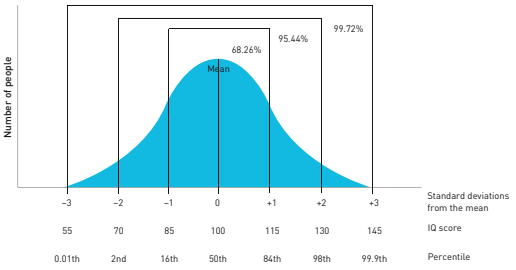
★ **25** **Explain** the intelligence quotient

Apply, analyse and interpret

★ **26** **Consider** why the speed of processing is vital to the Information Processing Theory of Intelligence.

★ **27** **Distinguish** between intelligence and the intelligence quotient (IQ).

★★ **28** **Interpret** the data shown in the graph below.



★★ **29** Intelligence tests are now designed to be culturally and linguistically fair. **Consider** a situation where this may lead to negative or confusing results.

Investigate, explain and communicate

★★★ **30** Answer the following questions relating to IQ:

- **a** **Identify** two examples where IQ tests can play an important role.
- **b** **Identify** two examples where IQ tests might be misused
- **c** **Justify** your answers to parts **a** and **b**.

★★★ **31** Answer the following questions regarding intelligence testing:

- **a** **Comment** on the considerations that a psychologist should make when deciding whether to administer a Wechsler IQ test to a child whose parents do not speak English
- **b** **Propose** what the psychologist needs to do in order to discover more about this child's level of intellectual functioning

★★ **32** **Evaluate** the following statements:

- **a** Intelligence is difficult to define.
- **b** Intelligence must be defined and measured very carefully because it is not known how it is formed.
- **c** In defining intelligence, it is essential to know whether it involves only cognitive abilities, or a combination of cognitive abilities and other skills.

★★★ **33** A limitation with Gardner's theory is that the multiple intelligences may not be separate intelligences, and are rather different names for the same thing.

- **a** **Design** a methodology to test two of the following:
  - linguistic
  - logical-mathematical
  - musical
  - spatial
  - bodily-kinaesthetic
  - naturalistic
  - interpersonal
  - intrapersonal
- **b** **Predict** the results of the methodology designed in part **a**. **Discuss** why these results are expected and how they would support Gardner's theory.

★★ **34** Emotional Intelligence is said to be a specific type of intelligence, and separate from Gardner's multiple intelligences. **Argue** support for Emotional Intelligence as a separate entity. In your response consider the facets of emotional intelligence and compare these with the multiple intelligences.

★★ **35** Since their creation, intelligence tests have been used negatively, including support for racism and barring people from certain types of employment. **Discuss** the importance of considering a person's whole being, rather than just their IQ.

Check your obook assess for these additional resources and more:

- » Student book questions
  Chapter 15 Review
- » Revision notes
  Revision notes for Chapter 15
- » assess quiz
  Test your understanding with an auto-correcting multiple-choice quiz
- » Flashcard glossary
  Key terms in Chapter 15

CHAPTER 16

Understanding the concepts of normality and mental illness

What is normality? How do we determine what thoughts, emotional responses and behaviours are normal or abnormal? Would you consider it normal if a friend told you that they were being pursued by aliens from Mars? How would you react if your Psychology teacher suddenly began screaming and running from the classroom for no apparent reason? What would you think if one of your friends came to school wearing bright blue 'budgie smugglers' (or 'togs' as we in the Sunshine State like to call them) during winter? Most of us would consider these behaviours quite odd and 'abnormal' or 'atypical'. However, it's not as simple as saying yes, this is normal (typical) or no, this is abnormal (atypical), because the notion of normality and abnormality does not have a finite value. Instead, it is viewed and measured along a continuum.

In this chapter, we will explore normality in terms of typical and atypical behaviours, and how some behaviours are adaptive while others are maladaptive. In addition, mental health, a state of emotional and social wellbeing, and mental disorder, characterised by extremes of normal thoughts, feelings and behaviours, will be discussed in terms of a continuum.

OBJECTIVES

- → Distinguish between adaptive and maladaptive behaviour
- → Summarise concepts of normality, including the sociocultural, functional, historical, situational, medical and statistical approaches
- → Distinguish between diagnostic manuals commonly used for diagnosis, including the *Diagnostic and Statistical Manual of Mental Disorders* (5th edition, 2013), and the *International Classification of Diseases* (10th revision, 2016)
- → Discuss the reliability and validity of diagnosis

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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FIGURE 1 In some cultures or social situations, having blue hair or tattoos is considered odd or abnormal.

SUGGESTED RESEARCH

SUGGESTED RESEARCH	**16.1** Distinguishing normal and abnormal behaviour (e.g. environments and behavioural contexts in Rosenhan, 1973)
SUGGESTED RESEARCH	**16.4** The classification and treatment of psychological disorders (e.g. discrepancies across cultures in Cooper, Kendall, Gurland, Sharpe, Copeland, & Simon, 1972)

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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* This chapter will provide information about mental health and mental disorders. This information is intended only as a guide and should not be used for diagnosis or treatment. You can seek support for anything discussed in this chapter by speaking with a family member, friend, teacher or trusted adult. Alternatively, the following organisations can offer support: Beyond Blue, SANE, Lifeline, Kids Help Line, the Black Dog Institute and Headspace. Links are available via your obook assess.

16.1 What is normal?

KEY IDEAS

In this section, you will learn about:

- normality versus abnormality
- approaches to normality, including the situational, sociocultural, historical, statistical functional and medical approaches.

normality
state of being normal, defined in terms of typical and atypical behaviours, and how some behaviours are adaptive and others are maladaptive.

normal behaviour
a behaviour that is accepted within society and is typical for the specific situation or context

Defining **normality** can be difficult, as a number of factors need to be considered before such a determination can be made. Typically a behaviour is considered to be **normal behaviour** when it helps a person to assimilate appropriately into their society or culture. In contrast, abnormal or atypical behaviour is viewed as 'out of the ordinary'. These behaviours go against societal and cultural expectations, may reflect some kind of impairment, or consist of unwelcome behaviours. Behaviours that are unhelpful and impair an individual's functioning are often referred to as 'maladaptive', while those behaviours that enable a person to operate in their community, attend school and relate with others are viewed as adaptive. So, what do you consider to be 'normal' behaviour? On what would you base your judgments?

CHALLENGE 16.1A

Act your age!

Have you ever been told to act your age? How does our expected behaviour change as we get older? What is the normal way to behave? What is normal?

In small groups, create a role-play to show how expected behaviour changes over the lifespan. You may want to consider showing emotions, appearance (clothing, make-up, hairstyles) or manners (table manners, addressing other people).

Consider if normal behaviour relates to age (use the role–play as an example to answer).

CHALLENGE 16.1B

Is this behaviour normal?

For each of the following situations, decide whether the person's behaviour is normal/typical or abnormal/atypical and give reasons for your answer.

1. Joe often urinates in the street.
2. Carla cries loudly during a school assembly.
3. Brendan's hair is so long that it reaches his buttocks.
4. Matina always covers up her face when she goes out.
5. Hilary wakes up screaming from horrible nightmares at least three times every week.
6. Mick often picks his nose in public.
7. Ella is so scared of school that she often sneaks back home instead of going.
8. Connor hears voices telling him what to do when he is outside in his garden.
9. Hamad will only eat his favourite types of food: yoghurt and white bread with margarine.
10. JinJing wears white gloves to work to avoid contamination from her environment.

SUGGESTED RESEARCH
16.1 Distinguishing normal and abnormal behaviour
Go to page 457 »

When you attempted Challenge 16.1B, did you create a list of factors that helped determine whether or not the behaviour was normal/typical? Look back at each statement. If all the people were 2 years old, would you consider their behaviours normal? Change their ages to 5 or 16 or 36 or 76 – would this alter your answer? In many cases, it probably would. Normality, which is characterised by typical behaviours, can be determined by evaluating a number of factors. These include the situation in which the behaviour occurs, the person's gender, their cultural, religious and educational background, their physical health, societal rules and influences, and their state of mental health.

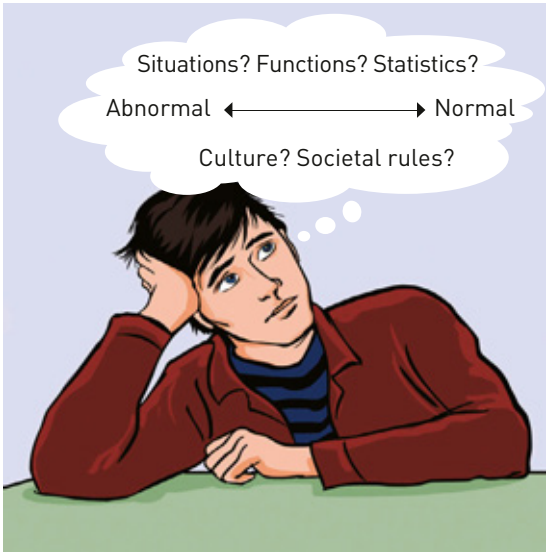


FIGURE 1 Deciding whether a behaviour is 'normal' or not is difficult – many factors need to be taken into consideration.

Approaches to normality

A behaviour is generally considered to be 'normal' when it is one that is typical for the specific situation or context, and accepted within the society and culture. A behaviour should also allow a person to function independently on a day-to-day basis, as expected for their age. A behaviour should not be personally distressing or self-defeating.

Situational approach to normality

situational approach to normality determines what is or isn't normal by using situational cues

How we behave in specific situations can classify our behaviour as being normal or not. For instance, would it be normal for you to suddenly stand up during school assembly and call out to another student on the other side of the hall? Probably not. On the other hand, calling out could be viewed as normal behaviour if you were playing soccer on the school oval at lunchtime and wanted to kick the ball to that student.

In what situations is it appropriate to laugh? Most likely, it is normal to laugh when a friend is telling a joke, but not when someone is delivering a eulogy at a funeral.

As we get older, we are expected to recognise the context or situation we are in and to behave appropriately. Situational determinants are also tied up with cultural expectations.



FIGURE 2 Is this behaviour normal for this situation?

Sociocultural approach to normality

sociocultural approach to normality suggests what is normal behaviour based on cultural and societal cues

Within a society, there are norms and rules that govern our social behaviour. These are known as the **sociocultural approach to normality** and can be linked to our ethnic and cultural background. The way we interact with others, the way we dress, what we eat and the way we talk can all be based on societal rules and expectations.

Australia is a multicultural society. Parents from different ethnic backgrounds often have different expectations of their children. It is likely that within your class, different students are expected to behave at home in different ways based on cultural or religious influences.

Have you had your ears pierced? If so, when was this done? In Chile, a baby girl usually has her ears pierced before leaving hospital after birth. Other societies and cultures may shun the thought of ear piercing completely. Body piercing and tattoos may be seen as normal in some societies and risky behaviours or taboo in others.

historical approach to normality suggests what normal behaviour is based on cues in different periods in time

Eye contact is another example of cultural differences in behaviour. In some cultures, such as Japan, it is considered rude and offensive for a child to look an adult in the eyes. In Australian mainstream society, a lack of eye contact may be interpreted as showing shyness, disrespect or even deceit.

In some countries it is more acceptable to express emotions than in others. Is it more acceptable in our society for younger or older children to cry? What about males and females? How has this changed over the years?

statistical approach to normality identifies normal behaviours by the frequency of this behaviour within the specified population

Historical approach to normality

The concept of normality is embedded in history and changes over time. For example, at what age do you plan to leave home? Is this different from the age your parents, grandparents and teachers first left home? This is the **historical approach to normality**.



FIGURE 3 Fashion changes over time. What will be considered normal dress in 20 years' time?

What about fashion? What were your teachers wearing when they were your age? What about your parents and grandparents? Even the way we speak and the language we use changes over time. Try speaking an older style of English, such as that used in a Shakespearean play, and you will probably get odd looks.

Statistical approach to normality

How long did you sleep for last night? What mark did you get for your psychology test?

Normality can also be defined in terms of the frequency with which a behaviour or characteristic occurs within the population. A set of data is collected, and measures of central tendency (mean, mode and median) and range are calculated to determine the average behaviour or characteristic. Data that lies outside the normal range for the

population could be considered abnormal. For example, an extremely tall girl whose family is quite short may not be considered normal, but a tall girl who comes from a tall family is considered normal for that population (her family).

The **statistical approach to normality** also relates to the developmental norms. For instance, if an infant does not learn to crawl within the expected timeframe, then further investigation may be needed just in case something is wrong.

Functional approach to normality

Psychological dysfunction occurs when there is a breakdown in the way a person thinks, feels and behaves. A person who can think, feel and behave in a manner that allows them to carry out the activities they wish to do and be a productive member of society is considered normal. The **functional approach to normality** suggests a person can function relatively independently at a level expected for their age.

Most of us will have experienced a time where we have not functioned well. For example, avoiding a party because you don't know anyone there. It is when these thoughts, feelings and behaviours become intense and interfere with typical, everyday activities that a mental illness or disorder may exist.

Medical approach to normality

The **medical approach to normality** views a mental disorder in terms of a physical illness with a possible biological basis. The person's state of mental health is determined by a set of symptoms that may have genetic, biochemical or physical origins. For example: a person suffering from a **mood disorder**, such as depression, may need anti-depressant medication such as a serotonin re-uptake inhibitor to help balance the chemical imbalance in the brain and relieve the person's symptoms of persistent sadness. If a parent has a mental disorder, then heredity may play a role and increase that person's chance of developing a mental disorder in the future.

psychological dysfunction
a breakdown in the way a person thinks, feels and behaves

functional approach to normality
suggests that behaviour is considered normal if the individual is able to lead a functional life

medical approach to normality
diagnosing someone with a mental illness, in the same way a person may be diagnosed with a physical illness; if a mental illness is diagnosed

mood disorder
a mood that is severe or persistent and disrupts a person's life or daily functioning

CHECK YOUR LEARNING 16.1

Describe and explain

1 **Define** normal/typical behaviour and **provide** an example to illustrate your understanding.
2 **Describe** abnormal/atypical behaviour and provide an example to illustrate your understanding.
3 **Summarise** the following approaches to normality:
   - **a** situational
   - **b** sociocultural
   - **c** historical
   - **d** statistical
   - **e** functional
   - **f** medical

Apply, analyse and interpret

4 **Differentiate** between the sociocultural and situational approaches to normality.
5 **Compare** the cultural and historical approaches of normality.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 16.1
- » Suggested research
  Worksheet: 16.1 Distinguishing normal and abnormal behaviour
- » Challenge
  Worksheet: 16.1A Act your age!
- » Challenge
  Worksheet: 16.1B Is this behaviour normal?

16.2 Adaptive and maladaptive behaviours

KEY IDEAS

In this section, you will learn about:

+ adaptive behaviours and maladaptive behaviours
+ early childhood and environmental influences.

Did you get up this morning, go to the bathroom, and maybe have a shower then go and grab a quick bowl of cereal for breakfast? Did you get a lift into school or did you catch public transport? If you said yes to most of these, then you are showing 'adaptive behaviours'.

adaptive behaviour behaviour or skill developed as we age (and gain experience) to assist in our ability to relate to others, become independent and function on a daily basis

Adaptive behaviours are age-appropriate 'everyday living skills' that can be as basic as walking, talking, dressing on our own, attending school or cooking up a huge bowl of popcorn. Essentially, these are skills that develop through experience, help us to adjust to our environment, assist in our ability to relate to others and allow us to become independent adults who can function effectively within our society and culture. The ability to developmentally cope and adapt is influenced by many factors.



FIGURE 1 A positive family environment can help a young person to develop adaptive behaviours as they feel safe and loved at home.

Factors that influence the development of adaptive behaviours:

- **Personality predisposition:** According to Geldard and Geldard (2009), coping has little to do with the nature of the specific problem, childhood history or environment. The ability to cope and maintain resilience is largely influenced by personality and temperament.
- **Resilience:** The ability to bounce back from difficult situations or life's problems can be learned from parental modelling, teachers and/or peers.
- **Secure attachment:** The relationship with the caregiver is positive, and the child is consistently nurtured and cared for. This develops trust, which can be transferred to others as the person develops and grows.
- **Parental interest in education:** This helps the young person develop their sense of belonging within the family structure and school, and enables them to develop positive self-worth.
- **Happy and secure home environment:** Provides a sense of security, regardless of whether parents live together or apart.
- **Financial security.**

maladaptive behaviour behaviour developed in early childhood as a means of reducing anxiety that interfere with a person's ability to function on a daily basis (such as tantrums, self-harm, screaming, aggressive or disruptive behaviour)

In contrast, **maladaptive behaviours** develop as a means of reducing anxiety and originate from early childhood experiences, family situations and environmental stressors. In a way, they

can be viewed as a **coping mechanism**. Unfortunately, these behaviours generally interfere with a person's ability to function on a day-to-day basis and impair their adjustment to different situations. These behaviours are sometimes evident when children begin school and can include rocking, repetitive movements or repeating words and phrases, ritualistic behaviours, self-harm, tantrums, screaming, violent or aggressive behaviour, lack of cooperation, verbally inappropriate behaviour, calling out in class or being disruptive. Although, developmentally, most children display unwanted and often annoying behaviours, it is those who do not seem to improve or learn to adjust to their environment who are at greater risk.

coping mechanism functional or dysfunctional strategies to reduce anxiety or stress

In addition, stressful and difficult early childhood experiences can affect learning and brain development. The family and home environment in which you live can also influence your behavioural response.



FIGURE 2 Maladaptive behaviours, such as tantrums, develop as a coping mechanism; however, they typically interfere with a person's ability to function in their day-to-day life.

Early childhood experiences

Factors that influence whether a child will develop adaptive or maladaptive behaviours include the following early childhood experiences:

- Avoidant or ambivalent attachment as an infant: When a baby is born, most of its contact is with its mother or main caregiver. If the baby does not receive consistent nurturing, the child may develop trust issues, which can be carried through to adulthood.
- Unhelpful parenting: Parent/guardian/carer uses an inconsistent and harsh parenting style.
- Parents that prioritise their own needs over those of their children.
- Parents who model maladaptive behaviours such as drinking excessively or taking drugs.
- Parents who show little interest in their children's educational needs.
- Parents who encourage 'risk-taking' behaviours. YouTube videos often show parents setting up amusing situations involving their children, showing little interest in whether or not their child gets hurt.
- Marital conflict can also influence the development of maladaptive behaviours whether parents live together or not. An environment that is filled with anger and discord makes young people feel insecure and vulnerable. Children will often hide during events, fearful that they might be on the receiving end. This increases their levels of anxiety, meaning that stress hormones are circulating through their system (fight-flight-freeze response).
- Violence, abuse and neglect: Children can develop post-traumatic stress disorder, anxiety and depression.
- Genetics: Some people can have a predisposition to psychological and behavioural disorders such as depression, psychosis, ADHD, conduct disorders, learning disabilities or substance abuse.



FIGURE 3 Violence, abuse and neglect have a negative impact on young people. Maladaptive behaviours, such as avoidance, usually develop as a coping mechanism.

- Personality predisposition: Personality can influence how children deal with stressors. Some personalities are more resilient and positive than others.
- Trauma, grief and loss: Illness, death in the family, rejection and abandonment can lead to various maladaptive behaviours.

Environmental stressors

Whether or not a child will develop adaptive or maladaptive behaviours is also influenced by the following environmental stressors:

- poverty and unemployment
- natural disasters.

Consider what it would be like living in a country that was prone to earthquakes or avalanches. A person could become quite withdrawn and avoid situations due to their high level of anxiety and fear.

Maladaptive behaviours often develop in response to highly stressful situations and are accompanied with physiological arousal or the stress response. When an individual wants to alleviate their anxiety, they try to avoid the situation. This is often more difficult as a small child but, as the person matures, this avoidant behaviour, which is fundamentally aimed at reducing the physiological experience of anxiety, can be redirected to alcohol, drugs, self-harm and isolation. Often, these behaviours are difficult to shift as young people sometimes don't like to seek help and may find it difficult to trust.

Maladaptive behaviours are potentially harmful to the person's emotional and physical wellbeing as well as to their friends and family. Without treatment, there are negative long-term effects on their mental health, which consequently have an impact on future employment and relationships. Ultimately, the presence of maladaptive behaviours is linked to some form of mental illness or disorder.

CHECK YOUR LEARNING 16.2

Describe and explain

1 **Describe** adaptive behaviours.
2 Using an example, **explain** what maladaptive behaviour is.
3 **Identify** and **describe** two adaptive and two maladaptive behaviours.

Apply, analyse and interpret

4 **Differentiate** between adaptive and maladaptive behaviours.
5 **Contrast** maladaptive and adaptive behaviours.

Investigate, evaluate and communicate

6 **Investigate** one type of adaptive behaviour. **Evaluate** why it is adaptive and how it benefits an individual as they mature.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 16.2
- » Weblink
  Adaptive and maladaptive behaviour
- » Weblink
  How behaviours can change
- » Weblink
  Adaptive coping behaviours

16.3 Mental health and diagnosis of mental illness

KEY IDEAS

In this section, you will learn about:

- mental health and mental disorders
- psychosis and neurosis
- mental health on a continuum.

mental health
a state of emotional and social wellbeing in which individuals can cope with the normal stress of life, work productively and contribute to their community

mental health problems
emotional, cognitive and behavioural difficulties that affect relationships and functioning in everyday life

mental disorder
exaggerated forms of thoughts, feelings and behaviours, implying the existence of a clinically recognisable set of symptoms and behaviours that usually need treatment to be alleviated; can interfere with a person's thoughts, emotions, perceptions and behaviours

The World Health Organization (WHO, 1992) describes **mental health** as a state of emotional and social wellbeing in which individuals can realise their own abilities, cope with the normal stresses of life, work productively and contribute to their community.

There are degrees of mental health – it is not just a 'Yes, I am mentally healthy' or 'No, I am not' phenomenon. There are times in our lives when we can be more mentally healthy than at others. For instance, we may experience **mental health problems** when we have extra stress. Our family situation may change or we may move schools, break up with a girlfriend or boyfriend, lose money, worry about upcoming examinations, grieve after the death of a loved one and so on. Adjusting to these situations may lead to mental health problems. They can cause emotional, cognitive and behavioural difficulties that affect relationships and functioning in everyday life.

A **mental disorder** is one that affects one or more functions of the mind and can interfere with a person's thoughts, emotions, perceptions and behaviours. A mental disorder implies the existence of a clinically recognisable set of symptoms and behaviours that usually need treatment to be alleviated (WHO, 1992). A mental disorder is therefore more severe and ongoing than a mental health problem. It involves a serious departure from normal functions, and can cause considerable distress and suffering for the person and their close friends and family.



FIGURE 1 You may experience mental health problems when you face very stressful periods in your life.

The management of mental disorders may include medication and psychotherapy from a psychiatrist and/or psychologist. They are more successfully treated when the person has protective factors such as family, friends and community support. The presence of risk factors such as social isolation, lack of family or friendships, unemployment, poverty and homelessness can hinder treatment and may affect the long-term management of the person's mental disorder.

Psychosis and neurosis

Mental illnesses can be broadly divided into two categories, psychosis and neurosis, although it is not always easy to distinguish between the two.

psychosis
a mental illness where there is some loss of contact with reality

hallucinations
false perceptions in the absence of sensory input

neurosis
non-psychotic illnesses where, although a sense of reality remains, there are difficulties with thoughts, feelings and behaviours, and the person experiences suffering and dysfunctional behaviour

Psychosis refers to situations when there is some loss of contact with reality. Mental disorders such as schizophrenia have episodes of psychosis. The person may experience **hallucinations** or lose the distinction between reality and an imaginary world.

Neurosis refers to non-psychotic illnesses such as anxiety, depression and personality disorders. There are difficulties with thoughts, feelings and behaviours. Someone with a neurotic disorder may say something like: 'I know I am being irrational, but I just can't help it …', but they are still in touch with reality.

Mental health continuum

Determining where a person may lie along the mental health continuum is often based on a range of symptoms. A person who is healthy will be demonstrating fairly normal or typical behaviours. A behaviour that is seen as 'reacting' is one where the person is showing common signs of distress; these are considered reversible or easily managed. When a person is considered 'injured', they are showing significant difficulty in functioning on a day-to-day basis.



FIGURE 2 Adolescence is a vulnerable time, making people more susceptible to psychological problems.

Those who have a mental disorder are people with a clinical diagnosis such as clinical depression, an anxiety disorder or possibly a psychotic disorder (discussed further in Chapter 17). Their symptoms are severe, persistent and considerably impair their functioning.

So, how do you know if you have a mental disorder? This can sometimes be tricky as many young people don't want to talk about how they feel. Sometimes, a parent or friend will notice changes in the person's behaviour, emotional responses and/or even their appearance. Alternatively, the person may realise that they are not handling things as they used to and are experiencing psychological distress. If you cannot function as you usually do, find that you avoid friends, have lost your appetite or feel anxious all the time, then the best thing to do is speak to a family member or someone you trust.

When a person is experiencing the type of symptoms that impair day-to-day functioning, then generally the first person they may see is their family doctor. Although a mental health diagnosis may take some time, the doctor will ask about the symptoms and general health and may even conduct a physical examination to make sure that the person is not suffering from a physical illness. If the symptoms are not due to a physical illness, then the doctor may refer the patient to a registered psychologist who is trained in the diagnosis and treatment of mental disorders.

One of the roles of a psychologist is to diagnose mental illness. A classification system is used to identify symptoms and make a diagnosis. Naming a mental disorder allows better communication between psychologists, psychiatrists, other health-care workers and educators, and also helps to clarify and define variables in research in the area. A correct diagnosis is extremely important as it can assist with the course of treatment and control of the disorder and symptoms.

CHECK YOUR LEARNING 16.3

Describe and explain

1 **Explain** what is meant by mental health.
2 **Explain** the mental health continuum model.
3 Using an example, **summarise** how mental health differs from mental disorder.
4 **Summarise** why it is important to view mental health as a continuum.

Apply, analyse and interpret

5 Kevin is often angry and suffers from anxiety. Recently, he has had continuous sad thoughts that he is unable to get rid of. Kevin is finding that these are affecting his work, and he is unable to concentrate or make decisions. Kevin has also recently been tired all the time, but struggles to sleep well.
   a **Apply** the mental health continuum to Kevin, and suggest where he may be.
   b Based on your understanding of mental health, **determine** if you think Kevin would be classified as having 'normal/typical' behaviour, of if he may be displaying 'abnormal/atypical' behaviour'.

Investigate, evaluate and interpret

6 **Comment** on the following statement: 'The mental health continuum is the best approach to psychological health'. In your judgment, **consider** the strengths and weaknesses of viewing mental health as a continuum.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 16.3
- » Video
  Understanding mental illness
- » Weblink
  The mental health continuum
- » Weblink
  Headspace

16.4 Diagnosing mental illness

KEY IDEA

In this section, you will learn about:

+ how mental health is diagnosed (e.g. DSM-5 and ICD-11).

The two main systems of classifying and diagnosing mental health disorders are the *Diagnostic and Statistical Manual of Mental Disorders* and the *International Classification of Diseases*.

Diagnostic and Statistical Manual of Mental Disorders

The *Diagnostic and Statistical Manual of Mental Disorders* (DSM), published by the American Psychiatric Association, is a handbook that is used to identify and classify symptoms of mental disorders. Diagnosis is based on a number of factors, including the person's medical condition, psychosocial stressors and the extent to which the person's mental state is interfering with everyday life.

The DSM is *descriptive* – it does not specify the *causes* of the mental disorder nor does it direct the *treatment*. It is a critical guide for clinicians. Diagnosing the mental disorder often provides the first step for clinicians to then decide on the best possible ways to support and facilitate treatment.

There have been a series of revisions made to the DSM since it was first published in 1952. The DSM – currently in its fifth edition, **DSM-5** – is the most widely used classification system in Australia and was released in 2013. Changes include the following: developmental focus, new diagnostic criteria, recognition of dimensional aspects of disorders and International Classification of Diseases codes.

DSM-5 the *Diagnostic and Statistical Manual of Mental Disorders*, 5th Edition, published by the American Psychiatric Association in May 2013; formerly known as DSM-V

The International Classification of Diseases

The *International Classification of Diseases* (ICD) is produced by the World Health Organization (WHO). Like the DSM, it is descriptive and largely based on the symptoms reported by the patient and criteria ranked as important by professionals. It does not consider causes or possible treatment.

It has undergone many revisions, and the *11th Revision of the International Classification of Diseases* (ICD-11) was published in June 2018.



FIGURE 1 One of the roles of a psychologist is to diagnose mental illness.

The ICD has become the international tool for diagnosing most health problems, including both physical and mental illness. It therefore covers a wider range of illnesses than the DSM, which is more commonly used to diagnose mental health conditions. Interestingly, mental disorders were not included in the ICD until its sixth revision in 1952 – the same year that the first edition of the DSM (DSM-I) was published. The number of disorders has increased as each revision has been published (see Table 1).

SUGGESTED RESEARCH
16.4 The classification and treatment of physiological disorders
Go to page 457 »

There is extensive overlap between the ICD and DSM, with many, but not all, mental disorders having virtually identical criteria. There are, however, many categories used in the DSM that are grouped into a single category in the ICD. For instance, neurotic, stress-related and somatoform disorders appear under one category in the ICD, while the DSM divides these into four different categories (anxiety disorders, somatoform disorders, dissociation disorders and adjustment disorders).

More than 200 countries are involved in the construction of the ICD, so it is less dynamic and less responsive to new ways of thinking about mental health issues than the DSM.

Publication	Year	Number of identified disorders
DSM-I	1952	106
DSM-II	1968	182
DSM-III	1980	265
DSM-IIIR	1987	292
DSM-IV	1994	365
DSM-IV-TR	2000	365
DSM-5	2013	Approx. 365

TABLE 1 Number of disorders in different DSM revisions

Use of DSM

The previous edition of the DSM, DSM-IV-TR system of 5-axis diagnosis, was an attempt to standardise diagnoses. It was considered to be too restrictive and the DSM-5 has now increased the importance of dimensional descriptions of disorders.

A person will often have diagnoses on both Axis I and Axis II. Consider, for example, the DSM multiaxial evaluation of 'Julia', age 38:

- Axis I: major depressive disorder
- Axis II: dependent personality disorder
- Axis III: type 1 (insulin-dependent) diabetes
- Axis IV: psychosocial stressors include husband being made redundant, teenage son facing Children's Court for vandalism
- Axis V: current GAF (Global Assessment of Functioning score) is 55

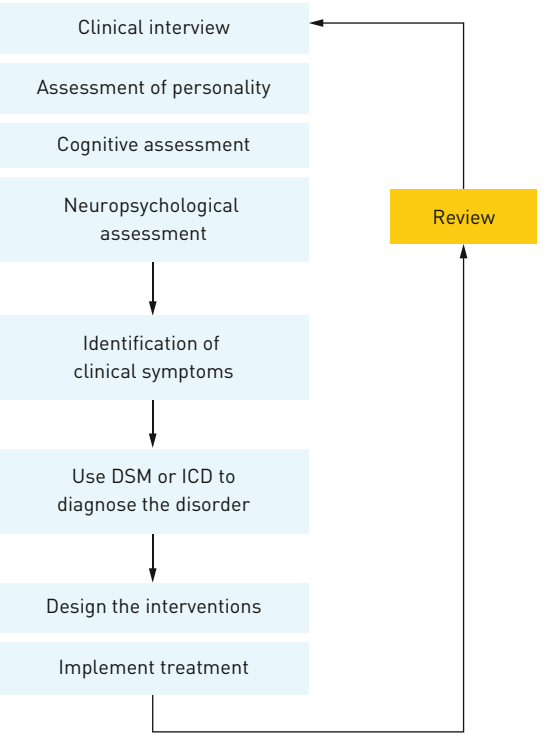


FIGURE 2 The steps in intervention when a person presents to a psychologist with a mental health problem, showing the role of the DSM or ICD in this process

Importance of the diagnostic system

Case study 16.4 describes a famous study published by Rosenhan in 1973. If a proper diagnostic system such as DSM or ICD had been used in the early 1970s, Rosenhan's study may have had completely different results.

Note that because none of the fake 'patients' received any form of treatment, there was really no need to label them with a diagnosis at all – they should more appropriately have been taken in for observation.

Rosenhan's studies highlighted the issues surrounding diagnosis. Misdiagnosis raises issues surrounding the justification of treatments. It also indicates the importance of recognising that a person may have completely recovered from a mental illness.

It must be noted that the assessment criteria for a mental illness and admission to hospital are now more rigorous, and many believe that the results from the Rosenhan study would be less likely today. However, the release of the DSM-5, even after 14 years in the making, has caused controversy, including some questions around its reliability.

Axis I: Clinical disorders: any major psychological disorder	
Disorder	**Example**
Disorders usually first evident in infancy, childhood or adolescence	ADHD Stuttering
Substance-related disorders	Substance (alcohol/drug) abuse
Schizophrenia	Paranoid schizophrenia
Mood disorders	Major depressive disorder Bipolar disorder
Anxiety disorders	Simple phobias Generalised anxiety disorder
Axis II: Intellectual disability and personality disorders	
1 Intellectual disability intellectually well-below average (lowest 5 per cent of population) 2 Personality disorders	
Disorder	**Example**
Paranoid personality disorder	Suspicious of others Constantly perceiving other people as threatening
Antisocial personality disorder	Lacking affection for others Hurt others without remorse
Borderline personality disorder	Lack of sense of identity Mood swings Manipulation of others Impulsive behaviours
Obsessive-compulsive personality disorder	Preoccupation with order/cleanliness/routines
Axis III: General medical conditions	
Disorder	**Example**
Any physical disorder	Diabetes, cancer, hypertension (high blood pressure), heart disease
Axis IV: Psychosocial and environmental problems	
Problems	**Example**
The psychologist makes references to social and environmental stressors experienced by the person over the past year.	Isolation Family break-up Unemployment
Axis V: Global assessment of functioning (GAF; a 'score' assigned by psychologist)	
Sample score	**Symptoms**
90	Minimal symptoms, good functioning in all areas
70	Some mild symptoms or some difficulty in social, occupational or school functioning but generally functioning quite well
40	Some impairment in reality testing or communication or major impairment in family relations, judgment, thinking or mood
20	Some danger of hurting self or others, occasional failure to maintain minimal personal hygiene or gross impairment in communication

TABLE 2 Axes used in identifying presenting issues in the DSM-5

CASE STUDY 16.4

Rosenhan's study (1973)

A study that shocked many who work with the mentally ill was published by Rosenhan (1973). In the study, eight psychologically 'normal' people visited different psychiatric hospitals in the United States complaining that they had heard voices saying 'empty', 'hollow' and 'thud'.

All eight were admitted to the psychiatric hospitals, with seven of them being diagnosed with schizophrenia, and the other with manic depression (now called bipolar disorder). Once admitted, they stopped complaining of hearing voices. On average, they stayed for 19 days (ranging between 7 and 52 days) and were discharged with a note on their file saying: 'schizophrenia [or bipolar disorder] in remission'. This meant that they were still legally listed as having the disorder. Not one person was told that they no longer suffered from a mental illness. Interestingly, some of the other patients at the hospitals suspected that Rosenhan's people were 'fakes'.

This is of great concern for lots of reasons. For example, if these people were applying for a job, or for life insurance, they must declare that they have the disorder even though it is 'in remission'. They should have been discharged with the notation 'misdiagnosis'.

These results caused a stir and led to an additional study. Rosenhan told a hospital that he was going to send in a number of 'fake' patients in a certain three-month period. At the end of this three months, staff at this hospital reported that of the 193 patients that had been admitted, 41 were suspected of being 'fakes' by at least one staff member. In actual fact, Rosenhan did not send any 'fakes' – all were genuine patients.

CHECK YOUR LEARNING 16.4

Describe and explain

1 **Identify** the two main systems for classifying mental disorders. **Describe** each system.
2 **Explain** the importance of health professionals being able to label and **identify** different disorders.
3 **Summarise** the World Health Organization's description of mental health.

Apply, analyse and interpret

4 **Compare** the DSM-5 and the ICD-10.
5 **Differentiate** between the different axes of the DSM-5.

Investigate, evaluate and communicate

6 **Evaluate** the impact that Rosenhan's experiment has had on the diagnosis and classification of mental health.
7 **Assess** the ethics of the Rosenhan study.
8 **Investigate** the initiatives that the World Health Organization has developed to support mental health around the world. **Discuss** how this benefits society and those with mental illnesses.
9 In Rosenham's second experiment, **propose** why the staff were so ready to diagnose the 'fakes'.

Check your obook assess for these additional resources and more:

» Student book questions
Check your learning 16.4

» Suggested research
Worksheet: 16.4
The classification and treatment of physiological disorders

» Weblink
Diagnosis

» Weblink
Diagnostic systems

16.5 Critique of the diagnostic classification systems

KEY IDEA

In this section, you will learn about:

+ criticisms of the DSM-5 and ICD-10 classification systems.

The DSM and ICD represent the most widely used classification systems for clinical diagnosis of mental disorders. Psychologists and psychiatrists are expected to use the latest DSM to diagnose their client's mental disorders. However, these classification systems are not without their critics. Psychologists need to be aware of both the advantages and limitations of the DSM so they can responsibly use it in their professional practice to facilitate more reliable diagnoses of mental disorders.

DSM codes are the same as the codes in the ICD, although the ICD does not include diagnostic criteria and other diagnostic features, including prevalence or risk factors. This restricts the use of the ICD as a substitute for the DSM (Thomason, 2014). Proponents of the DSM argue that a clinician needs to understand psychopathology and how to diagnose mental disorders before going directly to the ICD codes for a diagnosis.

According to Thomason, the DSM is criticised for a number of reasons:

- The diagnosis of mental disorders is too subjective. The DSM is used to diagnose mental disorders based on symptoms, not causes. Therefore, how do we know mental disorders really exist? This is linked to the notion that the diagnosis of mental disorders is not scientific enough; that is, because little is known about what causes a mental disorder, how do we know how to treat it?
- The DSM pathologises too many people, making it very easy to diagnose normal people, and efforts are needed to minimise any stigma attached to a diagnosis. Alternatively, some people can feel better when their condition is diagnosed, as it provides a way forward in terms of treatment. Further, the DSM is based on the medical model and assumes that mental disorders are medical disorders. Critics argue that psychologists should not use a manual designed mainly for 'medicalising' problems in living.
- It is difficult to establish the validity of mental disorders. The authors of the DSM (American Psychiatric Association, 2013) recognise that because the cause of most mental disorders is not known, 'a complete description of the underlying pathological processes is not possible for most mental disorders' (p. xii). The manual further recognises that there are fluid boundaries between many disorder 'categories'.

Criticisms have also been levelled against the DSM for not recognising the important influence of culture on people's behaviour and what is considered 'normal'. Failing to clearly distinguish between different categories of mental disorders is another shortcoming of the DSM. Further, the DSM has been criticised for allowing the pharmaceutical industry to influence psychiatrists to consider adding new disorders that require new medical treatments (Thomason, 2014).

Other criticisms of the DSM are that it is created based on American culture, tradition and other aspects. As illustrated by the example of Prea (Case study 16.5), this may not always be appropriate. Appendix I of the DSM gives instructions for diagnosing people within their cultural context.

CASE STUDY 16.5A

Prea

Prea is a 25-year-old woman who has stated the following: 'At times, I am controlled by a spirit. I can never predict when it will take hold of me. It is very powerful and makes me say and do all sorts of things – some of them I can't even remember. The spirit has been with me since I was 15 years old.'

When you read such a statement, you may immediately be inclined to think that Prea was suffering from a mental illness such as schizophrenia or dissociative identity disorder, which used to be called multiple personality disorder. But you need to be careful – there is more to Prea's story!

Prea comes from a small village in Sudan. In this society, it is common for females to report spiritual possession – in fact, about 45 per cent of females over 15 years of age report this phenomenon (Boddy, 1988). From a societal and cultural view, Prea is normal!



FIGURE 1 Prea comes from Sudan.

Validity of the categories of mental disorders

The goal of the system has been to enable and increase the consistency of diagnosis of mental disorders. However, it can be argued that this means that the validity of the categories may be overlooked. It is possible that a very precise and specific description may not truly reflect a disorder. For example, on 15 December 1973, homosexuality was removed from being classified as a mental illness. On this day, millions of gay people across the world were 'cured' of what had previously been considered to be a mental disorder.

CHALLENGE 16.5

Gender dysphoria (formerly gender identity disorder)

Gender dysphoria, commonly presenting as transsexualism, is a condition in which a person identifies with the opposite sex and desires to live as a member of that sex. Gender dysphoria is classified as a mental disorder in the DSM-5. Consider whether gender dysphoria should be classified as a mental illness.

External influences

The DSM criteria are created in discussion by multidisciplinary committees, which can be both a strength and a weakness. Eloquent and persuasive committee members may have a disproportionate influence on the committee listing the diagnostic criteria for a particular disorder; this could lead to new conditions being added as disorders – or to others being removed – despite lack of empirical evidence to support these decisions.

Additionally, the health insurance industry in the USA is very commercial and often will only pay for treatment for mental disorders that are listed in the DSM. As a result, there is a

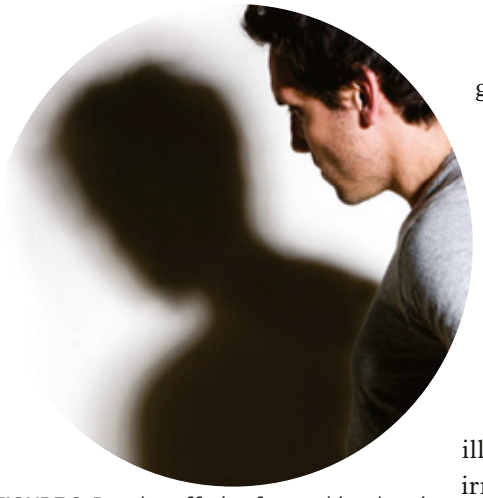


FIGURE 2 People suffering from schizophrenia may be unaware of their condition.

great tendency for conditions such as alcohol addiction or pathological gambling disorder to appear as diagnosable conditions in their own right, rather than (possibly) being symptomatic of other conditions.

Subjectivity in the diagnosis

Classification is based on symptoms reported by the person or behaviours they are subjectively observed to exhibit in the judgment of others. People may not disclose subjective feelings, such as intense anxiety, unhappiness or distress. People may also be indifferent to or unaware of their condition. This is especially true of a psychotic illness such as schizophrenia – where thought processes are, by definition, irrational, yet the patient believes they are thinking clearly. All these factors can make diagnosis difficult.

Categories or dimensions?

If you go to your doctor with a cough and high temperature, the doctor will probably take a blood test to determine exactly what the illness is so that appropriate treatment decisions can be made.

Psychological illnesses do not always fit into such neat categories and very often a person with one diagnosed disorder will have symptoms of one or more others (Kessler *et al.*, 2005). These are referred to as 'comorbidities'. If the categories really are separate and discrete disorders, then there should be no greater percentage of people who have generalised anxiety disorder (GAD) being diagnosed as depressed than the percentage in the general population; however, this is simply not the case. People diagnosed with GAD are many times more likely to be depressed than people with no other psychological condition, and the most common presentation of mood disorder is actually a comorbidity of the conditions of anxiety and depression.

A problem with categorical classifications is the tendency for stereotyping and labelling with a lack of flexibility in diagnosis – patients being seen as either having the disorder or not, with no difference between individuals.

The latest revisions of the DSM and the ICD have moved towards a less categorical structure by introducing dimensional classifications, especially of personality disorders. This means that mental health professionals would rate an individual on the extent to which they show personality characteristics such as the following:

- **neuroticism** (with emotional stability as its opposite), which means a person is anxious, stressed, depressed and self-conscious
- **agreeableness** (with self-interest and suspicion as its opposite), which means a person is compassionate and trusting
- **conscientiousness** (laziness and carelessness as its opposite), which means that a person is self-disciplined and reliable.

Other possible dimensions would be **compulsiveness**, **antisocial responses** and **social withdrawal**.

neuroticism
a person is anxious, stressed, depressed and self-conscious

agreeableness
a person is compassionate and trusting

conscientiousness
a person is self-disciplined and reliable

compulsiveness
repetitive or rule-following behaviours that sufferers believe they must perform in order to avoid imagined catastrophe or to relieve anxiety

antisocial response
behaviour or action that may harm or not consider the rights of others, or may arise as a result of a specific trigger or event in the person's environment

social withdrawal
a person's retreat from society and interpersonal relationships

Dimensional diagnosis in action

To apply the full biopsychosocial model (see p. 390), it is necessary to move away from the practice of simply slotting patients into convenient categories and instead relate the diagnoses more directly to the individual.

The DSM-5 makes the following statements:

> Although the DSM-5 remains a categorical classification of separate disorders, we recognize that mental disorders do not always fit completely within the boundaries of a single disorder. Some symptom domains, such as depression and anxiety, involve multiple diagnostic categories and may reflect common underlying vulnerabilities for a larger group of disorders. (p. xii)

This corresponds with the arrangement for the ICD-10 released in 2015:

> DSM-5 has moved to a nonaxial documentation of diagnosis (formerly Axes I, II and III), with separate notations for important psychosocial and contextual factors (formerly Axis IV) and disability (formerly Axis V). (p. 16)

You can see that this is how DSM and ICD aim to include the full biopsychosocial model.

Professor Tony Attwood from the University of Queensland is arguably one of the world's greatest experts in this area. In 2009 at a workshop in Melbourne, Attwood made a memorable statement:

> Asperger's syndrome (high-functioning autism) is like a 100-piece jigsaw puzzle. You find one piece, then another and another and begin to build up the picture; when you get to 80 pieces, you diagnose the condition … There's probably no one in the world with all 100 pieces – and all of us have at least 10. There are also many individuals who have 50, 60 or 70 pieces.

This shows the dimensional nature of this type of condition and the need for dimensions in its diagnosis.

CHECK YOUR LEARNING 16.5

Describe and explain

1 a **Identify** five criticisms of the DSM-5.
  b **Summarise** each of the five criticisms you identified.
2 **Describe** the ways American culture may differ from the rest of the world.
3 **Explain** the issue of categories or dimensions.

Apply, analyse and interpret

4 **Consider** the case study about Prea.
  a **Classify** her mental health from a Western perspective.
  b **Compare** her mental health with someone with the same experiences in Western society.

Investigate, evaluate and communicate

5 **Create** a table that links the different ways mental health is presented within your society. In this table, present the following:
  a behaviours considered normal and abnormal
  b approaches to mental health.
6 **Investigate** a disorder that may have comorbidities, such as anxiety or depression. Find out if the disorder is more commonly linked to another mental disorder, or if it typically exists relatively 'on its own'. **Evaluate** the implications for classification systems.
7 The DSM-5 recognises the importance of diagnosing the individual rather than slotting them into a category. What do you think the risks of fitting an individual into a category are? **Justify** your response.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 16.5
- » Challenge
  Worksheet: 16.5
  Gender dysphoria
- » Weblink
  ICD
- » Weblink
  Limitations of diagnosis

CHAPTER 16

Review

Summary

16.1
- A behaviour is generally considered to be 'normal' when it is one that is accepted within the society and culture and is typical for the specific situation or context. A behaviour should also allow a person to function independently as expected for their age. It should not be personally distressing or self-defeating.
- Approaches to defining normality include:
  - the situational approach (Is it normal for the specific situation or context?)
  - the societal and cultural approach (Is it normal within the society or culture?)
  - the historical approach (Was it normal in the past compared with today or even the future?)
  - the statistical approach (Is it normal in terms of statistics?)
  - the functional approach (Is it normal in terms of a person being able to function independently?)
  - the medical approach (Is there something medically wrong?).

16.2
- Adaptive behaviours are age-appropriate 'everyday living skills' that develop through experience, help us to adjust to our environment, assist in our ability to relate to others and allow us to become independent adults who can function effectively within our society and culture.
- Maladaptive behaviours develop as a coping mechanism to significant stressors and usually involve avoidant strategies. Influences that contribute to the development of maladaptive behaviours include insecure attachment, unhelpful parenting, violence, abuse, genetics, personality predisposition, trauma, grief/loss, poverty, unemployment and natural disasters.

16.3
- Mental health is a state of emotional and social wellbeing in which individuals can realise their own abilities, cope with the normal stresses of life, work productively and contribute to their community.
- Mental disorder is defined as: 'a recognised, medically diagnosable illness that results in the significant impairment of an individual's cognitive, affective (emotional) or relational abilities. Mental disorders can result from biological, developmental and/or psychosocial factors and usually require treatment to be alleviated.'

16.4
- The DSM-5 and ICD-11 represent the most widely used classification systems for clinical diagnosis of mental disorders.
- The DSM has both advantages and limitations, and psychologists need to be aware of any shortcomings to facilitate a more reliable diagnosis of mental disorders.

Key terms

- adaptive behaviour
- agreeableness
- antisocial response
- compulsiveness
- conscientiousness
- coping mechanism
- DSM-5
- functional approach to normality
- hallucinations
- historical approach to normality
- maladaptive behaviour
- medical approach to normality
- mental disorder
- mental health
- mental health problems
- mood disorder
- neurosis

- neuroticism
- psychological dysfunction
- psychosis
- situational approach to normality
- social withdrawal
- sociocultural approach to normality
- statistical approach to normality

Revision questions

Multiple choice

1 _____ is a state of emotional and social wellbeing in which individuals can realise their own abilities, cope with the normal stresses of life, work productively and contribute to their community.

a normality
b mental health
c mental disorder
d abnormality

2 The concept of *normality* can sometimes be dependent on a range of factors. Which of the following reflects behaviours that are historical?

a a person who wears a wig to a fancy dress party
b a student who is forced to use his right hand for writing in class
c a teenager who scores 120 on an IQ test
d a person who is unable to look after their personal day-to-day needs

3 Charles often wears a cap in class even though he has received detention after detention for this behaviour. Which approach does Charles' behaviour reflect?

a situational
b societal
c historical
d none of these

4 According to psychiatrists and medical doctors, individuals who require medication for their mental disorder reflect which of the following approaches?

a medical
b genetic
c situational
d functional

5 How is mental health best described?

a a state of happiness where a person is able to function well, maintain meaningful relationships and work well
b a state of emotional and social wellbeing in which people realise their own abilities, can cope with normal stresses and work productively within their community
c a state of physical and psychological health that allows a person to operate well with friends, family and work
d a state of wellbeing that is free from stress and where a person feels valued.

6 How is a mental disorder best described?

a a medically diagnosed illness that interferes with a person's thoughts, feelings and emotions
b a medically diagnosed illness that makes people hear voices, behave differently and feel depressed and helpless for long periods of time
c a medically diagnosed illness that affects a person's thinking, emotions and behaviours, due to heredity or developing from psychosocial factors
d **a** and **c**

7 By the time people grow up, some of them develop adaptive or maladaptive behaviours that can affect their overall mental functioning and interactions with others. Which of the following is considered a maladaptive behaviour?

a engaging in self-harm
b interacting with family and friends in a positive manner
c adapting to changing situations
d developing independence

8 According to the Mental Health Continuum Model, which of these is an example of an 'injured' behaviour where a person experiences 'significant functional impairment'?
   - **a** anger and anxiety
   - **b** good sense of humour
   - **c** intrusive thoughts
   - **d** constant fatigue

9 In terms of determining whether the person was 'healthy' according the Mental Health Continuum, which of the following behaviours would reflect this?
   - **a** trouble sleeping
   - **b** poor concentration
   - **c** procrastination
   - **d** normal mood fluctuations

10 Lizzy has been feeling rather low lately. She's lost her appetite and has withdrawn from most of her friends. She spends most of her time in bed and doesn't have the energy to do anything. Typically, what would be the first step in working out whether Lizzy has a mental disorder or physical illness?
   - **a** Make an appointment to see her family doctor.
   - **b** Use the DSM-5 to determine a diagnosis.
   - **c** Undertake several mental health assessment questionnaires.
   - **d** Get out of bed.

11 Mark has a tattoo and has dyed his hair bright purple. He likes to walk around without shoes on. Mark also goes to work five days a week, and earns a salary where he is able to provide for his young family. What approach would suggest Mark was abnormal, and which would suggest he was normal?
   - **a** Sociocultural, Functional
   - **b** Historical, Sociocultural
   - **c** Sociocultural, Medical
   - **d** Medical, Functional

12 Tyree is 29 and was recently fired from her job as a nurse. Tyree was fired because whenever she was given a shift she didn't want she would scream and throw a tantrum, pouting at her manager. Tyree is showing what form of behaviour?
   - **a** Functional behaviour
   - **b** Adaptive behaviour
   - **c** Maladaptive behaviour
   - **d** Historical behaviour

13 Select the best definition of psychosis
   - **a** a mental illness where someone experiences a loss of reality
   - **b** False perceptions in the absence of sensory input
   - **c** Non-psychotic illness where a sense of reality remains but there are difficulties with thoughts and feelings
   - **d** Normal thoughts that most people experience on a daily basis

14 Mental health can be said to be:
   - **a** continuous
   - **b** difficulties in behaviour
   - **c** synonymous with exaggerated thoughts, feelings and behaviours
   - **d** a state of social and emotional wellbeing

15 Which of the following can be used to diagnose mental illness?
   - **a** DSM-5, ICD-10
   - **b** diagnostic and statistic manual for international disease
   - **c** international classification of mental health
   - **d** DSM-10, ICD-5

Short answer

Describe and explain

★ **16** In your own words, **explain** the difference between normal (typical) and abnormal (atypical) behaviours.

★ **17** **Explain** the difference between the statistical and medical approaches to normality. Use examples for each approach to reflect your understanding.

★★ **18** **Define** the following approaches:
   - **a** historical approach to normality
   - **b** medical approach to normality
   - **c** functional approach to normality
   - **d** statistical approach to normality.

★ **19** **Explain** how the DSM-5 is used by professionals.

★ **20** **Identify** the axis of the DSM-5 that is used to diagnose major depressive disorder.

Apply, analyse and interpret

★★ **21** There are several factors that can influence whether a person develops adaptive behaviours. **Identify** two of these and **consider** how they impact behaviours.

★ **22** **Differentiate** between adaptive and maladaptive behaviours.

★ **23** **Compare** mental health and mental disorders.

★★ **24** **Distinguish** between the DSM-5 and the ICD-10.

★★ **25** **Consider** the processes of intervention when a person presents with a mental health issue. **Identify** each stage in the process.

Investigate, evaluate and communicate

★★ **26** **Discuss** how a person's personality can influence whether or not they develop maladaptive behaviours.

★★ **27** **Investigate** how maladaptive behaviours can interfere with people's ability to function normally.

★★ **28** **Evaluate** the importance of using a proper diagnostic system when determining someone's mental health. You may want to refer to Rosenhan's 1973 study.

★★★ **29** The DSM has received criticism for several reasons. Select one of the following limitations and **assess** the validity and reliability of it:

- **a** diagnosis of mental disorders is too subjective
- **b** DSM pathologises too many people
- **c** difficult to establish the validity of mental disorders

Check your obook assess for these additional resources and more:

- » Student book questions
  Chapter 16 Review
- » Revision notes
  Revision notes for Chapter 16
- » assess quiz
  Test your understanding with an auto-correcting multiple-choice quiz
- » Flashcard glossary
  Key terms in Chapter 16

CHAPTER 17

Recognising psychological disorders

We all want to be healthy – both physically and mentally – and there are steps we can take in our lives to maintain or improve our physical and mental health. Things can go wrong, however, and it can be difficult to work out why. No one is immune to suffering from a mental disorder.

There are times in life when we are more vulnerable to certain mental disorders, and some are common throughout the lifespan. Approximately 20–30 per cent of Australians will have a lived experience of mental illness at some stage in their lives. According to this statistic, we all know someone who is suffering, or has suffered from a mental illness. In most cases, you cannot tell if a person has been diagnosed with a mental illness and they tend to recover quite well.

In this chapter, we look at some categories of mental disorder and the common symptoms. We will also explore the prevalence, common symptoms and perceived causes of anxiety disorders including generalised anxiety disorder (GAD) and specific phobia.

Note: the terms 'mental disorder' and 'mental illness' are used interchangeably throughout this chapter.

OBJECTIVES

→ Describe psychological disorder
→ Recognise the main categories of psychological disorders, including the schizophrenia spectrum and other psychotic disorders (e.g. schizophrenia), mood disorders (e.g. depression), anxiety disorders (e.g. phobias) and personality disorders (e.g. borderline or antisocial personality disorder)
→ Examine the prevalence, symptoms and perceived causes of anxiety disorders, including generalised anxiety disorder (GAD) and specific phobia

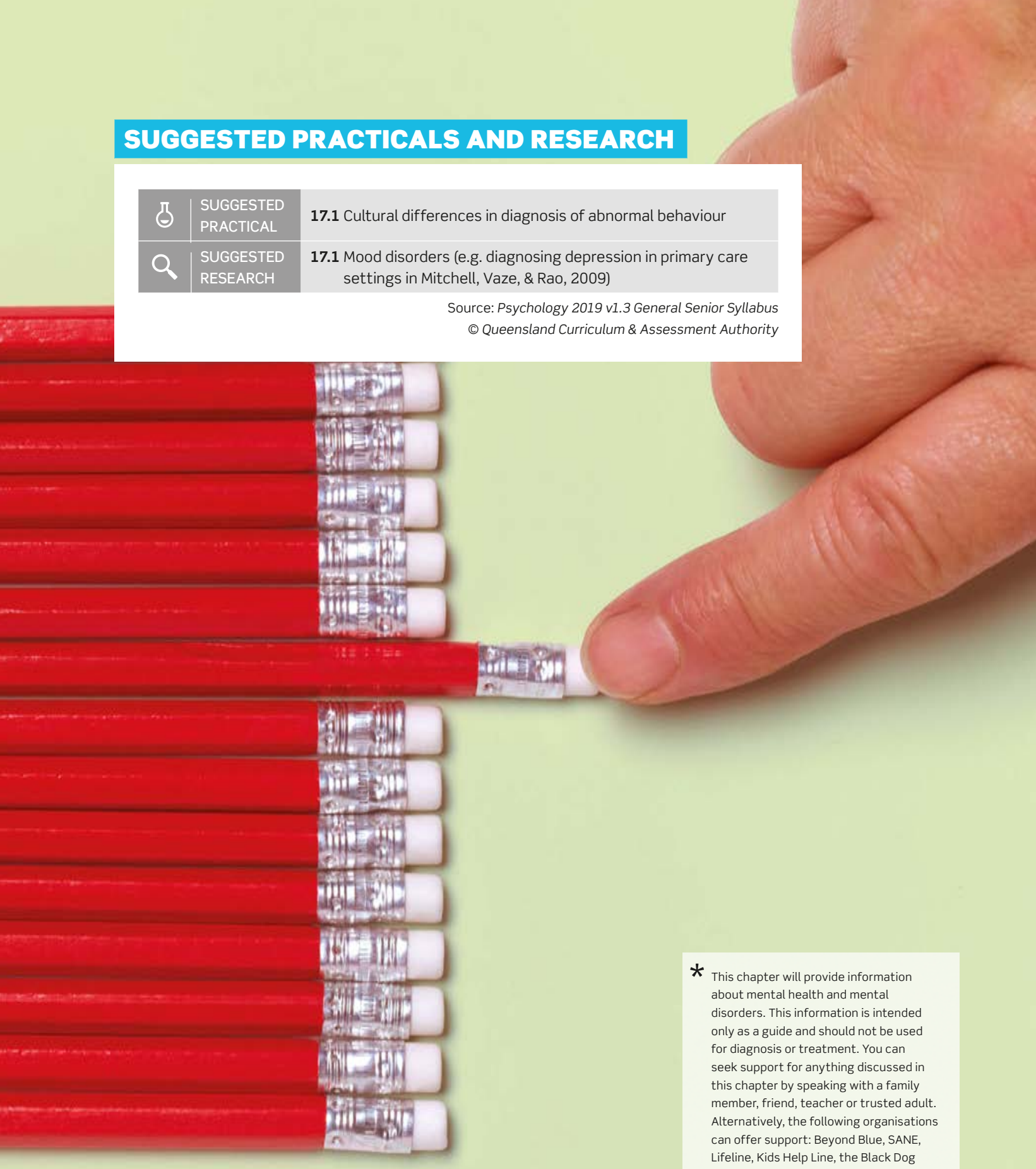
Source: *Psychology 2019 v1.3 General Senior Syllabus*
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FIGURE 1 Psychological disorders can affect people in different ways. Some people may feel very uncomfortable with a pencil being out of order.

SUGGESTED PRACTICALS AND RESEARCH

SUGGESTED PRACTICAL	**17.1** Cultural differences in diagnosis of abnormal behaviour
SUGGESTED RESEARCH	**17.1** Mood disorders (e.g. diagnosing depression in primary care settings in Mitchell, Vaze, & Rao, 2009)

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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* This chapter will provide information about mental health and mental disorders. This information is intended only as a guide and should not be used for diagnosis or treatment. You can seek support for anything discussed in this chapter by speaking with a family member, friend, teacher or trusted adult. Alternatively, the following organisations can offer support: Beyond Blue, SANE, Lifeline, Kids Help Line, the Black Dog Institute and Headspace. Links are available via your obook assess.

17.1 Categories of psychological disorder

KEY IDEAS

In this section, you will learn about:

- mood disorders, psychotic disorders and anxiety disorders
- major depressive disorder (MDD)
- prevalence and symptoms of mood disorders
- causes and treatments of mood disorders.

psychological disorder
any psychological dysfunction in an individual that is associated with distress or impairment in mood, behaviour or cognition that can adversely affect an individual in their everyday functioning

There are several categories of disorder in the DSM and ICD. A **psychological disorder** is dysfunction in an individual involving disordered moods, behaviours and cognition. Typically, this is associated with distress in the individual. In this section we will look at mood disorders, personality disorders, psychotic disorders and anxiety disorders.

Mood disorders

> I just want to sleep. I dread the thought of going to school and I can't seem to concentrate in class. The last thing I want to do is to talk to my friends. I feel as if I am in a black hole, struggling to get out. I know I am hopeless – I just can't be bothered.
>
> Jenny, aged 16, during a depressive episode that lasted four weeks

major depressive disorder (MDD)
a mental disorder diagnosed when an individual shows severe symptoms of flattened mood, low self-esteem, and lack of motivation for an extended period of time.

We all experience ups and downs in life. Major depression – or **major depressive disorder (MDD)** as it is called – is diagnosed when symptoms of flattened mood are severe and long-lasting. A person will have very low moods and low self-esteem, lack motivation and have difficulty thinking for a considerable time.

The onset of major depression can occur at any age, frequently being diagnosed during adolescence. Around 15 per cent of people are affected at some point in their lives. More boys than girls are diagnosed with depression before puberty, but after puberty, almost three times as many females as males are diagnosed. Depression is more common in lower socioeconomic groups.

To be diagnosed with depression, a person must experience a depressed mood or loss of interest and pleasure for at least two weeks. In addition, they must experience at least four of the following symptoms:

- insomnia (difficulties getting to sleep or staying asleep)
- appetite changes, or loss or gain of weight
- feelings of worthlessness
- thoughts of suicide
- difficulties concentrating
- loss of enjoyment of activities they usually enjoy
- intense feelings of sadness or guilt
- trouble initiating action
- anxious distress
- difficulties making decisions
- diminished libido (loss of interest in sexual activity)
- feeling slowed down, restless or excessively busy.

SUGGESTED RESEARCH
17.1 Mood disorders
Go to page 457 »



FIGURE 1 Symptoms of depression

The chances of a recurring episode are high, with 80 per cent experiencing a subsequent episode. On average, a person may experience four episodes of depression in their lifetime, with the average episode lasting for about three to four months or, in chronic cases, about two years.

Cause

A combination of biological, psychological and social factors causes major depression. There may be a genetic link (biological factor), neurotransmitter influences, psychological issues and environmental stresses, including stressful life issues and misuse of drugs and alcohol. There is a trend for more females to be diagnosed with depression than males.

One possible reason for this is biological factors – differences in the brain and physiological processes. Alternatively, the difference could be due to cultural variation between male and female roles. Although gender roles in our society are changing, there are still stereotypical expectations for males and females (Barlow & Durand, 1995; Kleinman & Cohen, 1997).

Treatment

Talking or cognitive therapies that involve identifying, evaluating and changing thinking patterns can be very effective. Building social support, improving coping skills and reducing stress can also greatly assist a person recovering from a depressive episode. Some people also need medication to increase the effect of neurotransmitters, such as serotonin. Medication is not a cure, but may help a person to undertake cognitive therapies.

Online information

There are many sources of information about mental illness available online, including organisations such as BeyondBlue, SANE Australia and the Black Dog Institute. Such organisations focus on promoting good mental health, tackling stigma and discrimination, and providing support and general information on various psychological disorders including anxiety and depression.

Personality disorders

personality disorders
psychological disorders in which an individual shows a rigid and unhealthy pattern of thinking, functioning and behaving

Personality disorders are consistent, long-term, and extreme personality characteristics that can cause a person unhappiness or seriously impact their ability to adjust to and function well in their environment. A person with a personality disorder typically has difficulty perceiving and relating to other people or situations. The current formal definition of a personality disorder in the DSM-5 is 'an enduring pattern of inner experience and behaviour that deviates markedly from the expectations of the individual's culture, is pervasive and inflexible, has an onset in adolescence or early adulthood, is stable over time, and leads to distress or impairment'.

Some practitioners may say that some characteristics of personality disorders can be seen in childhood or adolescence, but generally they are not diagnosed until adulthood.

Do not try to diagnose friends or family when reading about personality disorders. It requires a highly skilled psychiatrist or psychologist to make such diagnoses! Borderline personality disorder and antisocial personality are two examples of personality disorders.

Borderline personality disorder

borderline personality disorder (BPD)
extreme instability of moods and relationships with other people

Borderline personality disorder (BPD) is characterised by extreme instability of moods and relationships with other people. Onset typically occurs in late adolescence or early adulthood, and women are more likely to be diagnosed.

The cause of BPD is not clear, and most people with BPD are able to recover after diagnosis and treatment. People with BPD may feel empty, emotionally detached and impulsive, and may engage in self-harming behaviours. BPD is typically treated using psychological therapies.

Antisocial personality disorder

antisocial personality disorder (APD)
a tendency to appear calm and charming, while behaving in the opposite manner; no sense of shame or remorse, self-centred, incapable of love or affection, and likely to violate the rights of others

Antisocial personality disorder (APD) is characterised by a tendency to appear calm and charming, but this sincerity is only superficial. They are often unreliable in friendships, have no shame or remorse, are self-centred, are incapable of love or affection, and violate the rights of others.

People with APD may lie to others frequently, have a disregard for right or wrong, use their charm to manipulate others, and have a sense of arrogance, impulsiveness, hostility, a lack of empathy towards others, and poor or abusive relationships. They are also usually unable to consider the negative consequences of their behaviour.

People will usually display some symptoms prior to turning 15. Certain symptoms may decrease throughout life, but treatment is difficult and will depend on the situation of the individual.

Psychotic disorders

psychotic disorder
a mental disorder that can cause abnormal thinking or behaviour, and a loss of contact with reality

Sufferers of **psychotic disorders** can have problems communicating and withdraw from social contact, often into a world of delusions and hallucinations. While the cause of psychosis is not yet fully understood, symptoms often include confused thinking, delusions or hallucinations. Some people can experience a short-lived form of psychosis in which the symptoms of a psychotic disorder only last a few days or weeks. However, for people who experience psychotic disorders such as schizophrenia, the psychosis can be much longer term.

SUGGESTED PRACTICAL
17.1 Cultural differences in diagnosis of abnormal behaviour
Go to your obook assess »

Schizophrenia

Schizophrenia is one of the most puzzling and bizarre of all mental illnesses. It affects thoughts, emotions and behaviours, and may cause people to withdraw and lose touch with reality. It is characterised by deluded thinking, hallucinations and depression. Someone with schizophrenia may experience the following:

schizophrenia
a disease of the brain that causes patients to suffer from deluded thinking, hallucinations and depression

> Jodie is struggling in her second year of university. She has gradually withdrawn from her classes and, for the past three months, has only attended a handful of lectures. She prefers to stay home, has started to keep the curtains closed and stopped answering the phone. She is scared. She believes that her movements are being monitored and has heard a voice telling her that she is no good.

Prevalence

The onset of schizophrenia is usually in the late teens and early 20s, with an earlier onset for males (18 years) than females (25 years). About 1 per cent of the population will develop schizophrenia at some stage of their life, which makes schizophrenia as common as diabetes. With support and medication, many people with schizophrenia can lead normal and productive lives, but others cannot function independently and, without support, may end up homeless (Herman *et al.*, 1998).

Description and symptoms

Diagnosis of schizophrenia requires the presence of at least two of the following symptoms present for six months:

- **delusions**: false beliefs that are strongly held, despite evidence that they cannot be true. For example, a person may believe that a terrorist group is listening to their phone calls, watching their house and tapping into their brain to hear their innermost thoughts. Examples of delusions can be seen in Table 1.
- **hallucinations**: false perceptions in the absence of sensory input. Most commonly the hallucinations are auditory rather than visual (Sartorius, Shipiro, & Jablonsky, 1974). A person may hear voices that simply are not there. Typically the voices are in the third person. Examples of hallucinations can be seen in Table 2.
- disorganised speech and behaviour such as incoherent speech or '**word salad**' – a jumble of words
- other symptoms that cause social or occupational dysfunction (such as lack of motivation and emotions, withdrawal from social contact, or marked deterioration in functioning socially – at work/school and in self-care).

delusions
false beliefs that are strongly held despite evidence that they cannot be true

hallucinations
experiences of perceptions, such as sight or sound, which are not present in reality and can occur in each sense: auditory, tactile, visual, gustatory and olfactory

word salad
a jumble of meaningless words and phrases; commonly seen in schizophrenic states

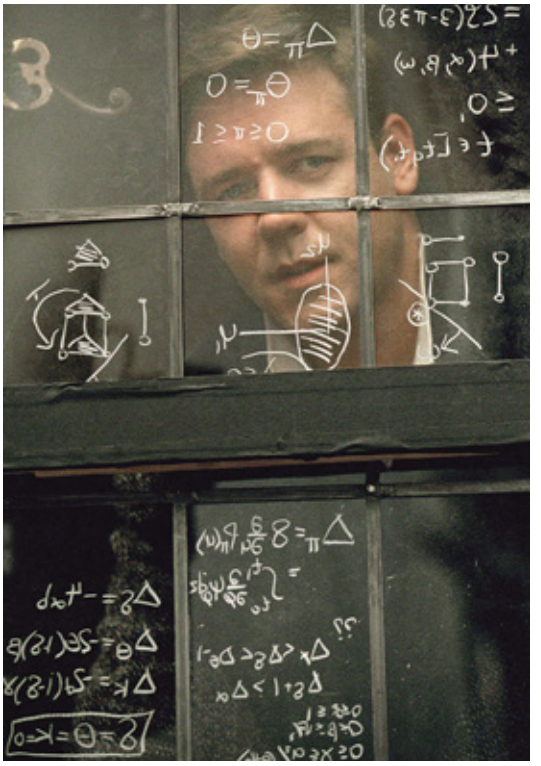


FIGURE 2 Russell Crowe portrayed John Forbes Nash, Jr in *A Beautiful Mind*. Nash is a Nobel Prize–winning mathematician who suffers from auditory hallucinations as part of his schizophrenia.



FIGURE 3 Some symptoms of schizophrenia. Not all people displaying such symptoms are necessarily diagnosed with the condition.

Delusion	Associated belief
Persecution	Belief that others are persecuting, spying on or trying to harm them
Reference	Belief that objects, events or other people have particular significance for them
Grandeur	Belief that they have great power, knowledge or talent
Identity	Belief that they are someone else, such as Jesus Christ or the Prime Minister of Australia
Guilt	Belief that they have committed a terrible sin
Control	Belief that their thoughts and behaviours are being controlled by external sources

TABLE 1 Types of delusions

Sense	Hallucination experience
Auditory	Hearing voices that may offer commentary on your behaviour, instruct you to behave in certain ways or insult you
Tactile	Experiencing tingling, electrical or burning sensations or unexplained pain
Visual	Seeing something that is not actually there
Gustatory	Believing you can taste something that is not present
Olfactory	Smelling odours that do not exist

TABLE 2 Types of hallucinations

delusions of persecution
a characteristic of paranoid schizophrenia, believing you are being watched or monitored

delusions of grandeur
a belief that you are extremely important

Delusions of perception (believing you are being watched or monitored) or **delusions of grandeur** (a belief that you are extremely important) can be characteristics of schizophrenia. Sufferers are usually occupied with hallucinations that support their delusion. Often the person will develop *ideas of reference*, where they believe that events in the media or in real life (such as overheard conversations), albeit trivial, are quite significant and confirm their delusion. For instance, a cursory glance from someone on the footpath may indicate to the sufferer that they are being watched.

A person experiencing disorganised speech has thought patterns that do not make sense. Speech is difficult to follow and can simply be words strung together that sound similar or are made up. One idea seems to trigger another, but how the ideas are connected is not clear. This incoherent jumble of words is known as word salad. Does the following passage make sense? It is an example of word salad:

> I am the nun. If that's not enough, you are still his. That is a brave cavalier, take him as your husband, Karoline, you know well, though you are my Lord, you were just a dream. If you are the dove-cote, Mrs K is still beset by fear. Otherwise I am not so exact in eating. Handle the gravy carefully. Where is the paint brush? Where are you, Herman?
>
> From Bleuler 1911, cited in Gross & McIlveen, 1998.

Inappropriate or lack of emotional responses may occur where the person laughs or cries at unlikely times or for no apparent reason, or does not show emotion. Behaviour is disorganised and does not seem to have a purpose. It can be unpredictable, childish, mischievous or bizarre. A person may completely neglect their appearance, stop washing and deteriorate to a point where they become incontinent (Davison & Neale, 2001).

Anxiety disorders

We all know what it is like to experience anxiety. However, while a little anxiety can be considered part of normal life, too much or too little can have negative consequences. To feel tense and apprehensive is a natural response to a perceived threat. It is when the frequency and intensity of this feeling is out of proportion to the situation and interferes with someone's everyday life that they may be diagnosed with an **anxiety disorder**.

anxiety disorder a mental disorder in which the frequency and intensity of feeling anxious is out of proportion to the situation and interferes with everyday life

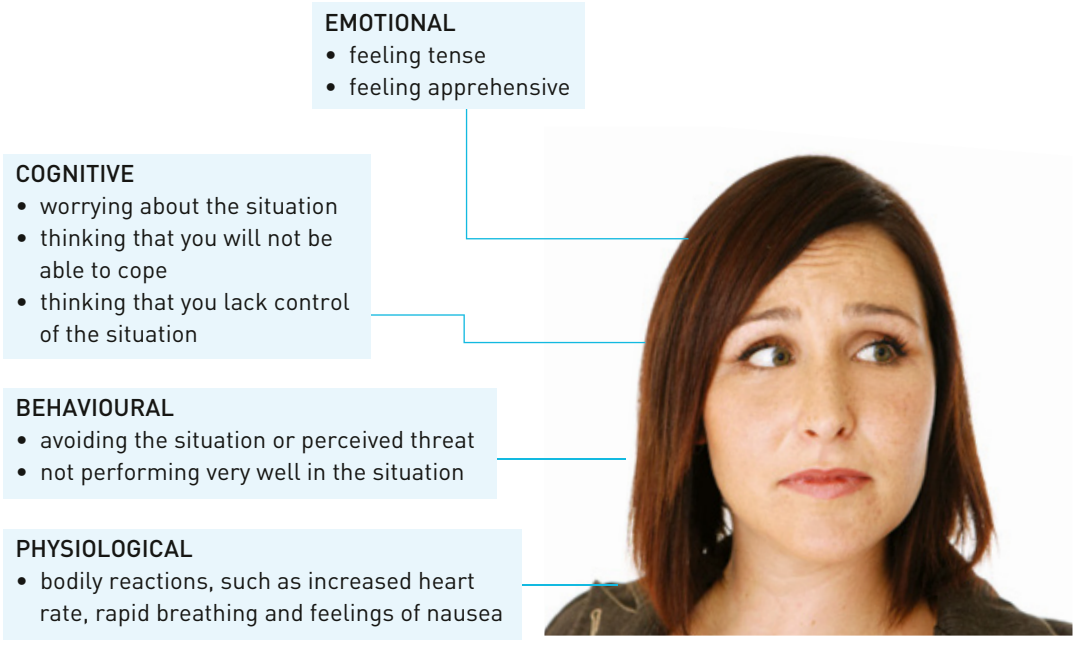


FIGURE 4 The symptoms of anxiety

There are four components that anxiety symptoms can be divided into. Figure 4 lists the symptoms of each component.

Anxiety disorders can occur at any age. About 10 per cent of the population is affected with an anxiety disorder at any given time, making this the most frequently occurring mental disorder. Australian females are almost twice as likely as males to suffer from an anxiety disorder (AIHW, 2008). In addition, it is common for an anxiety disorder to be associated with depression.

Anxiety disorders include various phobias, obsessive compulsive disorder (OCD), post-traumatic stress disorder and generalised anxiety disorder (GAD). The prevalence, symptoms and perceived causes of anxiety disorders, including GAD and specific phobias, are explained in detail in the next section.

Phobias

phobia
an irrational fear of a specific object or situation

agoraphobia
fear of crowds, assemblies of people and open spaces

social phobias (social anxiety disorder)
fear of being humiliated in front of people

specific phobias
fear of specific objects or situations such as illness, injury, disease or death

A **phobia** is an irrational fear of a specific object or situation. According to DSM-5, the anxiety must be out of proportion to the actual danger or threat, and experienced for at least six months. Most phobias belong to one of the following categories:

- **agoraphobia**: fear of crowds, assemblies of people and open spaces; the most common phobia and is most likely to occur in females in young adulthood
- **social phobias (social anxiety disorder)**: fear of doing something humiliating in front of others, perhaps while public speaking or interacting with people in some other situation; onset is often during adolescence
- **specific phobias**: fear of specific objects or situations, such as spiders or snakes, height, enclosed spaces, flying, darkness, illness, injury or death.

What is the difference between fear and phobia? Most of us express some fear towards certain objects or situations. We may have a fear of snakes or spiders or thunderstorms. Such fears can actually be healthy, since the source of our fear may be a threat to our safety. A fear can turn into a phobia, however, when the person experiences intense anxiety in the presence of the item or situation, or even when merely thinking about it. This fear is so strong that it interferes with everyday activities.



FIGURE 5 The fear of being trapped in an enclosed space is a specific phobia.

There are common fears that are associated with development at various ages. Table 2 (p.358) highlights these. Fears are often related to cognitive development; for instance, when children believe in magical thinking, they are likely to fear imaginary creatures. Such children may fear that a monster lives in their wardrobe and insist on the wardrobe door being closed at night. Once they pass this cognitive stage, their fear of monsters is resolved. As a child reaches Piaget's formal operational stage of thinking, they are able to anticipate more negative consequences and think more deeply about situations. This in turn is reflected in common fears, such as social anxiety, that may be carried into adolescence and beyond.

We will explore anxiety disorders further in the next section, focusing on specific phobias and generalised anxiety disorder (GAD).

CHALLENGE 17.1

Identify the mental illness

The following are hypothetical cases of people with a lived experience of mental illness. While you are not qualified to make a diagnosis, and there is not enough information included in these simple descriptions, use your knowledge to identify the mental illness that each case may depict.

1 Jake has not gone to school for the last month. He sits at home in darkness with the curtains closed. He must not turn on a light as he knows they are watching and recording his every thought and move. Voices are telling him that he is no good and he cannot trust anyone.

2 Nurang gets very nervous when he goes to the beach. He doesn't ever go in deeper than his ankles, and is known to run out of the water if he sees a large bunch of seaweed in a wave. Nurang struggles to swim in a pool because he has seen videos of sharks in aquariums and is scared that there may be one in the water.

3 Ranbir seems to be operating at an all-time low. For the last month, he has barely been able to force himself to leave his bedroom and is often not at school. When he is, he finds it hard to motivate himself and does not feel like talking to others.

4 Eden has been enjoying a social drink with colleagues after work for a couple of months now. Ben is keen to become more serious and asks Eden to go to the movies with him. Eden is very worried about taking their relationship to the next step. She makes up an excuse that she needs to help care for her elderly grandmother as she doesn't feel she is good enough for Ben and knows the relationship will only end in disaster.

CHECK YOUR LEARNING 17.1

Describe and explain

1 **Explain** what is meant by an *anxiety disorder*.
2 **Explain** the difference between a fear and a phobia.
3 **Identify** the four components of anxiety. Provide an example for each.
4 **Explain** what is meant by *psychotic disorders*.
5 **Describe** three symptoms of schizophrenia.
6 **Define** *major depressive disorder*.
7 There are many different types of personality disorder. **Summarise** how personality disorders are defined.

Apply, analyse and interpret

8 For the past two months, Mireille has been telling her parents that there are people out to get her. She describes them as government officials, and says that they always talk to her when she is alone. Mireille has stopped using her phone, and will no longer check her email. **Determine** what schizophrenic symptom Mireille is experiencing.
9 **Consider** why diagnosing someone with a personality disorder is so difficult.
10 Attila has recently lost 5kg. Attila was not trying to lose weight and has lost interest in playing tennis and basketball, which he used to love. Attila is also struggling to concentrate at school and is also feeling extremely guilty. **Apply** your understanding of mood disorders to Attila. What do you think he is experiencing?

Investigate, evaluate and communicate

11 **Investigate** borderline personality disorder. **Create** a table that summarises the major symptoms, possible causes and potential treatment.
12 **Investigate** the link between schizophrenia and marijuana. Information can be found on your obook. **Construct** an argument that supports the connection between schizophrenia and marijuana.

Check your obook assess for these additional resources and more:

» Student book questions
Check your learning 17.1

» Suggested practical
17.1 Cultural differences in diagnosis of abnormal behaviour

» Suggested research
Worksheet: 17.1 Mood disorders

» Challenge
Worksheet: 17.1 Identify the mental illness

17.2 Prevalence and symptoms of anxiety disorders

KEY IDEA

In this section, you will learn about:

+ the prevalence and symptoms of specific phobia and generalised anxiety disorder (GAD).

Do you know anyone who is terrified of spiders or snakes? Have you ever jumped onto a chair and started screaming at the sight of a mouse? Before discussing specific phobia in detail, it is important to understand its links to stress and anxiety and to independently define these terms.

stress
a psychological and physical response to internal or external sources of tension (stressors) that challenge a person's ability to cope; the stressors can be real or perceived

Stress is defined as the psychological and physical response to internal or external sources of tension (stressors). Symptoms of anxiety include heart palpitations, muscle tension, feeling shaky/hand tremors, choking sensation, dry mouth and an upset stomach. Does this sound like the fight-flight-freeze response? It is!

Have you ever felt anxious, perhaps just before sitting an exam or playing in a grand final? This is a normal part of human existence. For some, however, it can become a major problem with disturbing consequences. It may also be an indicator that an anxiety disorder is present.

Studies have found that anxiety disorders occur in approximately 18 per cent of the population (Drew, Bromet, & Switzer, 2000), and many people suffer from more than one of these disorders at a time. Women, especially between 45 and 54 years of age, are also more vulnerable to anxiety disorders (Australian Bureau of Statistics, 1998). Biopsychosocial factors play a role in most anxiety disorders (see p. 390).

Specific phobia

A specific phobia is a persistent, irrational and intense fear of a particular object or event. As with anxiety, exhibiting the fear response is normal, as long as it is a rational response to an actual situation that is happening. Many people are frightened of spiders or snakes and experience a fear response if one crosses their path. This fear response makes sense from an evolutionary perspective because humans are genetically wired to fear things that pose a threat to their survival. However, if that fear starts to interfere with a person's social functioning – where they deliberately avoid the distress-causing object, activity or situation to the point where it affects their day-to-day life – it then becomes a specific phobia. If the individual is faced with the feared object or event, they may experience acute physiological arousal – the fight-flight-freeze response – as in the case of anxiety disorders. In extreme cases, just thinking about the phobic object can cause intense fear and anxiety.



FIGURE 1 Fear of toads is known as *bufonophobia*.

There are four main types of specific phobia:

- animal phobias (e.g. fear of snakes, spiders, rats or dogs)
- natural environmental phobias (e.g. fear of heights, storms, water or darkness)
- situation phobias (e.g. fear of enclosed spaces, elevators, flying, dentists, driving, tunnels or bridges)
- blood-injection-injury phobias (e.g. fear of medical procedures or of the sight of blood).

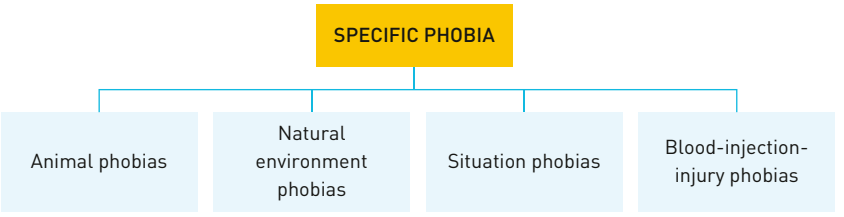


FIGURE 2 Specific phobia and subcategories

The connections between stress, anxiety and specific phobia are intricate. The physiological activation that occurs when we feel stressed is also accompanied by feelings of anxiety. Not only are stress and anxiety symptoms of specific phobia, they can also act as triggers for the condition.

Symptoms of specific phobia

Like all physical and mental health conditions, we can think about the relative severity of stress, anxiety and specific phobia in terms of their position along a continuum. One model breaks this continuum up into four broad categories: healthy, reacting, injured and disorder (see Table 1).

Healthy	Reacting	Injured	Disorder
Normal healthy functioning	Common and reversible distress	Significant functional impairment	Significant mental disorder; severe and functional impairment
← →			
• Normal fluctuations in mood, fear and anxiety • Normal levels of stress • Normal sleeping patterns • Physically well, full of energy • Socially active • Attends school and/or work	• Nervous, irritable, anxious • Moderate levels of stress • Trouble sleeping • Tired, low energy, muscle tension, headaches • Procrastination • Decreased social activity • Attends school/work	• Anxiety, pervasive and irrational fear • High levels of stress • Hypervigilance to threat information • Memory bias • Avoidance behaviours • Decreased performance • Social avoidance or withdrawal • High levels of absenteeism from school/work	• Excessive anxiety and fear, easily frightened, agitated • Extremely high levels of stress • Unable to fall or stay asleep • Exhaustion, physical illness • Unable to perform duties, absenteeism from school/work • Isolation, avoiding social events • Significant avoidance behaviours
No treatment required	Some professional psychotherapy	Professional psychotherapy	Professional psychotherapy and possible medication

Adapted from http://staffmentalhealth.providencehealthcare.org/staff/self-assessment

TABLE 1 Mental health continuum for specific phobia

To use the spider example, in the case of a specific phobia, a 'healthy' person may be frightened of them, but their fear is considered to be within a normal range. If they see a spider, they may simply squash it or ask a friend to catch it and release it into the garden. A 'reacting' individual will do just that: physically and psychologically 'react' to the spider by screaming, or running away each time they see one. They may also experience difficulty sleeping if they think that there might be a spider in their bedroom and misinterpret bits of black thread or fluff in their environment as spiders. If they are at the 'injured' level along the continuum, their phobic symptoms are significantly affecting their functioning. Once they reach the 'disorder' end of the spectrum, their specific phobia has affected their functioning to the point where they have a mental disorder that requires significant intervention. On a positive note, as mental health is determined along a continuum, a specific phobia can improve with treatment so that, over time, the person could go from being 'disordered' to 'healthy'.

Prevalence of specific phobias

Specific phobias are most common in children. Having specific fears at different times of childhood is normal, though most children will grow out of these as they get older; for some, these phobias can develop and create panic attacks.

For specific phobias, the age of onset depends on the phobia (see Table 2). Most specific phobias develop during childhood and eventually disappear. Those that persist into adulthood rarely go away without treatment.

Children are unlikely to be aware that their fear is irrational, and they are also more likely to develop a specific phobia than any other anxiety disorder.

Twin studies have revealed that anxiety disorders such as panic disorder and specific phobia are particularly heritable, occurring in 85 per cent of identical twins with a family history of these disorders (Nestadt *et al.*, 2000).

Phobia	Years of age
Animal	7
Blood	9
Dental	12
Claustrophobia	20

TABLE 2 Mean age of onset for selected phobias



FIGURE 3 Dental phobia often occurs at around 12 years of age.

CHALLENGE 17.2A

Mix and match!

Using the internet and other sources, match the phobia to its correct definition.

Agoraphobia	Fear of drafts, air swallowing or airborne substances
Acarophobia	Fear of being alone or of oneself
Anemophobia	Fear of neglecting duty or responsibility
Acrophobia	Fear of open spaces or of being in public places
Claustrophobia	Fear of work or functioning; surgeon's fear of operating
Agliophobia	Fear of crowds or mobs
Aichmophobia	Fear of the sea
Autophobia	Fear of heights
Brontophobi	Fear of being seen or stared at
Ergasiophobia	Fear of insects
Gephyrophobia	Fear of pain
Ochlophobia	Fear of needles or pointed objects
Paralipophobia	Fear of crossing bridges
Scopophobia	Fear of confined spaces, such as lifts
Thalassophobia	Fear of thunder and lightning

Generalised anxiety disorder

As discussed in Section 17.1, most people know what it is like to feel anxious from time to time. However, sometimes this shifts to feelings of extreme anxiousness all the time. Like specific phobias, **generalised anxiety disorder (GAD)** is a specific kind of anxiety.

generalised anxiety disorder (GAD) a psychological disorder characterised by excessive anxiety about several aspects of life

People with GAD feel anxious and worry most of the time, with little respite. These feelings are not dependent on a particular situation and can invade day-to-day activities. This can include anxious feelings about work, school, health, family, friends and financial issues. People with GAD may be anxious about several of these areas or a combination of a few. People with GAD may feel anxious at being late for school, which can trigger feelings of apprehension for the whole day. For example, they may become fretful about what they will have for dinner that night. This can also become a focus of their worry, and they may feel that something terrible is bound to happen.

People with GAD never stop worrying. For example, someone who was extremely anxious about paying their bills would not stop being anxious once they paid their bills. This person would find something to transfer their anxiety to. This might include needing to pay the next bills, keeping their job so that they continue to earn an income or they might worry about something else entirely, like what clothes to wear that week. For someone with GAD, the worry doesn't cease, it is just transferred.

Symptoms of GAD

People with GAD may experience any of the following symptoms over a 6-month period:

- feeling very worried about events or activities
- being unable to stop worrying
- difficulty participating in everyday activities due to worry (e.g. going to school).

They may also experience three or more of the following symptoms:

- restlessness
- difficulty sleeping or becoming easily tired
- difficulty concentrating
- irritability
- muscle tension.

The physical symptoms of GAD are muscle tension, mental agitation and susceptibility to fatigue (Barlow & Durand, 2011). For children to be diagnosed, only one of the physical symptoms listed above needs be present. People with GAD find it hard to focus their attention, as their minds are preoccupied with worrying. They tend to worry about minor, everyday life events. For adults, this might include worrying about household chores, running on time for appointments, or other health and finance concerns. Although these types of worries can be serious, and most of us experience them from time to time, people with GAD worry persistently to the point where they struggle to function on a daily basis for months on end (United States National Institute of Mental Health, 2016).

Prevalence of GAD

Anxiety disorders in Australia are common: approximately 14 per cent of Australians experience an anxiety disorder yearly. GAD is estimated to affect 3 per cent of Australians.

The first symptoms of GAD are usually around age 30, though it can present at any age. Women are affected more than men, but again, it can affect anyone at any time. In Australia, rates in 2002 were higher for men than woman, specifically in men aged 45–54 and those aged over 65 years (Hunt & Issakidis, 2002). It is also common for individuals with GAD to be diagnosed with another mental disorder. For example, 39 per cent of Australians diagnosed with GAD also meet the diagnostic criteria for depression (Tiller, 2013). This makes GAD more difficult to accurately diagnose and treat. It is not uncommon for people with GAD to be unable to identify an exact onset of symptoms; however, they typically report worrying as a common theme throughout their lives



FIGURE 4 Twin studies have shown that there are strong genetic links to the development of specific phobias.

Children who are diagnosed with GAD usually worry about school, sport, natural disasters or war. It often presents with children being overly conforming, perfectionistic in nature, having to redo tasks, asking questions that state 'OK, but what if…', and seeking frequent approval and reassurance from family, teachers and friends. About 6.9 per cent of Australian young people aged between 4 and 17 years have been diagnosed with an anxiety disorder, with about 2.2 per cent of these young Australians diagnosed with GAD (Australian Institute of Family Matters, 2015).

CHECK YOUR LEARNING 17.2

Describe and explain

1 **Describe** *specific phobia*. **Provide** an example.
2 **Explain** what is meant by generalised anxiety disorder (GAD).
3 **Identify** who is most likely to be diagnosed with GAD.
4 List four phobic responses a person who suffers from a phobia of spiders may experience.

Apply, analyse and interpret

5 When Marek was a child, he watched the movie *Jaws* with his parents. Marek is now a teenager, and a state-level swimmer for Queensland. Despite this, Marek refuses to swim in the ocean or even go to the beach. Marek visualises sharks being in the ocean, and can feel chills up his leg at the thought of one. **Apply** your understanding of specific phobias to suggest why Marek reacts this way.
6 When Sabrina was 8 years old she carried mail into her house. When she was in the laundry with her mother, she felt the mail move and threw it on the ground to see a spider jump out of it and run. Sabrina's mother screamed and rushed herself and Sabrina out of the house. **Propose** why Sabrina grew up to have a phobia of spiders.
7 Consider someone with GAD. Consider their symptoms, and how solving one issue may not solve the rest. Write down a series of things that they may worry about.

Investigate, evaluate and communicate

8 **Discuss** the similarities between specific phobia and GAD. In your discussion, **evaluate** the prevalence of both anxiety disorders, as well as the age of onset.

CHALLENGE 17.2B

Creepy crawlies

Jenna often jumps at the sign of black cotton on her floor, and is known to scream if something brushes against her skin unexpectedly. Jenna typically avoids dark closets and spaces because she believes spiders are more likely to live there.

Identify the specific phobia Jenna is experiencing, and determine which of the four specific phobia categories her symptoms fall under. Explain and justify your answer.

Check your obook assess for these additional resources and more:

- **Student book questions**
  Check your learning 17.2
- **Suggested research**
  Worksheet: 17.2
  The treatment and prevalence of common psychological disorders
- **Challenge**
  Worksheet: 17.2 Mix and match
- **Weblink**
  Specific phobia

17.3 Perceived causes of anxiety disorders

KEY IDEA

In this section, you will learn about:

+ the perceived biological, psychological and social factors contributing to anxiety disorder, focusing on specific phobia and generalised anxiety disorder (GAD).

There are several potential explanations for anxiety disorders. Biological components have been identified, as well as perceived psychological causes. Social and cultural factors can also contribute to the incidence of anxiety disorders.

We will discuss each of these causes with reference to specific phobia and generalised anxiety disorder (GAD).

Perceived biological causes

Psychological disorders and mental health can be strongly influenced by biological causes including genetic predisposition and reaction patterns.

People who have specific phobia or general anxiety disorder often have a history of mental health issues in their family. Of course, this doesn't mean that someone will have anxiety just because their parents or close relatives do, but it increases the likelihood. This can be seen in twin and adoption studies that look at the heritability of disorders.

Specific phobia and GAD can both be affected by three biological factors that contribute to the development and maintenance of an anxiety disorder:

- the fight-flight-freeze response
- GABA and glutamate (neurotransmitters)
- genetic predisposition and inherited vulnerabilities.

The fight-flight-freeze response

fight-flight-freeze response a physiological response to stress that causes an organism to react in a combative matter (fight), removing themselves from the situation (flight) or by not reacting at all (freeze)

The **fight-flight-freeze** response is important to human survival. It provides us with an instant burst of energy to deal with danger in our environment and is controlled by the sympathetic branch of the autonomic nervous system. Once activated, stress hormones such as adrenalin and noradrenalin are released into the bloodstream to increase our heart rate and respiration rate, circulate more glucose through our body for energy, improve focus and temporarily boost our stamina to either fight the impending danger or flee to a safe place.

It is important to recall that anxiety and fear are different: fear is a reaction to a danger presented, whereas anxiety is the anticipation of a threat that may or may not happen. A person with a specific phobia of spiders will experience an intense fight-flight-freeze response when they see a spider or a milder response by simply looking at a picture of one!

Symptoms of the fight-flight-freeze response can include:

- elevated blood pressure
- tremor (shaking in the hands)
- palpitations (abnormally fast heartbeat that the person is aware of)
- diarrhoea

- sweating
- shortness of breath
- skin sensation of prickling, burning or itching without identifiable physical cause
- dizziness.

GABA and glutamate

The neurotransmitters GABA (gamma-amino butyric acid) and glutamate play an important role in maintaining the right balance in our nervous system so that our levels of anxiety (physiological arousal) remain at an optimal level. GABA has an inhibitory role on the fight-flight-freeze response and glutamate has an excitatory role; the two transmitters work together. When a person has low levels of GABA, the increased presence of glutamate increases agitation and anxiety and can contribute to them developing a specific phobia.

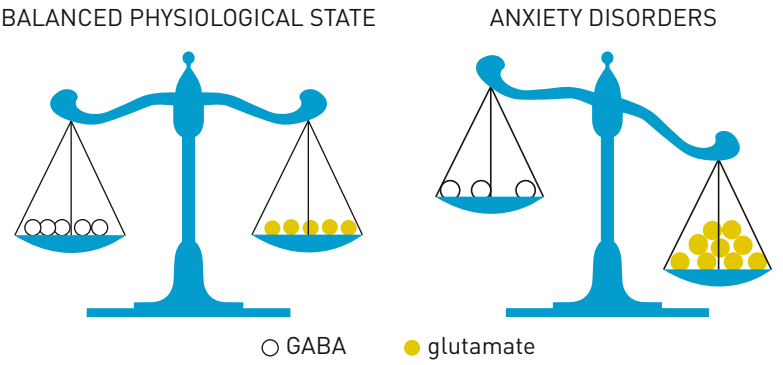


FIGURE 1 We need just the right amount of GABA and glutamate to maintain appropriate levels of anxiety.

Genetic predisposition and inherited vulnerabilities

Can a specific phobia and GAD be inherited? In a way, they can. It is not the phobia or GAD itself, however, that is inherited, but the person's biological make-up that can lead to a genetic vulnerability – such as being born with low levels of GABA. This vulnerability is also expressed in personality: individuals who are apprehensive about environmental objects and events are more likely to develop anxiety disorders and specific phobias. Although a person may have the genetic predisposition to develop GAD or a specific phobia, they will not necessarily develop one. Certain psychological, social and environmental influences can increase this likelihood.

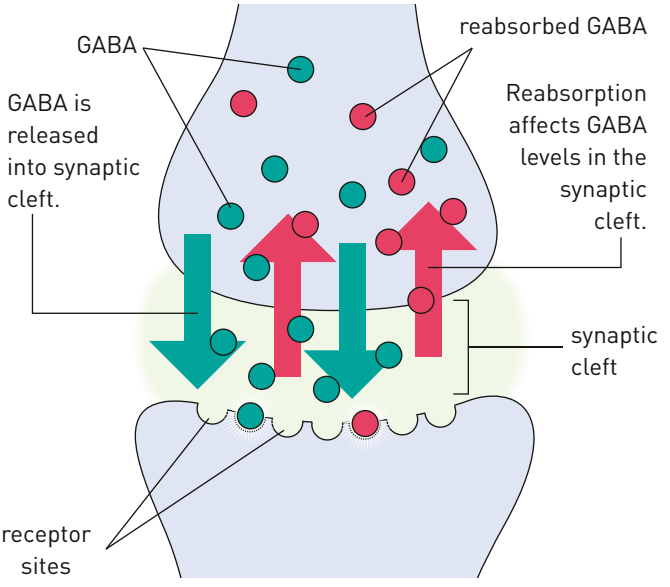


FIGURE 2 GABA at a synapse

Stressful life events

People may be more at risk if they experience a major life change that causes stress, such as the birth of a child, the breakdown/loss of a close relationship, or moving house/job. Physical, sexual or emotional abuse also increases the risk of developing GAD, as do other traumatic experiences in childhood, such as the death of or separation from a parent.

Psychological factors, including some personality traits, may put a person at greater risk of GAD; for example, being sensitive, being emotional or experiencing general nervousness, possessing an inability to tolerate frustration, feeling inhibited or having perfectionistic tendencies.

Perceived psychological causes

How do the different psychological approaches explain the development, reinforcement and management of specific phobias and GAD?

The psychological factors involved in developing an anxiety disorder refer to 'our thoughts, beliefs and perception about ourselves, our experiences and our environment' (Jacofsky *et al.*, 2010). Essentially, we are the sum of our experiences and, depending on genetics and personality, we will interpret environmental events in our own unique way. This allows people to develop mental short-cuts (heuristics) that enable them to function at work, with family and friends, and within the community at large. Those who are more sensitive and anxious and feel less in control are more likely to notice events in their environment and to view them as potentially threatening, even though they may not be. These thoughts and perceptions play a key role in developing a specific phobia or general anxiety disorder.

How do different theoretical approaches explain the specific phobia and GAD? In the next section, we will examine the behavioural and cognitive models to see how they differ.

The behavioural model and anxiety disorders

behavioural approach
uses the principles of classical and operant conditioning to examine how factors or stimuli in the environment can influence behaviours

The **behavioural approach** examines how an organism's behaviours are influenced by environmental factors and downplays the importance of thinking processes (cognition). According to the behavioural model, specific phobias and GAD are learnt through classical conditioning and maintained through operant conditioning.

Classical conditioning

Classical conditioning is a theory of learning which states that a neutral stimulus paired with an unconditioned stimulus elicits an unconditioned response. However, this can develop into a conditioned response if the stimulus is appropriately conditioned. In other words, we can develop a phobia of a neutral stimulus because we have been conditioned to associate it with fear. This is known as classical conditioning. Through this process people can develop phobias of such things as clowns or birds. While some people may view these things as harmless, others have been conditioned to be afraid of them.

For people with GAD, conditioned fear responses are believed to operate through a process of generalisation (Lissek *et al.*, 2014). That is, people prone to anxiety may have a realistic fear cue (such as fear of a friend being diagnosed with cancer), but they tend to worry about this fear consistently. This worry is not only activated by a cue directly related to the fear, but also when encountering similar events (such as hearing a story about a friend who had a skin mole removed). However, for anxiety-prone people, worry can also be cued by unrelated events, such as watching a medical drama on television.

Operant conditioning

Having a specific phobia is not just as simple as learning through association. The process of a child actively avoiding a visit to the dentist or having a tantrum that makes a session impossible has more to do with operant conditioning, a learning theory based on reward and punishment.

In the case of the dentist phobia, the avoidance of an unpleasant injection acts as a negative reinforcer that strengthens the likelihood of that behaviour being repeated. You could also say that the 'good' feeling of relief (at being able to avoid the injection) presents a positive reinforcement of the behaviour.



FIGURE 3 People who suffer from a specific phobia have shown a tendency to perceive events as more threatening than those who do not.

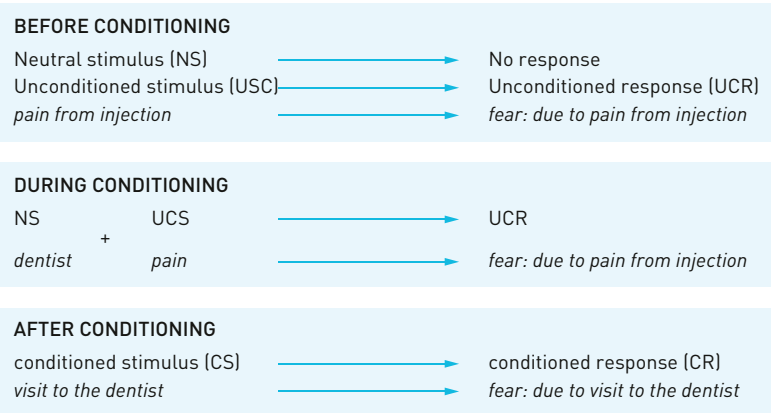


FIGURE 4 Acquisition of a dentist phobia through classical and operant conditioning

While classical and operant conditioning provide convincing behavioural explanations for the acquisition of a specific phobia, they do not fully explain situations where people are phobic about objects or events that they have never experienced.

The cognitive model and anxiety disorders

Unlike the behavioural model, the **cognitive model** emphasises the influence of thought processes on how we feel and behave. In treating specific phobia and GAD, psychologists use this model to examine and challenge the distorted thinking processes involved in the development and maintenance of the condition. The cognitive approach also reflects the notion that anxious individuals are likely to interpret situations, objects or activities as more dangerous than the average individual (Beck & Emery, 1985).

cognitive model examines how thought processes influence feelings and behaviours, and the role distorted thinking plays in the development and maintenance of psychological conditions

Our thoughts can be very powerful in influencing our behaviours and emotional responses. Studies have found that people who suffer from a specific phobia commonly report 'anxious beliefs, experience unrealistic expectations and make improbable predictions about the potential danger in a situation. In essence, they are reflecting "cognitive bias"' (Hood & Antony, 2012).

Cognitive bias refers to a 'systematic error in thinking that affects the decisions and judgments that people make'. This can also involve memory bias where a memory has been encoded inaccurately and influenced by the person's distorted thinking. Consequently, each time the person remembers the situation, object or event, it is usually more catastrophic or threatening than it really is.

cognitive bias error in thinking that affects decisions and judgment

Cognitive bias can involve catastrophic thinking, in which a person ruminates or obsessively thinks about a perceived threat. As the person overestimates the threat in a way that is often irrational, thoughts of worst-case scenarios lead them to an increased state of anxiety about the (often imagined) potential dangers of their specific phobia, or of their worrisome event in GAD.

This situation can be worsened when the person shows an attentional bias, or preference for noticing threat-relevant information as they remain more alert to their environment. For example, a person who suffers from arachnophobia will remain on high alert at all times in case there is a spider nearby. This can lead to the misreading of ambiguous stimuli – such as a small piece of fuzzy black fabric – as a spider and can lead the person to believe that the probability of being harmed by a spider is greater than it actually is.

A study conducted by Jones and Menzies (2000) found that individuals with a spider phobia had a tendency to 'overestimate the probability and consequences of being bitten' and tended to demonstrate avoidance behaviours.

Once a specific phobia has been established, according to both behavioural and cognitive approaches, avoidance behaviour is key to maintaining the anxiety around it. For a person with arachnophobia, this behaviour may include wearing gloves and protective clothing, placing clothes in sealed plastic containers or simply not going into areas where they fear a spider might lurk. These avoidant coping strategies are considered maladaptive. They alleviate the immediate feelings of anxiety in the short-term. However, they do not help the person to change their persistent unrealistic beliefs.

People with GAD engage in frantic, intense thought processes or worry. They are focused so hard on the upcoming or perceived threatening event or situation that they don't have the attentional capacity left to develop adequate coping or problem-solving strategies to arrive at a solution. They will likely underestimate their ability to cope with a stressful event or situation because they become chronic worriers and feel significantly stressed. This in turn makes them anxious and apprehensive, and they experience increased muscle tension while keeping careful watch for possible dangers or threatening situations.

Contributing social factors to anxiety disorders

Social and cultural factors can contribute to the type and incidence of specific phobia and GAD. Research has found that a child whose parent suffers from a phobia of moths, for example, is more likely to develop the same phobia as a result of simply observing their parent's fear response and making the cognitive connection that 'moths are dangerous'. Research has also shown that children of anxious parents are more likely to develop anxiety disorders, such as GAD.

People who experience anxiety disorder will often avoid certain behaviours or activities to avoid experiencing their anxiety. Sometimes, a parent, partner or friend may help to maintain the avoidance behaviour by trying to be helpful. For example, consider the person with arachnophobia. Spiders can be found in the garden, in cupboards and under beds. In fact, they live both inside and outside the home. A well-meaning parent may think that they are assisting their child by using insect repellents and not asking their child to help in the garden or take the clothes off the line. They are in fact encouraging avoidant behaviours and unwittingly helping the child to maintain the phobia.



FIGURE 5
Exposure to a parent's specific phobia can teach a child to fear the same stimulus.

Environmental triggers

In many instances, specific environmental triggers can lead to the development of a specific phobia. There are three possible environmental paths:

1. Direct exposure to a distressing or traumatic event, such as being attacked by a dog
2. Witnessing other people experiencing a traumatic event, such as seeing another person being attacked by a dog
3. Reading or hearing about dangerous situations or events; for example, developing a fear of dogs after hearing stories about children, adults or family pets being attacked by a dog.

In the same way, early environmental experiences such as trauma, and physical and mental abuse can increase a person's risk of developing GAD. Physical and mental abuse in adulthood as well as significant events such as the death of a loved one or divorce can all be contributing factors. Continual use of addictive substances such as caffeine heightens symptoms of anxiety and can lead to excessive worrying in vulnerable people (Meek, 2017).

Parental modelling

Albert Bandura combined behavioural and cognitive approaches to develop social learning theory. According to this theory, a great deal of our behaviour is learnt through imitating or modelling other people's behaviours. According to this theory, specific phobias can be learnt by observing other people's phobic reactions. Consider this scenario: a child is raised in a household where a parent is terrified of moths. Each time the parent sees one, they exhibit their fear by screaming and running out of the house. This increases the child's anxiety and leads them to believe that moths are dangerous and should be avoided at all costs. Thus, children whose parents show phobic responses are more likely to develop comparable fears of similar stimuli. Parental modelling can lead to the transmission of threat information, which is incorporated into the child's long-term memory.

Transmission of threat information

The transmission of information that a person perceives as threatening is not limited to the parent–child relationship. Information can be received from a range of different sources including the media, internet, friends and school. A student who is interested in travelling might develop a fear of flying if each time they Google 'travel or flying' they get plane crash websites with graphic pictures or video clips. If their fear prevents them from being able to board a plane, then threat information delivered by the internet has led to a specific phobia.

CHECK YOUR LEARNING 17.3

Describe and explain

1 **Identify** the causes of GAD.
2 **Identify** the causes of specific phobia.
3 **Describe** the biological influences on anxiety disorders.

Apply, analyse and interpret

4 Can specific phobia be inherited? **Explain**.
5 Provide an example of a psychological factor in specific phobia. **Compare** this to a psychological factor in GAD.

Investigate, evaluate and communicate

6 **Explain** the behavioural model of anxiety.
7 How can a psychologist use the cognitive model to understand specific phobia? **Justify** your response.
8 Parents, friends, teachers, family and partners can affect the development of anxiety disorders. For specific phobia, this can be helping the individual avoid the stimulus; for GAD, this can be by alleviating the stressor. **Assess** the impact this may have on the individual.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 17.3
- » Weblink
  What causes anxiety?
- » Weblink
  Generalised anxiety disorder
- » Weblink
  Managing anxiety

17.4 Who is affected by psychological disorders?

KEY IDEA

In this section, you will learn about:

+ the impact of psychological disorders on families and the wider community.

When a family member is sick, usually all members of that family are affected. In some cases, this may involve trips to the hospital to visit loved ones, and in others may be as simple as everyone in the household catching the same cold in winter. Psychological disorders can affect the family just as much, though in different ways.

Earlier in this chapter, we discussed the effect that a parent can have on a child's specific phobia, by maintaining that phobia. The interaction between parents and children can increase the likelihood of a disorder developing, and can also affect the family itself.

It is not uncommon for children to develop anxiety disorders throughout their youth. We have discussed generalised anxiety disorder and specific phobia, both of which have ages when onset is more likely. Obsessive compulsive disorder (OCD) can also have specific onset, often during childhood.



FIGURE 1 Many people will find this visually pleasing to look at, but if it were not presented this way it would not impact our daily lives. For someone with OCD, they would struggle to do anything until everything is organised.

Obsessive compulsive disorder is characterised by unwanted repetitive thoughts, and engaging in behaviours in response to these thoughts. This can include feeling compelled to wash hands for a certain amount of time, every time, or have everything set at an even number, such as the volume on the TV.

People with OCD can experience the following;

- a need for everything to be clean or in a particular order
- counting items or objects repetitively
- fears about both their own safety and the safety of those close to them.

Parents who have children with OCD, and other anxiety disorders, often intertwine their child's symptoms into their lives. Some children with OCD feel the need to check on their

parents multiple times in a night, sometimes up to 50 times. The children may also feel the need to say certain things to their parents, and have their parents respond in a certain way.

For these children, checking on their parents can provide temporary relief. While this helps the child in the short-term, the parents are losing sleep and may struggle to find energy for daily tasks. The lack of sleep can also put the parents at risk of developing depression or anxiety, as well as experiencing the symptoms of sleep deprivation, as discussed in Unit 1.

Parents and family members can also feel guilt that they did not pick up on their child's symptoms as soon as they 'should have'. They may worry that they caused the anxiety. In addition to this, parents may try to alleviate the symptoms by avoiding stressful situations. While this seems like a valid short-term solution, often this places greater stress on the family and the individual. Parents and carers can also feel trapped by the dependency of the child. Children with OCD or anxiety often require parental assistance to complete daily chores that are age appropriate.

For example, a child who feels that everything needs to be ordered in a particular way may spend hours rearranging their pencils before they can colour in. A parent may try to alleviate the symptoms by presenting the pencils already in the 'correct' order. While this may help the child, their parents may be dedicating excessive amounts of time to this.

In addition to the daily aspects of caring for an individual with a psychological disorder, parents and families can suffer financially. A parent may have to stop working to care for their child's needs, and to always be available. The cost of treatment and psychological appointments can also place financial strain on a family.

By acknowledging that psychological disorders affect the family as much as the individual experiencing the disorder, better treatment and support can be provided to treat the individual, and assist the family.

CHECK YOUR LEARNING 17.4

Describe and explain

1 **Identify** two ways that an individual with anxiety can affect their family.

2 **Explain** what is meant by obsessive compulsive disorder.

Apply, analyse and interpret

3 Choose one psychological disorder discussed in this chapter and **consider** what it would be like to live with someone who suffered from this disorder. How do you think it would impact your life?

Investigate, evaluate and communicate

4 'Society should do more for families who have children that have a psychological disorder.' **Evaluate** this statement. **Consider** what more society could do to assist families who experience psychological disorders. You may want to look at it from the perspective of children who have a parent with a psychological disorder, or from parents who have a child with a psychological disorder.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 17.4
- » Weblink
  Who is affected by psychological disorders.
- » Weblink
  Prevalence of psychological disorders
- » Weblink
  Anxiety in society

CHAPTER 17

Review

Summary

17.1
- There are several major categories of mental disorder. These include anxiety disorders, mood disorders, personality disorders and psychotic disorders, among others.
- Mental illness can occur at any stage during the lifespan. However, the onset of some mental illnesses is more likely to occur at different stages in life than others.
- MDD typically first presents during adolescence.
- Schizophrenia tends to show during adolescence/young adulthood. This is characterised by severe disturbances in thinking, emotions and behaviour.

17.2
- Specific phobia is a form of anxiety disorder that is defined as a persistent, irrational and intense fear of a particular thing, animal, situation, activity or person that interferes with a person's day-to-day functioning.
- Individuals with specific phobia and generalised anxiety disorder experience both psychological and physiological symptoms.
- The severity of a specific phobia can be rated along a mental health continuum as healthy, reacting, injural or disordered.

17.3
- In explaining the development of a specific phobia, the behavioural model focuses on the importance of behaviours and downplays the importance of thinking, while the cognitive model does the opposite.

17.4
- A psychological disorder experienced by a family member can affect the functioning of the family as a whole. Psychological disorders such as specific phobia, GAD and OCD can develop in childhood and adolescence, and impact on family functioning.
- Families with children suffering from psychological disorders can be adversely affected in a number of ways. These include the intertwining of the child's symptoms into the everyday lives of the parents; additional stress and negative emotions such as guilt experienced by parents and family members; the need for specialised daily care; and the extra financial burden placed on the household by the cost of treatment.
- A holistic approach to treatment can better support an individual suffering from a psychological disorder and assist the family by acknowledging that the disorder affects the family as much as it does the individual.

Key terms

- agoraphobia
- antisocial personality disorder
- anxiety disorders
- behavioural approach
- borderline personality disorder (BPD)
- cognitive bias
- cognitive model
- delusions
- delusions of grandeur
- delusions of perception
- fight-flight-freeze response
- generalised anxiety disorder (GAD)
- hallucinations
- major depressive disorder (MDD)
- personality disorders
- phobia
- psychological disorder
- psychotic disorder
- schizophrenia
- social phobias (social anxiety disorder)
- specific phobias
- stress
- word salad

Revision questions

Multiple choice

1 What is most common mental illness throughout the lifespan?
   - **a** depression
   - **b** schizophrenia
   - **c** Alzheimer's disease
   - **d** personality disorders

2 Which of the following is *not* a common symptom of schizophrenia?
   - **a** disorganised speech and behaviour
   - **b** paranoia
   - **c** delusions and hallucinations
   - **d** split personality

3 How many subcategories of specific phobia exist?
   - **a** four
   - **b** two
   - **c** three
   - **d** five

4 Which of the following terms is *not* reflected in the mental health continuum as it relates to specific phobia?
   - **a** healthy
   - **b** injured
   - **c** disorder
   - **d** developing

5 Unlike the behavioural model, the cognitive model emphasises the importance of:
   - **a** thought processes.
   - **b** personality predispositions.
   - **c** psychodynamic factors.
   - **d** cultural and environmental elements.

Short answer

Describe and explain

★6 **Describe** the main symptoms of people suffering generalised anxiety disorder in terms of the four main components of anxiety disorders.

★7 **Identify** the point is a rational fear considered to have become a specific phobia?

Apply, analyse and interpret

★★8
   - **a** **Differentiate** between normal fears and phobias.
   - **b** **Identify** the three main categories of phobias, and include one example of each.

★★9 **Consider** why depression is often called the 'common cold of mental illness'

★★★10 Amanda has a fear of birds. When she is outside, she actively avoids walking near them and at school she sits away from the courtyard where flocks of pigeons tend to gather. Images or videos of birds make her uncomfortable and bird sounds make her nervous.
   - **a** **Identify** the type of specific phobia Amanda is suffering from.
   - **b** Categorise Amanda's specific phobia as healthy, reacting, injured or disorder. **Explain** why.
   - **c** **Explain** the reactions that she would need to show to downgrade her phobia to the category below what she is currently experiencing.

Investigate, evaluate and communicate

★★11 'Today, therapists take a biopsychosocial approach to the treatment and management of specific phobia'. **Evaluate** what this statement means.

Check your obook assess for these additional resources and more:

- » Student book questions
  Chapter 17 Review
- » Revision notes
  Revision notes for Chapter 17
- » assess quiz
  Test your understanding with an auto-correcting multiple-choice quiz
- » Flashcard glossary
  Key terms in Chapter 17

CHAPTER 18

Risk factors and treatment of psychological disorders

As you are aware by now, mental illness is a major concern in today's society. One in five people experience at least one mental disorder in their lifetime. Psychological disorders can affect all areas of a person's life from employment, to relationships, to everyday functioning. The more accurate the information we have, the better equipped we are to deal with it in our lives.

OBJECTIVES

- → Describe the biopsychosocial (George Engle, 1980) approach to understanding psychological disorder
- → Summarise biological (genes, medication, sleep, substance use); psychological (rumination, impaired reasoning and memory, stress); and social (disorganised attachment, significant relationships) risk factors for psychological disorder
- → Describe the impact of stigma on help-seeking behaviours
- → Compare the use of psychotherapies, pharmacotherapies, electroconvulsive therapy (ECT) and psychosurgery in the treatment of psychological disorder
- → Explain the placebo effect

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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FIGURE 1 Identifying risks and developing treatment plans is one of the responsibilities of a psychologist.

SUGGESTED RESEARCH

SUGGESTED RESEARCH	**18.2** The relationship between the treatment and prevalence of common psychological disorders (e.g. does increased provision of treatment reduce prevalence? in Jorm, Patten, Brugha & Mojtabai, 2017)
SUGGESTED RESEARCH	**18.5** The impact of stigma on help-seeking behaviours (e.g. public attitudes about psychological disorders and treatments in Angermeyer, van der Auwera, Carta & Schomerus, 2017)

Source: *Psychology 2019 v1.3 General Senior Syllabus*
© Queensland Curriculum & Assessment Authority



* This chapter will provide information about mental health and mental disorders. This information is intended only as a guide and should not be used for diagnosis or treatment. You can seek support for anything discussed in this chapter by speaking with a family member, friend, teacher or trusted adult. Alternatively, the following organisations can offer support: Beyond Blue, SANE, Lifeline, Kids Help Line, the Black Dog Institute and Headspace. Links are available via your obook assess.

18.1 Risk factors and protective factors for psychological disorders

KEY IDEA

In this section, you will learn about:

+ risk factors and protective factors for psychological disorders.

Psychological disorders can develop for a number of reasons, and nobody is immune. There are many different risk factors associated with developing a mental disorder, including biological, psychological, sociocultural and environmental factors. These risk factors make it more likely for an individual to develop a psychological disorder. It is important to identify the cause of a mental disorder to enable the practising psychologist to better assist the individual in managing their condition and also reduce the chance of it recurring.

Risk factors and protective factors

risk factors factors that contribute to the likelihood of a person developing (or relapsing into) a mental disorder

protective factors factors that guard against the onset or relapse of a mental disorder

Risk factors are factors that contribute to the likelihood of a person either suffering from a mental disorder or experiencing a relapse. In contrast, **protective factors** guard against onset or relapse by supporting a person's general wellbeing. Unlike risk factors, addressing protective factors gives people resilience in the face of adversity and softens the effects of stress.

It is important to acknowledge the limitations of our current understanding of the risk factors for mental disorders and the significance of any single risk factor. Not everyone who is exposed to a risk factor will necessarily develop a mental disorder.

Level	Risk factors	Protective factors
Individual attributes	• Low self-esteem • Cognitive/emotional immaturity • Difficulties in communicating • Medical illness, substance use	• Self-esteem, confidence • Ability to solve problems and manage stress or adversity • Communication skills • Physical health, fitness
Social circumstances	• Loneliness, bereavement • Neglect, family conflict • Exposure to violence/abuse • Low income and poverty • Difficulties or failure at school • Work stress, unemployment	• Social support of family and friends • Good parenting/family interaction • Physical security and safety • Economic security • Scholastic achievement • Satisfaction and success at work
Environmental factors	• Poor access to basic services • Injustice and discrimination • Social and gender inequalities • Exposure to war or disaster	• Equality of access to basic services • Social justice, tolerance, integration • Social and gender equality • Physical security and safety

World Health Organization, 2012

TABLE 1 Factors affecting mental health

The *multidimensional model*, followed by many practitioners, recognises that risk factors interact, and that multiple and persistent risk factors are more likely to cause a mental disorder than any single risk factor. Table 1 sets out risk factors and protective factors that may affect mental health according to the World Health Organization.

The Four P's

When treating patients with a mental disorder, psychologists often try to identify factors that influence the mental disorder – what are those that increase the risk, and those that protect against the onset and reoccurrence of the disorder?

Together, these four factors might be conveniently referred to as the 'Four P's':

Predisposing risk factors

Predisposing risk factors refer to factors that increase vulnerability to mental disorders and takes into account certain traits or attributes that we might be born with.

These factors may include:

- inherited traits, such as certain genes that may increase the chances of a mental disorder developing; having a biological member of your family such as a parent or a sibling with a mental disorder
- environmental exposures before birth, such as to toxins, alcohol or drugs
- chronic social stressors, such as difficult circumstances during childhood, bullying and parental neglect
- brain chemistry, for example, some neural networks may be impaired and the malfunctioning leads to nervous system changes and possibly mental disorders
- ongoing chronic medical condition, such as diabetes, cystic fibrosis, cancer.



FIGURE 1 Predisposing risk factors include things we might inherit, or encounter in the early stages of development.

Precipitating risk factors

These factors help the practitioner to understand the patient's current symptoms and might include:

- stressful life situations (e.g. legal and/or financial problems, death of a loved one, divorce, witnessing parental violence)
- being the victim of parental emotional, physical or sexual abuse, or neglect
- belonging to an ethnic minority
- traumatic experiences (e.g. being assaulted, being affected by war or terrorism, military combat)
- long-term use of some medications.

Perpetuating risk factors

These factors inhibit recovery, in other words, make the mental disorder last longer than it otherwise would, and include:

- problems with alcohol, tobacco and drugs

- social isolation (e.g. having few friends or extended family, or few healthy relationships in general)
- relationship difficulties
- family conflicts
- poverty and/or homelessness
- medical conditions such as heart disease
- weakened immune system
- poor parental attachment
- previous mental illness
- missing school or work
- harm to self and/or others.



FIGURE 2 Homelessness is considered a perpetuating risk factor.

Protective factors

The following protective factors can help prevent the occurrence or reoccurrence of a mental disorder and include a person's strengths, resilience and supports:

- good diet
- maintaining fitness and good physical health
- maintaining good sleep patterns
- ability to recognise early warning signs of relapse of the disorder
- awareness of potential risks for developing or experiencing the relapse of a disorder
- maintaining appropriate medication when relevant
- staying connected with family and friends
- awareness, acceptance and recognition of the mental disorder
- joining a support group
- learning about mental disorders
- anticipating and planning appropriately for potential scenarios and relapses
- avoiding harmful use of alcohol and drugs
- being involved in education, art or other activity
- economic wellbeing and having a reliable job or means of income
- having a home.

CHECK YOUR LEARNING 18.1

Describe and explain

1 **Explain** what a risk factor is.
2 **Describe** a protective factor.
3 **Identify** the 'Four P's' of risk.

Apply, analyse and interpret

4 **Compare** risk and protective factors. Why do they affect individuals this way?

Check your obook assess for these additional resources and more:

» Student book questions
Check your learning 18.1

» Weblink
Social media and mental health

» Weblink
Self-esteem and mental health

» Weblink
Family mental health

18.2 Biological risk factors for psychological disorders

KEY IDEA

In this section, you will learn about:

- genetic vulnerability to specific disorders
- poor response medication due to genetic factors
- poor sleep
- long-term substance abuse.

Biological risk factors include genetic predisposition, physiological structures of the body and the biochemical processes of the brain and nervous system. These factors are examined in more detail below in the context of genetic vulnerability to specific disorders, poor response to medication due to genetic factors, poor sleep and long-term or sporadic substance abuse.

Genetic vulnerability to specific disorders

Twin studies, family studies and adoption studies have suggested that people can be more at risk of developing a mental disorder if it runs in the family. Our genes, passed on to us by our parents, instruct our body on how it will make the proteins that make up our cells, including those in our brain. A genetic mutation can cause proteins to be created that will function differently from how they should. Some people are genetically predisposed to producing low or high levels of particular neurotransmitters that render them at greater risk of a mental disorder.



FIGURE 1 People can inherit genetic vulnerability for a mental disorder from their parents.

It is important to note, however, that being vulnerable to specific disorders does not mean a person will definitely develop one. It simply means they are more susceptible to its onset.

Schizophrenia has a strong genetic link. Through twin studies and adoption studies, support has been provided for the genetic component. Heston (1966) conducted a study on 47 infants who were raised by adoptive parents, but whose biological mothers had schizophrenia. He also obtained 50 control participants who were raised with their biological and non-schizophrenic mothers. The findings showed that 16 per cent of the children whose biological mother had schizophrenia were diagnosed with this disorder compared to no participants from the control group (Kring *et al*,. 2007).

In support of these findings, further research was conducted in Finland with a larger sample of adopted children. It was found that of the 164 adoptees who had a parent with schizophrenia, the risk of developing the illness was 8.1 per cent, compared to the 197 control group adoptees who did not have a parent with schizophrenia, whose risk was 2.3 per cent (Tiernari *et al.* cited in Kring *et al.*, 2007).

The Genain quadruplets offer some insight into research on genetics and schizophrenia. These genetically identical quadruplets had psychological problems and had all developed schizophrenia in their 20s. There were several causes for the onset of schizophrenia, and one of them was genetic. The quadruplets had a family history of psychological problems on their father's side, and it is very likely that their genetic make-up, among other things, contributed to each quadruplet developing schizophrenia later in life (Nietzel *et al.*, 1998).



FIGURE 2 The Genain quadruplets all developed schizophrenia later in life. The chances of four unrelated individuals all being schizophrenic is 1 in 100 million.

SUGGESTED RESEARCH
18.2 The relationship between the treatment and prevalence of common psychological disorders
Go to page 457 »

Poor response to medication due to genetic factors

Some individuals respond better than others to medication, depending, in part, on their genetic make-up and metabolism. Abnormal levels of neurotransmitters are thought to be involved in mental disorders. For example, extremely low levels of a neurotransmitter called serotonin has been linked with depression. Antidepressant medications such as Zoloft or Prozac work to increase the levels of serotonin. These types of medication are known as selective serotonin re-uptake inhibitors (SSRIs). Depending on their serotonin level, individuals may need higher or lower treatment dosages, and the SSRI may be ineffective if underlying factors other than serotonin levels are causing a person's depression (Burton *et al.*, 2015).

Our bodies respond to medication via a five-stage process, and every individual can react to each stage differently (Habermann, 2016):

1. The first stage is how we absorb the drug into our body. This is known as the absorption stage.
2. The second stage is the distribution stage. It describes how our body distributes the drug to where it is needed. In the case of antidepressants, the site is the neural pathways in the brain.
3. The third stage is the target interaction stage. This involves where and how the drug interacts with the cells it was designed to treat. For antidepressants, the target is for the drug to bind with receptors in the brain and prevent the re-uptake of neurotransmitters, such as serotonin.
4. The fourth stage is metabolic processing: how our bodies change the chemical compound of the drug in order to use it or prepare for it to leave our system. This usually happens in the liver, but can also happen in the stomach or blood plasma.
5. The fifth stage is the excretion stage: how our body gets rid of the chemicals left over from the drug. People can therefore respond differently to a drug, depending on their genetic make-up.

Pharmacogenetics is a field of study that looks at how an individual's genetic make-up affects their response to drugs (Fabbri, Di Girolamo, & Serretti, 2013; Li, Tian, Seabrook, Drevets, & Narayan, 2016). It is hoped that this growing field of study will build our knowledge of how and why people respond differently to drugs, allowing us to better plan and treat mental disorders.

Poor sleep

Chronic sleep problems are associated with mental health issues and each can perpetuate the other. Sleep problems are particularly common in patients with anxiety, depression, bipolar disorder and attention deficit hyperactivity disorder. It is thought that sleep deprivation, or disorders such as insomnia, affect the way individuals regulate their emotions. For example, people who have been deprived of sleep seem to react more intensely to negative experiences or emotions than those who are not sleep deprived (Abbott, 2016; Franzen, Buysse, Dahl, Thompson, & Siegle, 2009). Patients who struggle to deal with negative emotions may be more susceptible to depression and other forms of mental disorders. Likewise, if sleep deprivation is a symptom of a mental health condition, then a patient's condition may be exacerbated by a loss in their ability to deal with emotions effectively.

Benzodiazepine medications can be used to treat poor sleep patterns by enhancing the effects of gamma-amino butyric acid (GABA), a neurotransmitter that affects our emotional reactions and ability to relax. However, one of the issues in using benzodiazepine medication is that it may intensify existing symptoms (i.e. depression), and prolonged use can lead to dependency (Barlow & Durand, 2011).



FIGURE 3 Antidepressant medication can be more or less effective, depending on someone's genetic structure.

Therefore, when treating chronic sleep problems, it is important to consider whether a mental health issue has caused the sleep problem – or if the sleep problem has contributed to a patient's poor mental health.

Long-term substance abuse

Long-term substance abuse has been linked with a number of mental disorders. There is an association between alcoholism and depression, cannabis and depression, and amphetamines with symptoms of paranoia and anxiety. Addictive substances, such as nicotine or alcohol, change the way the brain works by interfering with chemical neurotransmission. Some substances also affect the level of neurotransmitters released.

Nicotine, for example, affects the acetylcholine receptors in the brain (the 'pleasure pathway') and increases dopamine levels – a neurotransmitter involved in the production of feelings of reward and pleasure (Barlow & Durand, 2011; National Institute on Drug Use for Teachers, 2018).

Other substances affect how neuronal messages are transmitted. For example, repeated use of the drug ecstasy disrupts serotonin pathways in the brain, resulting in memory problems for long-time users. Similarly, cocaine attaches itself to dopamine transporters in the brain, preventing the re-uptake of dopamine into the neurons and causing dopamine to build up in the synapse (National Institute for Drug Use, 2016). This causes the euphoria experienced by users after taking the drug. Prolonged use of these substances can have devastating long-term effects on the way our brain functions. It can lead to poor memory functioning, changes in sleep patterns and appetite, as well as problems in how information is processed in the brain.

It is not clear whether a person with a mental disorder will abuse drugs to relieve their symptoms in the short-term. Long-term substance abuse can enhance the symptoms of an existing mental disorder. For example, some drugs can trigger the onset of early symptoms of a mental disorder such as schizophrenia in individuals genetically predisposed

to it. Drugs such as cannabis, cocaine, amphetamines and LSD can increase the risk of schizophrenia, leading to a relapse of symptoms in those who are recovering (Nielsen, Toftdahl, Nordentoft, & Hjorthøj, 2017).

CASE STUDY 18.2

Why pot makes some people psychotic

People who smoke pot may be at increased risk for psychosis if they have a certain genetic marker, a new study finds.

The results show people with this genetic marker who use cannabis are twice as likely to experience psychosis compared with those who use the drug but do not have the genetic marker.

Among people who use the drug every day, the risk for psychosis increases sevenfold for those who have the genetic marker.

Previous studies have linked smoking marijuana with an increased risk of psychiatric disorders, such as schizophrenia, but only a small number of those who smoke pot will ever have a psychotic episode. The new finding could help identify which cannabis users might be at risk for this side effect, the researchers said.

'Our findings help to explain why one cannabis user develops psychosis while his friends continue smoking without problems,' said study researcher Dr Marta Di Forti, of King's College London's Institute of Psychiatry.

The study involved 489 people living in London who had experienced a psychotic episode, and 278 healthy people without a history of psychiatric disorders.

The genetic marker in question is one variation of a gene called AKT1. The new finding confirms earlier research, which also linked this marker with the risk of psychosis after smoking pot.

The AKT1 gene is known to be involved in the signaling of the brain chemical dopamine, which is abnormal in those with psychosis, Di Forti said.

The genetic marker likely acts along with other genes to contribute to the risk of psychosis from cannabis smoking, the researchers said. Finding the genetic underpinnings of cannabis psychosis may lead to the development of therapies for the condition, said Dr John Krystal, editor of *Biological Psychiatry*, the journal in which the study was published November 15.

www.livescience.com, 19 November 2012

CHECK YOUR LEARNING 18.2

Describe and explain

1 **Explain** biological risk factors.

2 **Describe** how medication can be affected by genetics.

Apply, analyse and interpret

3 Poor sleep can influence the development of mental disorders, and be caused by mental disorders. **Determine** how a psychologist might assess which came first.

4 **Consider** the Genain quadruplets. Do you think that they provide support for the theory of biological risk factors?

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 18.2
- » Weblink
  Genetic factors and psychological disorders
- » Weblink
  The Genain quadruplets
- » Weblink
  Substance abuse and mental health

18.3 Psychological risk factors for psychological disorders

KEY IDEA

In this section, you will learn about:

+ rumination, impaired reasoning and memory, stress and poor self-efficacy as psychological risk factors.

Psychological risk factors include a person's personality, thoughts, feelings and behaviours. Such factors are explored below with particular reference to rumination, impaired reasoning and memory, stress and poor self-efficacy.

Rumination

rumination
excessive thinking or worrying

Rumination refers to obsessive thinking and worrying about the negative aspects of a past, present or future situation. It has the potential to adversely affect mental health if a person is unable to break the cycle of ruminating about the negative aspects of life, preventing them from developing strategies to address their perceived problems. Rumination is associated with anxiety and, if untreated, can lead to depression.

A possible explanation for why rumination occurs is the way our brains function in relation to memories. People tend to remember things that are related to each other. When we constantly remember negative things, the brain automatically recalls similar negative experiences; this causes the areas in the brain associated with negative thinking to 'light up'. This process is known as neural networking. Over time, such thinking can become a 'cognitive' habit (Belzung, Willner, & Philippot, 2015). And habits, as we know, are particularly hard to break.

Rumination is made worse if patients also experience symptoms of depression and anxiety. It is likely that the brain of a depressed patient lacks the necessary chemical (or synaptic connections) that allows them to switch to a more positive set of memories, making it difficult to generate new solutions to problems. Therefore, as rumination intensifies, so does the likelihood of experiencing depression and anxiety.

Cognitive behavioural therapy has been shown to be effective in treating rumination by teaching patients to reappraise the way they think about and interpret their thoughts. It enables the individual to assign a new set of emotions and thinking patterns to their cognitive experiences (Watkins, 2015).

Impaired reasoning and memory

Impaired reasoning and memory are often associated with dementia, depression, schizophrenia and bipolar disorder. Causes vary and depend on the type of mental disorder and the particular part of the brain that has been impaired. Approximately 70–80 per cent of people who suffer from schizophrenia show impaired reasoning and memory (Medalia & Choi, 2009).

Impaired reasoning can be described as the inability to engage in goal-directed thinking, where conclusions are drawn logically from what we know (the information we have stored in

memory). Patients with thinking impairments tend to 'jump to conclusions' without accessing all the information available. For people with schizophrenia, impaired reasoning is thought to lead to delusions (fixed, firm but false beliefs) that are held rigidly, even when evidence to the contrary is provided (Burton *et al.*, 2015).

Impaired memory is associated with schizophrenia, autism spectrum disorder, depression, dementia, post-traumatic stress disorder (PTSD) and bipolar disorder (Burton *et al.*, 2015). Depending on the type of disorder, both long-term memory and short-term memory can be affected. For example, individuals with schizophrenia show impairment to all forms of memory, in particular episodic memory (memory for past events and personal experiences), while those suffering PTSD show impairment to episodic and verbal memories (Milan *et al.*, 2012).

Memory impairment can be disabling for patients, causing confusion and disruption to their everyday lives. Individuals with impaired memory typically find it difficult to work, engage in everyday activities and maintain personal relationships (Burton *et al.*, 2015).

Stress

Stress can negatively affect mental health if it is not checked or managed. Stress causes our bodies to release hormones such as adrenalin and cortisol as part of the fight-flight-freeze response. If too much cortisol is released over long periods, the risk of developing a mental disorder such as depression is increased.



FIGURE 1 Stress can have a negative impact on mental health.

Elevated cortisol (known as the 'stress hormone') levels can also lead to memory and learning impairments. Cortisol has also been associated with the onset of mental disorders, such as schizophrenia, depression and substance abuse.

Stress can be caused by traumatic life events, such as a death of a loved one, a health scare or a break-up with a partner. Most of us encounter some sort of stress during our lives, most

of which we can deal with effectively. However, when stress has a substantial impact and is ignored, it can affect both our psychological and physical wellbeing (Burton *et al.*, 2015).

Effects of stress include depression, memory loss, impaired immune functioning and risk of developing a mental disorder (Burton *et al.*, 2015). The possibility that stress will lead to a mental disorder depends on a person's level of vulnerability (influenced by genetics, biology and social factors), their ability to cope with the stress, and the level of stress they experience (Burton *et al.*, 2015).

Poor self-efficacy

self-efficacy
an individual's sense of ability to control and succeed in their life

Self-efficacy refers to a person's general coping strategies and their perception of their ability to control the events that happen in their lives. People with poor self-efficacy can sometimes develop symptoms of anxiety and/or depression.

People with poor self-efficacy tend to believe that their environment is unmanageable, and they magnify the severity of threats they perceive around them. Lack of self-efficacy can contribute to depression and anxiety when patients feel they have no control over their negative and disturbing thoughts. They also lack the ability to engage in protective behaviours or activities that may assist them because they do not believe they can succeed.

Thus, self-efficacy affects how vulnerable a person is to experiencing stress, anxiety and depression. They become more vulnerable as they tend to dwell on their inability to cope, and tend to worry about things that may never happen. This is in contrast to people who have high self-efficacy and believe in their ability to cope and overcome stressors in their lives (Maciejewski, Prigerson, & Mazure, 2000).

CHECK YOUR LEARNING 18.3

Describe and explain

1 **Identify** and explain three psychological risk factors.
2 **Explain** what is meant by *rumination*.

Apply, analyse and interpret

3 **Compare** and contrast the effects of stress and the effects of impaired reasoning and memory on mental health.

Investigate, evaluate and communicate

4 A year ago, Marten's girlfriend broke up with him without warning. Marten now has a new girlfriend. Marten can't stop thinking about everything that went wrong with his ex-girlfriend and is convinced that the same thing will happen with his new girlfriend.

Evaluate what Marten is experiencing; is it rumination, poor self-efficacy or a combination of both? **Justify** your answer using your knowledge of psychological risk factors.

obook

Check your obook assess for these additional resources and more:

» Student book questions
Check your learning 18.3

» Weblink
The importance of relationships

» Weblink
Grieving the loss of someone

» Weblink
Grief and the brain

18.4 Social risk factors for psychological disorders

KEY IDEA

In this section, you will learn about:

+ social risk factors for psychological disorders, including disorganised attachment and loss of significant relationships.

The culture of a particular community or sector of society can place expectations on people that are associated with the onset of mental disorders. For example, pressure on women to be thin can lead to depression and other disorders, such as anorexia and bulimia. Social and economic factors, such as divorce or unemployment, can place some people at risk. Social isolation is another significant contributor to developing a mental disorder. Some particular social factors are explored in this section.

Disorganised attachment

disorganised attachment experienced by individuals who find it difficult to share their feelings or empathise with others

As discussed in Chapter 8, attachment is a strong, close and emotional bond that develops between an infant and its caregiver. A contributing factor to social isolation is the phenomenon of **disorganised attachment**, which affects individuals in society who find it difficult to share their feelings or to relate to others.

Children who exhibit disorganised attachment behave in contradictory ways. For example, they will approach their primary attachment figure while simultaneously gazing away, or appear disoriented, engage in rocking behaviour and have dazed facial expressions. The disorganised child's behaviour is difficult to understand.

Disorganised attachment in children at 12 months of age is linked to disruptive and aggressive behaviour in later childhood (Lyons-Ruth *et al.*, 1997). These behavioural patterns tend to persist across the lifespan, with disorganised attachment in adulthood leading to problems in managing and maintaining relationships, poor social and emotional regulation skills, and a low tolerance for stress. They may also exhibit aggressive and hostile behaviours and engage in problematic parenting styles, putting them at risk of developing mental disorders (Firestone, 2016).

Loss of significant relationships

People have many and varied relationships throughout their lives. A significant relationship is a relationship that a person considers to be of high importance to them. This can include family, friends, romantic partners and those we live with. Relationships like these usually involve feelings of love and affection. Loss of a significant relationship might be due to separation from a partner, the breakdown of a relationship with another family member or the death of someone close to you. All these circumstances can contribute to an individual experiencing anxiety and/or depression.

Grief is also commonly associated with loss and can be described as the physical, emotional, cognitive, behavioural and spiritual response to loss (Hall, 2014). For 10–15 per cent of people who experience loss, grief can become a chronic condition, lasting for years, especially in cases where bereavement has been violent, unexpected or untimely (Hall, 2014).



FIGURE 1 People often experience grief and sadness after the loss of a loved one. This can manifest as anxiety or depression.

Common reactions to loss of a significant relationship may include stress, anxiety, confusion, exhaustion, anger, guilt, shame and blame. Sleep loss and insomnia are also commonly associated with grief, as are physical reactions such as headaches, nausea and loss of appetite (Burton *et al.*, 2015).

Mental disorders such as anxiety or depression may also arise from prolonged or intense feelings of grief. Loss of significant relationships can also result in risky behaviours, such as increased alcohol consumption and drug use. For some people, the death of a loved one can cause acute grief that worsens over time rather than improving. This debilitating mental health condition is known as complicated bereavement disorder. People who suffer from this condition often have a history of clinical depression or anxiety, are emotionally dependent on the one they have lost, and can have alcohol and drug problems.

There is also a neurological basis involving the pleasure and reward system in the brain. When people experience grief, the limbic system, which is responsible for pleasure, reward and addiction, appears to be activated (Khoshaba, 2014).

CHECK YOUR LEARNING 18.4

Describe and explain

1 **Describe** social risk factors for psychological disorder.

2 **Explain** what is meant by *disorganised attachment*.

Apply, analyse and interpret

3 Rosanna's grandmother has just passed away. Rosanna was extremely close to her grandmother and misses her all the time. Rosanna's brother, David, didn't really like their grandmother and doesn't seem to have noticed any difference since her death. **Consider** the different reactions to the loss of a significant relationship and how this will affect their mental health.

Investigate, evaluate and communicate

4 **Evaluate** Case study 18.2 and consider biological risk factors and social risk factors. **Refer** to the development of schizophrenia.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 18.4
- » Weblink
  Disorganised attachment
- » Weblink
  Loss of relationships

18.5 Stigma and treatment

KEY IDEAS

In this section, you will learn about:

- the stigma surrounding mental illness and the ways this can affect treatment
- cumulative risks for psychological disorders.

Mental illness has long been stereotyped. You would have come across images of someone in a straight jacket maniacally laughing. You may have even heard it referred to as being a 'weakness' rather than illness.

This stereotyping has long affected those who suffer from mental illness. In some instances, people with a mental illness are unable to recognise that they are in need of help because they have never acknowledged their symptoms or are unaware that they may have mental disorder. Alternatively, people fear the stigma associated with having a mental illness.

stigma
a negative mark that applies to an individual and separates them from others

Stigma refers to a 'mark of disgrace' that labels a person as different and separates them from others. The stigma associated with mental illness can leave people feeling embarrassed or ashamed. Consequently, they are less likely to seek or accept help and will often go untreated for years. This not only affects the person suffering with the mental disorder, but also their family and friendship group. Imagine how difficult it would be if a family member had a phobia about flying? How would you be able to go on a holiday overseas together? A person suffering from a specific phobia may experience embarrassment, shame, distress, helplessness, sadness or anxiety as a result of their mental illness.

As with a number of different mental health conditions, there is often a stigma attached to a person seeking treatment. Stigma can lead to mental health patients feeling devalued and act as a barrier to people seeking professional help. For example, the stigma associated with mental illness can prevent individuals from seeking the psychological help they need.

There are two types of stigma associated with mental disorders: self-stigma and social stigma (Corrigan & Rao, 2012). Self-stigma occurs when a mental health sufferer internalises negative stereotypes and has subsequent negative emotional reactions to their mental illness, including low self-esteem and poor self-efficacy. Social stigma includes the various prejudices and discrimination directed at individuals with mental disorders by the general public. Public stigma tends to include negative stereotypes about mental illness, such as beliefs that they are dangerous or unpredictable. This stigma can lead sufferers and their families to avoid seeking treatment for fear of being associated with that stereotype. A person may also avoid seeking treatment because they do not want to seem weak to their families and friends when, in actual fact, suffering with a mental disorder has nothing to do with personal strength at all.

Cumulative risk

All of the factors discussed in the chapter so far might interact with each other to precipitate a mental disorder: this would be referred to as **cumulative risk**.

cumulative risk
the combined risks or factors that may interact with each other to influence a mental disorder

Individuals often encounter some kind of risk factors across their lifespan. Unfortunately, events such as loss or bereavement are a part of life. People with mental disorders, however, have often encountered multiple risk factors throughout their lives. Researchers have found that the accumulation of risk factors increases the chances of a person developing a mental disorder.

CASE STUDY 18.5

Fighting stigma: a key to increasing access to treatment

World Health Organization

Depression is a common illness and people suffering from depression need support and treatment. WHO marks the 21st Anniversary of World Mental Health Day on 9 October 2013.

Globally, more than 350 million people have depression, a mental disorder that prevents people from functioning well. But because of the stigma that is often still attached to depression, many fail to acknowledge that they are ill and do not seek treatment.

Depression is different from usual mood fluctuations. Depression induces a sustained feeling of sadness for two weeks or more and interferes with the ability to function at work, school or home. Effective treatments include psychosocial treatment and medication. The active involvement of depressed people and those who are close to them in addressing depression is key. The first step is to recognise the depression and reach out for support. The earlier the treatment begins, the more effective it is.

'We have some highly effective treatments for depression. Unfortunately, fewer than half of the people who have depression receive the care they need. In fact in many countries this is less than 10%,' says Dr Shekhar Saxena, Director of the Department for Mental Health and Substance Abuse. 'This is why WHO is supporting countries in fighting stigma as a key activity to increasing access to treatment.'

Cultural attitudes and lack of proper understanding of the condition contribute to a reluctance to seek help for depression.

Depression common in all regions

WHO estimates suggest that depression is common in all regions of the world. A recent study supported by WHO revealed that around 5% of people in the community had depression during the last year.

Depression results from a complex interaction of social, psychological and biological factors. There is a relationship between depression and physical health, for example, cardiovascular disease can lead to depression and vice versa. Up to one in five women who give birth experience post-partum depression.

In addition, circumstances such as economic pressures, unemployment, disasters, and conflict can also increase the risk of the disorder. At its worst, depression can lead to suicide. Tragically almost one million people commit suicide every year and a large proportion of them had experienced depression.

WHO response

WHO assists governments in including treatment of depression in their basic health care packages. Through WHO's Mental Health Gap Action Programme (mhGAP), health workers in low-income countries are trained to recognise mental disorders and provide proper care, psychosocial assistance and medication to people with depression.

World Mental Health Day was initiated by the World Federation for Mental Health in 1992. The day is used by many countries and organisations to raise public awareness about mental health issues and to promote open discussion of mental disorders, and investments in prevention, promotion and treatment services.

SUGGESTED RESEARCH
18.5 The impact of stigma on help-seeking behaviours
Go to page 457 »

For example, a person might have a neurotransmitter imbalance because of a genetic predisposition, and then they experience a significant life event such as divorce or the death of a loved one. This combination of factors may precipitate a mental disorder. The first three of the Four P's and the biological, psychological and social factors for developing a mental disorder can be put together into a workable table (such as Table 1), which psychologists can use to formulate a diagnosis and management plan for their patients or clients.

	Predisposing factors	Precipitating factors	Perpetuating factors
Biological	• Genetic background • Physical illness	• Substance abuse	• Medication metabolism • Physical illness • Substance abuse
Psychological	• Developmental experiences • Early life experiences – trauma • Personality style • Learnt behaviours	• Stressful life events	• Dysfunctional relationships • Social isolation
Social	• Culture • Ethnicity • Occupation • Social support	• Unemployment • Migration • Financial difficulties	• Unemployment • Stigma • Lack of support

TABLE 1 Three of the Four P's and biological, psychological and social risk factors

CHECK YOUR LEARNING 18.5

Describe and explain

1 **Explain** what is meant by stigma and explain how this affects treatment of psychological disorders.
2 **Describe** the cumulative risk for psychological disorders.

Apply, analyse and interpret

3 **Apply** your knowledge of the risk factors that contribute to mental disorders and complete the table below:

	Predisposing	Precipitating	Perpetuating
Biological			
Psychological			
Social			

Investigate, evaluate and communicate

4 From the table you have completed in question 3, **investigate** what some protective factors might be. You may need to conduct further research.
5 Having a risk factor does not guarantee developing a psychological disorder. **Discuss** this statement.

Check your obook assess for these additional resources and more:

» **Student book questions**
Check your learning 18.5

» **Suggested research**
Worksheet: 18.5 The impact of stigma on help-seeking behaviours

» **Weblink**
Cumulative risks

» **Weblink**
Fighting stigma

18.6 Biopsychosocial approach to understanding mental disorders

KEY IDEA

In this section, you will learn about:

+ the biopsychosocial approach to assessing and treating psychological disorders.

biopsychosocial model
a holistic approach to treating psychological disorders by looking at biological, psychological and sociocultural factors

The **biopsychosocial model** was first developed by George L. Engel in 1977 who believed that to truly understand and treat a person's mental and/or physical illness, it was important to consider their condition in terms of biological, psychological and social influences (Engel, 1977; Borrell-Carrio, Suchman & Epstein, 2004). His model was a 'holistic' option compared to the traditional biomedical model that had separated the body and the mind for centuries.

The biomedical approach tended to treat the individual from a purely physiological and molecular or cellular level in a distant and impersonal manner that ignored human distress. Engel also believed that the clinician/doctor/psychologist had an important role in influencing the course of both treatment and the person's recovery. If the clinician was perceived to be uncaring and uninterested in the patient, the recovery could be hampered and delayed. His aim was to bring greater 'empathy and compassion' into the patient–practitioner relationship, with the objective of attaining a better recovery outcome.

According to Engel, biological factors include physiological/anatomical, neurotransmitters, genetic factors, gender, age and ethnicity. Psychological factors are the individual's subjective perceptions, personality predisposition and their unique thoughts, feelings and behaviours. Social influences include family, friends, societal expectations and available services, cultural background and environment. The biopsychosocial model became a 'collaborative pathway to health'.

The biopsychosocial model has developed since its first inception and has been applied successfully in both medical and organisational settings. It considers questions such as these:

- Is there a family history of physical or mental illness?
- Is this person experiencing psychological distress (sadness, anxiety) because of an underlying physiological condition?
- Does their personality determine how well or how poorly they cope with stress?
- Are there any difficulties at home, school or work?
- Does their cultural background exert any extraordinary pressures or expectations that may be affecting them?
- What social support structures do they have in place?

This path of inquiry underpins the biopsychosocial framework and reflects an all-encompassing approach by the practitioner.

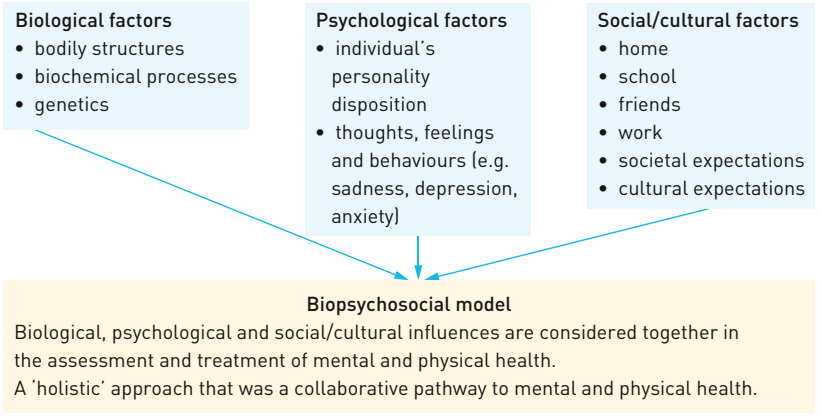


FIGURE 1 This biopsychosocial model considers three broad areas in assessing and managing mental and physical health.

Biological factors

This aspect of the biopsychosocial model considers a person's functioning in terms of bodily structures such as the brain and nervous system, biochemical processes (e.g. the role of particular neurotransmitters) and genetic predisposition (what has been inherited). It explains behaviour in terms of physiology.

Types of assessment/treatment include:

- neuroimaging: devices such as computerised axial tomography (CAT scan), positron emission tomography (PET scan), electroencephalogram (EEG), magnetic resonance imaging (MRI) or functional magnetic resonance imaging (fMRI)
- medication: antidepressants (for depression), psychotropic drugs (to manage delusions and hallucinations), mood stabilising drugs (to assist with anxiety)
- neuropsychological testing: questionnaires and intelligence quotient tests
- medical procedures.

Psychological factors

Psychological factors such as the following are taken into account:

- personality: an individual's personality predisposition (e.g. Are they outgoing (extroverted) or reserved (introverted)? Are they confident or fearful? What coping strategies do they use?)
- behaviour: what the individual's behaviour says about them (e.g. Is it conscious or unconscious? Are they aware of what they are doing or what consequences their actions might have for themselves or others?)
- perception: the individual's awareness of themselves and the universe around them
- cognition: the way in which they process information and their intelligence and decision-making skills
- attention: what incoming information they focus on and what they ignore
- motivation: what drives them to behave or think in a particular way.

Social factors

A range of social and cultural influences can either increase a person's resilience or contribute to their ill health. These influences can include:

- school environment or pressures
- work environment or pressures
- level of education
- availability and access to appropriate medical and support facilities
- socioeconomic factors such as poverty and homelessness.

These factors can be crucial to a person's recovery if they have been ill. Research has found that social support networks are just as important to an individual's recovery as the actual medical attention or diagnosis they receive. There is great emphasis on developing a professional but also caring relationship between clinician/doctor/psychologist and patient/client.

How can the biopsychosocial model be applied to a real-life situation? The following table gives an insight into how this framework can be adapted to treat someone with a psychological disorder.

	Onset of illness
Biological support	• Sedating medication for initial episode • Appropriate testing to determine diagnosis • Appropriate psychotropic medication to control delusions and hallucinations • Antidepressant medication • Nutrition and safety
Psychological support	• Reduce stimulation and calm down of patient/client. • Sit beside patient/client rather than facing them. • Acknowledge their delusions and hallucinations without challenging them. • Support the taking of appropriate medication. • Refer family members to appropriate support program(s). • Provide information regarding mental illness and the availability of support organisations. • Provide emotional support. • Work towards strategies of self-care and relationships with family.
Social support	• Organise hospitalisation or intensive clinical support at home. • Provide support and information for family and friends. • Establish whether there are any cultural issues that may either impede or support recovery/effective management.

TABLE 1 Application of the biopsychosocial model to treat psychological disorders



FIGURE 2 Marijuana can act as a trigger for psychotic episodes in some people.

Management of illness	Long-term strategies
• Psychotropic medication • Appropriate antidepressant medication • Mood stabiliser • Ongoing monitoring of symptoms and adjustment of treatment	• Psychotropic medication • Appropriate antidepressant medication • Mood stabiliser • Ongoing monitoring of symptoms on a less frequent basis and adjustment of treatment
• Increase levels of external stimulation. • Enable greater independence and responsibility for self. • Provide information about the illness. • Develop a wellness recovery plan and implement with patient/client. • Refer family members to ongoing support programs. • Ensure that links with support networks are made. • Discuss in detail their experiences and allow them to develop a greater awareness of their mental and physical state.	• Continue counselling support for the patient/client that allows them to debrief about their experiences. • Consider how this experience can enable a wellness recovery plan. • Provide ongoing information about the illness. • Ensure that important relationships are maintained. • Integrate a wellness recovery plan in daily life. • Possibly reduce frequency of appointments. • Continued referral of family to appropriate supports.
• Organise psychosocial rehabilitation services and respite programs to support patient/client and family. • Provide access to education to assist in facilitating and reinforcing relationships with family and friends. • Monitor whether cultural beliefs may interfere with taking medication working towards independence.	• Encourage increased independence. • Psychosocial rehabilitation may begin to decrease which may allow student to return to school. • Continue to monitor whether cultural beliefs have interfered with taking medication and working towards independence.

CHECK YOUR LEARNING 18.6

Describe and explain

1 **Explain** the biopsychosocial model.
2 **Describe** possible psychological factors that may affect an individual.
3 **Describe** how the biopsychosocial model differs from the biomedical approach.

Apply, analyse and interpret

4 Think of someone suffering from major depressive disorder (covered in Chapter 17). **Discuss** how the biopsychosocial approach could help them.
5 Suggest why the sociocultural aspect of the biopsychosocial model is important in dealing with a person with either a physical or mental illness. **Explain** and provide an example.

Investigate, evaluate and communicate

6 **Evaluate** why it would be important to consider all aspects of someone suffering from a mental disorder, and not just one aspect, such as biomedical.
7 **Create** your own biopsychosocial model. Set up a table similar to Table 1 and show how this could be applied to one of the following issues:
   a eating disorders
   b depression

Check your obook assess for these additional resources and more:

» Student book questions
Check your learning 18.6

» Weblink
The biopsychosocial approach

» Weblink
Cannabis and Schizophrenia

» Weblink
Management of mental illness

18.7 Treatment of psychological disorders

KEY IDEA

In this section, you will learn about:

+ the use of psychotherapies, pharmacotherapies, electroconvulsive therapy (ECT), psychosurgery and placebos in the treatment of psychological disorders.

There are many approaches to treating people who live with a mental illness, and these can be delivered by a broad range of health-care professionals. In this section we focus on the treatment approaches used in clinical psychology settings, including cognitive behavioural therapy. We also examine other treatment approaches based on the biological model, such as pharmacotherapy. Here we examine the usefulness of placebo treatments in mental health research. Finally, we examine specific treatments such as electroconvulsive therapy and psychosurgery for relieving symptoms of specific mental disorders.

Psychotherapies

psychotherapy using psychological, rather than medical, means to treat psychological disorders

cognitive behavioural therapy (CBT) a branch of psychology used to treat mental health problems or disorder by focusing on breaking unhealthy patterns for thinking or behaving and replacing these patterns with positive habits and coping skills

Psychotherapy is the use of psychological methods, such as cognitive behavioural therapy and desensitisation therapy, to help a person overcome and change their mental health in a positive way.

A common form of psychotherapy is **cognitive behavioural therapy (CBT)**. Cognitive behavioural therapy, often combined with relaxation, has been successfully used in treating a range of mental health issues such as depression, anxiety, panic disorders, post-traumatic stress disorder and obsessive compulsive disorder. CBT uses a combination of verbal and behavioural modification techniques to help change irrational patterns of thinking that create and maintain a mental health issue. CBT focuses on helping an individual change negative, dysfunctional thoughts and replace them with more positive, realistic ones.

In CBT, the individual is taught to recognise their thoughts about a situation and recognise that their behaviour influences these thoughts. They are also taught to recognise that their thoughts influence their behaviour. The idea being that, as a person recognises this, they can alter their maladaptive behaviour and thoughts and improve their reaction to the situation.

For example, a person with depression may seek CBT to assist them. In this instance, the assumption is that depression is caused by negative thoughts. A therapist would then help a client acknowledge and challenge these negative thoughts.

Systematic therapy is another form of psychotherapy. Systematic therapy is designed to not only treat the individual, but to treat them in relationship to their interactions, patterns and dynamics. In the case of phobias, this may be in the form of systematic desensitisation.

Psychodynamic psychotherapy was developed by Sigmund Freud. This technique involves psychoanalysis that requires patients to focus on repressed problems that may have begun in childhood. Psychotherapy helps people to understand their feelings towards

people they had lost or were in danger of losing. The primary focus of psychodynamic psychotherapy is to uncover the unconscious mental and emotional processes of a patient in order for them to gain insight into their beliefs and problems.

This understanding is believed to help relieve psychological symptoms and improve their lives. Psychodynamic psychotherapy has been primarily used to treat depressive symptoms and improve the way patients interact with others, including developing and maintaining relationships.



FIGURE 1 Cognitive behavioural therapy is carried out in one-on-one sessions with a psychologist.

Pharmacotherapies

Pharmacotherapy is the use of drugs and medication to assist mental health. This treatment is typically used where the therapist believes that the mental disorder is caused by biological factors. For example, SSRI drugs (e.g. Zoloft) may be prescribed for a patient suffering from depression to increase the levels of serotonin in the brain and thereby relieve depressive symptoms. Similarly, antipsychotic drugs (e.g. Clozapine) are designed to interact with dopamine neurotransmitters in the brain to control psychotic symptoms such as delusions and hallucinations in patients with schizophrenia (Durand & Barlow, 2011).

pharmacotherapy the use of drugs and medication to assist mental health

Pharmacotherapy can be used effectively to treat substance abuse. Methadone and buprenorphine can be administered as part of a comprehensive and fully supervised pharmacological treatment plan for long-term users of opioid-based drugs such as heroin. These medications can assist recovering substance abusers to successfully manage their physical dependence, drug craving and compulsive drug use (Department of Health and Human Services, Victoria, 2016).

Importantly, psychologists are not able to prescribe medication as part of the treatment program, and the treating psychiatrist or physician should consider whether psychological treatments such as CBT or psychotherapy should be offered in conjunction with pharmacotherapy. Patients may sometimes become reliant on medication and not seek alternative psychological treatments (McGrath *et al*., 2004). Furthermore, some patients may find it difficult to remember to take their medication or they may fail to adhere to the dosage recommendations, which affects their recovery.

Electroconvulsive therapy

Electroconvulsive therapy (ECT), previously known as electroshock therapy, is a psychological treatment in which seizures are induced in patients. These seizures are intended to provide relief in patients suffering from mental health issues, in particular bipolar mood disorder and major depressive disorder.

electroconvulsive therapy (ECT) psychological treatment where seizures are induced in patients

Patients undergoing ECT are anaesthetised and electrodes are placed on their heads, through which an electric shock is administered. Very little is known about how and why

the procedure works, but it is thought that by administering electric shocks to the brain, an anticonvulsant effect in the frontal and temporal lobes gives patients temporary relief from symptoms. Studies have found remission rates of 50–80 per cent in patients suffering from depression (Dierckx *et al.*, 2012; Fink & Taylor, 2007; O'Sullivan & Gilbert, 2003).

Although ECT may sound invasive, it is considered a safe and effective treatment for major depression, particularly when symptoms are resistant to other forms of therapy (Burton *et al.*, 2015). However, there are side effects, namely confusion, memory loss and amnesia, and patients can have difficulty recalling details of events happening around the time of treatment (Burton *et al.*, 2015). Relapse rates can also be high, and patients can require the procedure to be re-administered after a few months (Royal Australian and New Zealand College of Psychiatrists, 2004). However, patients report immediate relief from symptoms, unlike the pharmacotherapy treatments which can take weeks to show effect.

Psychosurgery

psychosurgery
brain surgery including lobotomies and deep brain stimulation to treat mental health disorders

As discussed earlier in this book (see Chapter 3), the Ancient Egyptians used trephination to allow evil spirits to escape, or good spirits in. Since then, **psychosurgery** has developed and now involves other brain surgeries.

Psychosurgery can be used to treat depression and anxiety disorders, such as obsessive compulsive disorder, as well as schizophrenia.

During psychosurgery, a small area or piece of the brain is removed or destroyed. Ideally, the surgery targets an area of the brain that is the cause of symptoms. It is not a guarantee, with less than half of all patients improving significantly after the surgery. Alternatively, treatment may be through deep brain stimulation (DBS) where affected areas are stimulated with electrodes. Recently, DBS has been used to treat Parkinson's disease, and is being trialled as a fall-back treatment for obsessive compulsive disorder, and more severe forms of depressive disorders (Fitzgerald, 2011). Recent studies also suggest that the risks for DBS (e.g. haemorrhaging) are relatively low, and that this procedure should be considered a viable treatment for patients whose disorders do not respond to medication or other psychological treatments (Fenoy & Simpson, 2014).

placebo
a variable other than the independent variable that causes a change in the value of the dependent variable due to the participant's belief that it will have an effect

Inherently, psychosurgery, like all surgery, carries risks that are not present in other treatments, and as such is typically used as a last resort, when patients have shown little or no improvement after trying alternate treatments. Risks and side effects of psychosurgical procedures include confusion, headaches, weight gain, memory loss, lethargy, personality changes, brain haemorrhaging and, in the worst case scenario, death (Lapidus *et al.*, 2013). For these reasons, some countries or states (e.g. New South Wales in Australia) have banned the use of psychosurgery, or have very strict legislation governing how and when it can be used. This is also why clearly detailed and informed consent processes are important for patients undertaking these methods.

Placebo treatments

placebo effect
refers to the participants' behaviour being influenced by their expectations of how they should behave, caused by the belief that they have received some treatment

The use of placebo treatments in mental health research is also cause for ethical debate, even though they are common in many research designs. A **placebo** is an inert or inactive substance (such as a sugar pill) that causes a reduction in symptoms simply because people believe that what they are taking will be effective (Burton *et al.*, 2015). Sometimes a belief in an effect can have just as much of an impact as an actual treatment for the relief of symptoms. This is known as the **placebo effect**.

While placebos can make people feel better, the effect can be small or temporary when compared with a legitimate treatment. An important part of research that involves participants is informed consent, and this cannot really be obtained when there is the deception involved in a placebo-controlled research design.

Another problem with placebo treatments in research is that it can sometimes require a participant to go without treatment. Imagine you have a mental disorder such as an anxiety disorder. You volunteer for a trial to test a new medication that is supposed to reduce your symptoms. You later find out that the medication you have been taking is a placebo. How do you feel about this?

In cases where a sound treatment for a mental disorder already exists, the use of a placebo treatment to trial a new medication can be seen as unethical. This is because medical health professionals are required to provide patients with the best proven treatment available (Rothman & Michels, 1994). However, there are arguments in favour of using placebo treatments in trials, such as that the placebo effect can still improve patient symptoms, and the outcome of the trials can often improve treatment methods overall.



FIGURE 2 The use of placebos is a contentious topic in mental health research.

CHECK YOUR LEARNING 18.7

Describe and explain

1 **Define** the placebo effect.
2 **Describe** the difference between pharmacotherapy and psychotherapy.
3 **Explain** what is meant by psychosurgery.
4 **Describe** how CBT works, and list some of the disorders that it can treat.

Apply, analyse and interpret

5 **Explain** why the use of placebo treatments might be unethical.
6 In some states, psychosurgery is not allowed, or highly restricted. **Propose** why this is the case.
7 **Identify** some of the risk factors for psychosurgery and **consider** why informed consent is vital for patients undergoing such procedures.

Investigate, evaluate and communicate

8 ECT therapy can have negative side effects. **Consider** what these may be and justify why a patient may still choose to have ECT.
9 When is pharmacotherapy used to treat psychological disorders? **Evaluate** what might happen if it were used at another stage.

Check your obook assess for these additional resources and more:

» Student book questions
Check your learning 18.7

» Weblink
Treatment for mental health disorders throughout time

» Weblink
Modern treatments for mental health disorders

» Weblink
The ethics of using a placebo

CHAPTER 18

Review

Summary

18.1
- Risk factors contribute to the likelihood of a person suffering from a mental disorder, or a person who has previously suffered a mental disorder experiencing a relapse.
- Protective factors guard against relapse by helping a person's wellbeing or giving them resilience in the face of adversity.
- Psychologists refer to the Four P's to describe factors influencing mental health:
  - Predisposing risk factors increase susceptibility.
  - Precipitating risk factors increase susceptibility and contribute to reoccurrence.
  - Perpetuating risk factors increase duration and inhibit recovery.
  - Protective factors protect from initial onset and prevent reoccurrence.
- Biological, psychological and social risk factors may contribute to the onset of a mental disorder.

18.2
- Biological risk factors include genetic vulnerability to specific disorders, poor response to medication due to genetic factors, poor sleep and substance abuse.

18.3
- Psychological risk factors include rumination, impaired reasoning and memory, stress and poor self-efficacy.

18.4
- Social risk factors include disorganised attachment, loss of a significant relationship and the role of stigma as a barrier to accessing treatment.

18.5
- Cumulative risk involves the accumulation of risks, including biological, psychological and social risks. The more risks accumulated, the higher the cumulative risk and, therefore, the higher the risk of developing a mental disorder.
- There is often stigma attached to people seeking treatment. A person suffering from a specific phobia may feel different and embarrassed by their illness. People with a mental disorder are often unfairly grouped together or stereotyped.

18.6
- The biopsychosocial model takes a holistic perspective on the assessment and treatment of mental and physical health disorders, taking into account biological, psychological and social factors.
- Biological factors consider a person's functioning in terms of bodily structures such as the brain and nervous system, biochemical processes and genetic predisposition.
- Social factors include consideration of a person's school or work environment, level of education, access to support services, and socioeconomic factors such as poverty.
- Psychological factors include an individual's personality predisposition, their behavioural patterns, their perceptions, cognitions and motivations, and what they pay attention to.

18.7
- Approaches to treating people who live with a mental illness can be delivered by a broad range of health-care professionals and include clinical psychological treatments such as CBT and biological treatments such as pharmacotherapy.
- Psychotherapy is the use of psychological methods, such as CBT, psychodynamic therapy and systematic therapy, to help a person positively influence their mental health.

- Pharmacotherapy is the use of drugs and medication to assist mental health. This treatment is typically used where the therapist believes that the mental disorder is caused by biological factors.
- Electroconvulsive therapy (ECT) is a psychological treatment in which seizures are induced in patients by administering electric shocks to the brain. ECT treatments relieve symptoms for patients suffering from mental health issues, such as bipolar mood disorder and major depressive disorder, that are resistant to other forms of treatment.
- Psychosurgery is the removal or destruction of a small area or piece of the brain associated with symptoms of depression and anxiety disorders such as obsessive-compulsive disorder (OCD) and schizophrenia. Deep brain stimulation (DBS) treats symptoms of disorders, such as Parkinson's disease, by electrically stimulating affected parts of the brain.
- A placebo is an inert or inactive substance (such as a sugar pill) that causes a reduction in symptoms simply because people believe that what they are taking will be effective.

Key terms

- biopsychosocial model
- cognitive behavioural therapy
- cumulative risk
- disorganised attachment
- electroconvulsive therapy (ECT)
- pharmacotherapy
- placebo
- placebo effect
- protective factors
- psychosurgery
- psychotherapy
- risk factors
- rumination
- self-efficacy
- stigma

Revision questions

Multiple choice

1 The cause of a mental disorder is attributed to:
   - **a** a single factor.
   - **b** poor diet.
   - **c** several factors.
   - **d** the interaction of several factors.

2 Risk factors for mental disorders include:
   - **a** predisposing, precipitating and perpetuating factors.
   - **b** precipitating, perpetuating and protective factors.
   - **c** predisposing, precipitating and protective factors.
   - **d** predisposing, perpetuating and protective factors.

3 Biological risk factors for mental disorders include:
   - **a** genetic predisposition.
   - **b** poor sleep.
   - **c** substance abuse.
   - **d** All of these answers are correct.

4 Psychological risk factors for mental disorders include:
   - **a** rumination and poor sleep.
   - **b** poor sleep and substance abuse.
   - **c** impaired reason and memory and poor self-efficacy.
   - **d** rumination, poor sleep and substance abuse.

5 Protective risk factors against a mental health disorder include:
   - **a** exercise and diet, good sleep patterns, staying connected with family and friends.
   - **b** staying connected with family and friends, good sleep patterns, weakened immune system.
   - **c** good fitness, poor parental attachment, having a home.
   - **d** having a home, missing school or work, economic wellbeing.

6 Perpetuating risk factors:
   - **a** prevent the occurrence or reoccurrence of a mental disorder.
   - **b** inhibit recovery from a mental disorder.
   - **c** trigger a mental disorder.
   - **d** are triggered by trauma.

7 Stigma can be a barrier to accessing treatment for a mental disorder because:
   - **a** sufferers are always dangerous.
   - **b** sufferers fear being stereotyped negatively.
   - **c** family and friends fear becoming negatively stereotyped.
   - **d** All of these answers are correct.

8 Social risk factors for a mental disorder include:
   - **a** the culture and values of the person's community.
   - **b** the level of support available for the sufferer in their local community.
   - **c** community expectations of individuals.
   - **d** All of these answers are correct.

9 Which hormones are associated with stress?
   - **a** cortisol
   - **b** oxytocin
   - **c** adrenalin
   - **d** cortisol and adrenalin

10 What is self-efficacy?
   - **a** a biological risk factor for a mental disorder
   - **b** a mood disorder
   - **c** obsessive worrying about oneself
   - **d** a person's general coping ability

11 Which of the following is not a biological risk for a mental health disorder:
   - **a** genetics
   - **b** poor sleep
   - **c** substance-abuse
   - **d** rumination

12 Disorganised attachment is:
   - **a** caused by separation anxiety as a child
   - **b** when an individual finds it difficult to share their feelings or empathise
   - **c** when a person is panicked that their caregiver will leave them
   - **d** the only cause of mental health disorders.

13 According to the biopsychosocial model of mental health, it is the combination of:
   - **a** psychological factors and social factors that influence the development of a mental health disorder
   - **b** the influence of social factors on biological factors that will cause a mental health disorder
   - **c** the interaction between biological, social and psychological factors influence mental health
   - **d** choosing to treat a patient based on one of biological, social or psychological factors

14 A psychologist has a patient with severe bipolar disorder. Which of the following could be used as treatment?
   - **a** electroconvulsive therapy
   - **b** psychotherapy
   - **c** pharmacotherapy
   - **d** placebo treatments

15 Which of the following is not an issue associated with placebo treatments?
   - **a** using a placebo as a trial can be unethical
   - **b** the effects of a placebo are often limited or temporary
   - **c** it can require patients to go without treatment
   - **d** they can improve patient symptoms

Short answer

★16 Provide an example of a predisposing risk factor for a mental disorder and **explain** why it is a risk factor.

★17 Provide an example of a precipitating risk factor for a mental disorder and **explain** why it is a risk factor.

★★18 Provide three examples of protective risk factors for a mental disorder and **explain** how these would assist in preventing the onset or reoccurrence of a mental disorder.

★19 **Describe** individual attributes that can be risk factors for developing a mental disorder .

★20 **Describe** social circumstances that can be protective factors from developing a mental disorder.

★21 **Explain** what genetic vulnerability to specific disorders is

★★22 Using an example **describe** rumination and **explain** how it can effect mental health.

★★23 **Define** the following:

- **a** psychotherapy
- **b** pharmacotherapy
- **c** electroconvulsive therapy
- **d** psychosurgery
- **e** placebo treatment

Apply, analyse and interpret

★★24 **Differentiate** between psychological, biological and social risk factors for developing a mental disorder.

★25 **Determine** how stress can affect mental health.

★★26 **Consider** the role of poor self-efficacy in mental health.

★★27 **Compare** the effects of disorganised attachment and the loss of significant relationships on mental health.

Investigate, evaluate and communicate

★★28 **Discuss** the distinction between psychological, biological and social risk factors.

★29 **Comment** on one protective and one risk factor associated with the successful treatment of mental disorders.

★★★30 The Genain quadruplets were a key example of the genetic influence in the development of mental disorders. **Investigate** the quadruplets further and **evaluate** their contribution to understanding mental health. In your evaluation, you should consider the following:

- reliability of the study
- validity of the study
- ethical treatment of the Genain quadruplets
- other factors that may have influenced the development of schizophrenia

★★★31 **Consider** Case study 18.2 and **investigate** the role of the AKT1 gene further.

★★★32 The stigma surrounding mental health and mental disorders can stop people from seeking treatment and help when they need it. **Discuss** how this may affect society as a whole, and then **propose** a way to reduce the stigma surrounding mental health.

★★33 Siobhan is a 24 year old female. Simone is relatively healthy, has a caring family and positive social life. Recently Siobhan has been diagnosed with Major Depressive Disorder. Siobhan's psychologist has been reviewing Siobhan's mental health using the biopsychosocial approach. **Identify** what Siobhan's psychologist needs to consider in their approach, and **discuss** what factors might affect Siobhan's mental health.

Check your obook assess for these additional resources and more:

- » Student book questions
  Chapter 18 Review
- » Revision notes
  Revision notes for Chapter 18
- » assess quiz
  Test your understanding with an auto-correcting multiple-choice quiz
- » Flashcard glossary
  Key terms in Chapter 18

CHAPTER 19

Emotion, cognition and wellbeing

Are your emotions the same as your feelings and your moods? What makes you happy? Is happiness the same as wellbeing? Think about times when you were experiencing happiness, or experiencing sadness, did your body do different things or did it react the same way? These questions and the ideas behind them will be explored through this chapter as we approach the way emotions are formed, the role of cognition in your emotions and the factors that influence our happiness and wellbeing.

OBJECTIVES

→ Compare the two-factor (Stanley Schachter and Jerome Singer, 1962) and appraisal (Richard Lazarus, 1982) theories of emotion
→ Explain the biological nature of cognitive appraisal, with reference to findings from the 2008 fMRI study by Kevin Ochsner and James Gross
→ Describe factors that influence happiness
→ Assess the degree to which subjective wellbeing (Ed Diener, 1984), psychological wellbeing (Carol Ryff, 1995), and the broaden-and-build-theory (Barbara Frederickson, 2004) influence happiness

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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FIGURE 1 People experience a wide range of colourful emotions!

PRACTICALS AND SUGGESTED RESEARCH

MANDATORY PRACTICAL	**19.2** Can your emotions be influenced?
SUGGESTED RESEARCH	**19.2** The appraisal theory of emotion (e.g. the role of physiological reactivity in coping; the significance of fear and anxiety in Herrald & Tomaka, 2002; Ohman, 2000)
SUGGESTED RESEARCH	**19.3** The physiology of emotion regulation (e.g. the pathways mediating successful emotion regulation in Wager, Davidson, Hughes et al., 2008)
SUGGESTED RESEARCH	**19.4** Happiness (e.g. defining and measuring happiness in Kesebir & Diener, 2008)

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19.1 What is emotion?

KEY IDEA

In this section, you will learn about:

+ how emotions are defined
+ defining emotions.

Every day when you are interacting with yourself or others, you are engaging with emotions. You may be noticing your own emotions after a long day, receiving a bad mark at school, falling in love, or having a fight with a friend. You might be angry after discussing something with your parents, or feeling worried about what you will do after you finish high school. In many of these situations there will be a common feeling; in some you will feel joy and excitement, and in others you may feel sad or afraid. But what causes these feelings?

People usually think of emotions the way they think of their feelings and moods. Though feelings, moods and emotions are connected, emotion is more complicated than what you feel. **Emotion** can be explained as a change in feeling that results in physical and psychological changes that influence your behaviour. Typically, psychologists think of emotion as having three components:

- physiological changes
- subjective feelings
- associated behaviour.

emotion
physical and psychological changes that influence your behaviour in response to a feeling or situation



FIGURE 1 What emotion do you think this woman is experiencing?

Physiological changes refer to the way your body is altered when you are experiencing a certain emotion. For example, if you are experiencing love or lust, you might feel butterflies in your stomach, and an increase in heart rate. You may also experience sweaty palms and flushing cheeks if you were nervous about this situation. When you experience an emotion your body can become aroused. **Arousal** in psychological terms refers to an increase in activity in the body that prepares us for action.

Subjective feelings are the feelings that are associated with an emotion. For some people, falling in love is happy and feelings of happiness will be associated with this situation. For others, falling in love may be fearful and they may feel scared or apprehensive.

Associated behaviour is the way that you react to these physiological changes and subjective feelings outwardly. For example, someone who is falling in love may want to hold hands with that person, or kiss them.

physiological changes
the alterations in your body and psychology when you experiencing an emotion

arousal
an increase in physiological activity in the body

subjective feelings
feelings that are associated with an emotion; they are subjective as they are personal and cannot be objectively measured

associated behaviour
encompasses the behavioural changes that are a result of the subjective feelings and physiological changes

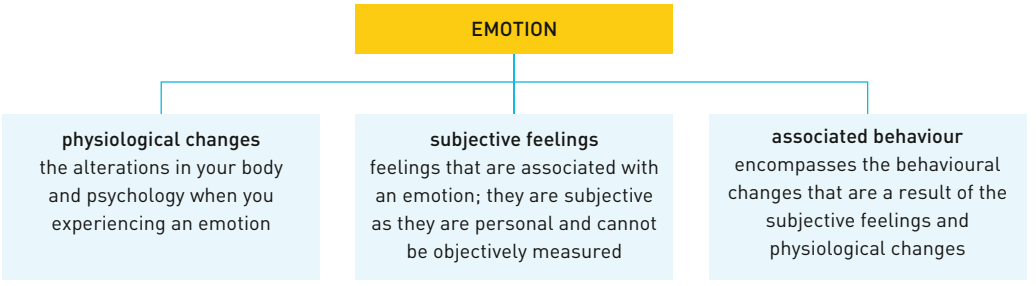


FIGURE 2 The components of emotion

CHECK YOUR LEARNING 19.1

Describe and explain

1 **Explain** what emotion is.
2 **Describe** the three components of emotion.

Investigate, evaluate and communicate

3 Choose one of love, joy, anger or sadness.
   a **Investigate** the physiological changes that occur when these emotions are experienced.
   b **Evaluate** why you think this happens

Check your obook assess for these additional resources and more:

» Student book questions
Check your learning 19.1

» Weblink
Your emotions

» Weblink
Identifying emotions

» Weblink
The difference between emotions and feelings

19.2 Theories of emotion

KEY IDEAS

In this section, you will learn about:

- Schachter and Singer's two-factor theory of emotion
- the appraisal theory of emotion.

As discussed in the previous section, emotions are recognised as having three components: physiological changes, subjective feelings and associated behaviour. Understanding how these three components interact is as important as understanding that they exist. In 1962, two psychologists, Stanley Schachter and Jerome Singer, were interested in the physiological changes that occur and how these interact, or how these relate to emotions.

The appraisal theory of emotion by Lazarus considers how emotions are experienced when people appraise a situation. This appraisal process stimulates both the physiological systems and the emotional response itself.

The two-factor theory of emotion

Schachter and Singer (1962) were concerned with what caused emotions. Similar to the question of whether the chicken or the egg came first, Schachter and Singer were interested in what came first: the emotion or the physiological arousal.

two-factor theory of emotion a theory that suggests emotion is caused by assigning a cognitive label to the physiological response to a situation

In 1962 they formed the **two-factor theory of emotion**. Schachter and Singer had theorised that people experienced physiological arousal and that their emotional response was based on their interpretation of the situation. They suggested that people experience the same level of physiological arousal in various situations, regardless of the emotion being experienced. They also asserted that the way people react to these situations was based on their cognitive assessments of the situations.





FIGURE 1 In the two-factor theory, the young woman and the people at the concert could be experiencing the same physiological changes, but assign each situation different emotions.

For example, consider the following two scenarios:

1 You are walking alone in the dark and see a group of men ahead, wearing dark clothes. You notice that your heart rate is rapid and that you are sweating. Based on the situation, you could conclude that you are experiencing fear.
2 You are at a concert dancing to your favourite band. You notice that your heart rate is rapid and that you are sweating. Based on the situation, you determine that you are experiencing excitement.

To Schachter and Singer, physical arousal alone was not responsible for our emotional responses. This led them to focus on the interaction between physical arousal and how people cognitively label that arousal.

Consider the two scenarios again. According to the two-factor theory of emotion, the way you process the experience is as follows:

In the 'alone at night' scenario:

- I see a group of men walking towards me.
- My heart is racing and I am sweating.
- My rapid heart rate and sweat are caused by fear.
- I am afraid.

In the 'concert' scenario:

- I am having fun seeing my favourite band.
- My heart is racing and I am sweating.
- My heart rate and sweat are caused by excitement.
- I am excited.

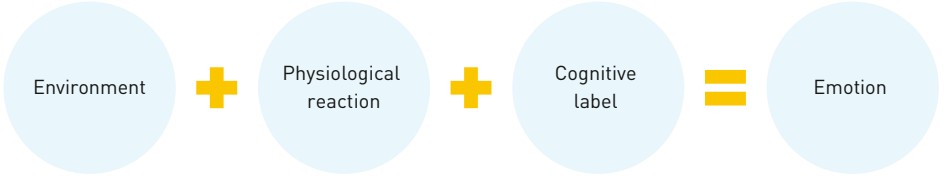


FIGURE 2 The process of emotion according to the two-factor theory of emotion

CASE STUDY 19.2

Schachter and Singer's experiment

To investigate their theory, Schachter and Singer conducted an experiment with 184 males. They divided these participants into four groups. Each group was told that they were injected with a drug 'suproxin' to test their eye sight. However, participants were actually injected with epinephrine, which increases heart rate and causes sweating. They correctly informed some participants, misinformed other participants, or told participants nothing about the possible side effects of the injection.

In group one, participants were told that they may feel some side effects of the drug such as shaking hands and that their heart may start to pound. They were also told they may begin to feel warm or flushed. In group two, participants did not have

any potential symptoms explained to them. In group three, participants were told that they may feel their feet go numb, and that they may experience a slight headache and an itching sensation. Group four were the control group – they were injected with a placebo and were told to expect no side effects.

After the injection, a confederate (an actor pretending to be a subject in an experiment who is actually working for the experimenter) entered the room with each group and displayed either euphoric or angry behaviour. Schachter and Singer found that the impact of the confederate was different for the participants in each of the four different conditions. After witnessing the euphoric confederate, participants in groups one, two and three each displayed euphoric behaviour. After seeing the angry confederate, participants in groups one, two and four felt angry.

Schachter and Singer (1962) found that participants who knew they had been injected with a drug would attribute their side effects (e.g. increased heart rate) to the drug, while those who became euphoric but did not know why would think they were either euphoric or angry, depending on the condition (see Burton *et al.* 2015). They argued that an emotional experience is a complex cognitive-emotional state whereby individuals cognitively interpret their physiological arousal.

For example, participants assessed the situation to decide why their body was reacting the way it was, and then assigned an emotion based on the situation. When participants saw a euphoric confederate, they decided they were feeling euphoric. When participants saw an angry confederate, they decided they were feeling angry. But when they could explain their physiological changes because of something else, in this case the 'suproxin' injection, they were less likely to be influenced by their environment.

Criticisms of the two-factor theory

The two-factor theory of emotion has been criticised, as researchers who have repeated the study have found that the confederate had a small impact on emotions. The theory has also been criticised as it focuses on the autonomic nervous system and does not consider the emotional processes that are part of the central nervous system.

Appraisal theory of emotion

appraisal
the cognitive processes that occur before an emotion is displayed

The term **appraisal** was developed by American psychologist Magda Arnold. Appraisal refers to the cognitive processes that occur before an emotion is displayed. Arnold suggested that the first step in experiencing an emotion is appraising the situation. This appraisal will initiate the emotional process by arousing both the physiological systems and the emotional response itself. Arnold's theory expressed that while the physiological changes are important to the emotional process, they are not important in the initiation of reactions to experiences.

appraisal theory of emotion
a theory that suggests we experience emotions based on our assessment of a situation or event

The appraisal theory of emotion

Building on Arnold's initial theory, Richard Lazarus developed a new **appraisal theory of emotion**. Lazarus's theory suggests that our emotions are a result of our evaluation of an event or situation (Lazarus, 1982). Seeing a person walking towards you may induce feelings of fear if you are alone and it is night-time; however, if you recognise this person, you are likely to reappraise the situation.

SUGGESTED RESEARCH
19.2 The appraisal theory of emotion
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Cognitive appraisal determines how a person deals with the situation and is influenced by their beliefs, goals, personal circumstances, life experiences and personality. Cognitive appraisal determines how we decide if we are capable of handling the situation and what resources we have to do this (Lazarus, 1982).

cognitive appraisal allows us to assess how well we can handle the situation

For example, a single father who is suddenly made redundant is likely to experience immense stress, sadness and anger. This situation could lead to financial ruin, and he may no longer be able to provide for his children. A teenager who has a part-time job on weekends, but still lives at home with their parents, is less likely to feel the same stress on being made redundant and may regard losing the job as inconvenient; they may even see it as an opportunity to find a more exciting job. In each situation, the individual has appraised the situation and determined how capable they are of coping with the redundancy.

There are two components to the appraisal theory of emotion: primary appraisal, which is our first assessment of the situation, and secondary appraisal, where we are able to look at the situation again.

Primary appraisal

Primary appraisal is the initial evaluation process where a person determines whether an event is a threat or a challenge. If the situation has no personal relevance for that individual, then it is viewed as neutral or irrelevant, and little or no further thought is needed. Conversely, should the situation be perceived as a stressor, the person will then work out what should be done about it during secondary appraisal.

primary appraisal the process by which someone initially evaluates whether or not a situation is threatening or irrelevant

During primary appraisal, the significance of a situation can be classified into one of four categories:

- **a harm or loss:** an assessment that some type of damage has been done such as an illness or poor test result (e.g. 'I just failed a major test'.)
- **a threat:** an assessment that there may be a future harm or a loss (e.g. 'I might fail the next major test.')
- **a challenge:** an assessment that there is opportunity for personal growth or that there may be a positive outcome (e.g. 'I didn't do well for the practice test, but with a bit of hard work, I'll do better'.)
- **neutral/irrelevant/benign:** an assessment that an event is of little or no personal importance to the person and, therefore, does not go beyond primary appraisal (e.g. 'My neighbour did poorly on his test.')

secondary appraisal the process of consciously appraising a situation by considering options available and how best to respond

Secondary appraisal

Secondary appraisal is the stage where a person considers their options in a situation and how to respond. This conscious appraisal of the situation considers the following: Do I have the resources and the energy to deal with the event? What strategies can I use to effectively cope with this situation? A student who fails a major assessment task might consider asking their teacher if they can resubmit the task and accept a penalty for repeating it. Alternatively, they might request to do a different task.



FIGURE 3 At first glance, you may not realise that this is a lizard, not a snake. Once you realise it is a lizard, you are more likely to decide that you are capable of dealing with the situation.

Both primary and secondary stages involve appraisal. In the primary phase, a person experiences an emotional response to the given situation. In the secondary phase, a person predicts the possible emotional impact of each potential response. In the example above, the student might experience great disappointment at failing the assessment task (primary appraisal) followed by relief at being able to resubmit or change subjects (secondary appraisal).

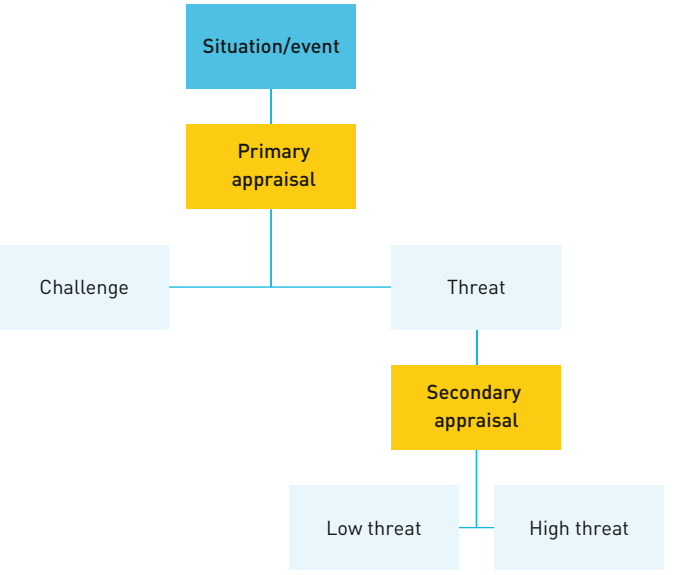


FIGURE 4 How the appraisal process works

Coping potential

coping potential
a person's ability to use either problem-focused coping or emotion-focused coping

Another aspect of secondary appraisal is the **coping potential** of a person. Someone's coping potential is their ability to use either problem-focused coping or emotion-focused coping.



FIGURE 5 Losing a job can be stressful for someone who needs their job, whereas someone who doesn't really need or care about their job may feel relieved.

Problem-focused coping

problem-focused coping
addressing a negative situation by using practical ways to deal with it, such as seeking information, and evaluating the pros and cons

Problem-focused coping looks at the causes of the emotion from a practical perspective and works out ways to deal with the problem or stressful situation with the objective of reducing that stress. Some problem-focused strategies:

- **Take control:** For example, a student who has performed poorly on an assessment task may decide to spend less time on Facebook and redirect that energy into preparing more comprehensive notes and revising more thoroughly. Or someone who has just lost their job may prepare a new resume and go online to look for a new position.
- **Seek information:** This involves looking for additional information on how to deal with the emotion. For example, someone who has just been diagnosed with an illness may seek a second opinion or see a specialist. They might even look up the symptoms, treatment and prognosis of their illness on the internet. Knowledge can sometimes reduce the level of stress.
- **Evaluate the pros and cons:** This involves taking a sheet of paper and dividing it so that the positives about the situation are listed on one side and the negatives on the other side. For example, a person wanting to leave their job or change a relationship may use this to help reduce their level of stress.

MANDATORY PRACTICAL
19.2 Can your emotions be influenced?
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Emotion-focused coping

Emotion-focused coping involves trying to reduce the negative emotional feelings associated with the stressor, such as embarrassment, fear, anxiety, depression, excitement or frustration. Emotion-focused strategies include:

- meditation
- relaxation
- talking to friends and family about your problem
- denial (pretending the event did not occur)
- ignoring the problem in the hope that it will disappear
- distraction (finding other methods to keep your mind busy and not on the problem; e.g. watching TV, reading, eating or playing video games)
- expecting a worse-case scenario so that you are ready for the worst
- physical exercise to reduce negative feelings (stress).

emotion-focused coping
reducing the negative emotional responses associated with stress such as embarrassment, fear, anxiety, depression, excitement and frustration by using strategies such as meditation, relaxation, talking to a friend/family, ignoring the problem and distraction

CHECK YOUR LEARNING 19.2

Describe and explain

1 **Explain** the difference between physiological reaction and emotional label.
2 **Explain** the two-factor theory of emotion.
3 **Describe** cognitive appraisal.
4 **Explain** the appraisal theory of emotion.
5 **Compare** primary appraisal and secondary appraisal.
6 Imagine that you are walking through the bush one day and suddenly a snake is in front of you. Your heart starts racing and you tremble. **Apply** the two-factor theory to this situation.
7 A woman is walking to her car during the day and an elderly man approaches her. Using the appraisal theory of emotion, **contrast** this occurrence with the woman's possible reaction if a young man approached her as she walked to her car at night.
8 A man is sitting at home on the Gold Coast and sees a spider crawling up his leg. He knows that Queensland has poisonous spiders and he panics. He then realises that it is just a common house spider and calmly removes the spider from his leg. **Determine** what stages of the appraisal theory he experienced.
9 **Differentiate** between the two-factor theory of emotion and appraisal theories of emotion.

Investigate, evaluate and communicate

10 Have you ever been really angry and started to cry instead of yell? Or have you ever been so happy that you had tears of joy? Crying is a physiological response that is typically associated with sadness or grief. **Evaluate** what you think these reactions mean in terms of the two-factor theory of emotion.
11 **Investigate** survival situations that have been reported in the news; these could include surviving a natural disaster, animal attack or burglary. Choose one scenario and **evaluate** it in terms of the appraisal theory of emotion.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 19.2
- » Mandatory practical
  19.2 Can your emotions be influenced?
- » Suggested research
  Worksheet: 19.2 The appraisal theory of emotion
- » Weblink
  The appraisal theory of emotion

19.3 Biological nature of cognitive appraisal

KEY IDEAS

In this section, you will learn about:

- the brain structures and systems involved in emotion
- LeDoux's biological model of emotion.

Both the two-factor theory of emotion and the appraisal theory of emotion offer cognitive explanations for how we interpret our body's physiological changes. But what causes these physiological changes? From Unit 1, we know that different areas of the brain are responsible for different processes, and regulate different physiological responses. In this section, we will look at which areas are responsible for cognitive appraisal, and how these areas form our cognitive appraisals.

Brain structures and emotion

To discuss the biological nature of cognitive appraisal, it is important to understand what brain structures are implicated. In Chapter 5, the four lobes of the brain were introduced, and the areas within each. Recall from Chapter 6 that certain areas of the forebrain are recognised as being involved in the expression and regulation of emotion.

In 2008, researchers Kevin Ochsner and James Gross studied fMRI imaging to determine if emotional responses were more present in certain areas of the brain. Their study focused on the limbic system, in particular the amygdala and prefrontal cortex. Ochsner and Gross (2008) suggested that a SCAN (social cognitive and affective neuroscience) model should be used to assess cognitive emotion regulation. SCAN models are multi-level and suggest that there should be a link between the measures of behavioural, experiential and physiological responses to the descriptions of information processing systems and their neural substrates (Ochsner & Gross, 2008).

Ochsner and Gross found that the prefrontal cortex is involved in cognitive reappraisal, as is the amygdala, which has been implicated in emotional responding. They found that the amygdala's involvement changes depending on what the reappraisal is trying to achieve. If the reappraisal's aim is to increase emotion, this may increase activity in the amygdala. Alternatively, if the goal of reappraisal is to decrease emotion, this may decrease activity in the amygdala (Ochsner & Gross 2008).

Ochsner and Gross also found that the systems involved in reappraisal may be different to those that are involved in other forms of emotional regulation, such as emotional suppression. They found that reappraisal was associated with a decrease in amygdala activity, and suppression was associated with an increase in amygdala activity.

The limbic system is one of the oldest structures in the brain. The limbic system has been associated with the recognition, regulation and expression of emotion, as well as other processes that, at times, rely on emotion, such as memory and learning. Table 1 provides an explanation of some of the components of the limbic system and their role in emotion.

The limbic system and specific brain structures are implicated in various stages in emotional regulation as shown in LeDoux's biological model of emotion.

SUGGESTED RESEARCH
19.3 The physiology of emotion regulation
Go to page 457 »

The limbic system	Implications for emotion
Amygdala	• Certain emotions are activated in the amygdala, such as fear. • The amygdala is also implicated in social processing and recognising emotions. • For example, studies have shown that psychopaths who struggle with recognising fear have different activity in the amygdala than people who are not psychopaths (Birnaumer *et al.*, 2005). • The amygdala is also involved in conditioning, a type of learning, which can influence how we respond to events or external stimuli.
Hippocampus	• It is involved in the regulation and expression of emotion. • It is directly related to the amygdala, and is fed emotional information from the amygdala. • When presented with emotionally charged stimuli, the hippocampus is activated and, because of its role with memory, will recall anything that may be relevant to the situation.
Hypothalamus	• Recall from Chapter 5 that the hypothalamus is located in the forebrain. • It is implicated in basic survival actions, including reproduction, eating, fighting and running. • The hypothalamus is part of the HPA axis, which is involved in the fight-flight-freeze response, preparing us to respond to threatening stimuli.
Thalamus	• Receives sensory information and relays this to the sensory cortex, and the amygdala.

TABLE 1 Components of the limbic system

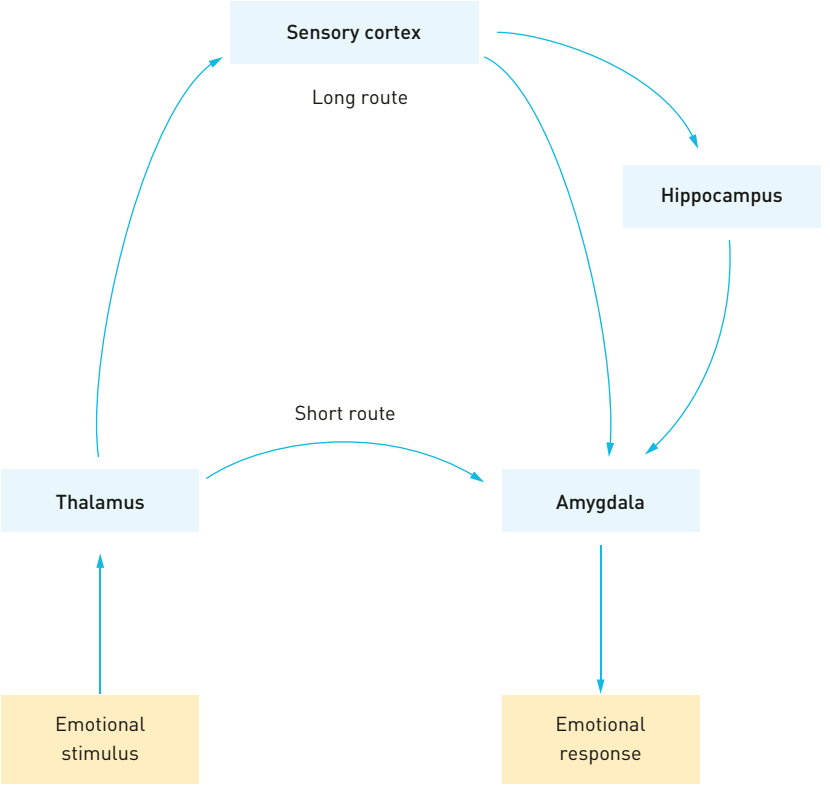


FIGURE 1 LeDoux's model of emotion with the long and short pathways

LeDoux's biological model

LeDoux (1999) proposed that there are two pathways of emotion in the brain. The first is considered the 'short pathway', the second the 'long pathway'.

short route
environmental stimuli are processed through the thalamus and straight to the amygdala

LeDoux's model of emotion
a model that proposes that there are two pathways of emotion in the brain

long route
environmental stimuli are processed through the thalamus to the sensory cortex, the hippocampus and then the amygdala, allowing time to consider the whole situation

The first pathway (the **short route**) in **LeDoux's model of emotion** involves an emotional stimulus being processed by the thalamus; this is then passed to the amygdala, which in turn produces an emotional response. According to LeDoux's theory, this occurs as an initial appraisal of a situation. LeDoux proposed that the short pathway is beneficial in survival situations. In an event where we need to activate the fight-flight-freeze response and prepare to fight or run from a situation, the short pathway activates the necessary physiological systems quickly.

The second pathway in LeDoux's model is the **long route**. The long pathway receives sensory information in the thalamus and then passes this information to the sensory cortex, which passes the information to the hippocampus and the amygdala. The long pathway provides time for us to appraise the situation by using further systems to determine if we are in danger or not.

To help you differentiate between the two, imagine you are swimming at the beach. While you're treading water and gradually floating farther out to sea, you suddenly see a shadow in the water. Almost instinctively, you begin to swim as fast as you can for the shore, having confused the dark shape beneath the surface for a shark. In this instance, your brain would have taken the short pathway and activated your survival systems: causing you to swim feverishly at the first hint of danger in order to preserve your life. When the long pathway is activated, your brain, using the hippocampus, is able to recognise that the shape may not be a shark and is actually seaweed, which would likely prompt an alternative, and more reasonable, response.



FIGURE 2 You may have experienced the appraisal theory of emotion when swimming at the beach and being unsure if a dark shape is a shark or seaweed.

CASE STUDY 19.3

The emotions of killer whales: support for the limbic system?

The human brain is widely recognised as being the most complex brain of all animals. It is capable of experiencing complex emotions and higher order thinking. Despite this, dolphins – in particular killer whales – have been shown to have a larger and more complicated limbic system than people.

Killer whales are the largest species of dolphin. They are a herd species, spending their entire lives in close family pods, with a matriarch at the head of the pod. Killer whales are highly social creatures, with their own dialects, hunting styles and social structures that can be as complex, if not more, as those of humans. The social nature of killer whales is integral to their survival.

MRI studies of a killer whale's brain have shown that the limbic system, or lobe, is significantly larger than in humans. MRI imaging has also shown that the areas adjacent to the limbic system in killer whales are highly related to emotional and social connections. Spindle cells are cells that are associated with the way that primates and humans process social structures. These cells have increased numbers in killer whales compared to humans.

Killer whales that have been studied in the wild or, unfortunately, captivity are known to display a range of emotions including anger, fear and joy. They have also been shown to be self-aware. The size of a killer whale's limbic system, and their complex social structures, can be used as a springboard for the importance of the limbic system in emotional regulation.



FIGURE 3 The human brain and dolphin brain have a similar structure but different systems.

CHECK YOUR LEARNING 19.3

Describe and explain

1 **Explain** the role of the limbic system in emotion.
2 **Describe** how the amygdala is involved in emotion.
3 **Identify** the brain structures involved in LeDoux's biological model.
4 Using an example, **describe** LeDoux's biological model of emotion.

Apply, analyse and interpret

5 **Compare** the short and long route of LeDoux's biological model of emotion.

Investigate, evaluate and communicate

6 Read Case study 19.3. **Assess** if this could support the importance of the limbic system in emotion.
7 **Hypothesise** the risks of only using the short pathway in LeDoux's biological model.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 19.3
- » Suggested research
  Worksheet: 19.3 The physiology of emotion regulation worksheet
- » Weblink
  A biological explanation of emotion
- » Weblink
  Brain structures involved in emotion

19.4 Factors that influence happiness and wellbeing

KEY IDEAS

In this section, you will learn about:

- factors that may increase a person's happiness
- subjective wellbeing
- psychological wellbeing.

People have chased the idea of happiness for centuries. It is a state that everyone strives to achieve, but what influences happiness is often unclear. As an emotional state, happiness has several components and is usually reliant on life satisfaction and wellbeing.

happiness
a state of wellbeing that encompasses a deep and meaningful satisfaction with life

Happiness is a state of wellbeing that encompasses living a good life – that is, with a sense of meaning and deep satisfaction. Research shows that happiness is not the result of bouncing from one joyful experience to the next; achieving happiness typically involves times of considerable discomfort.

There is debate about what influences happiness, and if happiness influences these factors. For example, people may assume that because someone has a higher income, they are happier than someone with a lower income. Alternatively, it may be the case that this person with the higher income earns a higher income because they are happier.

What makes people happy?

Happiness is a difficult construct to measure. Often happiness is measured using a self-report, or the reports of close family or friends. As with all self-reports, people are able to respond how they would 'like' to be seen. Even when friends or family are reporting, the individual may be portraying themselves as being happy despite the reality of their feelings.



FIGURE 1 What makes you happy? Bhutan reports one of the lowest gross domestic products in the world, but measures their gross national happiness instead.

SUGGESTED RESEARCH
19.4 Happiness
Go to page 457 »

Rather than focusing on factors that definitely influence happiness, it is best to think of these as factors that have the potential to influence happiness, and be influenced by happiness.

Table 1 provides a snapshot of some of the factors relevant to understanding happiness. Having one of these factors but none of the others is not a guarantee for happiness.

Factors that influence happiness	How they influence happiness
Age	Research by Ed Diener (1984) suggests that age has limited effects on levels of happiness. Younger people may feel more intense happiness, however, people may achieve greater overall happiness and wellbeing as they grow older.
Physical health	General physical health typically peaks between adolescence and middle age. During this time, people are less susceptible to illness, and typically immune systems are strong. You are no longer at risk of many childhood illnesses and are not yet affected by age-related debilitation, including weakening bones and age-related memory loss. Being less stressed about physical health has been associated with increased happiness levels.
Culture	Different cultures have different expectations of what should make someone happy. A notable example of this is Bhutan, which instead of measuring the country using gross domestic product, measures the gross national happiness. By Western measures, Bhutan is one of the poorest countries in the world, and yet their population is increasingly happy. The cultural expectations of where you live can influence how happy you are. This can be because of reduced stress as well as general happiness.
Religion	While religion may not be something that everyone participates in, research has shown that those who are actively religious have increased levels of happiness. This can be because they attend church regularly, and therefore have social engagements and a sense of community, which leads to increased happiness and wellbeing.
Income and employment	Being employed, with a good income, typically reduces stress for most individuals. But determining what people regard as a 'good' income is not as clear. People often assume that millionaires are much happier than the rest of the population, however, research by Diener (2004) suggests that once someone is able to earn an income to support themselves, their families and any medical costs, there is little difference in happiness levels. For example, someone earning $35,000 a year may not be able to cover their family's costs including medical, but someone earning $70,000 may be able to support these costs. In this instance, the happiness levels of someone earning $70,000 should be similar to someone earning $150,000, provided that both individuals are able to support their family.

TABLE 1 Factors that influence happiness

Subjective wellbeing

Happiness can be influenced by several factors, and there are various approaches to quantifying and qualifying happiness. One method of conceptualising happiness is **subjective wellbeing**. Subjective wellbeing focuses on how people evaluate their lives. The subjective nature of wellbeing is that it relies on a person's own experience (Diener, 1984). The concept of subjective wellbeing suggests that people can evaluate their lives from three main areas:

subjective wellbeing
how people evaluate their lives to determine their level of wellbeing

1. the domains of their lives (such as work, school, friends, family)
2. global judgment (general feelings about their lives)
3. ongoing feelings about what is happening to them.

Model of subjective wellbeing

From these three areas, an overall measure of someone's wellbeing can be developed. Ed Diener, also known as Dr Happiness, has dedicated most of his research to what drives people's wellbeing and happiness. His research has led to the development of his **model of subjective wellbeing**.

model of subjective wellbeing
Diener's model that wellbeing is based on life satisfaction and affective balance

Diener's (1984) research into subjective wellbeing opened a field that was concerned with how we can measure and increase happiness. There are two key areas to Diener's wellbeing model:

1. life satisfaction
2. affective balance

Life satisfaction

Life satisfaction involves a global judgment and satisfaction with specific areas of one's life. Life satisfaction is influenced by feeling an overall positive affect or mood, which is usually most closely influenced by the domains closest to you, for example, family, friends and marriage (Diener, 1984).

life satisfaction
how a person evaluates their fulfilment within specific areas of their life

Life satisfaction is also influenced by the amount of positive or negative feelings an individual has within certain periods of time. If person A experiences five periods of negative affect in their lifetime, they probably have high life satisfaction. In contrast, if person B experiences five periods of negative affect in one year, their life satisfaction may be low.

Affective balance

Affective balance encompasses all of the moods, emotions and feelings that an individual has over a period of time. An individual may experience a combination of positive feelings, such as happiness and excitement, and negative feelings, such as anger and sadness, or they may experience one more than the other (Diener, 1984).

affective balance
the moods, emotions and feelings that a person experiences

Perspectives of wellbeing

Subjective wellbeing has also been viewed from a top-down perspective and a bottom-up perspective (Diener, 1984).

Top-down perspective

When people view their wellbeing from a top-down perspective, they are likely to view their whole life in one way. For instance, if someone has a generally positive outlook on

life, or possesses general positive affect, they are likely to apply this broadly to all aspects of their life.

Top-down theories of wellbeing suggest that happiness may be by hereditary. This means genetics may predispose certain people to be more likely to experience either a positive affect or a negative affect (Diener, 1984).

Bottom-up perspective

Bottom-up perspectives suggest that there are certain basic human needs. When looking at wellbeing, people may experience higher levels of subjective wellbeing and feelings of fulfilment when these basic needs are fulfilled (Diner, 1984).

Subjective wellbeing looks at how people's beliefs, perceptions and life experiences can determine their happiness levels.

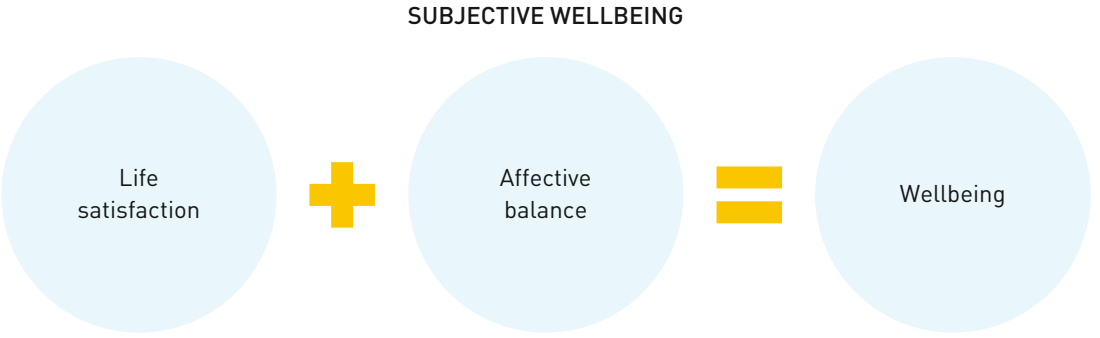


FIGURE 2 Subjective wellbeing is based on life satisfaction and affective balance.

Psychological wellbeing

Psychological wellbeing focuses on psychological wellness across six key areas:

- autonomy
- environmental mastery
- personal growth
- positive relations with others
- purpose in life
- self-acceptance.

The theory was developed by Carol Ryff (1995) who sought to create a multi-dimensional model of wellbeing. Each of the six key areas is evaluated by an individual to achieve an overall sense of wellbeing.

Multi-dimensional model of wellbeing

According to Ryff's (1995) multi-dimensional model of wellbeing, each of the following six components is relevant to understanding wellbeing, with each component equally important:

1 **Autonomy** is the ability of an individual to make their own decisions using their own free will.

2 **Environmental mastery** is a feeling of being able to influence our own lives.

psychological wellbeing
wellbeing as multi-dimensional with six key areas: autonomy, environmental mastery, personal growth, positive relations with others, purpose in life and self-acceptance

autonomy
independence and a feeling that someone is able to use their own free will

environmental mastery
being able to direct our own lives how we want to

personal growth
when a person feels that they can continue to progress and try new things

positive relations with others
when a person is able to develop and maintain close relationships with other people that include being intimate, having empathy and displaying and receiving affection

purpose in life
when a person has goals in life and feels that these goals provide their life with meaning

self-acceptance
when we are able to view ourselves as a whole in a positive way

3 **Personal growth** is when a person feels that they are able to continue to develop and experience new things, which they can recognise.
4 **Positive relations with others** is where individuals have close bonds with others that include intimacy, empathy and affection.
5 **Purpose in life** is when individuals have goals in life that give their lives meaning.
6 **Self-acceptance** is where individuals are able to have a positive outlook on all parts of themselves.

Table 2 displays how people may feel with high or low scores on each component. In self-report measures of wellbeing, participants respond to a series of questions relating to each component. Their scores are added up at the end to provide a total wellbeing score. Carol Ryff (1995) suggested that the six components are required to achieve a sense of wellbeing. She asserted that wellbeing means more than simply feeling happy and satisfied. She proposed that it is a combination of the six factors above that provided an overall sense of wellbeing.

Factor	High score	Low score
Autonomy	• Independent and self-determining • Able to regulate own behaviour • Resist social pressures or conformity • Evaluate satisfaction with life by own personal standards	• Concerned with expectations of others • Rely on the judgments of others to make important decisions • More likely to conform to social pressures and behave how society expects
Environmental mastery	• Able to manage their environment • Will choose or create environments that are suitable for their personal needs	• Difficulty managing everyday life • Feel as though they are powerless to change their environment • Feel that they have little control over the external world
Personal growth	• Open to new experiences • Sense of purpose and can see improvement in their self • Continued development	• Have limited sense of progression • Feel as though they lack improvement over time and may feel bored and uninterested in life
Positive relations with others	• Trusting and satisfying relationships with others • Have strong empathy and concern for others • Capable of affection and intimacy and understand human relationships	• Limited close and trusting relationships • Have limited concern for others' wellbeing • Isolated and will not understand the nature of human relationships
Purpose in life	• Feel that past, present and future lives have meaning • Have goals and aims for their lives	• Have a limited sense of meaning in past, present and future lives • Limited goals and aims for the future • No beliefs that give meaning to their lives
Self-acceptance	• Positive attitude towards themselves • Acknowledging all aspects, positive and negative of themselves • Positive feelings about past and current life	• Dissatisfied with themselves • Want to be different from what they are

TABLE 2 Possible feelings associated with high and low scores on psychological wellbeing



FIGURE 3 An aspect of the psychological model of wellbeing is being able to have positive, intimate relationships with others. Having friends is an example of this.



FIGURE 4 Having a goal and working towards something can help people achieve a sense of wellbeing.

CHALLENGE 19.4

Wellbeing and happiness

Use the components of Ryff's (1995) model of psychological wellbeing to think about your own happiness. Consider your autonomy, environmental mastery, personal growth, relationships with others, purpose in life and self-acceptance. Write a brief essay about how you think that these components may change in ten years. When formulating your response, make sure you justify your answer in relation to each component.

CHECK YOUR LEARNING 19.4

Describe and explain

1 **Explain** the difference between autonomy and personal growth.

2 **Identify** the six factors that Ryff (1995) determined were part of psychological wellbeing.

Apply, analyse and interpret

3 Jeffrey recently took a wellbeing test and found out that he scored low in autonomy and personal growth. **Infer** what Jeffrey is likely to feel about his life.

4 Tamika feels that she has a lot of control over her life, and thinks she can change things to improve her life. She also has been dating her boyfriend for a year, has close friendships and gets along with her family. **Discuss** what aspects of psychological wellbeing you think she would score highly on.

Investigate, evaluate and communicate

5 **Conduct** research online to find what a psychological wellbeing test may look like. **Evaluate** the questions and **consider** if they reflect the measures that Ryff (1995) suggested.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 19.4
- » Suggested research
  Worksheet: 19.4
  Happiness
- » Challenge
  Worksheet: 19.4
  Wellbeing and happiness
- » Weblink
  Wellbeing and happiness

19.5 The broaden-and-build theory of emotion

KEY IDEAS

In this section, you will learn about:

- the broaden-and-build theory of emotion
- the influence of positive and negative emotions on wellbeing.

Psychologists have often focused on negative emotions in their research towards happiness and wellbeing. They are the obvious choice, as presumably the causes of someone's sadness can be rectified by removing that cause and replacing it with the opposite. Negative emotions also have obvious biological and survival advantages. For example, when someone is afraid, this will activate their autonomic nervous system, which prepares their body to fight the threat or run, enhancing their chances of living. Positive emotions may not have such an obvious survival advantage, but recent research by Barbara Frederickson has shown that there are benefits to positive emotions that need to be considered in wellbeing.

The broaden-and-build theory

broaden-and-build theory focuses on the effect of positive emotions on wellbeing

The **broaden-and-build theory** focuses on positive emotions including joy, interest, contentment and love. Frederickson (2004) proposed that these positive emotions encourage discovery of 'novel and creative actions, ideas and social bonds', which helps to build an individual's resources. In turn, having greater resources allows individuals to experience greater wellbeing.

Frederickson recognised that not only do positive emotions contribute to positive wellbeing, these positive emotions can produce optimal wellbeing. The broaden-and-build theory provides a different approach to understanding emotion from other theories that have focused on how much negative affect a person has towards their overall satisfaction with life.

The influence of negative and positive emotions on wellbeing

Negative emotions can narrow one's focus (Frederickson, 2004). Recalling the example of fear, if the situation is life-threatening, having a smaller focus can encourage quick action that will result in an immediate benefit – for example, running away from a bear. These negative emotions and subsequent actions were once entirely beneficial to the survival of people.

Positive emotions do the opposite; they are likely to broaden an individual's focus so that they experience a greater array of thoughts and actions that enter their mind. Frederickson uses the example of joy. Joy makes people want to play, and this play encourages individuals to push their limits and use their creativity. Interest encourages the urge to explore and contentment encourages the urge to sit back and take the world in and integrate these circumstances into new views of the self and the world (Frederickson, 2004). Frederickson identified love as the merging of distinct positive emotions experienced within contexts of safe, close relationships and it creates recurring cycles of urges to play, explore and spend time with loved ones. Frederickson's (2004) broaden-and-build theory suggests that the way these emotions encourage positive actions represents the way that positive emotions broaden habitual modes of thinking or acting.

Positive emotions



FIGURE 1 Playing can help children build lifelong resources.

Earlier we viewed the benefits of negative emotions from an evolutionary and survival standpoint. Fear is obviously beneficial as it causes activation of the fight-flight-freeze response, a key survival strategy that animals, including humans, possess.

The broaden-and-build theory has highlighted that positive emotions have benefits to 'optimal wellbeing' (Frederickson, 2004), but just how does it do this? According to Frederickson, positive emotions positively influence wellbeing, in a number of ways:

- A broadened mind has long-term adaptive benefits. It can lead to building enduring physical and emotional resources.
- Juvenile play prepares the young for adult survival, and without play in youth, adults may not be equipped for later life. Play builds social resources, which with age can develop into social support, and this, in turn, becomes intellectual support.
- Interest leads to exploration. Exploration creates knowledge and develops intellectual complexity.

Perhaps what is key to 'optimal wellbeing' are the personal resources that are developed and maintained during positive emotional states (Frederickson, 2004). These personal resources are durable and adaptive and are likely to last throughout the lifetime.

The broaden-and-build theory focuses on positive emotions. These positive emotions help people to broaden their knowledge, understanding and life experiences. Because of this broadening, individuals are able to build skills and relationships across the lifespan, which in turn increases the likelihood of optimal wellbeing.

CHECK YOUR LEARNING 19.5

Describe and explain

1 **Explain** the *broaden-and-build theory.*

2 **Describe** positive emotions and how these can be beneficial.

Apply, analyse and interpret

3 As a child, Jamie hated to play outside and instead preferred to watch television indoors. As an adult, Jamie finds it difficult to make strong social bonds and is very sensitive to how people react to him. **Apply** the role of joy and play to Jamie's life.

Investigate, evaluate and communicate

4 **Assess** how the broaden-and-build theory influences happiness.

5 The broaden-and-build theory focuses on positive emotions instead of negative. Think about your own life, and the positive experiences you have had. **Discuss** how these have contributed to your wellbeing.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 19.5
- » Weblink
  The broaden-and-build theory
- » Weblink
  Benefits of positive emotions
- » Weblink
  Increasing positive emotions

CHAPTER 19

Review

Summary

19.1

- Emotions are the physical and psychological changes that influence our behaviour in response to a feeling or situation.
- There are three components to emotion: physiological change, subjective feelings and associated behaviour.

19.2

- The two-factor theory of emotion states that emotions are caused by assigning a cognitive label to our physiological response to a situation.
- The appraisal theory of emotion suggests that we experience emotions based on our assessment of a situation or event.
- Cognitive appraisal allows us to assess how capable we are of handling a situation.
- There are two ways we appraise a situation. Primary appraisal allows us to initially evaluate a situation, where we can determine if a situation is threatening, challenging or neutral. If we determine that it is a threatening or challenging situation, we can enter secondary appraisal. In secondary appraisal, we consider how we can deal with the threat/challenge. This is a conscious appraisal.

19.3

- The limbic system is involved in processing and regulating emotions. Research by Ochsner and Gross (2008) found that the amygdala is active during emotional responses. The hippocampus, hypothalamus and thalamus are also involved in the processing and regulation of emotions.
- LeDoux (1996) proposed a biological model of emotion. We can process information via a short route that receives sensory information from the thalamus and directs this straight to the amygdala. The long route receives sensory information from the thalamus and relays this to the sensory cortex, the hippocampus and then to the amygdala, allowing more time for us to make a judgment.

19.4

- Happiness is a state of wellbeing; there are several factors that influence happiness such as age, health, culture, religion and income.
- Subjective wellbeing was developed by Ed Diener in 1984. Subjective wellbeing suggests that we evaluate our lives from three areas: domains of our lives, general feelings about our lives, and ongoing feelings about what is happening to us.
- There are two key areas to the model of subjective wellbeing: life satisfaction and affective balance. Life satisfaction is how we view particular areas of our lives. Affective balance is all of the moods, emotions and feelings that we experience at a time.
- The theory of psychological wellbeing was developed by Carol Ryff. It is a multi-dimensional model that states our wellbeing is dependent on an assessment of our autonomy, environmental mastery, personal growth, positive relations with others, purpose in life and self-acceptance.

19.5

- The broaden-and-build theory of emotion focuses on the effects of positive emotions on wellbeing and happiness.
- Positive emotions can encourage durable resources for life. Play can encourage learning and social support, interest can lead to exploration, and contentment can encourage us to take the world in.

Key terms

- appraisal
- appraisal theory of emotion
- associated behaviour
- autonomy
- broaden-and-build theory
- cognitive appraisal
- coping potential
- emotion
- emotion-focused coping
- environmental mastery
- happiness
- LeDoux's model of emotion
- life satisfaction
- long route
- model of subjective wellbeing
- personal growth
- physiological changes
- positive relations with others
- primary appraisal
- problem-focused coping
- psychological wellbeing
- purpose in life
- secondary appraisal
- self-acceptance
- short route
- subjective feelings
- subjective wellbeing
- two-factor theory of emotion

Revision questions

Multiple choice

1 Which is not a component of emotion?
- **a** physiological changes
- **b** mood
- **c** subjective feelings
- **d** associated behaviour

2 Identify the most appropriate representation of the two-factor theory of emotion.
- **a** emotion + physiological response = cognitive label
- **b** cognitive label + emotion = physiological response
- **c** physiological arousal + cognitive label = emotion
- **d** environment + appraisal = emotional response

3 Consider the following scenario. Each evening on the way home from athletics training, Armand walks the same way. On one of the streets there is an unfriendly dog but it is usually behind a fence. This evening when Armand walked home, the dog was wandering along the street. Armand instantly crossed to the other side of the street, and felt his pulse quicken. What was Armand doing?
- **a** experiencing the primary appraisal stage
- **b** participating in secondary appraisal
- **c** providing a cognitive label for the situation
- **d** reacting to the environment

4 How is cognitive appraisal best defined?
- **a** the cognitive processes that occur before an emotion is displayed
- **b** thinking about a situation and deciding how to act
- **c** allowing people to assess how well they can handle a situation
- **d** our emotional and physiological responses

5 Which brain structure is not involved in emotion?
- **a** the limbic system
- **b** hypothalamus
- **c** amygdala
- **d** All are involved in emotion.

6 Which of these is the best example of LeDoux's biological model?
- **a** seeing a mouse and recognising that it is a mouse instantly
- **b** seeing a mouse and thinking it is a rat, and after time realising it is a mouse
- **c** seeing a mouse and assessing how quick your heart rate is to decide if you are afraid
- **d** seeing a mouse and not caring that you saw a mouse because a mouse doesn't threaten you

7 Happiness is measured differently at different stages of life. Which researcher proposed this idea?
- **a** LeDoux
- **b** Schachter
- **c** Diener
- **d** Frederickson

8 What is the difference between subjective wellbeing and psychological wellbeing?

- **a** Subjective wellbeing looks at six aspects of life that people need to have positive feelings about and psychological wellbeing only views your life satisfaction.
- **b** Subjective wellbeing emphasises the importance of affective balance and psychological wellbeing is only concerned with looking at life satisfaction.
- **c** Psychological wellbeing is a multi-dimensional model of wellbeing, whereas subjective wellbeing is based on an individual's life satisfaction and affective balance.
- **d** Psychological wellbeing is only concerned with mental health, and subjective wellbeing is concerned with physical health too.

9 Someone who scored highly on purpose in life on Ryff's questionnaire is likely to:

- **a** find meaning in their past, current and future life and have goals that reflect this meaning.
- **b** have meaningful relationships with others and feel empathy for people in their life.
- **c** rarely feel dissatisfied with themselves.
- **d** have no beliefs that provide their life with meaning.

10 According to the broaden-and-build theory, what is one benefit of playing when you are young?

- **a** building social resources
- **b** being physically active, which may encourage you to be active as an adult
- **c** developing interest, which may encourage you to gain knowledge
- **d** learning how to climb trees

Short answer

Describe and explain

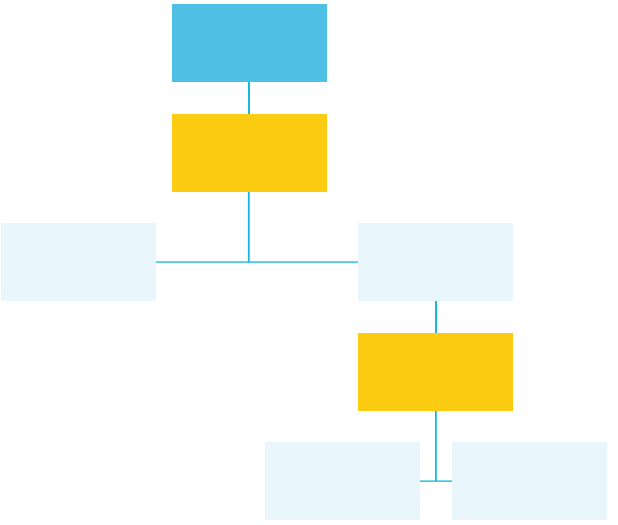
★11 **Define** emotion.

★12 **Describe** the two-factor theory of emotion.

★13 **Explain** the appraisal theory of emotion.

★★14 **Summarise** the broaden-and-build theory.

★★15 Label and **describe** the components of appraisal.



Apply, analyse and interpret

★16 **Classify** the following experiences according to a theory of emotion:

- **a** Experiencing a fright when you see a piece of black cotton, and then realising that it was not a spider
- **b** Stepping on a stick and thinking it is a snake
- **c** Having a racing heart when you hang out with friends and laugh at their jokes

★17 **Consider** the implications of never going through secondary appraisal.

★★18 **Determine** what may happen if LeDoux's long route was the only pathway ever used, and the short route didn't exist.

★★19 **Compare** the broaden-and-build theory, which focuses on positive emotions, to the two-factor theory of emotion.

★★20 When Malcolm was a child, his parents were very nervous, and didn't tend to let him play with other children a lot. He would attend school and then come home, and his only social interaction outside of school was when he was playing or competing in sports. As an adult, Malcolm sometimes struggles to talk to people, and often feels that he cannot ask anyone for help when he needs it. **Apply** the broaden-and-build theory to Malcolm.

Investigate, evaluate and communicate

★★★ **21** **Discuss** the advantages and disadvantages of Carol Ryff's multi-dimensional model of psychological wellbeing. In your discussion, **consider** why categorising certain aspects of life can assist wellbeing, and also **consider** how it may be detrimental.

★★ **22** **Construct** an argument in favour of subjective wellbeing instead of psychological wellbeing.

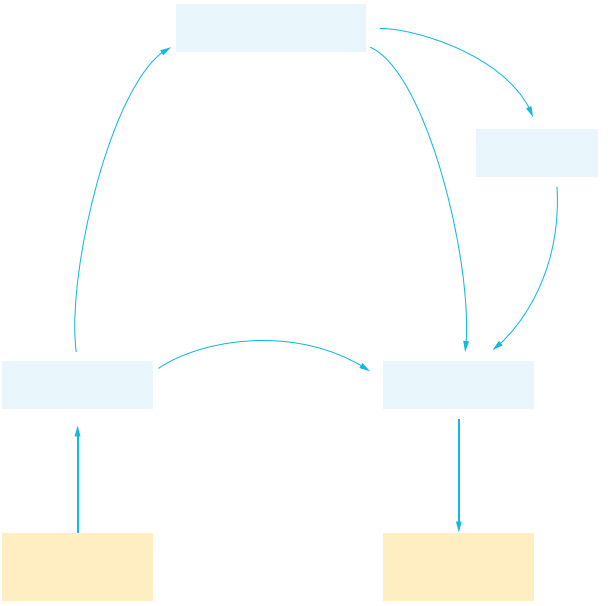
★★★ **23** **Discuss** this statement: 'Negative emotions are more important than positive emotions'. **Justify** your position using theories of happiness and emotion.

★★ **24** **Hypothesise** what might happen if psychology had a greater focus on happy emotions, rather than negative emotions such as fear.

★★ **25** **Create** a strategy for approaching happiness in your school. What would you encourage students to do more of or less of? In your strategy, include the areas of life you suspect they may need help with the most.

★★ **26** **Comment** on Diener's subjective wellbeing, and provide justification for life satisfaction and affective balance. How may this disadvantage someone's overall wellbeing?

★★ **27** Label the diagram below illustrating LeDoux's biological model. **Assess** the importance of having the short and long route using an example.



Check your obook assess for these additional resources and more:

- **» Student book questions**
  Chapter 19 Review
- **» Revision notes**
  Revision notes for Chapter 19
- **» assess quiz**
  Test your understanding with an auto-correcting multiple-choice quiz
- **» Flashcard glossary**
  Key terms in Chapter 19

CHAPTER 20

Motivation

At the most basic level, humans are motivated to survive, and certain physiological processes and responses exist for this reason. Beyond survival, people are motivated to do many different things; going to school, work, playing sport and exercising are just some examples. Identifying the things people are motivated to do is relatively easy, but identifying the reasons why people actually complete these tasks is more complex. This chapter will explore why people are able to achieve certain tasks as well as the reasons behind that motivation.

OBJECTIVES

- → Explain mindfulness with reference to attention and acceptance
- → Analyse the positive consequences of the flow experience (Jeanne Nakamura and Mihaly Csikszentmihalyi, 2002), with reference to enhancing positive affect, life satisfaction, performance and learning
- → Evaluate the achievement goal (task orientation and ego orientation), cognitive evaluation (intrinsic and extrinsic motivation), and self-efficacy (outcome expectations and efficacy expectations) theories of motivation
- → Describe the role of goal setting in motivation (Edwin Locke *et al.*, 1981)

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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FIGURE 1 Having a goal can help motivate people. Some people are motivated by climbing mountains.

SUGGESTED RESEARCH

SUGGESTED RESEARCH	**20.4** Children's motivation and performance (e.g. the effect of praising children for intelligence in Mueller & Dweck 1998)
SUGGESTED RESEARCH	**20.4** Cognitive evaluative theory (e.g. motivation in athlete-coach relationships in Blanchard, Amiot, Perreault et al. 2009; Kimball 2007)
SUGGESTED RESEARCH	**20.5** Goal setting and the prevention of health problems (e.g. the motivational efficacy of technological tracking devices for fitness in Schofield, Mummery, & Schofield, 2005)

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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20.1 Mindfulness

KEY IDEAS

In this section, you will learn about:

- attention and acceptance
- mindfulness-based therapies.

mindfulness
a set of skills that enable effective living through paying attention in a specific way, and reaching a level of acceptance about one's life

Founded in Buddhism, **mindfulness** has grown in popularity since its introduction to psychology in the 1970s. As a growing field of study, mindfulness is gaining credibility, and ongoing rigorous research is helping to establish its application as a therapeutic approach. For example, neuroimaging studies are currently exploring the neural mechanisms underlying mindfulness meditation to establish the effects of mindfulness practice on the brain.

Buddhism and other religions have practised mindfulness for centuries, as well as yoga and meditation. Mindfulness was introduced to psychology by Jon Kabat-Zinn in the late 1970s. Kabat-Zinn was introduced to mindfulness while studying at MIT and then began to practise living with mindfulness. Kabat-Zinn had a background in science and medicine and, after practising mindfulness, chose to remove the religious and spiritual background and focus on mindfulness in a clinical sense. At its core, mindfulness is focused on intentionally focusing attention on the present in an accepting way (Baer & Krietemeyer, 2006).



FIGURE 1 Yoga and meditation are often associated with being mindful.

Understanding the theory behind mindfulness is important. It is also important to realise that knowing the theory behind living a mindful life is not the same as living mindfully. This textbook will only focus on explaining the concepts of mindfulness – attention and acceptance – and will not teach you how to live mindfully.

Attention

attention (mindfulness)
how we attend to an environmental or internal stimulus

Attention is the first component of mindfulness. Previously, we have covered attention in the context of consciousness. Attention was considered to be the amount of focus that we are able to provide to a certain internal or external stimulus. In the context of mindfulness, attention is concerned with how we actually attend to an environmental or internal stimulus, rather than what we are attending to.

Mindfulness encourages individuals to self-regulate their attention. This is to encourage people to keep their attention on their immediate environment and experience, allowing for greater awareness of mental events in the present moment.

This increase in attention focuses beyond breathing and other physiological changes. It also centres on emotional fluctuations and the way we react to these changes. People who live mindfully are able to focus on the present moment and current events, rather than having their mind wander to previous or future events.

It has been said that people who regularly practise mindfulness are able to control their thoughts by controlling their attention (Kabat-Zinn, 2003).

Acceptance

Acceptance is the second major component of mindfulness. Once an individual is able to regulate their attention so that they are focusing on the present moment, they must then be able to recognise and identify these experiences in a certain way. When acknowledging present experiences, individuals should approach such experiences with openness, curiosity and acceptance (Bishop, Lau *et al.*, 2004).

In approaching any present experience with openness, mindfulness encourages individuals to accept the experience without any criticism or judgment. The appeal of accepting the present and themselves as they are, without judgment, has seen a rise in mindfulness-based therapies.



FIGURE 2 This is the typical pose most people associate with meditation, but nothing states that you need to be in this position.

Mindfulness-based therapies

Mindfulness-based therapies have been used and developed since mindfulness was introduced to psychology in 1979. Jon Kabat-Zinn developed mindfulness-based stress relief (MBSR) therapy, and since then many other psychologists have built acceptance-based therapies focused on accepting the present experience with an open mind. All mindfulness-based interventions and therapies encourage participants to change the way they pay attention and reach a non-judgmental acceptance of their experiences.

It is thought that mindfulness therapy can change the typical relationship between internal experiences and behaviour without directly needing to target emotions or cognitions for change.

Mindfulness is different from other psychological theories, in that it encourages people to change their entire way of thinking and living. Mindfulness, as a therapy for life, is not something people can pick up whenever they feel like it. It is something that must be practised so that you can attend to things in a mindful way, and so that you can approach what you attend to with acceptance. Mindfulness is not about achieving a goal, but learning to just 'be'.

CHECK YOUR LEARNING 20.1

Describe and explain

1 **Explain** what is meant by attention and acceptance in mindfulness.

2 **Describe** mindfulness.

Apply, analyse and interpret

3 Mindfulness has many applications. **Consider** what some of the challenges might be with practising mindfulness.

Investigate, evaluate and communicate

4 **Investigate** mindfulness-based stress reduction (MBSR), as originally developed by Jon Kabat-Zinn. **Evaluate** this as a treatment for depression, anxiety and other mental health issues.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 20.1
- » Weblink
  Meditation
- » Weblink
  What is mindfulness?
- » Weblink
  Mindfulness based therapies

20.2 The flow experience

KEY IDEAS

In this section, you will learn about:

- the flow experience
- enhancing positive affect and life satisfaction
- enhancing performance and learning.

Have you ever been so involved in something that you forgot about anything else? Perhaps you were learning to ride a bike. Do you remember how long you spent trying to learn? Did you still remember to eat? Can you recall how it felt when you had finally mastered riding a bike, and how it felt when you were peddling down the street, without having to think about what to do? You may have been experiencing flow. **Flow** is a mental state where we are entirely focused on what we are doing, to the point that we may forget about our basic needs.

flow
a psychological state where a person is deeply focused and involved in what they are doing, to the point that basic needs are ignored and they may be unaware of anything else

The flow experience was identified in 1975 by Mihaly Csikszentmihalyi, a Hungarian psychologist. Csikszentmihalyi became fascinated with artists and musicians and how they could become so focused on their work that they would become almost lost in it, to the point that they could go without food and sleep because they were so intent on what they were creating.

Csikszentmihalyi began to try to understand this experience and the artists who entered it. From this came the origin of **the flow experience**. Csikszentmihalyi was also fascinated by happiness, and how people could achieve a state of being happy. The flow experience was largely based around the notion that people could be at their happiest when they were in a state of flow.

the flow experience
a theory developed by Csikszentmihalyi and Nakamura to describe the immersion people find themselves in when focusing on a task



FIGURE 1 Artists getting lost in their work was the inspiration behind Csikszentmihalyi's research into the flow experience.

Csikszentmihalyi and Jeanne Nakamura (2002) have proposed six factors that are featured in a state of flow:

1. intense and focused concentration on the present moment
2. merging of action and awareness
3. loss of reflective self-consciousness
4. sense of personal control over the situation/activity
5. altered experience of time
6. experiencing the activity as rewarding.

Any of the above six components can be experienced individually, or you may even experience several at once, but unless you are experiencing all six at the same time, you are not having a flow experience. Since the original six factors were proposed by Csikszentmihalyi and Nakamura, an additional three factors have been suggested: receiving immediate feedback, feeling that you have the potential to succeed, and being so involved in the experience that other people are no longer a concern.

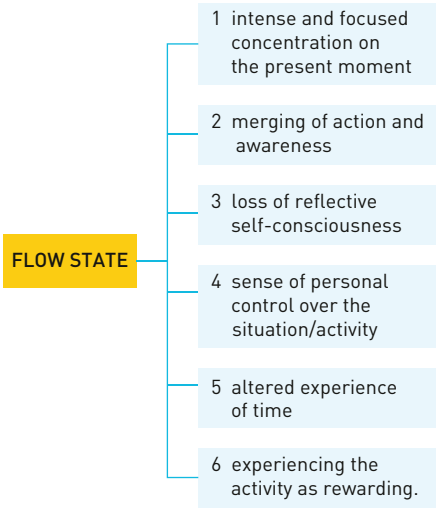


FIGURE 2 The six factors featured in a state of flow

CHALLENGE 20.2

Experiencing flow

Csikszentmihalyi identified flow in artists who were painting. Many athletes, artists and surgeons have reported experiencing the flow experience. Remember a time when you may have been experiencing flow, and consider the feelings that you had at the time. Identify the six factors in your experience.

Enhancing life through flow

Since its introduction, the flow experience has become a centre point for positive psychology. Positive psychology is a movement that focuses on mental health as a whole, rather than mental illness. As such, the flow experience has been shown to have positive benefits for life as a whole. The greater the amount of time spent in a flow state, the happier and successful people have been found to be.

Positive affect and life satisfaction

By nature, the flow experience should be a positive experience. When a person enters a state of flow, it is typically associated with enjoyment, and often while participating in an activity that the person is passionate about. An increase in enjoyment has been linked to increases in positive affect, and in turn, happiness and wellbeing.

The flow experience also leads to increased growth and personal development. In Chapter 19, the broaden-and-build theory identified that feelings of growth and personal development contribute to psychological wellbeing. The flow experience fosters growth, which should increase positive affect and wellbeing (Nakamura & Csikszentmihalyi, 1995; 2009).

These increases in positive affect have been linked with increased life satisfaction. Several aspects of entering a flow state increase positive affect. For example, those who frequently experience flow are likely to have greater life satisfaction than those who do not, possibly because of what they achieve while in the flow state. For example, an artist who enters flow and finishes work on a masterpiece may feel accomplished.

CASE STUDY 20.2

In the zone

Many athletes, across all sports, report entering a state of flow. For professional athletes, this makes sense – they spend the majority of their time training to achieve their goal. But for your everyday enthusiast, flow may not be as obvious. You may have heard the Brisbane Broncos say that they were 'in the zone' during a game, or you may have felt that way about your own game of tennis, rugby or netball. But what is this 'zone' and how do you enter it?

For many people in Australia, skiing and surfing are recreational activities. Many people partake in these sports to relax or to enjoy their holidays. It is not uncommon to hear skiers say that they were 'one with the mountain'. Skiers can frequently enter a state of flow. Perhaps it is encouraged by the beautiful scenery. In skiing, the most difficult run is a black run. Many skiers will report that though they have skied a black run hundreds of times before, a particular black run was the perfect run. They will start at the top and within a few turns have found their rhythm, with their knees bending at the exact right moment and the skis carving into the snow with each turn. Skiers will report not being aware of anything other than how their body is 'flying' down the mountain, and that their movements no longer required them to focus intently, because they were acting without thought. They will also become unaware that it may be negative 10 degrees, and they haven't been inside in hours. In this state, they are in flow.

Other people may experience this through surfing and 'riding the perfect wave'. In all likelihood, the perfect wave was not perfect, but the surfer entered a state of flow as they rode it in.

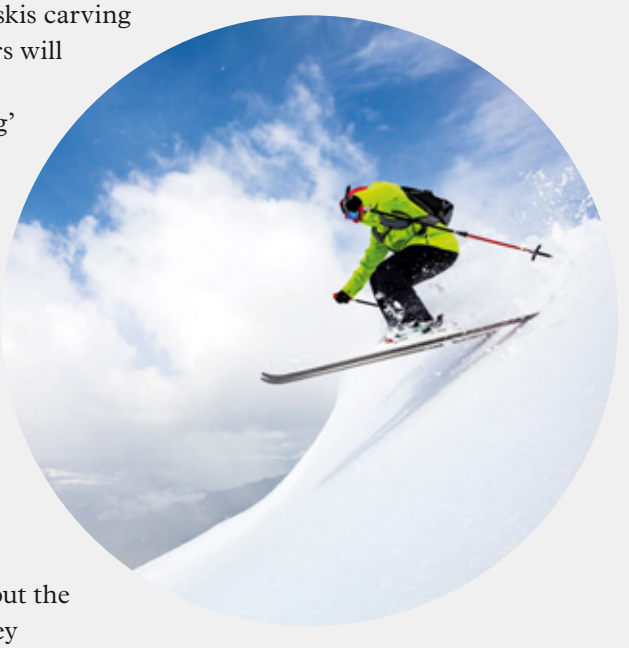


FIGURE 3 Skiers frequently report entering flow.

Performance and learning

Flow experiences allow people to develop their skills and strengths in a positive way. When someone is in a state of flow, they are directing their attention to become an expert of the task they are working towards. For an artist, this may be completing their painting; for a surgeon, this could be mastering a certain procedure. In order to continue their flow state, the individual must continue to seek greater challenges.

By taking on new challenges, or pushing one's ability, people are building and stretching their skills. When one finishes a flow experience, they may leave it feeling more competent and capable of new challenges.

Flow has been associated with an increase in intrinsic motivation, self-directed learning and increased performance in the specific area that their flow state was related to. For example, for a surgeon this would be surgery. Flow has been shown to increase achievement in activities as well as lowering anxiety and increasing self-esteem. Flow experiences can strengthen performance as they encourage people to work harder and take on more challenges (Nakamura & Csikszentmihalyi, 1995; 2009). However, performance also makes entering a flow experience more likely as people are more comfortable practising their skills.

Criticisms and concerns

The flow experience is overall a positive one and is linked to increases in positive affect and learning. However, despite these positive effects of the flow experience, like all good things, the flow experience has some drawbacks.

Flow experiences can become addictive to those that experience them frequently. When an individual is addicted to the flow experience, they may find it harder to cope with general life experiences because they are used to experiencing flow, which can make their general life seem less interesting.

CHECK YOUR LEARNING 20.2

Describe and explain

1 **Explain** what the flow experience is.
2 **Describe** the six factors of the flow experience.

Apply, analyse and interpret

3 Jasper is a competent maths student. Recently, Jasper has noticed that he is able to study and complete maths equations for hours without stopping, not even becoming aware of being hungry. Jasper gets great intrinsic reward from solving the problems, but his parents complain when he stays up too late to work on his maths. Jasper is usually unaware of the time. **Determine** if Jasper is entering a state of flow.
4 **Analyse** the positive effects of the flow experience. In your response, consider how it can enhance positive affect, life satisfaction, performance and learning.

Investigate, evaluate and communicate

5 Choose your favourite sports star or artist. **Investigate** the challenges that they would face in training and in competition. **Apply** the flow experience to your chosen person. **Evaluate** how you think this would help them succeed in their chosen field.
6 As a class, **discuss** your favourite activities or hobbies. In your discussion, try to **determine** if any of you have entered a state of flow, and what the experience was like.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 20.2
- » Challenge
  Worksheet: 20.2
  Experiencing flow
- » Weblink
  The Flow Experience
- » Weblink
  The benefits of flow

20.3 Motivation in the workforce

KEY IDEA

In this section, you will learn about:

+ how using the concept of flow can make employees more productive at work.

You would have heard the term 'work-life balance'. For a long time, employers would assume that to motivate employees, they had to offer them more money, somewhat similar to a donkey being led by a carrot on a string. Employers assumed that by offering more money, employees would be more dedicated to their work because they were getting a greater reward. This is a good source of external motivation, but employees also have higher rates of production if they can be internally motivated to perform or deliver. Recently, employers have begun to realise that employees may want different rewards, such as increased work-life balance and flexibility, or wanting to create a quality product, or deliver quality service.

When Csikszentmihalyi developed the theory of flow, it focused on athletes and artists, whose work is intrinsically motivating, and usually passionate to the individual. But research has built on this to suggest that if employees can engage in flow, they may be more productive and happier at work. This offers a different motivating strategy to the 'if we pay you more you will do more' idea.

For employees to find a state of flow, they need to see value in their work, and receive appropriate feedback from their managers. They also need to feel that they are being challenged, without being stressed. If an employee feels that the work is within their capability but will challenge their skills, it is easier to enter flow. Companies have also found that by turning work tasks that are routine into games, employees are more likely to complete them.

People are susceptible to distractions; this could be from external sources such as traffic on the street, their personal lives or other employees. Part of working with other people is the need to collaborate; however, people tend to be interrupted a minimum of 18 times per day while at work. These interruptions can prevent people from entering a state of flow. To encourage employees, there are several ways employers can use the theory of flow.

Increasing happiness at work

The flow experience can increase happiness at work for some employees. It also promotes engagement in the workforce and encourages greater overall wellbeing. Because of this, positively engaging in flow at work can increase continuous positive momentum and motivation (Kasa & Hassan, 2016).

Performance enhancement

The state of flow is typically associated with positive affect, and research by Kasa and Hassan showed that flow is positively correlated with enhanced performance. In their study, Kasa and Hassan looked at people who worked in hotel jobs and found that using flow as a motivator could help companies retain and attract employees (Kasa & Hassan, 2016).

Intrinsic motivation

Flow encourages greater intrinsic motivation, as well as needing intrinsic motivation to occur. If employers can instil intrinsic motivation within their employees, their employees will find it easier to enter a state of flow and increase production. When an employee can see value in their work, they are more likely to be intrinsically motivated. This value can increase their

productivity and the likelihood of entering flow. Employers need to recall that boredom can kill flow, and that something that is too challenging can kill flow equally. By using flow in the work environment, employers are likely to see greater efforts put in by their staff.



FIGURE 1 Employees who are able to enter flow will be more motivated and have increased productivity.

CHECK YOUR LEARNING 20.3

Apply, analyse and interpret

1 Think of your part-time job, your parents' work or what you may want to do for work when you leave high school. **Consider** how flow could be introduced at this job, and whether or not it would benefit your motivation.

2 A lot of the time people work to be paid. This is a necessity of life. Think about what else could motivate someone to go to work. **Compare** these reasons to money. Do you think that they would influence the flow state at work?

Investigate, evaluate and communicate

3 **Investigate** different methods of motivating employees. **Evaluate** if you think that flow might be better or worse than these. **Justify** your answers.

4 **Create** a hypothesis for this statement: 'Employees will have better performance if they are able to enter flow, than if they complete tasks without flow'.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 20.3
- » Weblink
  Motivating employees
- » Weblink
  How to stay motivated
- » Weblink
  Finding motivation

20.4 Theories of motivation

KEY IDEAS

In this section, you will learn about:

- cognitive evaluation theory and extrinsic and intrinsic motivation
- the achievement goal theory of motivation, including task-orientation and ego-orientation
- the self-efficacy theory.

Think of a time you really wanted to achieve something. Maybe you wanted your rugby league team to win on the weekend, or you really wanted to do well in a test at school, or perhaps you really wanted to go on a date with someone. No matter how much we want something, wanting it is rarely enough. Usually, we need to be motivated to work towards our goals. But what is it that motivates us? Our motivation is the reason for many of our actions, desires and needs. It may cause us to behave in a certain way, or make us want to repeat behaviours or activities.

Several theories propose reasons to explain why we are motivated by different sources for different events. These include the cognitive evaluation theory, the achievement goal theory and the self-efficacy theory. Each theory is discussed in turn.

Cognitive evaluation theory

cognitive evaluation theory (CET)
aims to explain the effects of external environments on our internal motivation

self-determination theory
a theory that focuses on the motivation behind the decisions that people make when not being influenced externally

extrinsic motivation
when people are motivated by external factors, such as receiving a reward or avoiding punishment

intrinsic motivation
when people are motivated by internal factors, such as excitement, pleasure or joy, to complete a task

The **cognitive evaluation theory (CET)** of motivation aims to explain the effects of external consequences on internal motivation. CET is a sub-theory of self-determination theory. **Self-determination theory** is concerned with the motivation behind the decisions that people make without external influence.

Before discussing CET, it is important to understand the differences between internal and external motivation, also called intrinsic and extrinsic motivation. People may be motivated by both at the same time, or they may be more motivated by one, depending on what the task or situation is.

Extrinsic motivation is when people participate in an activity or complete a task because they will receive something in return, such as a reward, or because there may be negative consequences if they do not complete the task, such as punishment. For example, a student may choose to go to school because if they do not they will get in trouble with their parents and their teachers.

Intrinsic motivation is when people participate in an activity or complete a task because they are benefitted by this. They may participate in sport because they have fun while playing or because they are satisfied when they achieve a personal best in a game. Intrinsic motivation depends on the individual's own attitudes and beliefs. Typically, intrinsic motivation has greater endurance than extrinsic motivation.

Consider wanting to achieve a high ATAR to study law. If you want to study law because you think it is interesting, this is a clear internal, or intrinsic, motivation. But if you want to study law in the hope that one day you will receive a high-paying job, you may also be motivated extrinsically.

CET suggests that events that affect an individual's perceived competency and self-determination affect the level of intrinsic motivation that they experience. The original theory proposed by Deci in 1975 has been subsequently updated. When considering external influences,

SUGGESTED RESEARCH
20.4 Children's motivation and performance
Go to page 457 »

there are three aspects that should be considered: the informational aspect, the controlling aspect and the amotivating aspect.

Informational aspect

The way you receive information about your ability can also change the way you are motivated. If you are rewarded for displaying competency, you are likely to have higher motivation. If you are punished when you don't display your ability, you are likely to be less motivated.

For example, if you write an essay and receive a high mark, you will feel that you are capable and be motivated to perform well on the next essay. If you receive an essay and are only told what you did wrong, you may not be motivated to try hard when you write the next essay.

Controlling aspect

The controlling aspect of CET is how someone decides why they are completing an activity or task and who they are completing it for. People must ask themselves, 'Am I doing this for myself'; students may ask 'Am I doing this for me, or my teacher, or my parents?'.

The greater the control that you feel over a situation, the more likely you will have higher motivation. That is, if you feel you are studying to improve your life or for your personal interests, you are likely to have more motivation than if you are just doing something to please someone else, in this case, perhaps your teachers or parents.

Amotivating aspect

To be **amotivated** is to have a lack of motivation to engage in an activity because you perceive yourself to be incompetent. As part of CET, the amotivating aspect is where an individual assesses their incompetence. If an individual determines that they lack competence, they may lose motivation to complete the task.





FIGURE 1 The way that information about your performance is provided to you can influence your motivation. The teacher on the top is providing negative feedback, and the teacher on the bottom is providing positive feedback. Which is more likely to motivate the student?

These three factors are all influenced externally. The perception that you are not capable or competent can come from the feedback you receive – this is the information factor. If your teacher only tells you what you did wrong, you may feel that you have little control over your marks, and you may become amotivated as a result. If you feel that you have control over your marks, and you are trying to achieve them for your own purposes, you are more likely to remain motivated.

amotivated
the perception that you are incompetent at a task and having little motivation to complete it because of this

Achievement goal theory

The achievement goal theory is used often in sports, as a popular way to motivate players and athletes to perform at a higher standard. The **achievement goal theory** focuses on the aim or purpose of an individual's behaviour and suggests that people seek competence and will be more motivated to achieve when they have clear goals (Wolters, 2004).

achievement goal theory
a theory that suggests people will be more motivated when they have clear goals that they believe they are capable of achieving

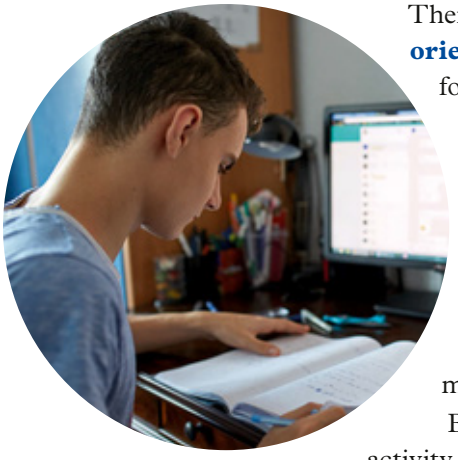


FIGURE 2 The reasons we are motivated to study can come from within or from external influences, such as our school or parents.

There are two particular goals that achievement goal theory focuses on: **task-orientation** goals and **ego-orientation** goals. Task-orientation goals are focused on mastering a skill, whereas ego-orientation goals are focused on comparing yourself to others.

Task-orientation

When people are striving towards a task, they are motivated by mastering the task at hand. This involves learning as much as they can about the task, and applying this to their approach to the task. People who are motivated by tasks have a strong belief that the more effort they put in, the more successful they will be (Wolters, 2004).

Being task-oriented often relies on being intrinsically interested in the activity. People who are task-oriented will often use self-comparison to judge their success. They demonstrate their competence by learning and displaying new skills.

For example, if you were an aspiring tennis player who wanted to enter the world circuit and you were task-oriented, you would focus on mastering your forehand and backhand shots, as well as your serve. You would feel great pleasure when you achieved the right spin on the ball and when you could see yourself mastering the performance, despite the outcomes of your matches.

task-orientation goals that are focused on mastering a skill

ego-orientation goals that are focused on becoming the best at that skill

Ego-orientation

On the other hand, ego-oriented people are likely to strive towards a task because they want to be better than someone or the best at something. Ego-oriented goals focus on a person's ability compared to someone else's ability. Competence in ego-oriented goals is displayed by being better than a competitor, not by mastering a task.

Being ego-oriented often relies on extrinsic motivators. People who are ego-oriented will use comparison to others as their main source of feedback and will feel little pride when they improve if they have not improved enough to be the best.

If you were an aspiring tennis player who wanted to enter the world circuit and you were ego-oriented, you would feel disappointment when your backhand was not as good as your competitors, and even more disappointment if you realised it was worse than your competitors. You would be motivated to become better because you want to beat the competitor, and would feel little reward when you improved your technique if it didn't mean you would win.

Applying achievement goal theory

The achievement goal theory asserts that motivation is the result of the goals that we set ourselves and our perceived ability to succeed in these goals. The result of the interaction between our goals and our competency varies according to whether we are task- or ego-oriented.

Intrinsic motivation tends to be a stronger motivator than extrinsic motivation. As task-oriented goals are more closely linked with intrinsic interest, people who are task-oriented are more likely to continue to work towards their goals even in the event that they are not successful (Wolters, 2004). Those who are ego-orientated, in contrast, are more likely to think that their ability is set and that no amount of effort they put in will change this. Ego-oriented people are therefore less inclined to try to improve their ability.

Task-oriented individuals will find ways to continue their motivation levels, despite any setbacks. In contrast, those who are ego-oriented may lose motivation if they face disappointment.

SUGGESTED RESEARCH
20.4 Cognitive evaluation theory
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Self-efficacy theory

Self-efficacy theory was developed by Albert Bandura, a psychologist who has contributed research to several areas including social psychology and developmental psychology.

Self-efficacy is a personal judgment or belief of how likely it is that you will succeed in a task or activity (Bandura, 1977). People with high levels of self-efficacy will be able to put effort in that will lead to successful outcomes. People with low levels of self-efficacy are likely to give up earlier or fail. It is important to distinguish between self-efficacy and **self-esteem**. Self-esteem is a general feeling about yourself as a whole, while self-efficacy applies to particular skills and situations.

Motivation can be affected by both low and high levels of self-efficacy. Essentially, people are more likely to participate in activities in which they think they can achieve success.

Those who believe that they are capable of performing a task are more likely to succeed in completing the task. People are also influenced by how effective their actions will be at reaching the final outcome; this is their **outcome expectancy** (Bandura, 1977). If you have positive beliefs about the outcome, you are more likely to be committed to achieving your goal and, as a result, achieve your goal.

People who have high levels of self-efficacy can be more inclined to make a greater effort towards the task they are working on. They may also be more motivated to continue to try for longer than those with low self-efficacy (Bandura, 1977). Despite this tendency, people with high self-efficacy can also show less motivation to learn about a new topic, and as a result, perform worse than someone with low self-efficacy who may be more motivated to learn about an unfamiliar subject.

self-efficacy
an individual's sense of ability to control and succeed in their life; a person's sense of self-efficacy can affect how they perceive or approach challenges or sources of stress

self-esteem
an individual's confidence in themselves and their capability

outcome expectancy
an individual's assessment of how effective their actions will be at reaching a particular outcome

CHECK YOUR LEARNING 20.4

Describe and explain

1 **Explain** the achievement goal theory with reference to task-orientation and ego-orientation.
2 **Describe** intrinsic and extrinsic motivation and provide an example of each.
3 **Explain** what self-efficacy is.
4 **Define** the cognitive evaluation theory of motivation.

Apply, analyse and interpret

5 Ronnie has a chemistry test this week. Recently her parents have been encouraging her to try to study medicine, but Ronnie hates chemistry. Despite this, Ronnie is trying to study to achieve a good mark in chemistry.
   a **Apply** one of the theories of motivation to Ronnie.
   b Based on this theory, **determine** the likelihood of Ronnie maintaining motivation.
   c **Explain** why Ronnie is motivated.

Investigate, evaluate and communicate

6 **Evaluate** the theories of motivation discussed in this section (CET, achievement goal theory and self-efficacy theory). In your evaluation, **consider** the advantages and disadvantages of each theory.

Check your obook assess for these additional resources and more:

» Student book questions
Check your learning 20.4

» Suggested research
Worksheet: 20.4
Children's motivation and performance

» Suggested research
Worksheet: 20.4
Cognitive evaluation theory

» Weblink
Achievement goal theory

20.5 Goal setting in motivation

KEY IDEAS

In this section, you will learn about:

- the goal-setting theory of motivation
- the five principles of goal setting
- the role of goal setting in motivation.

Earlier in this chapter, we discussed why people are motivated by different things and how these can increase or decrease performance and facilitate task completion. But is there a 'better' way to motivate people? In 1981, Edwin Locke *et al.* discovered that the more direct a goal is, the more successful it will be in motivating someone, when compared to using indirect goals.

Locke *et al.* (1981) demonstrated that there was a relationship between how difficult a task was, and how well people performed when trying to complete this task. This was the **goal-setting theory of motivation**. Their research found that achieving a hard goal will provide more incentive to work towards goal achievement. It also found that a specific goal is beneficial, but if the goal is too easy, it may not be achieved.

goal-setting theory of motivation a theory that states that people are motivated to achieve tasks when they have set goals that are clear, challenging and have a good level of complexity, they can commit fully and they receive feedback

Since, this original research, Locke and Latham (1990) proposed the principles of goal setting. They suggested that in order to be motivating, goals need to: be clear; be challenging; be committed to; be informed by feedback; have the appropriate level of complexity.

Let's put these five principles into practice. Imagine that you are part of a hockey team that is trying to get into the grand final after coming fourth for the last two seasons. The hockey league has 10 teams in it.

Clear

When people have clear goals, they know what they need to do to complete them; if a goal is not clear, it can be hard to state whether it has been achieved (Locke *et al.*, 1981).



FIGURE 1 Sports teams often use motivational strategies to increase performance.

Clear targets mean that people can adjust their strategies, as well as see how they are progressing. Being able to see progress can encourage people to keep trying to achieve their goal.

In the hockey team scenario, a clear goal is to be in the grand final. This is easy to measure as it will be clear when they make the grand final, and their place on the league ladder will provide indications of their success.

Challenging

The level of challenge a goal presents can determine how motivated people can be to achieve it. The harder it is to accomplish the goal, the greater the motivation, provided they do actually believe that they can achieve it. It is no good to have a challenging goal that people believe to be unachievable – instead of motivating them, this can be very demotivating and prevent people from trying (Locke *et al.*, 1981).

SUGGESTED RESEARCH
20.5 Goal setting and the prevention of health problems
Go to page 457 »

The reward that people experience also increases if the goal is more challenging. In the hockey example, reaching the grand final is challenging as they have not been able to do so for the past two seasons. It is also achievable as they have come fourth out of 10 each season.



FIGURE 2
Setting a to-do list can help make goals clear, and can provide rewards when items are completed.

Commitment

People must be committed to achieving their goals. The goal must be achievable and agreed on for them to be effective. The more challenging a goal, the greater the need for commitment (Locke *et al.*, 1981).

In the hockey example, if everyone thinks it is a nice idea to be in the final, but no one is prepared to commit to the goal, it is unlikely that the team will ever make the grand final.

Feedback

Feedback can provide opportunities to confirm expectations and adjust goal difficulty. It is important to have clear targets to reach so that people can see for themselves how their progress is going (Locke *et al.*, 1981).

In the example of the hockey team, feedback on how they are playing would highlight areas that are working in their team and areas that aren't. Feedback could also come from winning games throughout the season.

Task complexity

It is important to keep things as simple as possible, while keeping the challenge. If a goal doesn't have sufficient time dedicated to it, and enough time to work towards it, people can lose motivation (Locke *et al.*, 1981).

For the hockey team, the goal was to reach the grand final, but it wasn't specified if this was to be the next season, or two seasons away. The team would need to assess if it was realistic to reach the grand final with one extra season, or if they would need two or more seasons.

Without goals, motivation cannot be directed anywhere. Goals help people channel their motivation into specific areas, to achieve or accomplish specific tasks.

CHECK YOUR LEARNING 20.5

Describe and explain

1 **Explain** what the five factors of goal setting need to have.

Apply, analyse and interpret

2 **Consider** your motivation for school. **Apply** the five aspects of goal-setting theory to your attendance. Write out each of the five factors in relation to your study (clear, challenging, committed, feedback and task complexity).

Investigate, evaluate and communicate

3 **Assess** how goal setting may help a struggling athlete to perform better.

Check your obook assess for these additional resources and more:

- » Student book questions
  Check your learning 20.5
- » Weblink
  Motivate yourself
- » Weblink
  Setting goals
- » Weblink
  Goal setting theory of motivation

CHAPTER 20

Review

Summary

20.1

- Mindfulness is a set of skills that enables us to live effectively by paying attention in a specific way and reaching a level of acceptance about our lives.
- In mindfulness, attention refers to the how we pay attention to stimuli, including time and preference.
- Mindfulness stresses the importance of accepting the things that we pay attention to.
- By practising mindfulness, people can become more aware of their lives and accept their lives as a whole, which leads to greater wellbeing.

20.2

- The flow experience describes the way that some people are able to fully immerse themselves when focusing on a task.
- There are six factors in the flow theory: intense and focused concentration on the present moment, merging of action and awareness, loss of reflective self-consciousness, a sense of personal control over the situation/activity, an altered experience of time and experiencing the activity as rewarding.
- Experiencing flow is associated with increased positive affect and life satisfaction.

20.4

- There are several theories of motivation including cognitive evaluation theory (CET), achievement goal theory and self-efficacy theory.
- CET tries to explain the effects of our external environment on motivation.
- Extrinsic motivation is when people are motivated by external events; intrinsic motivation is when people are motivated by their own internal needs and desires.
- CET has three aspects: information aspect, how we receive feedback; controlling aspect, how much we are completing an activity for ourselves; and amotivating aspect, which states that we are not motivated because we have decided we are not capable, or incompetent.
- Achievement goal theory suggests that people have greater motivation when they have clear goals that they are able to achieve.
- Achievement goal theory implies that people can be task-oriented (motivated by mastering a skill) or ego-oriented (motivated by being better than someone else).
- The self-efficacy theory of motivation states that people with high levels of self-belief in a specific task will be more motivated than those with lower levels of self-efficacy.
- Self-efficacy theory states that if people have positive beliefs about the outcome of their efforts, they will be more committed to achieving their goal, and therefore will reach their goal.

20.5

- The goal-setting theory of motivation suggests that the more direct a goal is, the more likely people will achieve it.
- The goal-setting theory states that a goal must be clear, challenging and have a good level of complexity, and a person must be committed to it and receive feedback. This will mean the person is more motivated to achieve the goal.

Key terms

- achievement goal theory
- amotivated
- attention (mindfulness)
- cognitive evaluation theory (CET)
- ego-orientation
- extrinsic motivation
- flow
- goal-setting theory of motivation
- intrinsic motivation
- mindfulness
- outcome expectancy
- self-determination theory

- self-efficacy
- self-esteem
- task complexity
- task-orientation
- the flow experience

Revision questions

Multiple choice

1 What would a person practising mindfulness experience?

- **a** paying attention to everything around them, and agonising over how their life is
- **b** attending to the present moment, and accepting their life as a whole
- **c** focusing on their past and future, and accepting that these will come
- **d** not paying attention to their lives, and not accepting their feelings towards their life

2 How can mindfulness be best explained?

- **a** practising yoga on a daily basis
- **b** meditating every time you have a bad day
- **c** paying attention to the present and accepting the present
- **d** meditating and paying attention to the present

3 **Identify** what someone in a state of flow would experience.

- **a** intense and focused concentration on the present moment, merging of action and awareness and an altered experience of time
- **b** an altered experience of time, finding the activity rewarding, and a sense of no personal control over the activity
- **c** merging of action and awareness, extreme self-awareness, and a sense of personal control over the situation
- **d** feeling that they have no control over the activity, and get limited reward from completing the activity, and intense and focused concentration

4 Which of these is *not* a benefit of the flow experience?

- **a** increased positive affect and life satisfaction by making people feel that they can't achieve anything
- **b** increased positive affect and life satisfaction by creating feelings of personal development and growth
- **c** increased learning and performance by encouraging people to take on new challenges
- **d** decreased learning, performance and life satisfaction

5 Samir is a dancer and often says that she is 'in the zone'. Identify what may be a problem with being the zone frequently.

- **a** Samir may become dissatisfied with other aspects of her life.
- **b** Samir would experience greater enjoyment from her dancing.
- **c** Samir would become a better dancer and try more challenging tasks.
- **d** Samir may lose track of time because she is so immersed in dancing.

6 What does it mean if you are intrinsically motivated to play tennis?

- **a** You are motivated because your parents think tennis is a good skill to have in life.
- **b** You are motivated so that you can win a lot of money in a grand slam title one day.
- **c** You are motivated by seeing your friends and the enjoyment you get out of playing.
- **d** You are motivated by your parents giving you money for playing.

7 Jonah is only extrinsically motivated to get into university. Which of the following definitely does not apply to him?

- **a** Jonah is motivated because he enjoys studying and wants to learn more.
- **b** Jonah is motivated by his parents expecting that him to go to university.
- **c** Jonah is motivated by being offered a reward for getting into university, such as a car.
- **d** Jonah is motivated by his school having 90% of its students go to university.

8 What are the three aspects of cognitive evaluation theory?

- **a** informational aspect, controlling aspect and motivating aspect
- **b** amotivating aspect, controlling aspect and learning aspect

c informational aspect, controlling aspect and amotivating aspect

d amotivating aspect, intrinsic aspect and extrinsic aspect

9 Someone who is task-oriented:

a wants to be better at something so that they can master the task.

b tries to learn more about the task because they believe that the more effort they put in the more successful they will be.

c is intrinsically motivated.

d is all of the above.

10 Robert is ego-oriented in rugby. This means that Robert:

a wants to be worse than everyone.

b wants to be the best player on the field.

c is externally motivated.

d experiences both **b** and **c**.

11 What is low self-efficacy?

a thinking that you are not good at a particular task

b having a general belief that you aren't good at anything, and general negative feelings about your life as a whole

c thinking that you are capable of doing anything

d having a belief that there is no point in trying, because no matter what it is, you will perform badly

12 What are the five factors of goal setting?

a being clear, providing little challenge, having little commitment, receiving no feedback and not having the resources necessary

b having a clear goal that is challenging, you want to commit to, receiving feedback on any progress and having adequate complexity

c having an unclear goal, that is challenging, you can commit to, receiving limited feedback, and having adequate time and resources to complete the task

d having a clear goal that is challenging, that you don't want to commit to, being extrinsically motivated, and having a sense that you aren't capable of completing the task because there isn't enough time

13 Which of the below does not apply to the cognitive evaluation theory?

a Informational aspect

b Intrinsic and extrinsic motivation

c Amotivating aspect

d Task-orientation

14 Micah experienced a flow state over the weekend while painting. Which of the following did Micah experience?

a intense focus on the painting, a merging of awareness and action of painting, loss of reflective self-consciousness about painting, a sense of personal control over the painting, distorted awareness of time and finding the painting rewarding

b intense focus on the painting, a merging of awareness and action of painting, strong self-efficacy about painting ability, a sense of personal control over the painting, distorted awareness of time and finding the painting rewarding

c intense focus on the painting, a merging of awareness and action of painting, strong self-efficacy about painting ability, a sense of personal control over the painting, accurate experience of time and finding the painting boring

d intense focus on the painting, a merging of awareness and action of painting, extremely self-aware, feeling that he had limited control over the painting and being very unaware of the time

15 According to goal setting theory, you are more likely to be motivated if you:

a have a clear goal and are challenged

b are challenged and comprehend the task

c experience low task complexity and minimal feedback

d are not committed to the task and receive accurate feedback.

Short answer

Describe and explain

★ **16** **Summarise** mindfulness, including acceptance and attention.

★ **17** Shintaro often thinks about his past and his future, and forgets to focus on his present life. When he thinks about the future he thinks about everything he hasn't done and what he will need to do. **Identify** how mindfulness may help Shintaro have a more optimistic outlook on his life.

★ **18** In your own words, **explain** the informational, controlling and amotivating aspects of cognitive evaluation theory.

★★ **19** **Define** and **provide** an example of:

- **a** a clear goal
- **b** a challenging goal
- **c** commitment to a goal
- **d** feedback towards the goal
- **e** an appropriate level of task complexity.

★ **20** **Describe** how goal setting is used in motivation.

★ **21** **Identify** a goal that would not be challenging and a goal that would be unclear.

Apply, analyse and interpret

★★ **22** **Identify** the benefits of the flow experience. In your response, **compare** these to the potential negative effects.

★ **23** **Determine** what goal-setting theory may achieve in terms of motivation.

★★ **24** Imagine that you are a motivational psychologist. Your local sports team has approached you as they are struggling to motivate their players. By applying one of the motivational theories discussed, suggest a way to build motivation among the team. Be sure to **consider** the following:

- **a** What motivates the team?
- **b** How does this motivate them? Is it intrinsic or extrinsic?
- **c** Are there any extra incentives?

★★ **25** **Compare** cognitive evaluation theory and achievement goal theories of motivation.

★★ **26** **Distinguish** between intrinsic and extrinsic motivation.

Investigate, evaluate and communicate

★★★ **27** **Discuss** the original six factors of the flow experience. In your discussion, **evaluate** why these six factors may be considered necessary for the flow experience. You may also want to **consider** why an additional three factors were suggested.

★★ **28** **Arugue** why the flow experience increases positive affect and life satisfaction, as well as performance and learning.

★★ **29** **Assess** the importance of extrinsic and intrinsic motivation in relation to the cognitive evaluation theory.

★★ **30** According to achievement goal theory, people can be task-oriented or ego-oriented. **Predict** which will achieve better short-term results, and which would achieve better long-term results.

★★ **31** **Evaluate** the importance of outcome expectancy.

★★★ **32** **Evaluate** the theories of motivation and goal-setting theory. **Determine** if you think that a combined used of the goal-setting theories would yield greater motivation.

★★★ **33** **Design** a motivation theory. You may base it upon the theories discussed, or you may want to merge parts or all of the theories. **Justify** why you have included, excluded or merged theories based on your understanding of motivation.

Check your obook assess for these additional resources and more:

- » Student book questions
  Chapter 20 Review
- » Revision notes
  Revision notes for Chapter 20
- » assess quiz
  Test your understanding with an auto-correcting multiple-choice quiz
- » Flashcard glossary
  Key terms for Chapter 20

UNIT 2

Practice exam questions

Individual behaviour

Multiple choice

1 Maddy is feeling depressed and finds herself not wanting to go out, socialise or attend school. This is not usual behaviour for Maddy. She would therefore be considered abnormal according to the _____ approach to normality.
   - **a** statistical
   - **b** functional
   - **c** medical
   - **d** historical

2 Lachlan just received a poor score for his recent Psychology test. He took this result to be an indicator that he needs to put more work into his study from now on. According to Lazarus and Folkman, this would be an example of:
   - **a** challenge
   - **b** cognitive appraisal
   - **c** threat
   - **d** harm/loss.

3 Samantha was walking home alone on Friday night from the train station. Samantha takes this walk every day but began feeling uneasy when she noticed a man standing in her front lawn. Samantha was experiencing:
   - **a** cognitive appraisal
   - **b** the long route
   - **c** the short route
   - **d** fear.

4 Mr. Johnson was told by his students that he had high emotional intelligence. **Identify** which of the following Mr. Johnson is likely to display:
   - **a** happiness, an ability to empathise, good at controlling emotions and having musical awareness
   - **b** perceiving emotions, facilitating thought, understanding emotions and managing emotions
   - **c** good linguistic skills, musical and nature awareness and intrapersonal skills
   - **d** bad at perceiving emotions in others and an inability to control his emotions

5 The scale best used for measuring intelligence in children under the age of 10 is:
   - **a** WAIS
   - **b** WISC
   - **c** WPPSI-III
   - **d** intelligence quotient.

6 Troy likes to wear a watermelon helmet and goggles. Troy attends university and goes to his part-time job wearing the watermelon. He is always polite and submits all of his assignments on time, and never misses a bill. Select the approach to normality that would suggest Troy is normal:
   - **a** functional approach
   - **b** situational approach
   - **c** historical approach
   - **d** sociocultural approach

7 Select the most appropriate example of an adaptive behaviour:
   - **a** screaming and pulling one's hair when stressed
   - **b** making sure you check left and right before crossing the street
   - **c** yelling at your teacher when you get a bad mark
   - **d** asking your teacher how you could improve your test results in the future

8 Which of the following is not part of the flow experience?
   - **a** concentration on the present moment
   - **b** increased awareness of time
   - **c** finding the situation rewarding
   - **d** sense of control over the situation

9 Mr. Lewinski was trying to motivate his class to study for their test. He decided to try to encourage them by using the achievement goal theory of motivation. This means that his students would:

- **a** be either task oriented or ego oriented
- **b** be concerned with the outcome expectancy of the task
- **c** set several goals to achieve a good result on the test
- **d** experience extrinsic motivation for the task.

10 Mr. Lewinski decided to run a study on his class to evaluate if his motivation had worked. He did not tell the students this and did not get their permission to be involved. Mr. Lewinski may have breached:

- **a** informed consent
- **b** debriefing
- **c** withdrawal
- **d** all of the above.

Short answer

11 Compare the sociocultural and historical approaches to normality. Provide an example of normal behaviour and an example of abnormal behaviour for both.

12 Explain the mental health continuum.

13 Aimee and Alice are sisters who are moving from Melbourne to Singapore. This will mean leaving their friends behind and starting at a new school. Aimee is excited at the prospect of learning about a new culture and meeting new people. Alice is feeling anxious and apprehensive at making the move away from her old friends at school.

- **a** According to Lazarus' Cognitive Appraisal, identify Aimee and Alice's primary appraisals of the move.
- **b** Distinguish between a primary and a secondary appraisal.

14 Placebo treatments are commonly used in the treatment of mental disorders.

- **a** Provide one advantage and one disadvantage of the use of placebo treatments.
- **b** Provide two reasons as to why it can be unethical for a doctor to treat a patient using a placebo.

15 A psychologist has designed a program for improving a client's mental health using a biopsychosocial model. For each protective factor of this mental health model, provide an example and a reason to justify why it is a protective factor for improving mental wellbeing.

16 Discuss the flaws of the DSM and the ICD with reference to the legalisation of Same Sex Marriage.

17 Compare mood disorders and anxiety disorders. Refer to major depressive disorder and specific phobia in your response.

CHAPTER 21

Research and practical manual

Part of studying psychology is researching existing literature, as well as conducting your own experiments to investigate phenomena. This chapter provides examples of how you can approach the mandatory practicals, as well as things to look out for when conducting research.

In Chapter 1, The Psychology Toolkit, ethical considerations are discussed (see Section 1.6, p. 30). As psychological research typically involves people and animals, it is important that you read through the ethical requirements and ensure that they are met before conducting an experiment. No psychological research can be conducted without informed consent.

Consult with your teacher before participating in or completing any practicals in this manual.

UNIT 1 PRACTICALS

MANDATORY PRACTICAL	**11.1** Factors that influence sleep
SUGGESTED PRACTICAL	**8.1** Correlational investigation: Technology and cognitive development
SUGGESTED PRACTICAL	**9.1** Replication of Fergus Craik et al. (1996)

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UNIT 2 PRACTICALS

MANDATORY PRACTICAL	**19.2** Can your emotions be influenced?
SUGGESTED PRACTICAL	**17.1** Cultural differences in diagnoses of abnormal behaviours

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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FIGURE 1 Rorschach tests were once a very popular method to investigate mental health and psychological phenomena.



11.1 MANDATORY PRACTICAL Factors that influence sleep

MAKE SURE YOU HAVE CONSIDERED ETHICAL GUIDELINES AND HAVE INFORMED CONSENT FROM ALL PARTICIPANTS.

Unit 1, Topic 4: Use a correlational research design to conduct an investigation into the relationship between normal sleep hours and one other variable (e.g. listening to music, food before bed, amount of exercise in the day, reading on electronic devices, etc.).

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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Context

The ideal amount of sleep for an adolescent is 8–10 hours per night; but because of school pressures, social lives and sports commitments, many teenagers sleep less than this. Regardless of external pressures, there are some activities that, if engaged in before sleep, may or may not influence how much sleep you get. These factors need to be considered, because there are severe consequences to sleep deprivation, including increased stress, changes in mood and adverse health effects.

Aim

Determine whether the total amount of sleep experienced in one night may affect a person's perception of stress.

Materials

- Fitbit or other sleep/activity tracker (this may be an application on your phone)
- Smartphone (iPod, Android, etc.)
- Sleep questionnaire
- Informed consent and participant information sheet

Method

1 Recruit at least 20 participants to complete a sleep questionnaire. Make sure they consent to the study prior to participating.

2 The questionnaire should include questions about:
- the average hours of sleep they get each night
- another factor you are interested in investigating. For example, ask students to identify how stressed they feel on a daily basis or other stress questions such as: 'On average how often do you feel stressed? – Never, Rarely, Sometimes, Often, Always' or 'On a school day, identify your stress level on average from 1-10'.

3 Participants can also monitor the proportion of REM vs. NREM sleep using Fitbits, iPhones, etc. Use this to correlate with one other factor, like stress levels, using a stress questionnaire.

* Please note, because this is a correlational design, you cannot control the independent or dependent variables, instead you are only looking for a relationship between one variable (sleep or total sleep or length of sleep) and a second variable (stress).

Results

1 Collate data by filling in a table similar to the following:

TABLE 1 Results

Participant number	Total sleep per night	Stress levels (/100)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
		...

*If students decide to look at break down of NREM and REM, instead of the total sleep column, you should divide this into two columns one for NREM total time and REM total time.

2 Plot the number of hours of sleep on a graph (x-axis) against stress levels (y-axis) in a scatter plot. Each participant score should represent their hours of sleep and stress levels, you may represent each participant as a dot or a cross.

3 Perform a correlational data analysis to compare the results. See your obook for online calculators for Pearson's product moment correlation or Spearman's rank-order correlation.

4 Justify why you choose the Pearson's or Spearman's correlation based on the data you have collected.

Discussion

1 Interpret the results and determine if stress affects total sleep hours.

2 Explain the results using your knowledge about the purpose of sleep.

3 Identify which level of stress was most beneficial for total sleep in your sample.

4 If you were to complete the experiment again, what factor would you modify to increase the reliability and validity of your results? Explain your answer.

5 Propose two possible extraneous variables that could have affected your results.

6 Evaluate the use of self-reports in psychological research.

Conclusion

Summarise the outcomes of this experiment



FIGURE 1 Quality of sleep is as important as the amount of sleep.

19.2 MANDATORY PRACTICAL

Can your emotions be influenced?

Unit 2, Topic 5: Use an experimental research design to investigate the effect of watching emotive (e.g. a scary movie) versus informative (e.g. an advertisement for toothpaste) stimuli on emotional responses (measured as a change in heart rate).

Source: *Psychology 2019 v1.3 General Senior Syllabus*
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Context

Theories of emotion suggest that we experience physiological reactions and then assign an emotion to them based on environmental context. Watching two different video clips and seeing if they change or create particular emotions may or may not support the theory of emotion by showing the physiological changes based on environmental stimuli.

Aim

The aim of the experiment is to determine whether watching an emotive or informative stimuli effects emotional responses.

Materials

- Heart rate monitor (Fitbit or equivalent or count your pulse)
- Emotive video clip to stimulate emotion (ensure the video is age appropriate by checking the classification rating)
- Informative video clip
- Informed consent
- Standardised instructions and debriefing note
- YouTube or other video streaming device (e.g. Vimeo, etc.)

Method

1. Recruit 10-20 participants and provide them with informed consent prior to participation. If participants are under 16 years of age, ensure parental consent is sought and signed prior to participation. Note: There is no need for deception for this experiment, however, participants should be warned that the emotive clip may cause an unwanted emotional response.
2. Provide consented participants with a code to maintain confidentiality (a repeated measures design should be used).
3. Ensure the heart-rate tracking device is correctly fitted. If not using a heart rate monitor, instruct participants on how to correctly measure their heart rate (search online or consult your obook).
4. Record a baseline heart rate (BPM) for each participant.
5. Show participants the emotive video and record their heart rate at the end of the clip.
6. Ask participants to remain still and calm without speaking until their heart rate reaches their baseline measurement.
7. Show participants the informative video and record their heart rate at the end of the clip.
8. Collect results for the baseline, the emotive video and the informative video.
9. Conduct descriptive and inferential statistics on the dataset.

Results

1. Record results in the table below:

TABLE 1 Results

Participant	Baseline heart rate	Informative heart rate	Emotive heart rate
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

2 Plot the results for all participants' baseline heart rate, emotional heart rate and informational heart rate on a graph. Draw an appropriate graph for the data collected, and include the standard deviation as error bars.

3 Perform a data analysis to compare results across the different conditions (Wilcoxin Signed-Ranks test).

Note: you will need to perform more than one test

Discussion

1 Interpret the results from the graph and statistical analysis and explain if there was a difference in the heart rates between the emotive and informational videos.

2 Describe if the change was the same across all participants.

3 Identify if a person's starting heart rate has an impact on how the stimuli affected their heart rate after watching the stimuli.

4 Determine two possible limitations in the design of the experiment and suggest an improvement for each.

5 Evaluate the results of this experiment including the reliability and validity of the data.

6 Explain the real-world implications of the results.

Conclusion

Summarise the outcomes of this experiment.



FIGURE 1 Will watching an emotive stimuli change your emotional response?

Suggested research guide

Thinking critically about research is an important skill in Psychology. Please refer to Chapter 1, The Psychology Toolkit, for assistance in recognising valid and reliable research and interpreting statistical evidence.

The table below provides a summary of all suggested research in the senior Psychology syllabus. You will need to search for these articles yourself, using the skills suggested in the Toolkit, such as referring to journals or university databases. Your obook assess features practical worksheets for each suggested research.

UNIT 1	SUGGESTED RESEARCH
SUGGESTED RESEARCH	**2.1** Investigate and summarise the nature-versus-nurture debate (e.g. the case of the mixed-up brothers of Bogota in Dominus, 2015).
SUGGESTED RESEARCH	**3.3** How neuroimaging can be used to understand brain-behaviour relationships in MRI (in Maguire, Woollett, Spiers, 2006)
SUGGESTED RESEARCH	**3.3** Review research investigating how neuroimaging can be used to understand brain-behaviour relationships in PET (in Raine, Buchsbaum, LaCasse, 1997)
SUGGESTED RESEARCH	**5.2** Brain-behaviour relationships in brain structure (e.g. the case of Phineas Gage in Damasio, Grabowski, Frank et al., 1994)
SUGGESTED RESEARCH	**6.1** Brain-behaviour relationships in the developing brain (e.g. the adolescent brain in *Inside the teenage brain* 2002).
SUGGESTED RESEARCH	**6.1** The influence of learning on infant brain development (e.g. the effects of learning in infancy on brain structure and function in Rutgers University, 2014)
SUGGESTED RESEARCH	**6.3** Neuroplasticity in enriched and deprived environments (e.g. brain changes in response to experience in Rosenzweig, Bennet, & Diamond, MC 1962; Hyde, Lerch, Norton, Forgeard, Winner, Evans & Schlaug 2009; Draganski, Gaser, Busch, Schuierer, Bodgahn, & May, 2004)
SUGGESTED RESEARCH	**8.1** Attachment and psychological development in infancy (e.g. the significance of secure parent/carer bonds for shy infants in University of Waterloo, 2015)
SUGGESTED RESEARCH	**8.2** The potential effects of deprivation (e.g. the English and Romanian adoptees study in Rutter, O'Connor & English and Romanian Adoptees (ERA) Study Team, 2004)
SUGGESTED RESEARCH	**8.3** Information processing and metacognition (e.g. the effects of increasing cognitive load in Killeen et al., 2017)
SUGGESTED RESEARCH	**8.3** Sociocultural theory and cognitive development (e.g. the influence of social networks in Christakis 2010)
SUGGESTED RESEARCH	**12.2** Review the case study on disc jockey Peter Tripp and explain the physical and psychological effects of sleep deprivation in Thomas Bartlett, 2010; *Secrets of sleep deprivation Peter Tripp Pt 1 of 2; Secrets of sleep deprivation Peter Tripp Pt 2 of 2*

Source: *Psychology 2019 v1.3 General Senior Syllabus © Queensland Curriculum & Assessment Authority*

UNIT 2	SUGGESTED RESEARCH
SUGGESTED RESEARCH	**14.3** Genes and intelligence (e.g. parent-child studies in Plomin, Fulker, Corley, & DeFries, 1997)
SUGGESTED RESEARCH	**15.1** Emotional intelligence (EQ) and life skills (e.g. EQ as a predictor of life skill sin Bastian, Burns, & Nettelbeck, 2005)
SUGGESTED RESEARCH	**16.1** Distinguishing normal and abnormal behaviour (e.g. environments and behavioural contexts in Rosenhan, 1973)
SUGGESTED RESEARCH	**16.4** The classification and treatment of psychological disorders (e.g. discrepancies across cultures in Copper, Kendell, Gurland, Sharpe, Copeland, & Simon, 1972)
SUGGESTED RESEARCH	**17.1** Mood disorders (e.g. diagnosing depression in primary care settings in Mitchell, Vaze, & Rao, 2009)
SUGGESTED RESEARCH	**18.2** The relationship between the treatment and prevalence of common psychological disorders (e.g. does increased provision of treatment reduce prevalence? in Jorm, Patten, Brugha, & Mojtabai, 2017)
SUGGESTED RESEARCH	**18.5** The impact of stigma on help-seeking behaviours (e.g. public attitudes about psychological disorders and treatments in Angermeyer, van der Auwera, Carta, & Schomerus, 2017)
SUGGESTED RESEARCH	**19.2** The appraisal theory of emotion (e.g. the role of physiological reactivity in coping; the significance of fear and anxiety in Herrald & Tomaka, 2002; Ohman, 2000)
SUGGESTED RESEARCH	**19.3** The physiology of emotion regulation (e.g. the pathways mediating successful emotion regulation in Wager, Davidson, Hughes et al., 2008).
SUGGESTED RESEARCH	**19.4** Happiness (e.g. defining and measuring happiness in Kesebir & Diener, 2008)
SUGGESTED RESEARCH	**20.4** Children's motivation and performance (e.g the effect of praising children for intelligence in Mueller & Dweck, 1998)
SUGGESTED RESEARCH	**20.4** Cognitive evaluation theory (e.g. motivation in athlete-coach relationships in Blanchard, Amiot, Perreault et al., 2009; Kimball 2007)
SUGGESTED RESEARCH	**20.5** Goal setting and the prevention of health problems (e.g. the motivational efficacy of technological tracking devices for fitness in Schofield, Mummery, & Schofield, 2005)

Source: *Psychology 2019 v1.3 General Senior Syllabus © Queensland Curriculum & Assessment Authority*

GLOSSARY

A

abnormal
used to describe data that lie outside the normal range for the population

accommodation
Piaget's term for when new situations, objects or information are encountered and the person's schema is either modified or a new schema is created

achievement goal theory
a theory that suggests people will be more motivated when they have clear goals that they believe they are capable of achieving

adaptive plasticity
the ability of the brain to change, adapt and grow throughout life

adaptive behaviour
behaviour or skill developed as we age (and gain experience) to assist in our ability to relate to others, become independent and function on a daily basis

adenosine
a neurotransmitter produced when our cells use energy and accumulates when we are awake

adolescence
a lifespan stage, between childhood and young adulthood (approximately 12 or 13 years to 18 or 19 years of age)

adrenalin
a type of neurotransmitter

affective balance
the moods, emotions and feelings that a person experiences

agoraphobia
fear of crowds, assemblies of people and open spaces

agrammatism
verbal communication that lacks grammar (syntax) – see also Wernicke's aphasia

agreeableness
a person is compassionate and trusting

alpha waves
the typical brainwave pattern (reasonably high frequency, but not as high as beta waves, and low amplitude, but slightly higher than beta waves) that occurs when awake but very relaxed

altered states of consciousness
any state of consciousness that deviates from normal waking consciousness, in terms of marked differences in level of awareness, perceptions, memories, thinking, emotions, behaviours and one's sense of time, place and self-control; it can be deliberately induced or occur naturally

alternative hypothesis
hypothesis that there will be a relationship between the independent and dependent variables

amotivated
the perception that you are incompetent at a task and having little motivation to complete it because of this

amplitude
in terms of brainwaves, the height of the peaks and troughs of the curved graph that represents brain wave activity

amygdala
an almond-shaped structure, located in the medial temporal lobe of the brain that is central to emotion, aggression and implicit learning; it is vital in initiating and processing emotional responses and in forming emotional memories

animism
Piaget's term for the preoperational stage where children will believe that inanimate objects are alive

anomia
partial or complete loss of the ability to recall names

antisocial personality disorder (APD)
a tendency to appear calm and charming, while behaving in the opposite manner; no sense of shame or remorse, self-centred, incapable of love or affection, and likely to violate the rights of others

antisocial response
behaviour or action that may harm or not consider the rights of others, or may arise as a result of a specific trigger or event in the person's environment

anxiety disorder
a mental disorder in which the frequency and intensity of feeling anxious is out of proportion to the situation and interferes with everyday life

aphasia
the impairment of language caused by damage to the brain (usually a stroke)

appraisal
the cognitive processes that occur before an emotion is displayed

appraisal theory of emotion
a theory that suggests we experience emotions based on our assessment of a situation or event

arousal
a psychological state of being physically awake and alert

arousal (emotion)
an increase in physiological activity in the body

assimilation
according to Piaget, the process where new experiences are combined with existing schemas

associated behaviour
encompasses the behavioural changes that are a result of the subjective feelings and physiological changes

association areas
regions of the cerebral lobes that are not part of the sensory (visual, auditory, somatosensory) or motor cortices and integrate the information between the motor and sensory areas and higher order mental processing

attention
narrowing the focus of awareness to a stimulus of interest

attention (mindfulness)
how we attend to an environmental or internal stimulus

autonomic nervous system
responsible for communications between the body's non-skeletal muscles and the internal organs and glands that carry out bodily functions

autonomic processes
processes that require little attention and thought, and can allow you to do two things at once

autonomy
independence and a feeling that someone is able to use their own free will

awareness
how conscious (aware) we are of internal and/or external events; level of awareness can vary in normal waking consciousness

axon
the part of a neuron along which the electrochemical nerve-impulse is transmitted

B

behavioural approach
uses the principles of classical and operant conditioning to examine how factors or stimuli in the environment can influence behaviours

beta waves
typical brainwave pattern – high frequency (fast) and low amplitude (small) – during normal waking consciousness, associated with being alert, active, anxious and paying (selective) attention

biological model of intelligence
explains intelligence through the structure and functioning of the brain

biopsychosocial model
a holistic approach to treating psychological disorders by looking at biological, psychological and sociocultural factors

body
the physical being, including the brain

borderline personality disorder (BPD)
extreme instability of moods and relationships with other people

brain stem
part of the brain that connects the brain to the spinal cord

bright light therapy
the use of a high-intensity light to advance or delay sleep and therefore treat circadian phase disorders

broaden-and-build theory
focuses on the effect of positive emotions on wellbeing

Broca's aphasia
a result of damage to Broca's area that leads to difficulty in expressing messages in words or sentences, but the ability to comprehend speech is largely unaffected

Broca's area
the speech production centre of the brain

C

central nervous system (CNS)
composed of the brain and the spinal cord and controls the body by processing and responding to sensory input from the peripheral nervous system

centration
Piaget's term for the preoperational stage where children can only focus on one aspect of a task at a time

cerebellum
a component of the hindbrain that coordinates the sequence of body movement

chronic sleep deprivation
not getting enough sleep over an extended period of time; long-term sleep deprivation

circadian phase disorders
a sleep disorder that affects a person's internal sleep–wake clock, resulting in disturbed sleep

circadian rhythm
biological rhythms that occur approximately once every 24 hours, for example, the sleep–wake cycle and body temperature

circuit formation
a process that involves axons of new neurons growing out to target cells, forming new synapses (also known as synaptogenesis)

cognitive appraisal
allows us to assess how well we can handle a situation

cognitive behavioural therapy (CBT)
a branch of psychology used to treat mental health or disorders by focusing on breaking unhealthy patterns of thinking or behaving and replacing these patterns with positive habits and coping skills

cognitive bias
error in thinking that affects decisions and judgment

cognitive development
the development of mental abilities throughout the lifespan

cognitive evaluation theory (CET)
aims to explain the effects of external environments on our internal motivation

cognitive model
examines how thought processes influence feelings and behaviours, and the role distorted thinking plays in the development and maintenance of psychological conditions

cognitive strategies
mental strategies that an individual uses to solve both simple and complex cognitive problems

cognitive verbs
words that prompt the type of response required to help students provide the right type of information when answering a question

compulsiveness
repetitive or rule-following behaviours that sufferers believe they must perform in order to avoid imagined catastrophe or to relieve anxiety

computed tomography (CT)
a device that produces a high-resolution, 3D computer-enhanced image of the brain

conclusion
the final decision about what the results mean in an experiment, either rejecting or supporting the hypothesis

confidentiality
participants must not be identified in any way in terms of test results, their involvement in the study or any other confidential data

confounding variable
a variable other than the independent variable that has a systematic effect on the value of the dependent variable. If a confounding variable exists, no valid conclusions about the research can be drawn

conscientiousness
a person is self-disciplined and reliable

consciousness
our awareness of our own thoughts, feelings and perceptions (internal events) and our surroundings (external events) at any given moment

conservation
the inability to understand that objects stay the same despite changes in their appearance

contextual model of intelligence
explains intelligence as forming according to the culture of the individual

continuum of awareness
the levels of awareness that can be experienced, from deep unconsciousness to heightened awareness, on a continuous scale including normal waking states and altered states of consciousness

contra-lateral
the physiological nature of how one side of the brain controls the opposite side of the body

control group
the group of research participants not exposed to variations in the independent variable; the results are compared with the experimental group so that the effects of the independent variable can be determined

controlled observation
observation of voluntary behaviours within a structured environment such as a laboratory

controlled processes
processes that require mental effort to focus attention on the required task

convenience sampling
using whoever is available at the time of research

coping mechanism
functional or dysfunctional strategies to reduce anxiety or stress

coping potential
a person's ability to use either problem-focused coping or emotion-focused coping

corpus callostomy
a surgical procedure that severs the corpus callosum

corpus callosum
the thick band of about 200 million nerve fibres connecting the right and left hemispheres

correlation
a statistical measure of the strength and direction of the relationship between two variables; does not show a cause- and-effect relationship, but describes the way in which the variables vary in relation to each other

cortisol
a hormone released by the adrenal glands

counterbalancing
a method for controlling order effects in a repeated measures design

critical period
a period in life when certain experiences must happen for normal development to proceed

cross-sectional design
a form of independent groups design, where data is collected at one time from participants of all ages and different age groups, and compared

cultural bias
when an examinee may have a normal or higher intellectual ability, but performs poorly on an intelligence test because some of the questions are about things that are culturally unfamiliar

cumulative risk
the combined risks or factors that may interact with each other to influence a mental disorder

D

daydreaming
our private thoughts, feelings and imagined scenarios that occur when we shift our attention internally while ignoring the external world; often visualised thoughts that are positive and pleasurable; they occur naturally and often, and are mostly considered an altered state of consciousness

debriefing
the experimental process in which, after the experiment, subjects are told of the purpose of the research, and any deception is explained; a vital ethical component of any psychological research

deception in research
the provision of false or incomplete information for the purpose of misleading research participants

deep sleep
collectively stage 3 and stage 4 of NREM sleep

delayed sleep-wake phase disorder
a circadian phase disorder that delays sleep patterns, often seen in adolescence

delta waves
the typical brainwave pattern – a steady pattern of low frequency (slow) and high amplitude (large) – associated with NREM deep sleep

delusions
false beliefs that are strongly held despite evidence that they cannot be true

delusions of grandeur
a belief that you are extremely important

delusions of persecution
a characteristic of paranoid schizophrenia, believing you are being watched or monitored

dendrites
branch-like segments of a neuron that receive signals from other neurons or sensory receptors via the synapses and deliver these to the soma

dependent variable
the property that is measured in psychological research, to look for effects of the independent variable

deprivation
the absence or lack of important things that are needed for development

deprived environment
an environment that lacks brain stimulation

developmental norms
used to indicate the average age at which individuals reach certain milestones

developmental plasticity
the development and consolidation of neural pathways in babies, children and adolescents

disorganised attachment
experienced by individuals who find it difficult to share their feelings or empathise with others

divided attention
the ability to attend to and perform multiple activities at the same time

double-blind procedure
the method of allocating participants to groups so that neither the experimenter nor the participants are aware of who is in the E-group or C-group

DSM-5
the *Diagnostic and Statistical Manual of Mental Disorders*, 5th Edition, published by the American Psychiatric Association in May 2013; formerly known as DSM-V.

dualism
the view that the mind is a separate entity from the body and that our conscious awareness is not physical

E

early-morning awakening insomnia
a form of insomnia characterised by problems with waking up too early and not being able to go back to sleep

egocentrism
Piaget's term for when a person does not make distinctions between their own thoughts, feelings and perceptions and those of others

ego-orientation
goals that are focused on becoming the best at that skill

electrical stimulation of the brain (ESB)
a technique that sends mild electrical impulses through a probe to map the brain

electroconvulsive therapy (ECT)
psychological treatment where seizures are induced in patients

electroencephalograph (EEG)
a device that detects, amplifies and records electrical activity in the brain in the form of brainwaves

electromyograph (EMG)
a device that detects, amplifies and records the electrical activity of heart muscles

electrooculograph (EOG)
a device that detects, amplifies and records electrical activity in the muscles that allow the eye to move

emotion
physical and psychological changes that influence your behaviour in response to a feeling or situation

emotion-focused coping
reducing the negative emotional responses associated with stress such as embarrassment, fear, anxiety, depression, excitement and frustration by using strategies such as meditation, relaxation, talking to a friend/family, ignoring the problem and distraction

emotional intelligence (EQ)
the ability to perceive, use, understand and manage emotions in oneself and in others

enriched environment
an environment that provides social and physical brain stimulation

environmental mastery
being able to direct our own lives how we want to

evolution
the gradual changes in populations over generations (through genetic inheritance) that help their species to survive

evolutionary (circadian) theory of sleep
a theory stating that sleep serves as a means to increase an animal's or human's chance of survival in its environment

experience-dependent learning
learning that occurs at any time during an individual's life as a result of experience

experience-expectant learning
experiences necessary for learning to occur, most often during sensitive periods

experimental group (E-group)
the group of research participants exposed to the independent variable; the results are compared with the control group so that the effects of the independent variable can be determined

experimenter effect
the outcome of an experiment being influenced by the person conducting the experiment

expressive aphasia
a common term that refers to Broca's aphasia

extraneous variable
a variable other than the independent variable that could cause changes in the value of the dependent variable

extrinsic motivation
when people are motivated by external factors, such as receiving a reward or avoiding punishment

F

fight-flight-freeze response
a physiological response to stress that causes an organism to react in a combative mamer (fight), by removing themselves from the situation (flight) or by not reacting at all (freeze)

flow
a psychological state where a person is deeply focused and involved in what they are doing, to the point that basic needs are ignored and they may be unaware of anything else

flow experience
a theory developed by Csikszentmihalyi and Nakamura to describe the immersion people find themselves in when focusing on a task

forebrain
part of the brain responsible for higher order thinking processes; includes the cerebral hemispheres

frequency
the number of brainwaves per second

frontal lobe
the largest lobe of the brain; has several functions, including initiating movement of the body, language, planning, judgment, problem-solving, aspects of personality and emotions

functional approach
a psychological approach that focuses on people's conscious adaptation to the physical and social environment

functional approach to normality
suggests that behaviour is considered normal if the individual is able to lead a functional life

functional magnetic resonance imaging (fMRI)
special imaging technology used to see which parts of the brain are active

G

generalisation
a judgment about the extent to which the research findings can be applied to the population represented by the sample

generalised anxiety disorder (GAD)
a psychological disorder characterised by excessive anxiety about several aspects of life

Geschwind's territory
area of the brain that provides a connection between Broca's area and Wernicke's area

goal-setting theory of motivation
a theory that states that people are motivated to achieve tasks when they have set goals that are clear, challenging and have a good level of complexity, they can commit fully and they receive feedback

glial cells
cells that play an important role in supporting neurons by surrounding and holding them in place, supplying nourishment and oxygen, removing dead neurons and insulating neurons to increase the speed of nerve impulse transmission

H

hallucinations
false perceptions in the absence of sensory input

hallucinations (schizophrenia)
experiences of perceptions, such as sight or sound, which are not present in reality and can occur in each sense: auditory, tactile, visual, gustatory and olfactory

happiness
a state of wellbeing that encompasses a deep and meaningful satisfaction with life

heredity
genetic inheritance; the genetic characteristics received from the biological mother and father

heritability
how much heredity contributes to intelligence; expressed as a coefficient from 0 to 1 where 0 means heredity has no influence and 1 means heredity has 100 percent influence on intelligence

hindbrain
the primitive parts of the brain comprising the cerebellum, pons and medulla, adjacent to the spinal cord

hippocampus
located in the brain's medial temporal lobe and involved in the transfer of information from short-term memory to long-term memory

historical approach to normality
suggests what normal behaviour is based on cues in different periods in time

homeostasis
the state of balance in the body's metabolism

hyperarousal
an altered state of consciousness and heightened (or hyper) awareness

hypothalamus
structure of the forebrain that plays a major role in controlling emotion and motivated behaviours, such as eating, drinking and sexual activity

hypothesis
a prediction of the outcome of research stated in terms of the influence of changes in the value of the independent variable on the value of the dependent variable

I

imprint
an immediate attachment that is formed (to the first moving object seen after birth)

inborn reflex
an automatic response to certain stimuli that babies are born with

independent groups design
allocates participants to E- group or C- group at random; also known as 'between participants design'

independent variable
the variable that is manipulated by the experimenter who then measures resulting changes in the dependent variable

infancy
a lifespan stage, between birth and childhood (approximately 0 to 2 years of age)

information-processing theory of intelligence
focuses on understanding the cognitive processes that underlie intelligence

informed consent
the ethical basis for psychological treatment or experimentation requiring that the subject (or client) is fully aware of all procedures and their likely and possible effects, and participates on a voluntary basis

insomnia
a sleep disorder characterised by difficulties falling asleep, staying asleep and waking up at the right time

intelligence
can be defined in many ways, including one's capacity for learning, problem-solving, and applying knowledge and skills to adapt to unfamiliar situations

intelligence quotient (IQ)
standardised score for an individual's intelligence as measured by a specific intelligence test; IQ scores are based on how much an individual's test score deviates from the mean score for the standardisation group

interneurons
neurons that transmit information between motor and sensory neurons and the CNS

interval data
data is measured on a scale where each step is the same value, but zero does not mean that the property does not exist

intrinsic motivation
when people are motivated by internal factors, such as excitement, pleasure or joy, to complete a task

irreversibility
children's inability to realise that an action can be done and then undone

J

jet lag
the disruption of the sleep–wake cycle when travelling across time zones

K

K- complexes
sharp rise and fall in amplitude, lasting for about two seconds

L

learning
a relatively permanent change in the way an individual behaves due to experience

LeDoux's model of emotion
a model that proposes that there are two pathways of emotion in the brain

life satisfaction
how a person evaluates their fulfilment within specific areas of their life

linguistic bias
the words in a test are more familiar to examinees who speak one language than those who speak another

longitudinal studies
a form of repeated measures design where the same participants are investigated over a period of time

long route
environmental stimuli are processed through the thalamus to the sensory cortex, the hippocampus and then the amygdala, allowing time to consider the whole situation

M

magnetic resonance imaging (MRI)
a neuroimaging procedure that uses harmless magnetic fields and radio waves to produce a computer-enhanced image of brain structure

major depressive disorder (MDD)
a mental disorder diagnosed when an individual shows severe symptoms of flattened mood, low self-esteem, and lack of motivation for an extended period of time

maladaptive behaviour
behaviour developed in early childhood as a means of reducing anxiety that interfere with a person's ability to function on a daily basis (such as tantrums, self-harm, screaming, aggressive or disruptive behaviour)

Mann-Whitney U test
typically used for ordinal data to test whether two means are equal or not

matched participants design
a subject-selection procedure that attempts to eliminate confounding variables by 'matching', on key characteristics, each individual in the experimental group with an individual in the control group

maturation
a predetermined biological sequence of behaviours that occur at certain ages

materialistic monism
the view that consciousness (the mind) results from the complex physical interactions between the neurons

mean
the average of all the scores, calculated by adding up all the scores and dividing that total by the number of scores

median
the middle number (or mean of the two middle numbers) of a number series listed in numerical order

medical approach to normality
diagnosing someone with a mental illness, in the same way a person may be diagnosed with a physical illness; if a mental illness is diagnosed

melatonin
a sleep hormone that causes sleepiness and is released when it is dark; it is secreted from a small structure in the brain called the pineal gland

mental disorder
exaggerated forms of thoughts, feelings and behaviours, implying the existence of a clinically recognisable set of symptoms and behaviours that usually need treatment to be alleviated; can interfere with a person's thoughts, emotions, perceptions and behaviours

mental health
a state of emotional and social wellbeing in which individuals can cope with the normal stress of life, work productively and contribute to their community

mental health problems
emotional, cognitive and behavioural difficulties that affect relationships and functioning in everyday life

metacognition
a key factor that involves an individual's personal awareness and understanding of their own thought processes

metacognition (intelligence)
an understanding and use of the way a person thinks when solving problems, reasoning, planning and decision-making

midbrain
connects the hindbrain with the forebrain and controls arousal levels, attention and consciousness

migration
during developmental plasticity, the movement of newly formed neurons

mindfulness
a set of skills that enable effective living through paying attention in a specific way, and reaching a level of acceptance about one's life

mind-versus-body problem
a much debated and controversial question of whether the mind is a separate entity from the body, including the brain

mode
the most commonly occurring score in the dataset

model of subjective wellbeing
Diener's model that wellbeing is based on life satisfaction and affective balance

monism
the view that the mind is the same thing as the brain

mood disorder
a mood that is severe or persistent and disrupts a person's life or daily functioning

more knowledgeable other
another individual with greater knowledge about a particular topic

motor neurons
neurons that communicate messages from the CNS to the particular muscles that an organism intends to move at any particular moment

multiple intelligences theory
proposes that people possess many independent types of intelligence

myelin
a white fatty, waxy substance that covers the axon to insulate it from the surrounding fluid and from other neurons

myelination
the production of myelin, which insulates a neuron's axon, speeds transmission and aids coordination

N

narcolepsy
a sleep disorder that causes sudden and unexpected sleeping

naturalistic observation
observation of voluntary behaviours occurring within the subject's natural environment

natural selection
process of survival of the fittest, where animals that adapted to changes in their environment were strong, lived longer than others and produced more offspring, while those that did not adapt, died

neural pathways
bundles of neurons that provide connections between one part of the nervous system and another

neuron
nerve cells, responsible for communication within the body

neurosis
non-psychotic illnesses where, although a sense of reality remains, there are difficulties with thoughts, feelings and behaviours, and the person experiences suffering and dysfunctional behaviour

neuroticism
a person is anxious, stressed, depressed and self- conscious

nerve
bundle of axons running together in the peripheral nervous system

neurotransmitters
chemicals that help the communication across nerve synapses

nominal data
data that has qualitative value rather than quantitative value, where there is no ranking or ordering of the values implied

non-rapid eye movement (NREM) sleep
one of two phases of sleep, characterised by little or no rapid eye movement, and often divided into four stages of NREM sleep that are determined mainly by predominant brainwave patterns

norepinephrine
a neurotransmitter involved in regulating arousal that helps keep us alert during the day

norepinephrine (noradrenalin)
a neurotransmitter that is released by the sympathetic nervous system

normal behaviour
a behaviour that is accepted within society and is typical for the specific situation or context

normality
state of being normal, defined in terms of typical and atypical behaviours, and how some behaviours are adaptive and others are maladaptive.

normal waking consciousness
the states of consciousness we experience when we are awake and aware of our thoughts, feelings and perceptions from internal events and the surrounding environment; we experience a real sense of time and place and create our reality and a baseline to judge all other states of consciousness

norms
standardised scores representing the conversion of test raw scores into scores that can be compared with the performance of the wider population

null hypothesis
hypothesis that there will be no significant difference between groups; any difference observed is caused by error

O

objective data
data that is measured according to an identifiable external criterion

objective measures
methods free from bias, such as measuring cognitive response time

object permanence
realising that an object still exists when it is no longer visible

occipital lobe
the cerebral cortex at the rear of the brain; the location of the primary visual cortex and association areas involved with integration of visual stimuli

operationalisation
quantification of a variable

ordinal data
data that has a definite sequence, but the gap between one level and the next is not constant

outcome expectancy
an individual's assessment of how effective their actions will be at reaching a particular outcome

P

parasympathetic nervous system
branch of the autonomic nervous system that is responsible for maintaining day-to-day functioning of the body, such as digestion, heart rate, breathing and some glandular functions

parietal lobe
the location of the primary somatosensory cortex in the brain; it enables a person to perceive their own body and to perceive where things are located in their immediate environment

partial sleep deprivation
having some sleep in a 24-hour period but not getting enough to meet your needs; may occur for just one night or for several nights and can have serious consequences

Pearson product moment correlation
a measure of the strength of the linear relationship between two continuous variables

percentile
a score that indicates the percentage of people who have obtained the same raw score as a particular examinee on a psychometric text

peripheral nervous system (PNS)
composed of all the nerves and ganglia outside the brain and spinal cord that communicate information to and from the central nervous system

personal growth
when a person feels that they can continue to progress and try new things

personality
lasting and distinctive behaviours, thoughts, motives and emotions that typify how we react and adapt to other people and situations

personality disorders
psychological disorders in which an individual shows a rigid and unhealthy pattern of thinking, functioning and behaving

pharmacotherapy
the use of drugs and medication to assist mental health

philosophy
a discipline that tries to understand behaviour by using logic and reason rather than observation and experimental research methods

phobia
an irrational fear of a specific object or situation

phrenology
a pseudoscience that suggests our mental abilities and personality are controlled by 37 areas of the brain and that the shape and size of the skull can be measured to determine a person's character

physiological changes
the alterations in your body and psychology when you experiencing an emotion

physiological measures
the observation of a measurable bodily (physical or physiological) response (such as heart rate, brainwave activity and galvanic skin response)

placebo
a variable other than the independent variable that causes a change in the value of the dependent variable due to the participant's belief that it will have an effect

placebo effect
refers to the participants' behaviour being influenced by their expectations of how they should behave, caused by the belief that they have received some treatment

plasticity
the ability of the brain's synapses to be modified

polysomnogram
a continuously moving chart that displays data collected simultaneously from EEG, EOG, EMG and any other devices

population
the group of people about which we wish to draw conclusions

positive relations with others
when a person is able to develop and maintain close relationships with other people that include being intimate, having empathy, and displaying and receiving affection

positron emission tomography (PET)
a technique that measures the volume and location of blood flow in the brain by tracking a radioactive substance (e.g. glucose) that has been injected into the person's bloodstream

primary appraisal
the process by which someone initially evaluates whether or not a situation is threatening or irrelevant

primary auditory cortex
located in the upper part of the temporal lobe; receives sound information from the ears in the temporal lobe

primary motor cortex
located at the rear of each frontal lobe; responsible for movement of the skeletal muscles of the body

primary somatosensory cortex
located at the front of each parietal lobe; processes sensations such as touch, pressure, temperature and pain from the body

primary visual cortex
located in the occipital lobe and involved in the processing of information from the eyes

privation
when attachment never occurs – that is, if an infant/ child never forms a close relationship with anyone

problem-focused coping
addressing a negative situation by using practical ways to deal with it, such as seeking information, and evaluating the pros and cons

processing speed
the time it takes for an individual to mentally perform a cognitive (or mental) task

proliferation
the first stage in the development of the nervous system, where cells destined to become neurons divide and multiply

protective factors
factors that guard against the onset or relapse of a mental disorder

psychograph
an electric-powered device that, using the principles of phrenology, measures a person's head to provide an assessment of a person's personality

psychological constructs
hypothetical concepts created to explain phenomena that are believed to exist or occur, but cannot be directly observed or measured

psychological disorder
any psychological dysfunction in an individual that is associated with distress or impairment in mood, behaviour or cognition that can adversely affect an individual in their everyday functioning

psychological dysfunction
a breakdown in the way a person thinks, feels and behaves

psychological wellbeing
wellbeing as multi-dimensional with six key areas: autonomy, environmental mastery, personal growth, positive relations with others, purpose in life and self- acceptance

psychology
the systematic study of the mind (mental processes) and behaviour

psychometric model of intelligence
explains intelligence through the use of factor analysis of the results of many different intelligence tests that have been completed by many different people

psychometric test
a standardised measure of a selected aspect of an individual's behaviour, used to identify individual differences in psychological functioning among people

psychosis
a mental illness where there is some loss of contact with reality

psychosurgery
brain surgery including lobotomies and deep brain stimulation to treat mental health disorders

psychotherapy
using psychological, rather than medical, means to treat psychological disorders

psychotic disorder
a mental disorder that can cause abnormal thinking or behaviour, and a loss of contact with reality

purpose in life
when a person has goals in life and feels that these goals provide their life with meaning

Q

qualitative data
descriptions of the characteristics of what is being studied

quantitative data
measurements (numerical information) about the variables being studied

R

random allocation
a subject-selection procedure where all participants who have been selected for an experiment have an equal chance of being in the E-group or C-group

random sampling
a sampling procedure in which every member of the population has an equal chance of being selected

range
the difference between the highest score and the lowest score in the dataset

rapid eye movement (REM) sleep
one of two phases of sleep, characterised by rapid eye movement

ratio data
measurements that represent quantities in terms of equal intervals and an absolute zero point of origin

reaction range of intelligence
the amount by which IQ scores may vary depending on the interaction of heredity and the environment

receptive aphasia
a term for Wernicke's aphasia in which an individual is unable to understand language in its written or spoken form

reliability
the extent to which a measure could be expected to produce the same result with the same subject(s) under the same conditions on other occasions

REM rebound
the significantly larger amount of time spent in REM sleep than usual that follows a period of being deprived of REM sleep

repeated measures design
a subject-selection procedure where each participant is part of both the E-group and the C-group

restorative (restore and recover) theories of sleep
a theory stating that sleep allows us to recharge our bodies, and recover from the physical and psychological work during the day; it also allows our body's growth processes to occur

reticular formation
a network of neurons that sits across both the midbrain and hindbrain and connects the hindbrain and forebrain; plays an important role in the control of arousal and the 'sleeping and waking' cycle

reversibility
Piaget's term for understanding that inversion (reversing) of an action will return it to its original state

risk factors
factors that contribute to the likelihood of a person developing (or relapsing into) a mental disorder

rumination
excessive thinking or worrying

S

sample
the members of the population who have been chosen to take part in the research

sawtooth waves
random, fast waves that are slightly bigger than alpha wave

scaffolding
providing support to a child to help them learn and master a task independently

scatter diagram
diagrams that show the values of the two variables for each participant in the sample by representing the intersection of those two values with a dot on a graph

schizophrenia
a disease of the brain that causes patients to suffer from deluded thinking, hallucinations and depression

scientific method
a standardised way of making observations, gathering data, testing hypotheses and interpreting results to establish theories in order to describe and measure human behaviour

seasonal affective disorder (SAD)
a depressive disorder that develops during winter

secondary appraisal
the process of consciously appraising a situation by considering options available and how best to respond

selective attention
the ability to focus on only select stimuli or objects in the environment and to filter out other distractions

selective inattention
the way we attend to (or do not attend to) information that may be relevant but emotionally upsetting

self-acceptance
when we are able to view ourselves as a whole in a positive way

self-determination theory
a theory that focuses on the motivation behind the decisions that people make when not being influenced externally

self-efficacy
an individual's sense of ability to control and succeed in their life

self-efficacy (theory)
an individual's sense of ability to control and succeed in their life; a person's sense of self- efficacy can affect how they perceive or approach challenges or sources of stress

self-esteem
a feeling of confidence and comfort in one's abilities and self-worth

selective inattention
the way we attend to (or do not attend to) information that may be relevant but emotionally upsetting

sensitive period
period in time that is particularly suited to learning things due to the nature of the growing brain

sensory neurons
neurons that carry sensory information from the body and from the outside world into the CNS

sequential designs
a combination of longitudinal and cross-sectional designs, which draws on strengths and eliminates weaknesses of either approach

seriation
Piaget's term for the preoperational and cross-sectional designs, which draws on strengths and eliminates weaknesses of either approach

short route
environmental stimuli are processed through the thalamus and straight to the amygdala

single-blind procedure
allocating participants to groups in such a way that they do not know whether they are in the E-group or the C-group

single photon emission computed tomography (SPECT)
an imaging technique that detects gamma rays (radiation) and uses a number of 2D images to create an accurate 3D image

situational approach to normality
determines what is or isn't normal by using situational cues

sleep apnoea
a type of sleep disorder characterised by periods of the cessation of breathing during sleep

sleep disorders
changes in sleep–wake cyles that typically have negative effects

sleep-maintaining insomnia
a form of insomnia characterised by difficulty staying asleep throughout the night

sleep-onset insomnia
a form of insomnia characterised by difficulty falling asleep at the beginning of the night

sleep spindles
periodic bursts of rapid frequency

sleep-wake cycle
the biological process of alternating between sleep and wakefulness

sleepwalking
a type of sleep disorder characterised by walking or completing routine activities during the night

social construct
something that is guided by social rules and norms

social phobias (social anxiety disorder)
fear of being humiliated in front of people

social withdrawal
a person's retreat from society and interpersonal relationships

sociocultural approach to normality
suggests what is normal behaviour based on cultural and societal cues

soma
the cell body and largest part of the neuron; controls metabolism and maintenance of the cell

somatic nervous system
transmits sensory information to the CNS and carries motor commands from the CNS to the skeletal muscles

Spearman correlation
a measure of two ordinal variables that uses the ranked values for each variable to examine how they change together but not necessarily at a constant rate

specific phobias
fear of specific objects or situations such as illness, injury, disease or death

spinal cord
the bundle of nerve fibres connecting the brain with the peripheral nervous system

standard deviation
a measure that tells us how far, on average, scores are different from the mean

states of consciousness
an individual's level of awareness of internal events (thoughts, feelings and perceptions) and external surroundings; an individual experiences a range of different states of consciousness throughout the day

statistical approach to normality
identifies normal behaviours by the frequency of this behaviour within the specified population

stigma
a negative mark that applies to an individual and separates them from others

Strange Situation
a method used by Ainsworth to study the differences in quality of attachment between an infant and a caregiver

stratified sampling
a sampling process by which the effects of a certain variable can be eliminated as a possible confound in an experiment

stream of consciousness
an analogy, termed by James, that explained consciousness as an ever-changing stream of thoughts that can shift smoothly and effortlessly from one moment to the next, just like water flowing in a stream

stress
a psychological and physical response to internal or external sources of tension (stressors) that challenge a person's ability to cope; the stressors can be real or perceived

structural approach
a psychological approach that involves reducing our conscious experiences into smaller, basic elements

subjective data
information about the variables being studied based on opinion, with no external yardstick by which they are measured

subjective feelings
feelings that are associated with an emotion; they are subjective as they are personal and cannot be objectively measured

subjective reporting
methods used to measure states of consciousness, such as self-reporting or video monitoring

subjective wellbeing
how people evaluate their lives to determine their level of wellbeing

suprachiasmatic nucleus
located in the hypothalamus where the left and right optic nerves cross paths, it controls circadian rhythms in response to external stimuli

schemata
a term used by Piaget to describe a cognitive or mental plan that is a guide for related actions and perceptions (singular: schema)

symbolic thinking
development of symbols to represent objects or events

sympathetic nervous system
branch of the autonomic nervous system that activates the fight-flight-freeze response

synapses
the junction between two neurons

synaptic pruning
the loss of excess neurons and synapses usually formed in infancy and childhood

synaptogenesis
the process of moulding or forming new synapses

systems model of intelligence
explains intelligence as including a range of types of abilities that function as a system

T

task- orientation
goals that are focused on mastering a skill

temporal lobe
the part of the forebrain beneath the temporal plate of the skull, at the side of the head above the ears; contains Wernicke's area and the primary auditory cortex

teratogen
environmental agent or toxin that harms the embryo or foetus

terminal buttons
bulb-like structures at the end of the axon that release neurotransmitters

thalamus
definition to come

theta waves
the typical brainwave pattern (medium frequency and mixed amplitude [some high, some low]) during the early stages of sleep

total sleep deprivation
going without sleep for an entire 24-hour period; may occur for just one night or for several nights and can lead to serious consequences

trephination
an ancient surgical procedure that involves creating a hole in a patient's head while they are still awake

t-test
a comparison of means in data that reveals how significant the differences are

two- factor theory of emotion
a theory that suggests emotion is caused by assigning a cognitive label to the physiological response to a situation

Type I error
when the existence of a result is incorrectly assumed to be present

Type II error
when the absence of something is incorrectly assumed to be present

U

ultradian rhythm
a biological rhythm that is shorter than 24 hours, such as the NREM–REM sleep cycle

V

validity
the extent to which an instrument measures what it is supposed to measure

variance
a measure of how much, on average, the scores differ from the mean

voluntary participation
participants have the right to decline to participate in a study, they must not be pressured to take part in the study and must not be tricked into taking part

W

Wernicke's aphasia
results from damage to Wernicke's area that causes difficulty in understanding written and spoken language that makes sense to others

Wernicke's area
part of the left temporal lobe, responsible for language reception and interpretation and for creation of grammatically correct speech

Wilcoxen signed-rank-test
a test compares two sets of scores from the same set of participants when the data is not normally distributed

withdrawal rights
the right of participants to leave a study at any stage, including the right to withdraw their results after the study has been completed, regardless of the possible effects on the results

word salad
a jumble of meaningless words and phrases; commonly seen in schizophrenic states

Z

zeitgebers
external or environmental cues that affect the sleep–wake cycle, such as the level of light in a room

zone of proximal development
continuum of cognitive development stretching from solo performance to collaborative cooperation

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The front cover shows a neuron, which processes, receives and transmits information through the body. Neurons typically have three components: the branch-like dendrites, which receive information from other neurons; the soma, which receives information from the dendrites to control the cell; and the axon, which transmits information.

OXFORD
UNIVERSITY PRESS
AUSTRALIA & NEW ZEALAND

ISBN 978-0-19-031329-6
9 780190 313296

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