CAMBRIDGE
UNIVERSITY PRESS

VCE UNITS
1&2

Cambridge Senior Science

Psychology

Kate **Gallagher**
Natasha **Eshuis**
Andrew **Keating**
Alisha **Muller**
Suresh **Sundram**
Natalie **Zuccon**

ISBN 978-1-009-25401-4

CAMBRIDGE
UNIVERSITY PRESS

Shaftesbury Road, Cambridge CB2 8EA, United Kingdom

One Liberty Plaza, 20th Floor, New York, NY 10006, USA

477 Williamstown Road, Port Melbourne, VIC 3207, Australia

314–321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre, New Delhi – 110025, India

103 Penang Road, #05-06/07, Visioncrest Commercial, Singapore 238467

Cambridge University Press is part of Cambridge University Press & Assessment, a department of the University of Cambridge.

We share the University's mission to contribute to society through the pursuit of education, learning and research at the highest international levels of excellence.

www.cambridge.org

First published 2022

20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2

Cover designed by Loupe Studio
Text designed by Shaun Jury
Typeset by QBS Learning
Printed in China by C & C Offset Printing Co., Ltd.

A catalogue record for this book is available from the National Library of Australia at www.nla.gov.au

ISBN 978-1-009-25401-4 Paperback

Additional resources for this publication at www.cambridge.edu.au/GO

Please be aware that this publication may contain images of Aboriginal and Torres Strait Islander people who are now deceased. Several variations of Aboriginal and Torres Strait Islander terms and spellings may also appear; no disrespect is intended. Please note that the terms 'Indigenous Australians' and 'Aboriginal and Torres Strait Islander peoples' may be used interchangeably in this publication.

Cambridge University Press & Assessment acknowledges the Australian Aboriginal and Torres Strait Islander peoples of this nation. We acknowledge the traditional custodians of the lands on which our company is located and where we conduct our business. We pay our respects to ancestors and Elders, past and present. Cambridge University Press & Assessment is committed to honouring Australian Aboriginal and Torres Strait Islander peoples' unique cultural and spiritual relationships to the land, waters and seas and their rich contribution to society.

About the authors

Kate Gallagher is the lead author of the VCE Psychology team. She has taught VCE Psychology for many years across all three sectors in Victoria, as well as A level Psychology in England. Kate has also been involved in leading VCAA Psychology as a previous Study Design review panellist, examination specification/sample paper writer and examination assessor. In addition, she has shared her passion for VCE Psychology with teacher candidates as a tutor in the Psychology learning area at the University of Melbourne Graduate School of Education.

Natasha Eshuis has held Head of Psychology and lead Mathematics roles during her 12-year teaching career across government and independent schools. She has also worked as a therapist for children on the autism spectrum and as a VCAA examiner for Psychology. She has authored and published various VCE Psychology resources. Natasha has experience leading trauma-informed education, positive psychology education and STEM-focused programs. Natasha is an enthusiastic teacher who is passionate about lifelong learning.

Andrew Keating is a co-founder and director of Psyched, the VCE Psychology Teachers' Network. He has held Head of Curriculum and VCE Coordinator positions throughout his career and is a published textbook author for VCE Health and Human Development. Andrew has been a VCAA Assistant Chief Assessor and worked on VCAA Study Design Review Panels.

Alisha Muller has been a VCE Psychology teacher for the last 12 years. She has been a VCAA assessor, a presenter for Carter Down Education Services and has written content for other educational publications.

Professor Suresh Sundram is Chair and Head of Department of Psychiatry, School of Clinical Sciences, Monash University, and Director of Research, Mental Health Program, Monash Health. He is a research psychiatrist and neuroscientist and leads the Translational Molecular Psychiatry program at Monash University, focusing on understanding the causes of and developing new treatments for the major mental disorders. He has served as an advisor to the United Nations and numerous national governments on asylum seeker and refugee mental health and has worked with the VCAA on curriculum development in Psychology.

Natalie Zuccon has been a Years 7–12 Science and Maths teacher since 2011, specialising in VCE Psychology. Over the years, she has developed her expertise through VCAA assessing, VCAA Study Design reviews and resource writing. Most of all, she enjoys sharing her love and enthusiasm for Psychology with her students.

ISBN 978-1-009-25401-4

Contents

ISBN 978-1-009-25401-4

UNIT 2

How do internal and external factors influence behaviour and mental processes?

Answers are available in the Interactive Textbook and the teacher resources.

ISBN 978-1-009-25401-4 Gallagher et al

Overview: How to use this resource

The Cambridge Education Australia and New Zealand website has more information and demos for this title.

This overview guides you through all the components of the **print and PDF textbooks**, the **Interactive Textbook (ITB)**, and the teacher resources in the **Online Teaching Suite (OTS)**. Users of the award-winning *Cambridge Science 7–10 for the Victorian Curriculum* will recognise some similarities with this senior science resource, including the hosting of the digital material on the Edjin platform, which was developed from *Cambridge HOTmaths* and is already being used successfully by thousands of teachers and students across Victoria.

Print book features

Learning objectives

In the Curriculum table at the start of each chapter, the Study Design dot points are translated into Learning objectives, describing what students should be able to do by the end of the chapter:

Black text indicates the portion of the dot point covered by the section shown in the second column

White text indicates the portion of the dot point covered by other sections

Curriculum

Key Science Skills

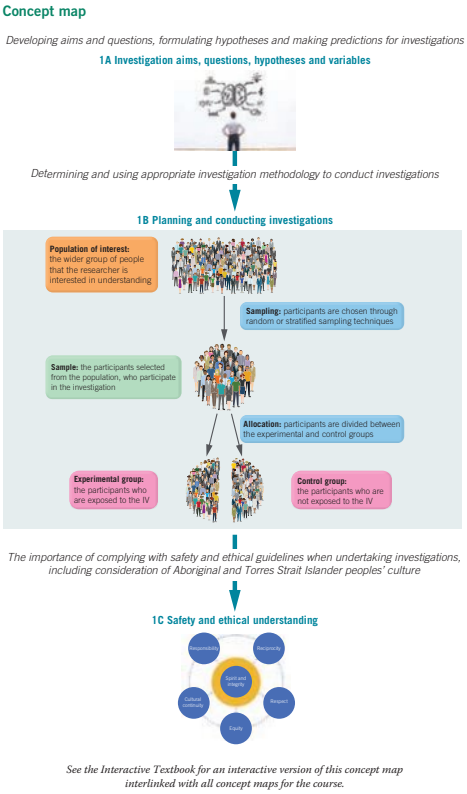
Study Design:	Learning objectives – at the end of this chapter I will be able to:
Generate, collate and record data • Systematically generate and record primary data, and collate secondary data, appropriate to the investigation	**2A Processing and analysing data** **2A.1** Distinguish between primary and secondary data **2A.2** Systematically generate and record primary data, and collate secondary data for an investigation
• Design and conduct investigations; select and use methods appropriate to the investigation, including consideration of sampling technique (random and stratified) and size to achieve representativeness, and consideration of equipment and procedures, taking into account potential sources of error and uncertainty; determine the type and amount of qualitative and/or quantitative data to be generated or collated	**2A.3** Determine the type and amount of qualitative and quantitative data to be generated or collected in an investigation **2A.4** Identify potential sources of error and uncertainty when designing and conducting investigations

Learning objectives are turned into Success Criteria (achievement standards) at the end of the chapter and are assessed in the Chapter review and tracked in the Checklists

Relevant Study Design dot points are repeated at the start of each section in the chapter, and an overall curriculum grid is provided in the teacher resources.

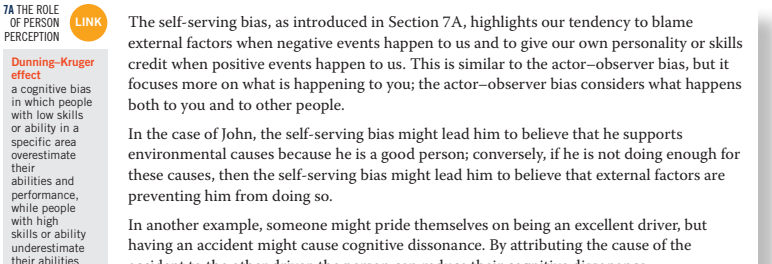
Concept maps

Concept maps display each chapter's structure with annotations emphasising interconnectedness, providing a great memory aid. The versions in the ITB are hyperlinked and offer an alternative way of navigating through the course. An overall concept map of Units 1&2 is also provided on page xiv.



Links

The interconnectedness of topics in Psychology is demonstrated through links between sections, displayed in the margins. In the ITB, these are hyperlinks that provide an alternative way of navigating through the course.


7A THE ROLE OF PERSON PERCEPTION LINK

Dunning–Kruger effect a cognitive bias in which people with low skills or ability in a specific area overestimate their abilities and performance, while people with high skills or ability underestimate their abilities and performance

The self-serving bias, as introduced in Section 7A, highlights our tendency to blame external factors when negative events happen to us and to give our own personality or skills credit when positive events happen to us. This is similar to the actor–observer bias, but it focuses more on what is happening to you; the actor–observer bias considers what happens both to you and to other people.

In the case of John, the self-serving bias might lead him to believe that he supports environmental causes because he is a good person; conversely, if he is not doing enough for these causes, then the self-serving bias might lead him to believe that external factors are preventing him from doing so.

In another example, someone might pride themselves on being an excellent driver, but having an accident might cause cognitive dissonance. By attributing the cause of the accident to the other driver, the person can reduce their cognitive dissonance.

ISBN 978-1-009-25401-4

Chapter sections

Chapters are divided into numbered sections, each with a consistent set of features.

Engage

At the start of each section, these boxes provide points of interest for the topic, emphasising its place in Psychology. This material, though not assessable, can be used as examples of applications.

Explain

This icon marks the start of essential content that is assessed.

Glossary

Scientific terms are highlighted in the text, definitions are given in the margin of the print and PDF textbooks, or on mouseover in the ITB, and the terms are listed at the start of each chapter and section.

Check-in questions

Each section in the chapter has one or more sets of check-in questions, for formative assessment. Full answers are provided in the digital resources.

Skills

Skills boxes in every section provide advice and guidance on how to answer and prepare for questions, especially in examinations. The ITB has video versions of these which provide extra comments and an alternative medium of delivery. In the VCE Psychology textbooks there are also Key Science Skills boxes, shown on p.ix.

Study Design coverage for section

Glossary terms in the section

Normal variations in brain development

Study Design:
Normal variations of brain development within society, as illustrated by neurodiversity

Glossary:
Alertness
Central coherence
Executive function
Neurodivergent
Theory of mind
Working memory

ENGAGE

Phantom limb pain

Phantom limb pain, in which sensations or pain are felt in a limb that is no longer there, is a common and debilitating condition experienced by approximately 70% of people who have had one or more limbs amputated. The neurological basis of phantom limb pain is not completely understood, with several theories attempting to explain its cause and how the central nervous system and/or peripheral nervous system contribute to the condition.

EXPLAIN

What are typical and atypical behaviours?

Typical development when behaviours, skills or abilities fall within the expected range of development or progress at a similar pace compared to peers of the same age

As you already know from Chapter 3, when considering psychological development, particularly during childhood, it is expected that a child will develop skills and abilities within certain time frames. For example, most babies start to crawl between 6 and 12 months of age, and children usually speak their first word between 10 and 14 months of age. When a child's behaviours, skills or abilities fall within the expected range of development, or progress at a similar pace compared to peers of the same age, this is referred to as **typical development**. This is what we understand as 'normal' when it comes to reaching developmental milestones. The term 'normal' is often used in society, but what does it mean?

Glossary definitions

Terms in the glossary

Check-in questions – Set 1

1 What is the difference between an aim and a hypothesis?
2 What are the key three pieces of information to include in a hypothesis?

1A–2 SKILLS

Identifying the IV and DV

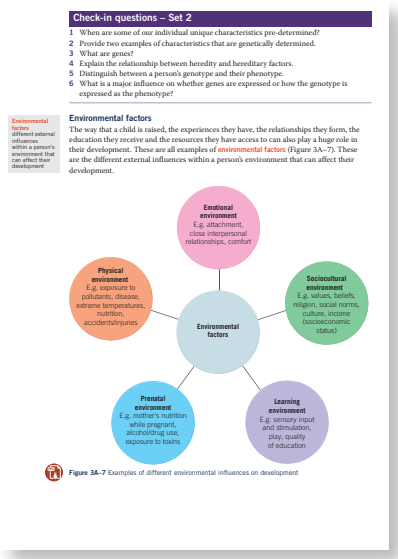
A way to help identify the IV and DV in a study is to understand that the DV depends on the IV. Level of attention (DV) depends on sugar consumed (IV), as shown in Figure 1A–4.

Another way to identify the variables is to think about what the two groups of participants do differently (the IV) and what the two groups of participants do the same (the DV) (Figure 1A–5). For example, one group will consume sugar, and the other

ISBN 978-1-009-25401-4

Charts, diagrams and tables

Detailed charts integrating text and diagrams, and illustrated tables, feature throughout the print books. In the ITB, most of these are available as animated slide-show presentations for students to use, with copies for teachers to display on data projector or whiteboard.



Check-in questions – Set 2

1 When are some of our individual unique characteristics pre-determined?
2 Provide two examples of characteristics that are genetically determined.
3 What are genes?
4 Explain the relationship between heredity and hereditary factors.
5 Distinguish between a person's genotype and their phenotype.
6 What is a major influence on whether genes are expressed or how the genotype is expressed as the phenotype?

Environmental factors

The way that a child is raised, the experiences they have, the relationships they form, the education they receive and the resources they have access to can also play a huge role in their development. These are all examples of environmental factors (Figure 3A–7). These are the different external influences within a person's environment that can affect their development.

Figure 3A–7 Examples of different environmental influences on development

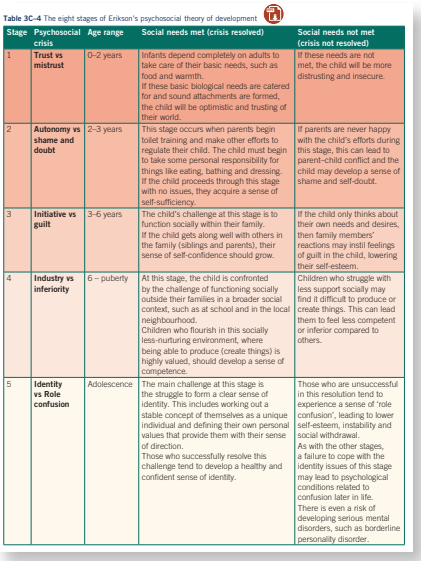
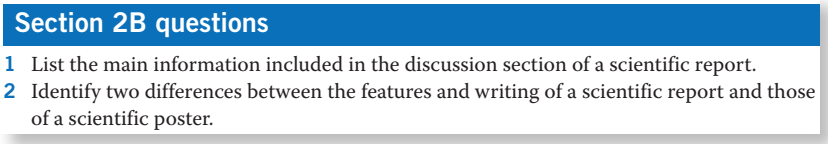


Table 3C–4 The eight stages of Erikson's psychosocial theory of development

Stage	Psychosocial crisis	Age range	Social needs met (crisis resolved)	Social needs not met (crisis not resolved)
1	**Trust vs mistrust**	0–2 years	Infants depend completely on adults to take care of their basic needs, such as food and warmth. If these basic biological needs are catered for and sound attachments are formed, the child will be optimistic and trusting of their world.	If these needs are not met, the child will be more distrusting and insecure.
2	**Autonomy vs shame and doubt**	2–3 years	This stage occurs when parents begin toilet training and make other efforts to regulate their child. The child must begin to take some personal responsibility for things like eating, bathing and dressing. If the child proceeds through this stage with no issues, they acquire a sense of self-sufficiency.	If parents are never happy with the child's efforts during this stage, this can lead to parent–child conflict and the child may develop a sense of shame and self-doubt.
3	**Initiative vs guilt**	3–6 years	The child's challenge at this stage is to function socially within their family. If the child gets along well with others in the family (siblings and parents), their sense of self-confidence should grow.	If the child only thinks about their own needs and desires, then family members' reactions may instil feelings of guilt in the child, lowering their self-esteem.
4	**Industry vs inferiority**	6 – puberty	At this stage, the child is confronted by the challenge of functioning socially outside their families in a broader social context, such as at school and in the local neighbourhood. Children who flourish in this socially less-nurturing environment, where being able to produce (create things) is highly valued, should develop a sense of competence.	Children who struggle with less support socially may find it difficult to produce or create things. This can lead them to feel less competent or inferior compared to others.
5	**Identity vs Role confusion**	Adolescence	The main challenge at this stage is the struggle to form a clear sense of identity. This includes working out a stable concept of themselves as a unique individual and defining their own personal values that provide them with their sense of direction. Those who successfully resolve this challenge tend to develop a healthy and confident sense of identity.	Those who are unsuccessful in this resolution tend to experience a sense of 'role confusion', leading to lower self-esteem, instability and social withdrawal. As with the other stages, a failure to cope with the identity issues of this stage may lead to psychological conditions related to confusion later in life. There is even a risk of developing serious mental disorders, such as borderline personality disorder.

Section questions

Summative assessment is provided at the end of each section, with full answers provided in the digital resources.



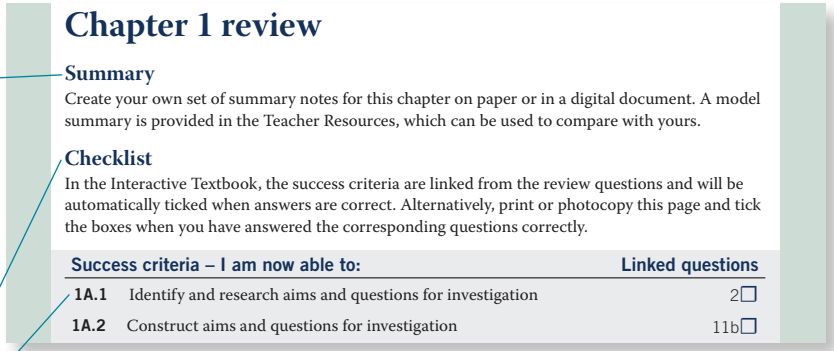
Section 2B questions

1 List the main information included in the discussion section of a scientific report.
2 Identify two differences between the features and writing of a scientific report and those of a scientific poster.

Chapter reviews

Summaries: Students are encouraged to make their own set of summary notes, to help them assimilate the material. Model summaries are provided in the teacher resources, to be given to those who need help. Creating summaries can also be turned into an assessment task, with the models serving as the answer.

Checklists and **Success criteria:** The learning objectives from the front of the chapter are listed again in the form of success criteria linked to the **multiple-choice** and **short-answer questions** that follow. The checklists are printable from the ITB, and students can tick off their achievement manually. If they do the questions in the ITB, they are ticked automatically when the questions are marked.



Chapter 1 review

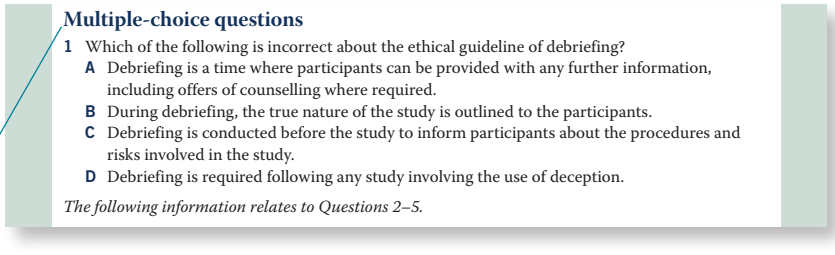
Summary

Create your own set of summary notes for this chapter on paper or in a digital document. A model summary is provided in the Teacher Resources, which can be used to compare with yours.

Checklist

In the Interactive Textbook, the success criteria are linked from the review questions and will be automatically ticked when answers are correct. Alternatively, print or photocopy this page and tick the boxes when you have answered the corresponding questions correctly.

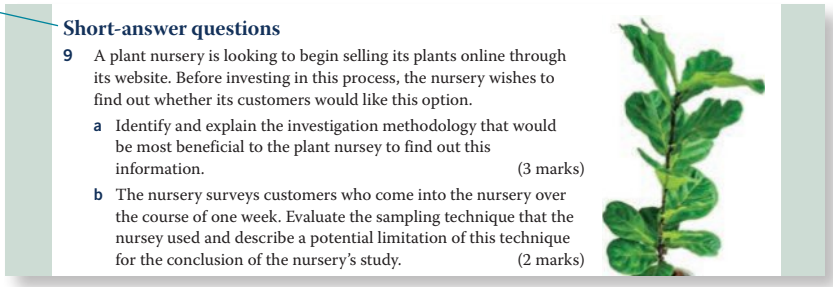
Success criteria – I am now able to:		Linked questions
1A.1	Identify and research aims and questions for investigation	2☐
1A.2	Construct aims and questions for investigation	11b☐



Multiple-choice questions

1 Which of the following is incorrect about the ethical guideline of debriefing?
- **A** Debriefing is a time where participants can be provided with any further information, including offers of counselling where required.
- **B** During debriefing, the true nature of the study is outlined to the participants.
- **C** Debriefing is conducted before the study to inform participants about the procedures and risks involved in the study.
- **D** Debriefing is required following any study involving the use of deception.

The following information relates to Questions 2–5.



Short-answer questions

9 A plant nursery is looking to begin selling its plants online through its website. Before investing in this process, the nursery wishes to find out whether its customers would like this option.
- **a** Identify and explain the investigation methodology that would be most beneficial to the plant nursery to find out this information. (3 marks)
- **b** The nursery surveys customers who come into the nursery over the course of one week. Evaluate the sampling technique that the nursery used and describe a potential limitation of this technique for the conclusion of the nursery's study. (2 marks)

Unit revision exercises

Each Unit has a revision exercise in the print book, with both multiple-choice and short-answer questions.

ISBN 978-1-009-25401-4 Gallagher et al

Special content

- The Study Design's requirement to cover Aboriginal and Torres Strait Islander peoples' knowledge, cultures and history is provided by topics within chapter sections as well as in the digital resources. See the overview on page xi.

Elder. Aboriginal people's understanding of social and emotional wellbeing varies between different cultural groups and individuals.

Figure 9A–10 proposes a model for Aboriginal SEWB with seven overlapping domains, including body; mind and emotions; family and kinship; community; culture; Country; and spirituality and ancestors. The seven SEWB domains are sources of Aboriginal wellbeing and connection that support a strong and positive identity.

As the model suggests, at the centre is the individual, who is surrounded by a network of relationships between individuals, family, kin and community. It also recognises the importance of connection to land, culture, spirituality and ancestry, and how these affect the individual.

Figure 9A–10 A model of social and emotional wellbeing for Aboriginal people.
Source: *National Strategic Framework for Aboriginal and Torres Strait Islander Peoples' Mental Health and Social and Emotional Wellbeing 2017–2023*
© Commonwealth of Australia 2017.

- **Key Science Skills** are given prominence in this resource through:
  - ► two chapters on science skills (see contents list)
  - ► chapter curriculum tables and checklists indicating coverage of Key Science Skills from the Study Design
  - ► skills boxes focusing on Key Science Skills
  - ► integration of questions applying science skills in question sets and activities
  - ► guidance on investigations and use of logbooks in the digital resources.

Key Science Skills

Skills	Questions and Skills boxes
Identify, research and construct aims and questions for investigation	Chapter review – 11
Identify independent, dependent and controlled variables in controlled experiments	Chapter review – 12
Formulate hypotheses to focus investigations	Chapter review – 14
Predict possible outcomes of investigations	3C Key Science Skills
Design and conduct investigations; select and use methods appropriate to the investigation, including consideration of sampling technique (random and stratified) and size to achieve representativeness, and consideration of equipment and procedures, taking into account potential sources of error and uncertainty; determine the type and amount of qualitative and/or quantitative data to be generated or collated	Chapter review – 13
Analyse and evaluate psychological issues using relevant ethical	Chapter review – 21

3C KEY SCIENCE SKILLS

Formulating aims, variables and hypotheses
In VCE Psychology, you may be asked to design a piece of research or an experiment that looks at the relationships between concepts covered within the study design. You could also be asked to identify or design elements for an existing research project. Examples include:

- determining a research question to investigate
- constructing an aim
- identifying the independent, dependent and controlled variables (if it is a controlled experiment)
- formulating a hypothesis to focus an investigation.

Let's consider a typical example.

12 The independent variable in Harlow's experiment with rhesus monkeys was
- **A** whether the infant spent more time clinging to the wire or cloth surrogate.
- **B** which attachment style the infant demonstrated: secure, insecure-avoidant or insecure-resistant.
- **C** whether the monkey was reared by a wire or cloth surrogate.
- **D** whether the food was provided by the wire or cloth surrogate.

ISBN 978-1-009-25401-4 Gallagher et al

Interactive Textbook features

The digital version of the textbook is hosted on the Edjin platform, offering easy navigation, excellent on-screen display and multimedia assets, as well as auto-marking of multiple-choice questions, and workspaces for other questions with self-assessment and confidence rating tools. The different kinds of digital assets are listed below:

- Printable **Worksheets** with extra questions and activities (and content in some cases) are provided for all chapters, marked by an icon in the margin, as shown on the right.

WORKSHEET 1B–1
COMPARING INVESTIGATION METHODOLOGIES

- **Videos** are provided for all chapters, and are of two kinds: **concept videos** demonstrate or illustrate important theory, while **skills and example videos** work through the textbook's skills and example boxes, providing extra explanation and guidance. Some videos are provided in the print pages as QR codes for immediate access and review.

VIDEO 4E–1
COPING WITH STRESS

- **Animated slide-show presentations** (in PowerPoint Show format) are provided of many charts, diagrams and tables, as marked by an icon in the margin as shown at right, enabling them to be explored interactively.
- **Answers** (suggested responses) to questions are provided as printable documents in the teacher resources and, if enabled by the teacher, below the question workspaces for short-answer questions in the ITB.
- **Prior knowledge** can be tested with an auto-marked quiz with questions from the Year 9 and 10 *Cambridge Science for the Victorian Curriculum.*

Online Teaching Suite features (teacher resources)

The OTS provides Edjin's learning management system, which allows teachers to set tasks, track progress and scores, prepare reports on individuals and the class, and give students feedback. The assets include:

- **Curriculum Grid** and **teaching programs**
- Editable and printable **Chapter tests** with answers
- **Checklists** with linkage to the success criteria for the chapter question sets and tests
- A **question bank** and test generator, with answers
- **Practice exams** and **assessment tasks**, with answers
- Editable versions of **Worksheets** in the Interactive Textbook, and answers to them
- Editable versions of the PowerPoint files in the Interactive Textbook
- Downloadable, editable and printable **practicals**
- Editable and printable chapter **summaries** (model answers for the chapter summary activity)
- **Teacher notes** on selected content with additional theory explanation and suggestions for further activities and resources
- **Curated links** to internet resources such as videos and interactives.

Exam generator

The Online Teaching Suite includes a comprehensive bank of exam-style and actual VCAA exam questions to create custom trial exams to target topics that students are having difficulty with. Features include:

- Filtering by question-type, topic and degree of difficulty
- Answers provided to teachers
- VCAA marking scheme
- Multiple-choice questions that will be auto-marked if completed online
- Tests that can be downloaded and used in class or for revision.

ISBN 978-1-009-25401-4 Gallagher et al

Overview: Aboriginal and Torres Strait Islander knowledge, cultures and history

The VCE Psychology Study Design includes aspects of Aboriginal and Torres Strait Islander knowledge, cultures and history. This overview is a guide to where they are covered in this resource.

Aboriginal and Torres Strait Islander peoples' world views are highly integrated: each aspect of culture, history and society connects with all other aspects. Each community has their own personalised system of thinking, doing and knowing based on sharing culture and adapting to the environment around them.

In order to gain an understanding of any system, Indigenous or not, time and effort is needed to appreciate it. That time is limited in this course; and it is wrong to try and generalise the Indigenous culture of Australia, or even of Victoria. Instead, the coverage in the resource should be taken as a collection of examples, and students should read up on or engage with their local Indigenous community to understand their cultural aspects.

This textbook includes Aboriginal and Torres Strait Islander knowledge, cultures and history in these sections:

- 1C Safety and ethical understanding
- 3B The biopsychosocial approach
- 4D Supporting psychological development and mental wellbeing
- 7D The influence of prejudice, discrimination and stigma
- 9C Applying the biopsychosocial model to visual and gustatory perception

In addition, for students, the Interactive Textbook includes a an introductory guide prepared by First Nations consultants advising on approaches to studying Aboriginal and Torres Strait Islander knowledge, cultures and history, with links to further reading.

For teachers, the teacher resources include a guide to approaches to teaching Aboriginal and Torres Strait Islander knowledge, cultures and history in the VCE Psychology course, with links to internet resources.

Guide to terms used in this resource

Language is very important in discussing Indigenous issues, especially given the past history of deliberately offensive usage in Australia, where language was used to oppress and control.

Indigenous
First Australians and First Peoples of any country

Respectful usage requires a capital I.

First Australians, First Nations or First Peoples
Indigenous people of Australia

These terms have become more common in recent years, with 'Indigenous' as the adjective.

Aboriginal
an Aboriginal person is someone who is of Aboriginal descent, identifies as being Aboriginal and is accepted as such by the Aboriginal community with which they originally identified

One of the reasons that 'First Nations' and allied forms have become more common is that the term 'Aboriginal' was sometimes used disrespectfully, and still is in some circles.

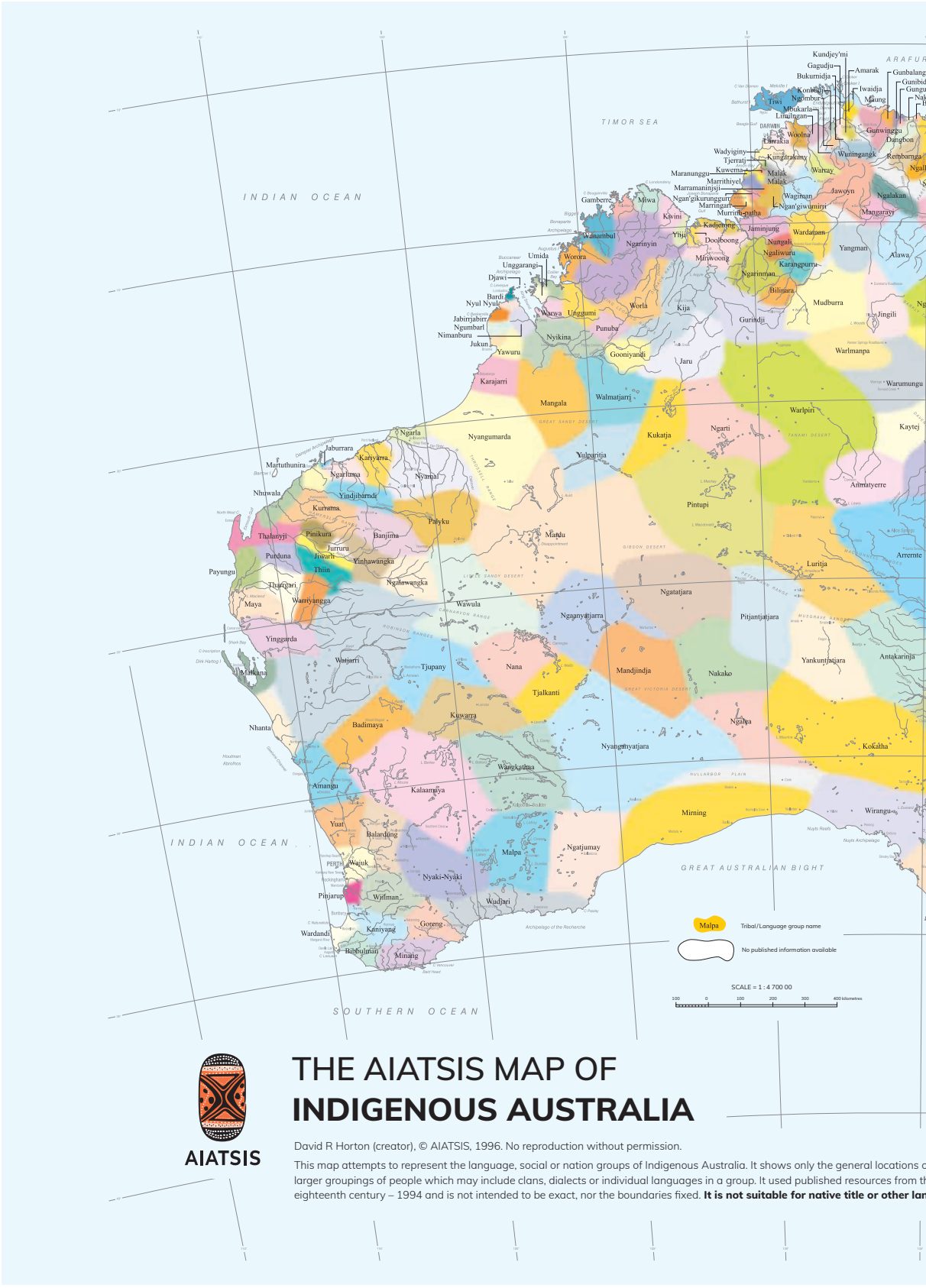
Aboriginal and Torres Strait Islander peoples
the Australian Indigenous population includes Aboriginal People, Torres Strait Islander People, and people who have both Aboriginal and Torres Strait Islander heritage. The term 'Aboriginal and Torres Strait Islander' encompasses all three

While this is still used in official circles and is in the name or title of many organisations and documents, it is tending to be replaced by 'First Australians' and similar terms, especially in everyday use. This is partly because the abbreviation 'ATSI' is considered disrespectful by Indigenous people, who regard it as lazy not to use a full title. The abbreviation should not be used to refer to people.

Cambridge University Press & Assessment acknowledges the Australian Aboriginal and Torres Strait Islander peoples of this nation. We acknowledge the traditional custodians of the lands on which our company is located and where we conduct our business. We pay our respects to ancestors and Elders, past and present.

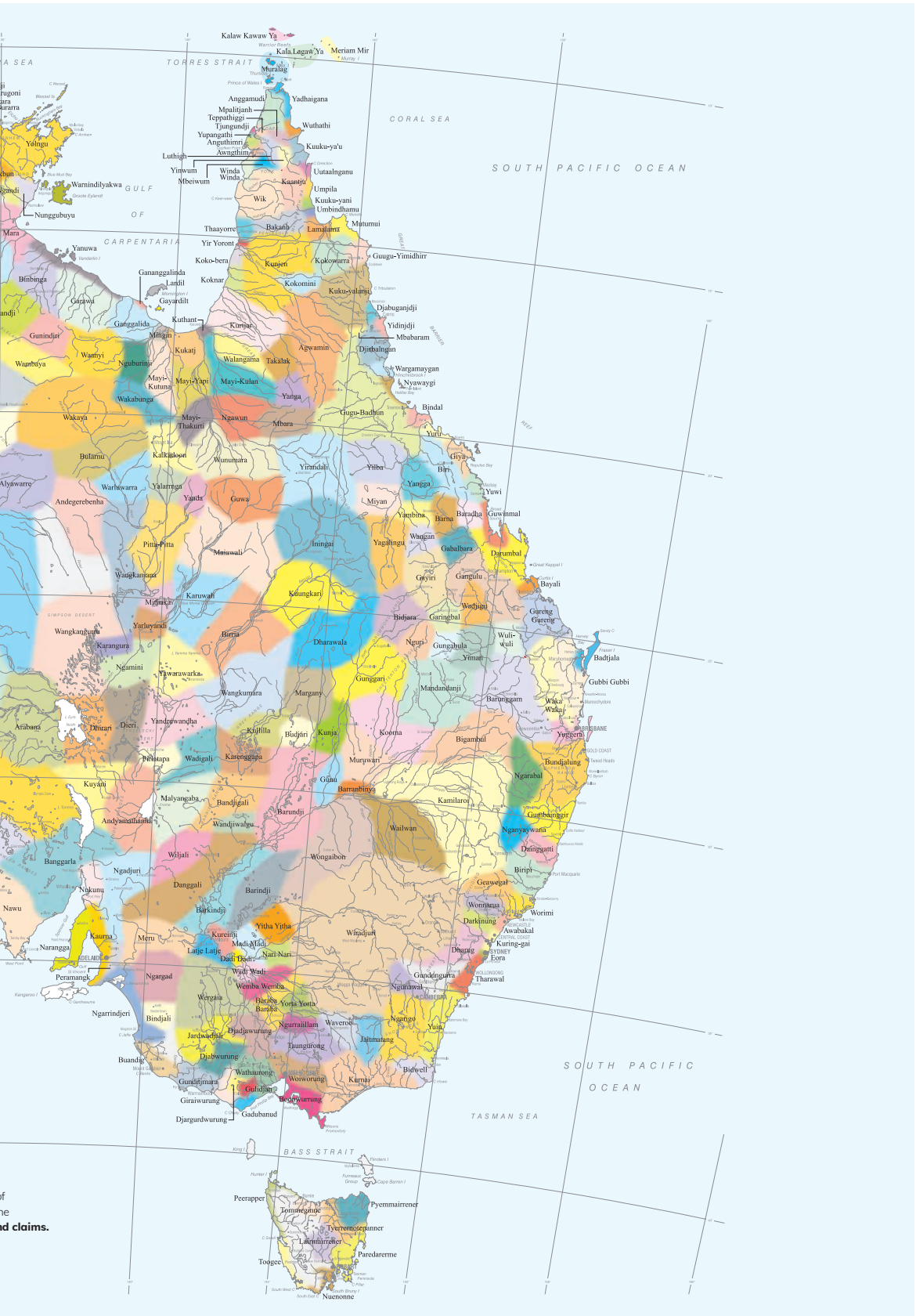
ISBN 978-1-009-25401-4

Map of Indigenous peoples of Australia



AIATSIS Map of Indigenous Australia, showing the general locations of larger language, social or nation groups. To zoom in on detail especially in Victoria, access the map in the Interactive Textbook.

ISBN 978-1-009-25401-4 Gallagher et al



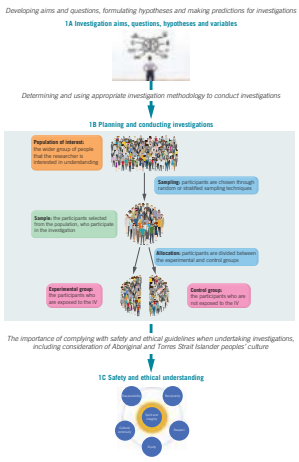
This map attempts to represent the language, social or nation groups of Aboriginal Australia. It shows only the general locations of larger groupings of people which may include clans, dialects or individual languages in a group. It used published resources from the eighteenth century – 1994 and is not intended to be exact, nor the boundaries fixed. It is not suitable for native title or other land claims. David R Horton (creator), © AIATSIS, 1996. No reproduction without permission. To purchase a print version visit: https://shop.aiatsis.gov.au/

ISBN 978-1-009-25401-4

Concept maps for Units 1&2

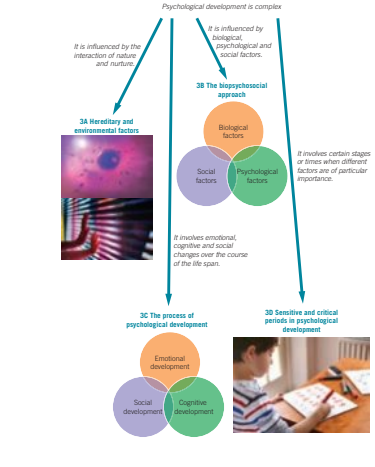
This spread displays the concept maps for Chapters 1–10. Access the digital versions in the ITB and click on hyperlinks to explore the interconnections of the topics.

Chapter 1 Scientific investigation, planning, ethics and safety

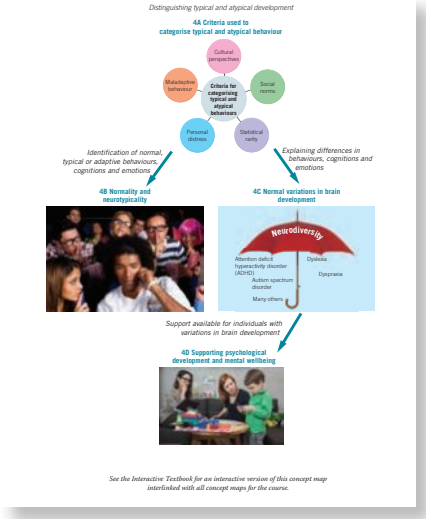


Chapter 2 Recording and analysing data, drawing and communicating conclusions

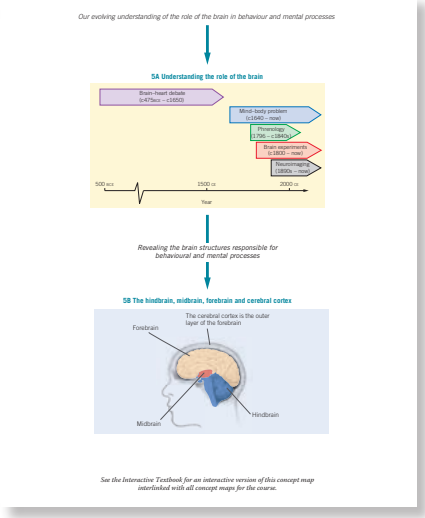
Chapter 3 The complexity of psychological development



Chapter 4 Typical and atypical psychological development

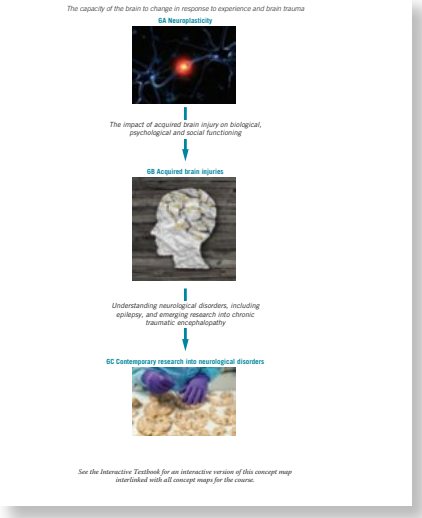


Chapter 5 Role of the brain in mental processes and behaviour

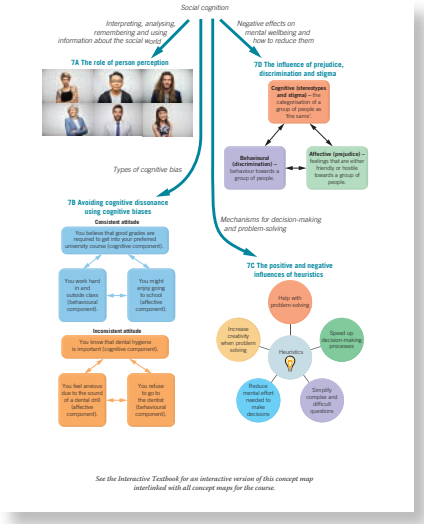


ISBN 978-1-009-25401-4

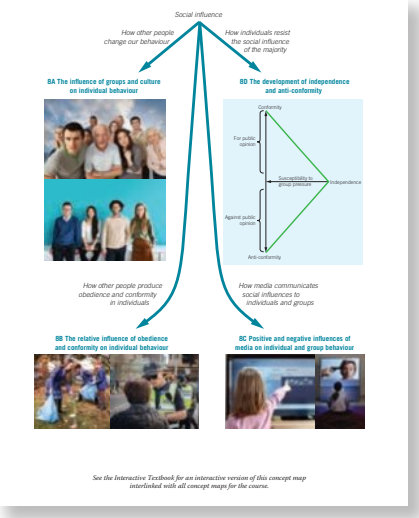
Chapter 6 Brain plasticity and brain injury



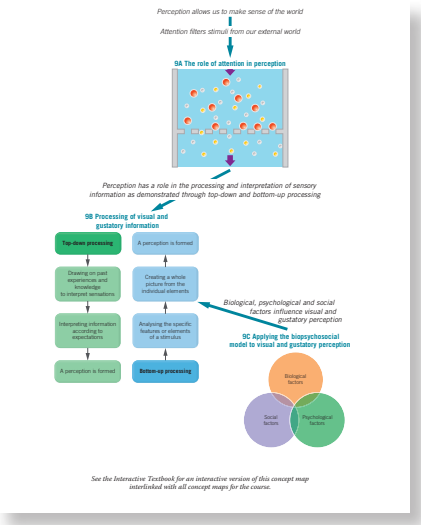
Chapter 7 Social cognition



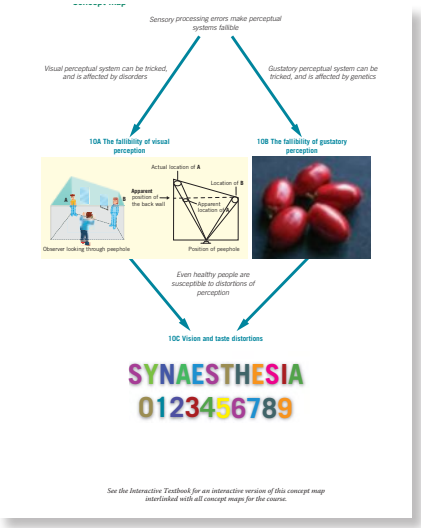
Chapter 8 Individual and group behaviour



Chapter 9 Perception



Chapter 10 Distortions of perception



ISBN 978-1-009-25401-4

KEY SCIENCE SKILLS

CHAPTER 1 SCIENTIFIC INVESTIGATION, PLANNING, ETHICS AND SAFETY

Introduction

How do we know that the left half of our brain controls the right side of our body? How do we know that the memories of eyewitnesses can be unreliable? How do we know that our sense of taste can be influenced by what we see? In Psychology, we learn about the behaviour and mental processes of humans by conducting scientific research.

It is important to distinguish between scientific ideas, such as proposed by these questions, and non-scientific ideas, such as horoscopes or palm reading. The key difference is that scientific ideas are formed by using the scientific method. They are observable and testable. In this chapter, we begin to cover the key science skills that are required for conducting scientific investigations in psychology and evaluating the research of other investigators. Further key science skills are covered in Chapter 2. Both chapters are included in the Units 3&4 book (with different questions) so they may be deferred or revised in Year 12.

Curriculum

Key Science Skills

Study Design:	Learning objectives – at the end of this chapter I will be able to:
Develop aims and questions, formulate hypotheses and make predictions • Identify, research and construct aims and questions for investigation	**1A** **Investigation aims, questions, hypotheses and variables** **1A.1** Identify and research aims and questions for investigation **1A.2** Construct aims and questions for investigation
• Identify independent, dependent and controlled variables in controlled experiments	**1A.3** Distinguish between independent, dependent, controlled, extraneous and confounding variables **1A.4** Identify the independent, dependent and controlled variables within controlled experiments **1A.5** Identify extraneous variables to be controlled in a controlled experiment **1A.6** Explain the effect of extraneous and confounding variables on the results of a controlled experiment

ISBN 978-1-009-25401-4 Gallagher et al

Study Design:	Learning objectives – at the end of this chapter I will be able to:
• Formulate hypotheses to focus investigation	**1A.7** Write a hypothesis to focus an investigation
• Predict possible outcomes of investigations	**1A.8** Predict the possible outcomes of an investigation
Plan and conduct investigations • Determine appropriate investigation methodology: case study; classification and identification; controlled experiment (within subjects, between subjects, mixed design); correlational study; fieldwork; literature review; modelling; product, process or system development; simulation	**1B Planning and conducting investigations** **1B.1** Describe and identify examples of the use of different investigation methodologies, including case study; classification and identification; controlled experiment; correlational study; fieldwork; literature review; modelling; product, process or system development; and simulation **1B.2** Describe and identify the use of within subjects, between subjects and mixed designs in a controlled experiment **1B.3** Evaluate strengths and limitations of different investigation methodologies and select an appropriate investigation methodology for a proposed investigation **1B.4** Evaluate strengths and limitations of different investigation designs for a controlled experiment and select an appropriate design for a proposed investigation
• Design and conduct investigations; select and use methods appropriate to the investigation, including consideration of sampling technique (random and stratified) and size to achieve representativeness, and consideration of equipment and procedures, taking into account potential sources of error and uncertainty; determine the type and amount of qualitative and/or quantitative data to be generated or collated	**1B.5** Describe and identify the use of random and stratified sampling techniques in an investigation **1B.6** Evaluate strengths and limitations of different sampling techniques and select an appropriate technique to achieve representativeness **1B.7** Select and use appropriate equipment and procedures for an investigation, and select an appropriate sample size to achieve representativeness
• Work independently and collaboratively as appropriate and within identified research constraints, adapting or extending processes as required and recording such modifications	**1B.8** Work independently and collaboratively within constraints, adapting or extending processes as required and recording modifications

ISBN 978-1-009-25401-4

Study Design:	Learning objectives – at the end of this chapter I will be able to:
Comply with safety and ethical guidelines • Demonstrate ethical conduct and apply ethical guidelines when undertaking and reporting investigations	**1C Safety and ethical understanding** **1C.1** Describe and evaluate the use of general ethical principles to be followed in psychological investigations, including integrity, justice, beneficence, non-maleficence and respect **1C.2** Describe and evaluate the use of the additional ethical guidelines to be followed in psychological investigations, including confidentiality, voluntary participation, informed consent procedures, withdrawal rights, use of deception and debriefing **1C.3** Consider the ethical implications of investigations when planning an investigation and demonstrate ethical conduct and apply ethical guidelines when recording data, using data and reporting outcomes of investigations
• Demonstrate safe laboratory practices when planning and conducting investigations by using risk assessments that are informed by safety data sheets (SDS), and accounting for risks	**1C.4** Demonstrate safe laboratory practices by identifying areas of risk and using risk assessments that are informed by safety data sheets when planning and conducting investigations
• Apply relevant occupational health and safety guidelines while undertaking practical investigations	**1C.5** Evaluate the use of and apply relevant occupational health and safety guidelines while planning and undertaking practical investigations
• Analyse and evaluate psychological issues using relevant ethical concepts and principles, including the influence of social, economic, legal and political factors relevant to the selected issue	**1C.6** Analyse and evaluate psychological issues with reference to the influence of relevant social, economic, legal and political factors **1C.7** Analyse and evaluate psychological issues using ethical concepts and the general ethical principles of integrity, justice, beneficence, non-maleficence and respect

Glossary

Allocation
Beneficence
Between subjects design
Case study
Classification and identification
Confidentiality
Confounding variable
Control group
Controlled experiment
Controlled variable
Correlational study
Debriefing
Deception in research
Dependent variable
Ethical guidelines
Ethical
Experimental group
Extraneous variable
Fieldwork
Hypothesis
Independent variable
Informed consent procedures
Integrity
Investigation aim
Investigation design
Investigation methodology
Investigation question
Justice
Literature review
Mixed design
Modelling
Non-maleficence
Occupational health and safety (OHS)
Population
Primary data
Product, process and system development
Random allocation
Random sampling
Respect
Risk assessment
Safety data sheet (SDS)
Sample
Sampling technique
Secondary data
Simulation
Stratified sampling
Voluntary participation
Withdrawal rights
Within subjects design

ISBN 978-1-009-25401-4

Concept map

Developing aims and questions, formulating hypotheses and making predictions for investigations

1A Investigation aims, questions, hypotheses and variables

Determining and using appropriate investigation methodology to conduct investigations

1B Planning and conducting investigations

Population of interest: the wider group of people that the researcher is interested in understanding

Sampling: participants are chosen through random or stratified sampling techniques

Sample: the participants selected from the population, who participate in the investigation

Allocation: participants are divided between the experimental and control groups

Experimental group: the participants who are exposed to the IV

Control group: the participants who are not exposed to the IV

The importance of complying with safety and ethical guidelines when undertaking investigations, including consideration of Aboriginal and Torres Strait Islander peoples' culture

1C Safety and ethical understanding

See the Interactive Textbook for an interactive version of this concept map interlinked with all concept maps for the course.

ISBN 978-1-009-25401-4

Investigation aims, questions, hypotheses and variables

Study Design:
Develop aims and questions, formulate hypotheses and make predictions

- Identify, research and construct aims and questions for investigation
- Identify independent, dependent and controlled variables in controlled experiments
- Formulate hypotheses to focus investigations
- Predict possible outcomes of investigations

Glossary:
Confounding variable
Control group
Controlled experiment
Controlled variable
Dependent variable
Extraneous variable
Hypothesis
Independent variable
Investigation aim
Investigation question

ENGAGE

What does a research psychologist do?

There are many different areas of psychology, including clinical, counselling, forensic, health, educational and sport psychology. Instead of solely practising in one of these fields, many psychologists conduct research in their field of interest or combine research with practice. Research psychologists work in universities or organisations to conduct their studies. Here is a personal account of what a research psychologist's job can look like in the field of neuropsychology.

Figure 1A–1 Research is conducted in all areas of psychology to help us understand more about every aspect of the human experience.

Working in research psychology

By Jason Mattingley

Australian Psychological Society

Most research psychologists spend long hours devising experiments, gathering data, analysing the evidence and preparing their findings for the scientific community in the form of articles and conference presentations. In a typical day, I might plan and conduct research projects with other members of the laboratory group, analyse new data, write articles for scholarly publications, and provide anonymous reviews of manuscripts submitted by other researchers. Other tasks include: lecturing to undergraduate psychology students; supervising research projects and providing career advice; managing budgets for the laboratory's research grants; preparing applications for research funding; and reviewing grant applications.

ISBN 978-1-009-25401-4 Gallagher et al

Understanding the way the brain represents different aspects of our perceptual world has helped us to devise more effective ways of managing and rehabilitating people with neurological disabilities, such as stroke and Alzheimer's disease. Revealing the brain bases of emotion processing may also help us to better understand some of the symptoms of psychiatric conditions such as schizophrenia and post-traumatic stress disorder.

Figure 1A–2 Understanding the way the brain works is a significant part of research in psychology.

Source: Australian Psychological Society

EXPLAIN

Investigation aims and questions

Psychology is considered to be a science because it follows a scientific approach when conducting research. When a researcher has an idea about a study they wish to investigate, they first decide on an **investigation aim**, which is the purpose of the study. It is written as a statement that includes the variables being studied. For example, the aim for an investigation might be 'To investigate the effect of sugar consumption on attention levels in children'. Variables are elements that change or vary in an investigation, and can be modified, measured or controlled. These will be discussed in more detail later in this section.

Investigation aim
the purpose of a study

The researcher also develops an **investigation question**, which is, the question the study intends to solve, or what the researcher is trying to find out. For example, the investigation question could be 'Does consuming sugar affect attention in children?' The investigation aim and question come from identifying a gap in current knowledge or from observing an interesting experience that the researcher wishes to explore further.

Investigation question
the question that is to be solved by a study

Hypotheses

Researchers begin an investigation with an idea of the possible results. They will use current theory to form a **hypothesis**, a statement outlining the probable outcomes of an investigation. The investigation will test whether the hypothesis is supported, partly supported or refuted (not supported). For example, a hypothesis for the earlier investigation question is 'It is hypothesised that children who consume sugar will have a lowered level of attention as compared with those who do not consume sugar' (Figure 1A–3). The hypothesis outlines whether one variable (the dependent variable (DV)) will change as a result of another variable (the independent variable (IV)). Independent and dependent variables will be discussed in detail next.

Hypothesis
an idea or explanation for something that is based on known facts but has not yet been proven

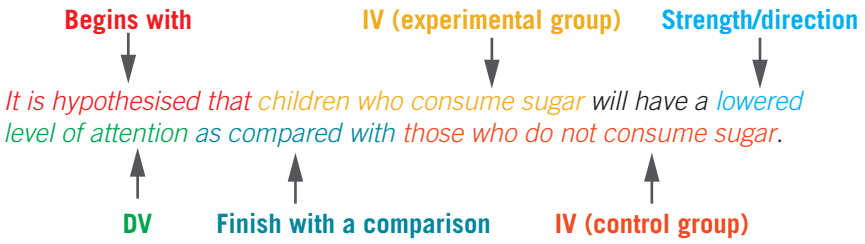


Figure 1A–3 An example of a hypothesis. The key parts are identified.

ISBN 978-1-009-25401-4 Gallagher et al

VIDEO 1A–1 SKILLS: WRITING HYPOTHESES

1A–1 SKILLS

Writing hypotheses

The hypothesis should be written in one sentence and include three key parts:

- the IV and DV being investigated
- an indication of the strength or direction of the variable (whether the DV is going to increase, decrease, improve, worsen, show more or less etc.)
- a comparison of the groups being investigated (what the experimental group will show compared with the control group).

In VCE Psychology, you are not required to include the population in a hypothesis, and a generic reference such as writing 'those who' is sufficient. You do not need to describe how the variables will be measured in a hypothesis; however, if you do, you should do this consistently for each variable. Additionally, a hypothesis should not include a reason or explanation.

Question

Yuri is examining whether exposure to violence could affect aggression levels during social sport. His participants were 20 volunteers from a local basketball club. He randomly assigned the participants to one of two groups – the experimental group or the control group. Participants in the experimental group were told they would be playing the highest-ranking team in the basketball league in a week's time, and they were provided with two films to watch over the week. The participants did not know the films were regarded as violent. Participants in the control group were also told they would be playing the highest-ranking team and were given no films to watch. In the basketball match one week later, the participants were observed, and their aggressive behaviours recorded.

Write a possible hypothesis for Yuri's investigation.

Attempted answer

I hypothesise that the experimental group will be aggressive, and the control group will not show aggressive behaviours during their basketball match one week later because they did not watch the violent films.

Marking comments

This response would receive 0/3 marks. It incorrectly includes an explanation for the hypothesis and does not correctly identify the IV, and the strength or direction of the hypothesis could be clearer.

Suggested answer for full marks

It is hypothesised that those who watch violent films before playing in a basketball match will have a higher level of aggression during the match than those who do not watch violent films before their basketball match.

Check-in questions – Set 1

1 What is the difference between an aim and a hypothesis?
2 What are the key three pieces of information to include in a hypothesis?

ISBN 978-1-009-25401-4 Gallagher et al

VIDEO 1A–2 VARIABLES

Variables

Independent and dependent variables

Some scientific investigations aim to study the relationship between two or more variables, and the hypothesis will have explained the relationship between the variables. Variables are elements that change or vary in an investigation, and can be modified, measured or controlled. For example, for the research question 'Does consuming sugar affect attention in children?', the variables are 'consuming sugar' and 'attention'. There are two main types of variables in a research question – the **independent variable** and the **dependent variable**. Other variables, including extraneous, controlled and confounding, are discussed next.

Independent variable the variable that is being manipulated (controlled, selected or changed) by the researcher

Dependent variable the variable that is being measured by the researcher

The independent variable (IV) is the variable that the researcher manipulates (controls, selects or changes), and the dependent variable (DV) is the variable that the researcher measures. Research seeks to find out the effect of an independent variable on a dependent variable. For example, for the research question 'Does consuming sugar affect attention in children?', the independent variable is the consumption of sugar and the dependent variable is the level of attention (Figure 1A–4). The consumption of sugar may affect attention levels. The researcher manipulates the consumption of sugar and then measures the child's attention.

The DV depends on the IV.
The level of attention depends on whether sugar has been consumed.

Figure 1A–4 The variables can be identified by understanding that the dependent variable depends on the independent variable.

1A–2 SKILLS

VIDEO 1A–3 SKILLS: IDENTIFYING THE IV AND DV

Identifying the IV and DV

A way to help identify the IV and DV in a study is to understand that the DV depends on the IV. Level of attention (DV) depends on sugar consumed (IV), as shown in Figure 1A–4.

Another way to identify the variables is to think about what the two groups of participants do differently (the IV) and what the two groups of participants do the same (the DV) (Figure 1A–5). For example, one group will consume sugar, and the other

ISBN 978-1-009-25401-4 Gallagher et al

group will not consume sugar, then both groups will perform a test of their attention. So, the IV is consuming sugar because the two groups do this differently, and the DV is level of attention because the two groups do this the same way.

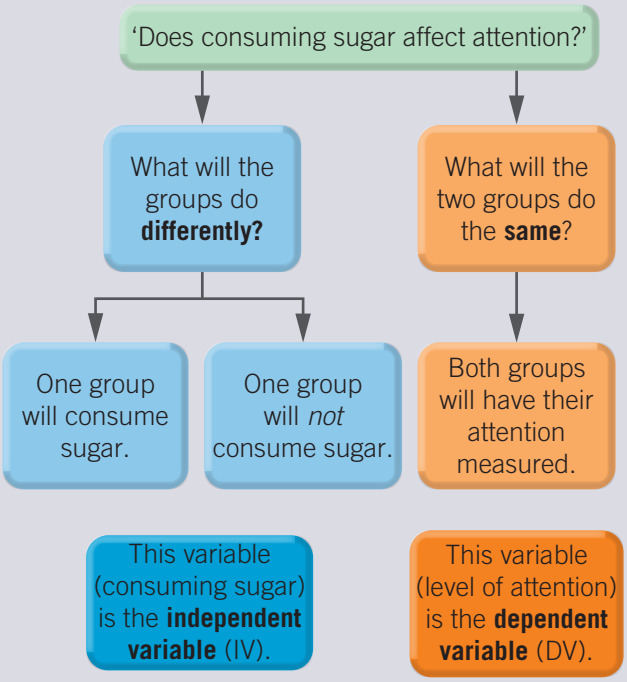


Figure 1A–5 You can identify the variables by thinking about what the groups of participants will do the same and what they will do differently.

Check-in questions – Set 2

1 What is the difference between the independent variable and the dependent variable?
2 Copy the following table of research scenario examples and tick whether the bolded variable is the IV or the DV.

Research scenario	IV	DV
The effect of diet on **happiness** levels.		
Whether **using an air purifier** nightly decreases asthma symptoms.		
Do households with a higher income have more **television streaming service subscriptions?**		
Students remember more content when they **write their own exam notes.**		
Soft-drink companies sell more sugar-free drinks when they are **placed in the middle of the retailer's fridge.**		

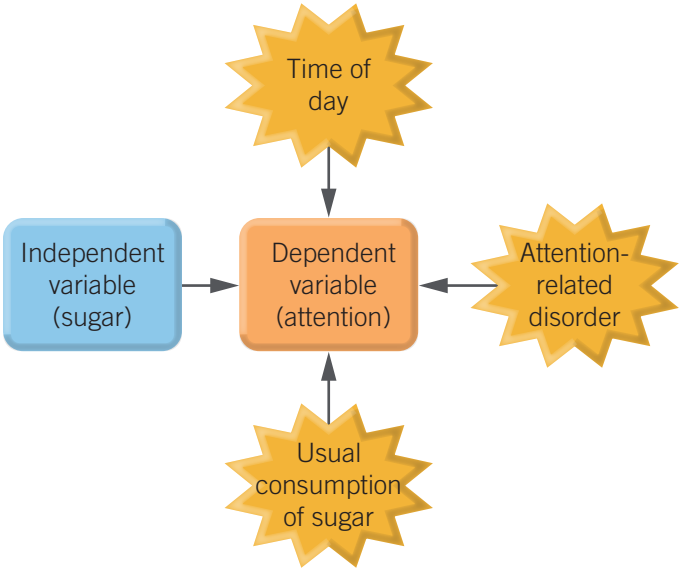
Controlled experiment an experimental investigation of the relationship between one or more independent variables and a dependent variable, in which all other variables are controlled

Extraneous, controlled and confounding variables

A **controlled experiment** is an investigation methodology that aims to test the effects of an IV on a DV, with all other variables controlled. In addition to the IV and DV, other variables need to be considered when conducting an investigation, including extraneous variables and confounding variables. It is important that all other variables are controlled for, as much as possible, so that researchers can be sure that it was the IV affecting the DV, and not another variable.

ISBN 978-1-009-25401-4 Gallagher et al

Extraneous variables are variables other than the independent variable that may have an unwanted effect on the dependent variable and results. For example, in an experiment testing the effect of sugar consumption on attention, a child with an attention-related disorder may perform poorly on the attention test because of their disorder, not because they did or did not consume sugar (Figure 1A–6). Or in an experiment testing a new drug for migraines, a person may be in a more positive mindset because they think they have received a drug that is going to help them. It may not be clear whether their headaches have eased because of the drug or because of their new positive mindset, which may bring about other healthy behavioural changes that could help migraines. Extraneous variables threaten the internal validity of an investigation, that is, whether the study actually investigates what it sets out or claims to investigate. There are several types of extraneous variables, including:



Extraneous variable
a variable other than the independent variable that may have an unwanted effect on the dependent variable and results of an investigation

LINK 2A PROCESSING AND ANALYSING DATA

Figure 1A–6 Extraneous variables such as time of day, attention-related disorders and usual consumption of sugar can all influence the dependent variable of attention.

Controlled variable
a variable that is held constant to ensure that the only influence on the dependent variable is the independent variable

LINK 1B PLANNING AND CONDUCTING INVESTIGATIONS

- individual differences between participant variables, such as age, sex, personality traits, previous experiences, behavioural differences and current feelings
- differences in the experimental setting between the groups, such as temperature, noise level, light level or time of day
- aspects of the experiment or environment that provide the participants with cues to the study's aim or expected findings, influencing their natural behaviour
- the influence of the experimenter on participant responses or on the procedures in a study
- the effect of practice or boredom when a participant completes multiple trials.

Researchers try to determine which extraneous variables may be a problem in a study, and then design the methods in their investigation to control them before they begin the study. **Controlled variables** are variables that are held constant to ensure that the only influence on the dependent variable is the independent variable. When an extraneous variable has been accounted for, it becomes a controlled variable. Controlled variables help to ensure validity of the results, because it can be more clearly seen that the results have changed because of the effects of the IV alone, and not another factor (Figure 1A–7).

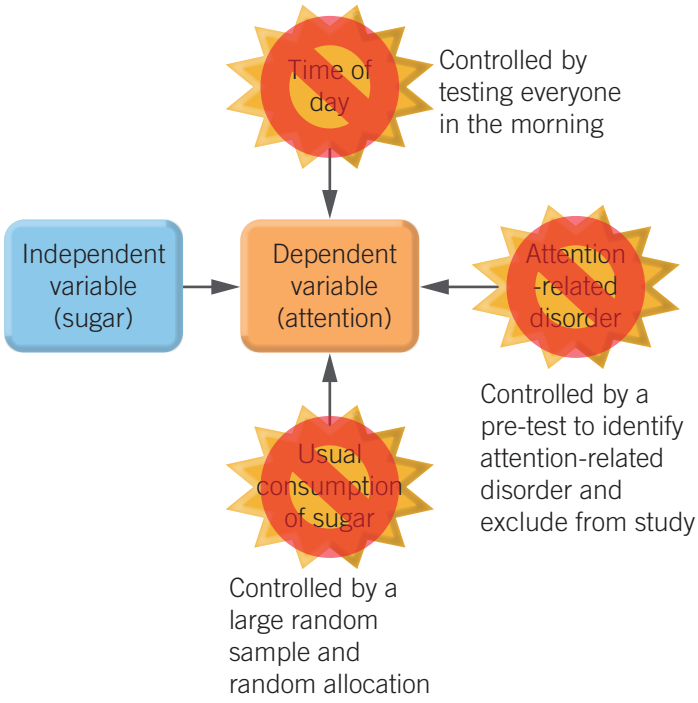


Figure 1A–7 Extraneous variables such as time of day, attention-related disorders and usual consumption of sugar can all be controlled for before the investigation begins, to prevent them from influencing the dependent variable of attention.

ISBN 978-1-009-25401-4 Gallagher et al

Controlled variables are not of direct relevance to the research, and they are not the same as the control group in an investigation, because they are kept constant for both the experimental and control conditions. For example, in a study on the effect of caffeine on subjects' time of reaction to images appearing on a screen, it would be necessary to control for vision impairment, comfort levels and screen brightness, because these are all potential extraneous variables that could influence a participant's reaction time results. Different procedures can be used to control for extraneous variables, including:

- using an appropriate investigation design
- using an appropriate sampling technique and random allocation
- increasing the sample size
- using written scripts for verbal instructions and ensuring the experimental setting remains constant among groups
- using deception and preventing the participants and/or researcher from knowing which group is exposed to the experimental and control conditions
- providing a placebo or fake treatment to the control group
- selecting a different investigation methodology where variables do not need to be controlled, such as fieldwork.

1B PLANNING AND CONDUCTING INVESTIGATIONS LINK

When an extraneous variable cannot be controlled, it should at least be monitored closely throughout the investigation to determine any unwanted effect on the results.

Confounding variable an unwanted variable that has affected the results of an investigation

Extraneous variables that are not controlled before a study begins can become confounding variables. **Confounding variables** are unwanted variables that affect the DV and results in an investigation, and it cannot be determined whether the IV or the confounding variable caused the change in the DV. In research, as far as possible, only the IV should influence the DV. If an extraneous variable is not controlled for, it is possible that both the IV and the confounding variable have affected the results, and it is not possible to determine the degree of influence of each. This means that the internal validity has been compromised and no conclusions can be made for the study because there is more than one possible explanations for the results. In addition to extraneous variables that were not controlled for, confounding variables may also be a type of variable that simply cannot be controlled for by the researcher.

2A PROCESSING AND ANALYSING DATA LINK

Figure 1A–8 Using a placebo, or a fake treatment in place of the real medication, can be one procedure to control for extraneous variables.

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 3

1 What is the difference between extraneous variables and confounding variables?
2 What is the purpose of controlled variables in an investigation?

WORKSHEET 1A–1 IDENTIFYING VARIABLES

ACTIVITY 1A–1 IDENTIFYING INVESTIGATION AIMS, QUESTIONS, VARIABLES AND HYPOTHESES

For the following investigation scenarios, decide whether they are examples of an investigation question, aim or hypothesis by ticking the correct box. Then, identify the IV and DV for each scenario. The first one has been completed for you.

Investigation scenario	Is this an example of an investigation question, aim or hypothesis? (Tick the correct box)			Identify the IV	Identify the DV
	Question	Aim	Hypothesis		
Does the temperature of milk influence our perception of its sweetness?	✔			Temperature of milk	Sweetness level
Working in a dedicated study space will result in an increased retention of learning.					
To find out whether drinking coloured water will increase daily water consumption.					
That fresh flowers in living spaces will improve mood more than fake flowers.					
Will working outside in fresh air increase productivity?					
To investigate the effect of screen time on eyesight.					

ISBN 978-1-009-25401-4

Section 1A questions

1 Write an investigation aim, question and hypothesis for the following scenarios.
   a A psychologist working with older patients notices that her patients need a way to remember to bring their important items like their keys, wallet and phone in the mornings when they leave home. The psychologist creates a short, catchy reminder song that the patients can sing before leaving the house, and wishes to test its effectiveness.
   b Jeremiah is a mobile app developer who is testing whether a new messaging app performs better than the old app.

2 Identify the IV and the DV in the following scenarios and suggest a variable that should be controlled for.
   a Ali works in developing children's toys. Ali wonders whether children are more likely to choose red toy cars because they think they go faster than blue toy cars. He records how many blue and red toy cars are bought from a store over the week.
   b A social psychologist is studying how people behave differently in groups compared to when they are by themselves. They think that the more people present, the less likely people are to help someone in need. They decide to test whether a participant would help a person pick up their dropped belongings when there are already one, two, three or four people nearby.

3 Identify an extraneous variable in the following research scenario and explain how the lead researcher could control for it.
   The lead researcher of a team has designed a new medicine to test a serious disorder. The participants are divided into groups, where some take the new medicine, some take the old medicine and some take no medicine. The research team then measures the participants' symptoms. The research team may be nominated for an award if this medicine works, so they really want the study to be successful. When measuring the symptoms of participants in the new medicine group, one of the researchers does not record the symptoms of participants in the same way as those in the other groups, in the hopes that their hypothesis (that the new medicine is a more effective treatment) will be supported.

Figure 1A–9 Extraneous variables, such as individual differences between participants, can have an unwanted effect on the results.

ISBN 978-1-009-25401-4 Gallagher et al

1B Planning and conducting investigations

Study Design:

Plan and conduct investigations

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

Glossary:

Allocation
Between subjects design
Case study
Classification and identification
Control group
Correlational study
Experimental group
Fieldwork
Investigation design
Investigation methodology
Literature review
Mixed design
Modelling
Population
Primary data
Product, process and system development
Random allocation
Random sampling
Sample
Sampling technique
Secondary data
Simulation
Stratified sampling
Within subjects design

ENGAGE

Current research topics in psychology

The Australian Psychological Society (APS) is the peak body for psychologists in Australia, dedicated to advancing the discipline and profession of psychology. Psychologists who are members of the APS can submit their research project to the APS to increase awareness about their project and to invite psychologists and participants to be involved. The APS website lists some of the current research projects that are open to participants, and is an interesting source for seeing how psychologists are responding to current issues with research. For example, in the months following the devastating bushfires in Victoria and New South Wales in 2019–2020, several research projects were conducted to investigate various aspects of those events, such as the mental health of the workers who are supporting the bushfire victims. Visit the APS website at www.psychology.org.au and search for current research projects.

Figure 1B–1 Tired rural volunteer firefighters take a well-earned break. The mental health of firefighters and those who work with bushfire victims is an example of research listed on the APS Current Research page.

ISBN 978-1-009-25401-4 Gallagher et al

VIDEO 1B–1 SAMPLING TECHNIQUES

EXPLAIN

Selecting a sample for an investigation

An investigation question is created with a particular group of people in mind, known as the **population**. For example, a researcher may wish to find out how sugar affects attention in *children* or how energy drinks affect driving performance in *P-plate drivers*. A population of interest is the wider group of people that a study is investigating. A population is not necessarily all people in the world, but it is whichever group of people the researcher is aiming to provide conclusions about; for example, children, P-plate drivers, females in Victoria, people with dementia.

Population the wider group of people that a study is investigating

Sample the smaller group of people selected from the population who will be participants in the investigation

Once the population is decided, the researcher can select their **sample**; that is, the smaller group of people selected from the population who will be participants in the investigation (Figure 1B–2). When describing the sample, the researcher needs to include all the specific characteristics, such as the number of participants, their age, sex, location, and any other characteristics deemed to be relevant to the study. For example, an Australian researcher studying the effect of sugar on attention in children might determine their population to be all Australian children under 10 years old, and their sample might be 100 children (50 males and 50 females) aged 5–10 years from Victorian public primary schools.

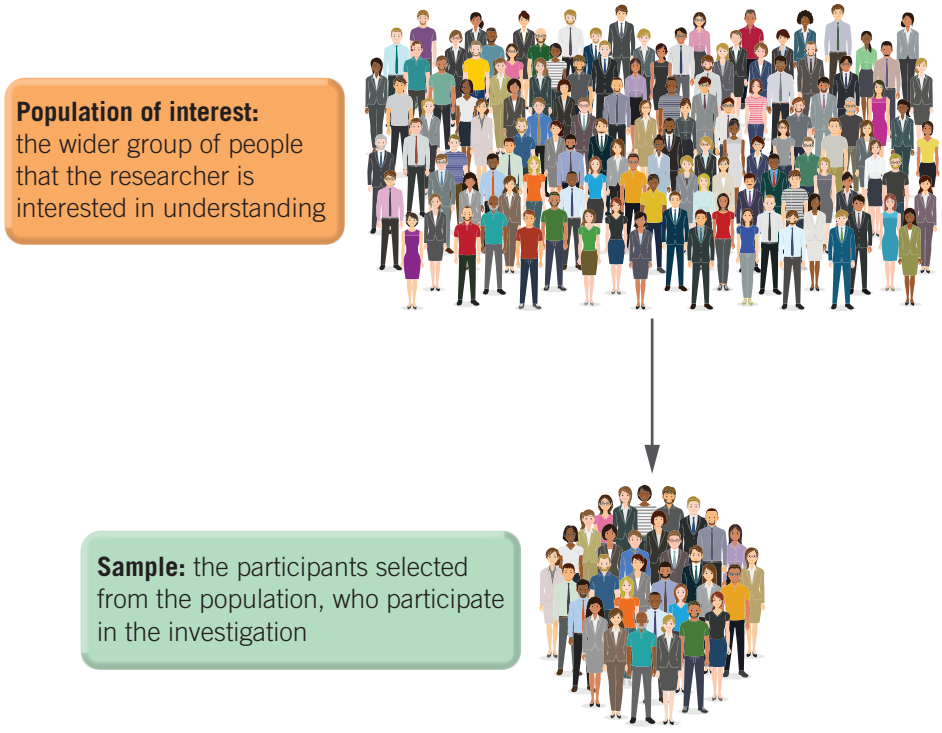


Figure 1B–2 A sample is a small group of participants taken from the wider population.

VIDEO 1B–2 SKILLS: IDENTIFYING POPULATIONS AND SAMPLES

1B–1 SKILLS

Identifying populations and samples

When asked to identify the population from a research scenario, think about who the researcher is interested in applying the results to. Often the population can be found in the aim of a study. The population is rarely 'all people in the world'.

A description of the population would typically not include the number of people, just the broad characteristics that make them similar. When describing the sample, specific details such as the number of participants, where they were selected from, and any other common characteristics should be included, such as age or sex.

ISBN 978-1-009-25401-4 Gallagher et al

Question

A researcher wanted to investigate whether children with motor development delays will improve their fine motor skills by using building block toys. A total of 150 two-year-old children with motor delays from Melbourne participated.

Identify the population and describe the sample for this study.

Suggested answer for full marks

Population: children with motor development delays

Sample: 150 two-year-old children with motor delays from Melbourne

Sample size

LINK 2A PROCESSING AND ANALYSING DATA

A sample should be representative of the population, meaning that the characteristics of people within the sample should represent those in the population. There is no set limit for an ideal sample size, but the chosen sample needs to be large enough compared to the population to represent variables such as age, sex, geographical location or socio-economic status. For example, in an investigation on Victorian children, a sample of 50 children is not very proportionate to the approximately 740 000 children under 10 in Victoria. However, a sample of 5000 children is more appropriate.

Large samples are important to help ensure the sample is as representative of the population as possible, and to minimise any particular participant variables that could influence the results. A small sample may not be representative of the population and may also allow a single participant to have a large effect on the results.

Figure 1B–3 A large sample size can help the sample be more representative of the population, and minimise any extreme individual differences between participants that could affect the results.

For example, in a test on memory on two samples of 10 and 30 people, one participant within the top IQ range could influence results to a larger degree in the smaller sample. In sample 1 (10 people), the unique participant's score pushes up the mean score to 5 out of 10. However, in sample 2 (30 people), this person's results would not have as much influence. In sample 2, the unique participant's score is evened out by the 20 extra participants, to give a mean of 4.5 out of 10.

Sample 1:

4, 5, 5, 5, 3, 4, 5, 5, 4, 10

$$\text{mean} = \frac{50}{10}$$

$$= 5$$

Sample 2:

4, 5, 5, 5, 3, 4, 5, 5, 4, 10, 4, 5, 5, 5, 3, 4, 5, 5, 4, 3, 4, 5, 5, 5, 3, 4, 5, 5, 4, 3

$$\text{mean} = \frac{136}{30}$$

$$= 4.5$$

ISBN 978-1-009-25401-4 Gallagher et al

Sampling techniques

Sampling technique involves procedures for selecting participants from the population

There are different ways to select the sample from the population. Two types of **sampling technique** are random sampling and stratified sampling. Each sampling technique has its own strengths and weaknesses, but the most important feature for all samples is that they are representative of the population.

Random sampling

Random sampling selecting participants from the population in a way that means each member of the population has an equal chance of being selected to participate in the study

Random sampling involves selecting participants from the population in such a way that each member of the population has an equal chance of being selected to participate in the study. There are different ways of achieving a random sample, but all of them begin with all members of the population being available to be chosen. This means that if there is a large enough sample, the participants are likely to be representative of the population, thereby allowing results to be generalised or applied to the population.

A simple example of how a random sample can be obtained is by putting all names of the people in the population into a box and pulling out the required number of people to form the sample. In large-scale research, a common method of selection is to assign a unique number to each member of a population and then select those numbers at random using software (Figure 1B–4). The participants assigned those numbers will then form the sample.

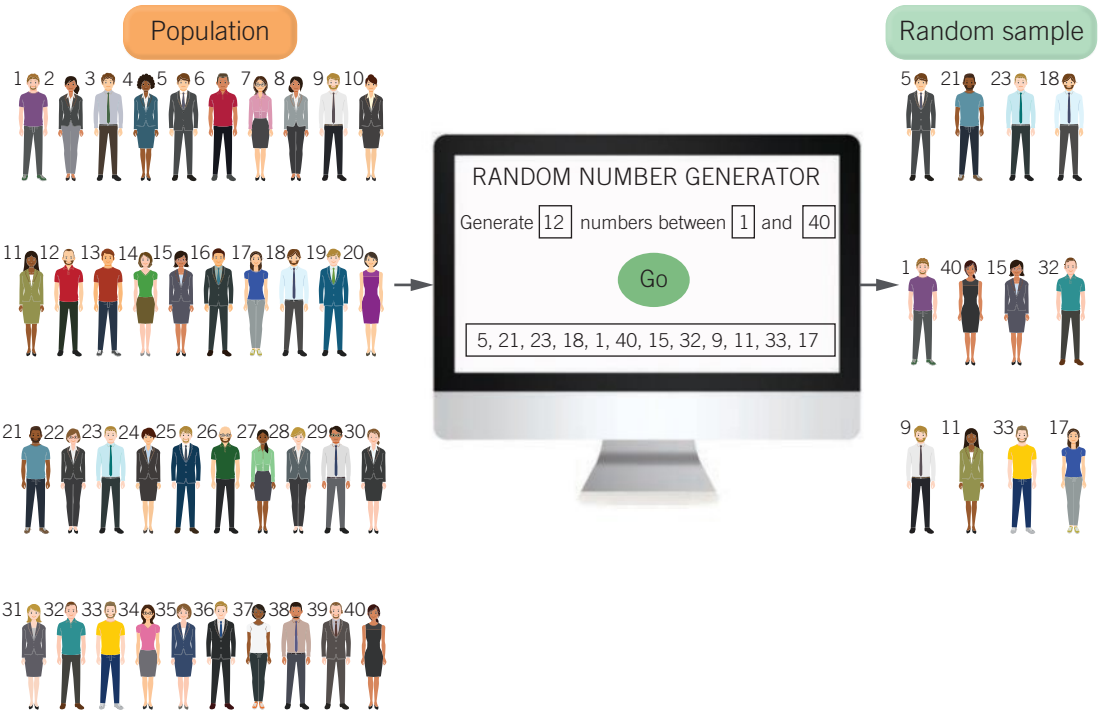


Figure 1B–4 A random sample can be obtained by assigning all members of the population a number and using random number generator software to select the required number of participants.

Table 1B–1 Strengths and limitations of random sampling

Strengths	Limitations
• A large enough random sample is probably representative of the population, improving external validity.	• Small random samples may not be representative of the population, reducing the external validity. • It may be difficult, time consuming, impossible or unethical to obtain names of all members of the population.

2A PROCESSING AND ANALYSING DATA LINK

ISBN 978-1-009-25401-4 Gallagher et al

Stratified sampling

In some investigations, it is important that the different subgroups within a population are fairly represented in a sample. A way to ensure this is to use a **stratified sampling** technique. This is where the population is first divided into subgroups, and participants are randomly selected from each subgroup, in the proportion that they appear in the population (Figure 1B–5). The subgroup can be based on any characteristic deemed important to the study, such as age, sex, geographic location or socio-economic status. This sampling method produces a more representative sample than using random sampling, which reduces bias and improves external validity, allowing results to be generalised to the population.

Stratified sampling first dividing the population into subgroups, and then randomly selecting participants from each subgroup in the proportion that they appear in the population

For example, in high schools there are usually more students in Years 7 and 8, and fewer students in Years 11 and 12. If a local high school wanted a sample of their students to complete a study, a stratified sample would ensure all year levels are represented fairly, and would include more Year 7 and 8 students than Year 11 and 12 students, as appears in the student population. For a study on Units 3 & 4 Psychology students, there need to be more female students in the sample than male students, because the current ratio of females to males studying Psychology is approximately 3:1. So, the sample should have this same ratio too.

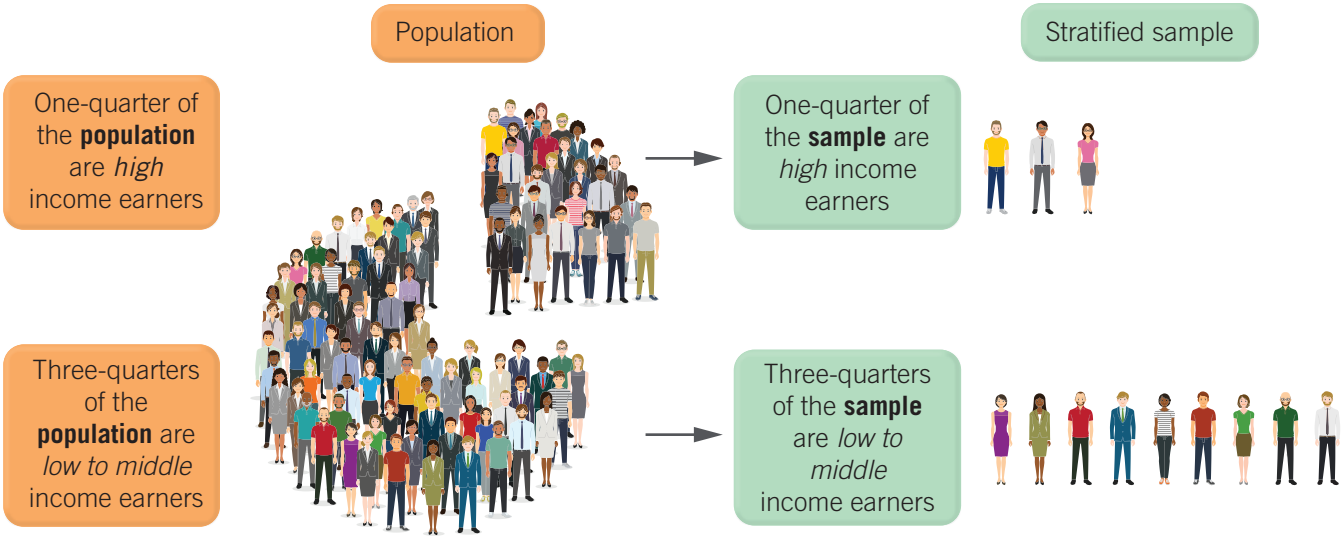


Figure 1B–5 A stratified sampling technique allows for any important subgroup of the population, such as those with certain levels of income, to be fairly represented in the sample.

Table 1B–2 Strengths and limitations of stratified sampling

Strengths	Limitations
• A large enough stratified sample is probably representative of the population, improving external validity. • Important subgroups of a population are ensured fair representation.	• It may be difficult, impossible or unethical to obtain names of all members of the population. • It is more time consuming than using a random sampling technique because of the need to form subgroups and any pre-testing required.

LINK 2A PROCESSING AND ANALYSING DATA

ISBN 978-1-009-25401-4

VIDEO 1B–3 SKILLS: IDENTIFYING SAMPLING TECHNIQUES

1B–2 SKILLS

Identifying sampling techniques

You may be asked to identify the sampling technique used in a research scenario and explain whether it was a suitable choice for the investigation. Alternatively, you may need to identify when neither random nor stratified sampling was used, and explain how this resulted in a poor representativeness of the sample.

Both random and stratified sampling require the researcher to have access to every member of the population of interest. This means that a sample will probably be a good representation of the population and the investigation will have good external validity.

Use the following steps to determine whether random or stratified sampling was used.

Random sampling:

1. Determine the researcher's population of interest, which can usually be found in the investigation's aim.
2. Decide whether the sampling technique gave each member of that population an equal opportunity of being selected. For example, the technique might be a lottery method ('picking a name out of a hat') or using random number generator software.

Stratified sampling:

1. Determine the researcher's population of interest, which can usually be found in the investigation's aim.
2. Determine whether the sampling technique first involved dividing the population into specific strata or subgroups, based on a characteristic such as age, sex, geographical location or another personal characteristic. For example, a researcher may divide the population into age brackets, determining the proportions of those age brackets, and then selecting participants from each age bracket, ensuring that the numbers are kept proportionate to the population.
3. Decide whether the final sample was pulled from those subgroups in the same proportion in which they existed in the population.

If the researcher's population of interest was 'people' or 'all children' or 'all Australian basketball players', it is unlikely that they would have access to every single member in order to use either a random or a stratified sampling technique.

If neither of these sampling techniques was used, you should consider that the sample may not be a good representation of the population. This may have detrimental effects on the external validity of the investigation.

Check-in questions – Set 1

1. Describe the difference between a sample and a population.
2. What is the most important requirement when using a random sampling technique?
3. How is a sample chosen by the stratified sampling technique?

ISBN 978-1-009-25401-4 Gallagher et al

Selecting an investigation methodology

Research investigations can be conducted in different ways by using different methodologies. The type of **investigation methodology** chosen depends on what a researcher is studying and what data they wish to obtain. Some studies require strict controlled conditions, while others can be completed in the participant's own home.

Investigation methodology the particular type of research study

Not every study is an 'experiment'. A controlled experiment is only one possible type of investigation methodology that can be used for research. Other types of methodologies are case study; classification and identification; controlled experiment; correlational study; fieldwork; literature review; modelling and simulation; and product, process or system development. Each type of investigation methodology has its own strengths and limitations, and the one that is chosen will depend on the type of data required and a consideration of its potential sources of error and uncertainty.

Controlled experiment

A controlled experiment involves an experimental investigation of the relationship between one or more IVs and a DV; all other variables are controlled. The aim of a controlled experiment is to find out whether an IV has an effect on a DV. For example, a researcher could test whether drinking energy drinks affects driving performance on a driving simulation test.

In controlled experiments, participants are randomly allocated to an experimental group or a control group, and the results of the groups are then compared. For example, before completing a driving simulation, one group of P-plate drivers consumes a can of an energy drink, and the other group does not. The results are compared to see if there was a difference in driving performance due to consuming the energy drink. These two types of groups in a controlled experiment are discussed next.

LINK **1A** INVESTIGATION AIMS, QUESTIONS, HYPOTHESES AND VARIABLES

Table 1B–3 Strengths and limitations of controlled experiments

Strengths	Limitations
• Controlled experiments can identify a cause-and-effect relationship between an IV and a DV. • Results may be generalised to the population of interest if the study is deemed to have good validity. • Controlled experiments can be repeated to gather more data and test the reliability of results.	• Controlled experiments require strictly controlled conditions, which are difficult to maintain, so results may be influenced by extraneous variables. • Participant behaviour may be influenced by the artificial nature of the setting. • It may be unethical or impossible to conduct a controlled experiment on a particular variable. • External validity may be low if the conditions are too artificial to extrapolate results to the population of interest outside the experiment.

LINK **2A** PROCESSING AND ANALYSING DATA

Allocating participants to groups

Once the sample has been chosen, the participants are divided into the different groups required in the study. This is known as **allocation**. **Random allocation** involves dividing the sample into groups in such a way that each participant has an equal chance of being placed into the experimental group or the control group. A simple random allocation procedure can be achieved by placing the names of all participants of the sample into a box, drawing them out one by one and placing into alternating groups. Random allocation helps to ensure the groups of a study are equal in participant characteristics, and therefore any change to the results of a study is more likely to be due to the effect of the independent variable, not the extraneous variable of unwanted differences in participant variables between the groups.

Allocation dividing a sample into groups in an investigation

Random allocation dividing a sample into groups in such a way that each participant has an equal chance of being placed into the experimental group or the control group

ISBN 978-1-009-25401-4 Gallagher et al

Experimental group the group that is exposed to the independent variable and receives the experimental treatment

Control group the group that forms a baseline level to compare the experimental group with

In a simple controlled experiment the participants are allocated to one **experimental group** and one **control group** (Figure 1B–6). The experimental group is exposed to the independent variable and receives the experimental treatment. Members of the experimental group participate in the experimental condition. For example, in the study on whether sugar consumption in children affects attention, the experimental group would consume sugar by eating lolly snakes. The control group forms a baseline level to compare with the experimental group. Members of the control group participate in the control condition and are not exposed to the independent variable and do not receive the experimental treatment. For example, the control group would not consume sugar and therefore would not have any lolly snakes. A control group is necessary to see the natural baseline levels of the dependent variable, before any influence of an independent variable. For example, we need to know what children's attention levels are like without any sugar before we can see the influence of consuming sugar on their attention.

There is only ever one control group in a study, but more complex controlled experiments may have more than one experimental group. For example, participants in one experimental group may consume five lolly snakes before their attention test, and participants in a second experimental group may consume 10 lolly snakes before their attention test.

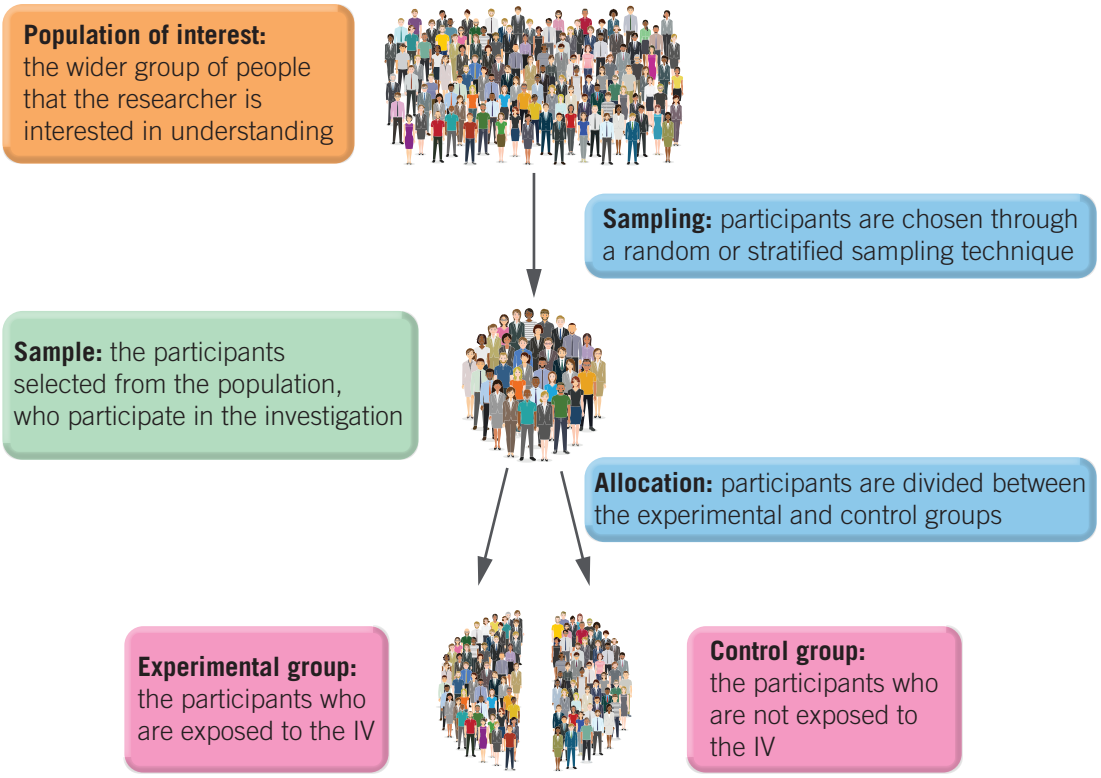


Figure 1B–6 The sample is chosen from the population, and then participants are allocated to the experimental and control groups.

Check-in questions – Set 2

1 What is the difference between sampling and allocation?
2 What is the purpose of a control group?

ISBN 978-1-009-25401-4 Gallagher et al

Selecting an investigation design

LINK 1A INVESTIGATION AIMS, QUESTIONS, HYPOTHESES AND VARIABLES

Allocating participants to the conditions in a considered way can help reduce unwanted effects on the results. There are three **investigation designs** that involve different ways that participants experience the experimental and control conditions. Each design has strengths and limitations, and which design is chosen will depend on the goals of the study, what type of data is being collected and what kinds of variables are most important to control.

Investigation design a framework that determines how participants experience the experimental and control conditions

Between subjects design an investigation design in which participants are randomly allocated to either the control or the experimental condition

A **between subjects design** is when participants are randomly allocated to either the control or the experimental condition (Figure 1B–7). For example, a participant in an investigation on whether sugar affects attention is required to either consume sugar (experimental condition) or not consume any sugar (control condition). Participants in the different groups in an investigation must be equal in characteristics of importance; otherwise, differences in participant variables can be an extraneous variable that can affect the DV. For example, if half the children in the experimental group usually eat sugar every day, but only a quarter of children in the control group eat sugar every day, then the groups are not equal on an important characteristic for this study. So, ensuring the groups are matched on participant characteristics is a challenge with using a between subjects design.

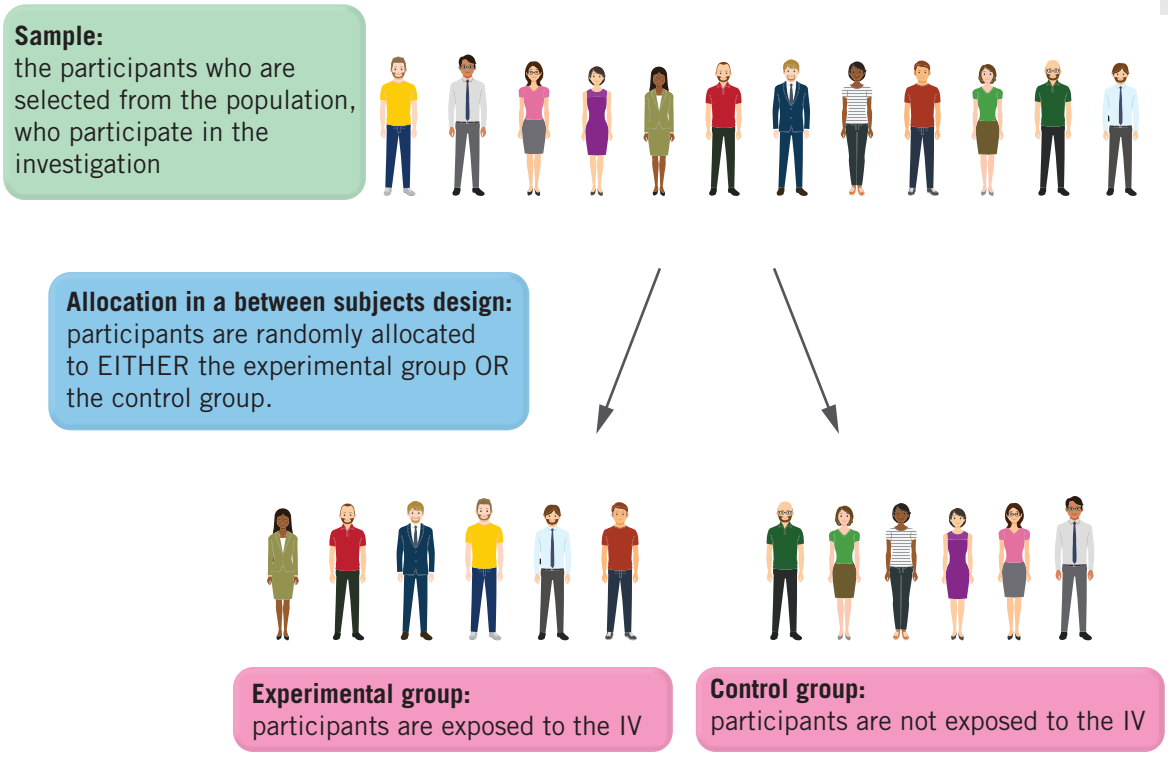


Figure 1B–7 Participants in a between subjects design complete only one condition in the study.

LINK 2A PROCESSING AND ANALYSING DATA

Table 1B–4 Strengths and limitations of a between subjects design

Strengths	Limitations
• A between subjects design is the most time-efficient design because both groups can be tested at the same time and no pre-testing is required. • It has a lower rate of participant withdrawal than a within subjects design because participants only complete one condition. • There is better control of participant knowledge of the study and there is no effect of prior participation extraneous variables influencing results compared with a within subjects design.	• More participants are needed in a between subjects design than a within subjects design. • There is less control over the extraneous variable of participant variables between groups, which may influence results in an unwanted way, lowering validity.

ISBN 978-1-009-25401-4 Gallagher et al

1A INVESTIGATION AIMS, QUESTIONS, HYPOTHESES AND VARIABLES LINK

The second type of investigation design is a **within subjects design**. A within subjects design involves all participants in the sample completing both the experimental and control conditions. In a within subjects design, any effect of participant variables can be completely removed because the same participants are in both the experimental and control conditions (Figure 1B–8). For example, all children in the sample will first complete the attention test without consuming any sugar, and then complete the attention test again after consuming sugar. Because the same participants complete both conditions, each participant's unique characteristics influence the results in both conditions, so there is no weighted influence to either condition. For example, one child who has an attention disorder may react to sugar more or less than a child without an attention disorder. Either way, by participating in both conditions, their disorder will affect their attention results in the control condition equally to their attention results in the experimental condition, so therefore the effect is equal among groups.

Within subjects design
an investigation design in which all participants in the sample are involved in both the experimental and control conditions

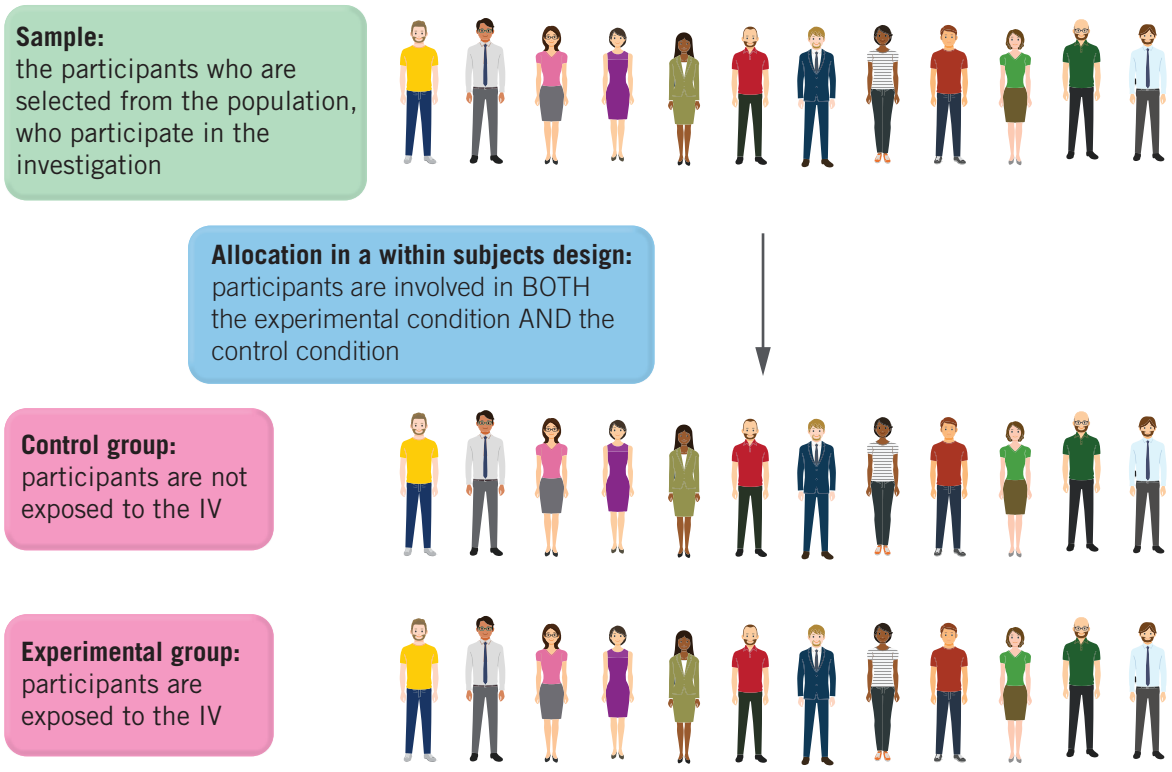


Figure 1B–8 Participants in a within subjects design complete all conditions in the study.

Table 1B–5 Strengths and limitations of a within subjects design

2A PROCESSING AND ANALYSING DATA LINK

Strengths	Limitations
• In a within subjects design, there is no extraneous variable of participant variables between groups, improving validity. • Fewer participants are needed than in a between subjects design.	• There is less control over participant knowledge of the study. The extraneous variable of prior participation in the first condition may influence their behaviour while completing the second condition. • It is more time consuming than a between subjects design because both conditions cannot be tested at the same time. • There is a higher rate of participant withdrawal from the study than in a between subjects design because the DV has to be measured multiple times.

ISBN 978-1-009-25401-4 Gallagher et al

A third option for investigation design is the **mixed design**. A mixed design involves a combination of a between subjects design and a within subjects design. This design combines some of the strengths of within subjects and between subjects designs and may reduce some of each design's limitations.

Mixed design an investigation design that combines elements of a between subjects design and a within subjects design

A simple mixed design investigation may test the effect of one independent variable at two time periods, such as through a pre-test and a post-test. For example, in an investigation testing whether listening to classical music while studying improves performance, each participant is allocated to either the experimental or the control condition (the between subjects design element) and then completes a pre-test to determine their baseline score before studying while listening to classical music or no music. Then they complete a post-test to determine whether their score improved (demonstrating the within subjects design element).

A mixed design may also involve two independent variables, whereby one variable is tested through a between subjects design and the second variable is tested through a within subjects design. For example, in an investigation testing whether male or female students benefit from listening to classical music or pop music while studying for a test, the between subjects element is whether the student is male or female, and the within subjects element is listening first to classical music and then to pop music while studying. One of these variables could also be a naturally occurring variable that the researcher has not manipulated, such as age, sex, geographical location or the presence of another particular characteristic.

LINK 1A INVESTIGATION AIMS, QUESTIONS, HYPOTHESES AND VARIABLES

Table 1B–6 Strengths and limitations of a mixed design

Strengths	Limitations
• Differences in participant variables between groups are controlled in the within subjects design element. • Can test the effect of multiple independent variables on a dependent variable in one investigation. • Testing multiple independent variables in one investigation can be time and cost effective compared to completing two or more separate investigations.	• There is a higher rate of participant withdrawal from the study than using a between subjects design alone, which can be detrimental to the internal validity. • There is less control over participant knowledge of the study. Prior participation in the first condition may influence their behaviour while completing the second condition. • There is less control over differences in participant variables between groups in the between subjects element, which may influence results in an unwanted way, lowering validity.

LINK 2A PROCESSING AND ANALYSING DATA

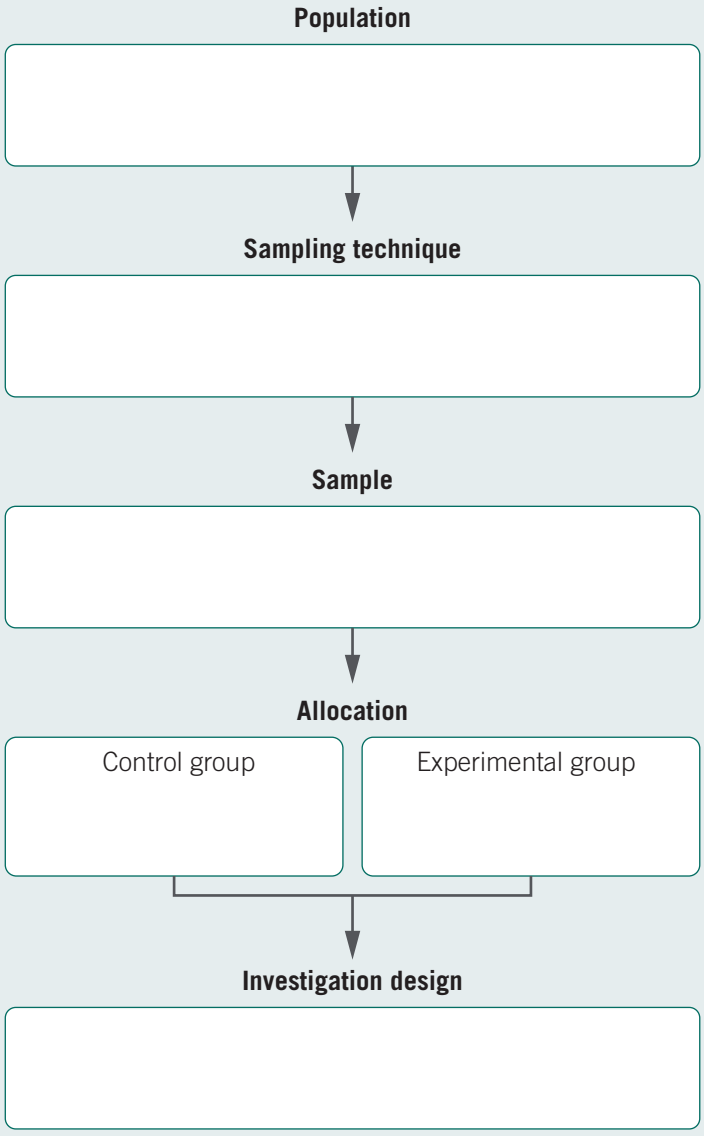
Check-in questions – Set 3

1 What is an investigation design?
2 Which condition(s) are participants allocated to in a:
  a between subjects design?
  b within subjects design?
3 What is involved in a mixed design?

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 1B–1 IDENTIFYING EXPERIMENTAL PROCEDURES

Create a copy of this flow chart and complete it to show the order of some of the research procedures described in the scenario below. For example, in the 'Population' box, you need to determine and then write in details about the study population in the scenario.



Scenario

A researcher is testing a new clock that aims to help Australian children learn when it is time to get out of bed in the morning. The clock displays blue colours and pictures relating to night-time and sleep during the desired sleeping hours, and yellow colours and pictures relating to breakfast and waking up during the desired waking hours. The researcher requests that kindergartens across the country send out an advertisement for families with children under five years old to participate in the study. The researchers receive replies from 1205 families who want to be involved. All the families are asked to track their child's sleep for two months before receiving the clock to trial over the following two months.

Case study
an investigation of a particular activity, behaviour, event or problem that contains a real or hypothetical situation and includes real-world complexities

Using case studies

A **case study** is an investigation of a particular activity, behaviour, event or problem that contains a real or hypothetical situation and includes real-world complexities.

There are several formats for a case study. A case study can:

- be historical, with analysis of causes, consequences and what has been learned from the case; for example, learning about the role of the frontal lobe from investigating the case of Phineas Gage (Figure 1B–9)

ISBN 978-1-009-25401-4 Gallagher et al

- involve a real situation or a role-play of an imagined situation where plausible recommendations are to be made; for example, studying language acquisition due to neglect in the Genie 'the Wild Child' case, where a child raised in social isolation and who suffered abuse did not develop speech until she was rescued.
- be based around problem-solving where developing a new design, methodology or method is needed; for example, identifying a unique situation where a new process of treatment is required.

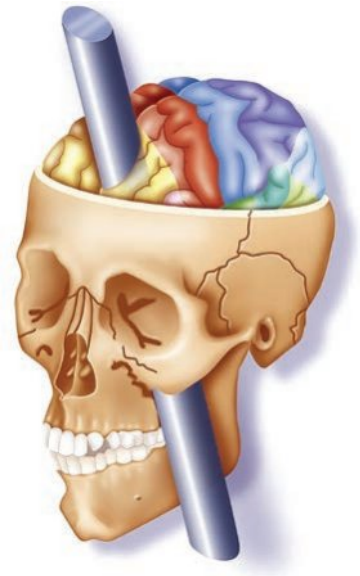


Figure 1B–9 Phineas Gage (1823–1860) was a US railway worker who experienced a traumatic brain injury in which a large iron rod was driven through his head, destroying much of his frontal lobe. The research on Gage involved a case study investigating the effects of frontal lobe damage on a person.

Case studies typically involve an individual or a small group of people and are used when it is only possible to have a limited number of participants, such as when looking at the effects of a rare experience or when it would be unethical or impossible to expose a person to a particular variable. For example, for research into a rare disorder such as fatal familial insomnia (a brain disorder characterised by an inability to sleep), it would be difficult to find a very large sample of eligible participants. Additionally, it would be unethical for a researcher to try to cause a person to develop fatal familial insomnia in order to study its effects. In a case study, the person or small group of people may undergo various tests, observations and questionnaires in order to collect data.

Table 1B–7 Strengths and limitations of case studies

Strengths	Limitations
• Case studies are useful when a limited number of participants are available. • They can be used to study experiences where it would be unethical or impossible to design and conduct a controlled experiment. • They can provide rich qualitative data. • They can act as a basis for further research.	• One person or a small group of people cannot be representative of a population, so results from a case study cannot be generalised to the population, and there is a low external validity. • Researcher bias may influence the recording, collation and treatment of data. • They may not be repeatable to gain more data or to test reliability of results. • They are typically time consuming.

LINK 2A PROCESSING AND ANALYSING DATA

Classification and identification

Classification and identification is another type of investigation methodology that involves two distinct components. Classification in research involves arranging phenomena, objects or events into manageable sets (Figure 1B–10). Identification involves recognising phenomena as belonging to a particular set or being part of a new or unique set. In psychology, classification is used for organising human behaviour, mental processes and events into common groupings with similar features, from which an individual's experience can then be identified.

Classification and identification a type of investigation that involves arranging phenomena, objects or events into manageable sets, and recognising phenomena as belonging to a particular set or part of a new or unique set

ISBN 978-1-009-25401-4 Gallagher et al

4A CRITERIA USED TO CATEGORISE TYPICAL AND ATYPICAL BEHAVIOUR LINK

Classification and identification can help people in ways such as determining whether their experience is usual or unusual, and can lead to further research into areas of need. For example, the *Diagnostic and Statistical Manual of Mental Disorders* or *DSM*, described in Section 4A, is a classification system that groups together mental health disorders into categories based on similar characteristics, such as the experience of anxiety, psychosis or mood-related symptoms.

Standardised classification allows for consistent identification using a common language; that is, based on rules. For example, using a common language helps the identification process to pinpoint a particular mental health disorder based on symptoms and allows a person to seek specific treatment for that disorder, at the exclusion of other similar disorders.

Figure 1B–10 Classification involves arranging things such as the behaviour of people into sets, from which phenomena can later be identified.

Classification and identification can be used to determine learning difficulties in a child or behaviours that are considered abnormal for their age of development. Being able to classify a particular animal species as endangered allows countries to make laws that direct the behaviours of people. Being able to differentiate between agricultural pests allows farmers to use the right products to protect their crops. Classification and identification can allow us to make the correct decisions and predict expected behaviour.

Table 1B–8 Strengths and limitations of classification and identification

Strengths	Limitations
• Classifications can allow for a narrowed focus of research. • People identified as having a similar classification can feel a sense of belonging and support. • Using classifications can allow for efficient processing of large amounts of information. • Classifications can help make predictions and inferences.	• Labelling through identification can lead to stereotyping, prejudice or discrimination. • Classifications may be based on subjective criteria. • Large amounts of information are required to create classifications.

Correlational study an investigation that involves planned observation and recording of events and behaviours that have not been manipulated or controlled to understand the relationships or associations existing between variables, to identify which factors may be of greater importance, and to make predictions

Correlational study

A **correlational study** involves planned observation and recording of events and behaviours that have not been manipulated or controlled to:

- understand the relationships or associations existing between variables
- identify which factors may be of greater importance
- make predictions.

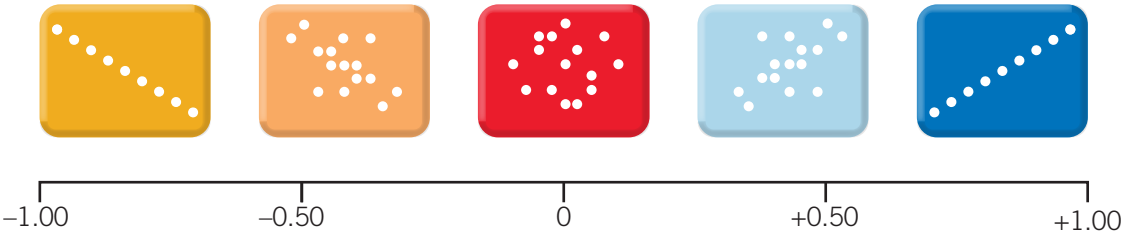
ISBN 978-1-009-25401-4 Gallagher et al

Figure 1B–11 Many mental health disorders have a bi-directional relationship with sleep trouble or sleep disorders, and there is a correlation between them.

Correlational studies describe the statistical association and strength of the relationship between two variables; however, the variables are not controlled by the experimenters. Therefore, correlational studies cannot find how changing one variable causes a change in another variable, and therefore a cause-and-effect relationship is not found as in controlled experiments.

Correlational studies collecting quantitative (numerical) data can present the relationship between the variables in a scatterplot, with three main interpretations (Figure 1B–12):

- A positive correlation demonstrates a relationship in which both variables together increase or decrease. For example, as an adult gets older, the likelihood of greying hair increases.
- A negative correlation demonstrates a relationship in which an increase in one variable results in a decrease in the other variable. For example, as an adult gets older, their memory ability tends to decline.
- A zero correlation demonstrates that there is no relationship between the variables. For example, as an adult gets older, the weather gets neither colder nor hotter.



Negative correlation			Zero correlation	Positive correlation		
Strong	Moderate	Weak		Weak	Moderate	Strong
For example: As an adult gets older, their memory ability tends to decline.			For example: As an adult gets older, the weather gets neither hotter nor colder.	For example: As an adult gets older, the likelihood of greying hair increases.		

Figure 1B–12 The strength of a correlation is described according to Pearson's r, which ranges from –1.00 to +1.00.

ISBN 978-1-009-25401-4 Gallagher et al

For example, a researcher could use a correlational study to measure the extent of the relationship between happiness and the number of hours people spend at their job. Participants could complete a questionnaire in which they indicate the number of hours they work each week and their self-reported level of happiness on a scale of 1 to 10. Statistical analysis of the results might determine a negative correlation whereby an increased number of hours worked each week is associated with a decreased level of happiness. However, it could not be determined that working more caused a decrease in happiness because many other variables could affect happiness that were not controlled for, such as the type of job the participants were working in.

The strength of a correlational relationship is measured by statistical tests to determine correlation coefficients such as Pearson's *r* (Figure 1B–12). Correlation coefficients range from −1.00 (the strongest possible negative relationship) to +1.00 (the strongest possible positive relationship), and a zero correlation has a Pearson's *r* value of 0.

Table 1B–9 Strengths and limitations of correlational studies

Strengths	Limitations
• The direction and strength of a relationship between variables can be determined using a correlational study. • They can be used to gather initial information that is investigated further or to research behaviours where controlled experiments cannot be used for practical or ethical reasons. • Observation of real-life behaviours with no manipulation of variables may result in behaviours that are more natural. • Secondary data can be used. • If a relationship between two variables is determined, the value of one variable can then be used to predict the value of the other variable. • They can be used to determine the repeatability, reproducibility and validity of measurements, and they are often high in external validity. • Extra procedures to control for extraneous variables are not needed.	• Correlation does not equal or imply causation, so even if a strong relationship is determined, you cannot assume that one variable causes a change in the other. • The relationship is bi-directional, and you cannot determine which variable has more influence. • A large amount of data is required. • As extraneous variables are not controlled for, you cannot determine that there was not an influence of a third variable, meaning there is a low internal validity.

Check-in questions – Set 4

2A PROCESSING AND ANALYSING DATA LINK

1 What does a controlled experiment aim to find out?
2 When would a researcher choose to use a case study instead of a controlled experiment?
3 What is the difference between classification and identification?
4 When is a correlational study used instead of a controlled experiment?

ISBN 978-1-009-25401-4 Gallagher et al

Fieldwork

Fieldwork is a type of investigation methodology that involves collecting information by observing and interacting with a selected environment. Often the environment is a real-life setting (Figure 1B–13), rather than a controlled laboratory setting, and can be based on enquiry or the investigation of an issue. Usually a correlation between variables is being sought, rather than a cause-and-effect relationship, because extraneous variables are not being controlled. Fieldwork may be conducted through a range of methods, including direct qualitative and/or quantitative observations and sampling, participant observation, qualitative interviews, questionnaires, focus groups and yarning circles. Each of these methods will be discussed, and they each have their own strengths and limitations.

Fieldwork
a type of investigation that involves collecting information through observing and interacting with a selected environment

Direct observations and sampling

Fieldwork using direct observations and sampling involves watching and recording participant behaviour, including how they interact with their environment, typically without interference or intervention from the researcher. Qualitative and quantitative data can be collected, and data sampling methods determine the acquisition of a representative sample through:

- time sampling (e.g. only recording behaviour over a particular time interval, such as recording student behaviour for only one minute out of every 10 minutes in class)
- event sampling (e.g. only recording the behaviour when a specific event occurs, such as recording how many students react to a teacher asking a question in class)
- situational sampling (e.g. recording the same behaviour over multiple circumstances, such as recording student and teacher interactions in class, in the playground and at the bus bay after school).

Figure 1B–13 Fieldwork often involves observing behaviour in real-life settings.

Participant observation

Fieldwork conducted through participant observation involves the researcher becoming an active participant in the group that is being studied, either in a disguised way, where the researcher is 'undercover' posing as a genuine member of the group, or in an overt way, where the researcher's participation is not concealed, and the participants are aware of the researcher's identity and presence.

Participant observation allows the researcher to guide the direction of the study and prompt in-depth and honest discussions that may have been impossible to access by an outsider. For example, in a well-known experiment, psychiatrist David Rosenhan, pretended to be 'insane' by simulating psychiatric symptoms such as hallucinations and was admitted to a psychiatric hospital. Once admitted, Rosenhan observed the behaviours of hospital staff and other patients under the guise of being a patient himself.

ISBN 978-1-009-25401-4 Gallagher et al

Interviews, questionnaires, focus groups and yarning circles

Fieldwork conducted through interviews, questionnaires, focus groups and yarning circles involve self-report methods where the participant responds to questions and statements about the way they think, feel and behave.

Interviews consist of structured or unstructured questions that are answered verbally by the participant. Interviews can be conducted face to face, by phone, or by video conference, and the responses are recorded by the interviewer. Interviews allow participants to give more emphasis and elaborate on certain points, and participants can use their own words to describe their experiences. For example, an interview on mobile phone preferences might include questions such as 'Explain why Android is your preferred mobile phone operating system'.

Questionnaires are a set of structured, written, open- or close-ended questions that are answered in a set format. They can be conducted face to face, on paper, online or by phone. For example, a questionnaire on mobile phone preferences might include questions such as 'Select your preferred mobile phone operating system: Android or iOS', or 'How many years have you owned Android devices?' or 'What is the model of your current mobile phone?'

Focus groups involve a trained moderator conducting a collective interview of multiple participants. Focus groups allow for dialogue and dynamic interaction between participants to gather a rich understanding of the perspectives, opinions, ideas and beliefs of the group. For example, a school may conduct a focus group with eight students from different year levels to determine their perspectives on using either tablets or laptops for schoolwork.

Yarning circles are a culturally informed alternative to focus groups. They are used to explore topics with Indigenous participants through reciprocal dialogue, storytelling and informal conversations to provide an insight into the Indigenous participants' thoughts and feelings about a topic. Yarning circles have been used by Indigenous peoples for centuries to learn from the collective group, build respectful relationships and pass on cultural knowledge. Yarning provides an opportunity to speak in a non-judgemental place where inclusion, respect and collaboration are of most importance. In a yarning circle, verbal statements can be a word, sentence or longer explanation, and can aid a scientific investigation to collect information in a culturally respectful manner. For example, a yarning circle could be used to evaluate the effectiveness of a new youth sporting program aimed at increasing student attendance at a high school in an Indigenous community.

Figure 1B–14 Student leaders and captains are often interviewed for their opinion on school-related issues.

Through these different methods of fieldwork, researchers can gather a wide range of data on a person's own experiences, behaviour, attitudes, beliefs and opinions, particularly ones that may be difficult or impossible to observe.

ISBN 978-1-009-25401-4 Gallagher et al

Table 1B–10 Strengths and limitations of fieldwork

Strengths	Limitations
• Information on sensitive topics can be obtained using fieldwork. • A large amount of quantitative data can be gathered in a questionnaire in less time than for a controlled experiment. • Participant anonymity in questionnaires can reduce dishonest or biased answers. • Rich qualitative responses can be obtained in the participant's own words. • Natural settings are more likely to show behaviour that reflects real life. • If participants are unaware that they are being studied, there is no change in their behaviour due to their belief of how they are expected to behave. • Fieldwork can be used when it would be impossible or unethical to investigate by controlled experimental methods. • Fieldwork can help to gain insight into existing data or behaviours that were not expected.	• Observed behaviour is subjective and open to interpretation and bias by the researcher. • Fieldwork is prone to social desirability bias, whereby participants respond in a way that they think they should respond, particularly if the researcher is present. • In questionnaires, interviews, focus groups and yarning circles, participant responses may be inaccurate because of dishonesty, memory issues, difficulty communicating, language abilities or misunderstanding the question. • Qualitative data can be difficult to summarise. • Interviews, focus groups and yarning circles can be time consuming. • There is minimal control over extraneous variables and results may not be replicable. • There are ethical concerns with the lack of informed consent in some cases.

LINK 2A PROCESSING AND ANALYSING DATA

Literature review

A **literature review** involves collating and analysing **secondary data** findings and/or viewpoints. The findings can come from multiple published sources, including scholarly books and journal articles (Figure 1B–15). Literature reviews combine theories and results that evaluate a body of literature to answer a research question, provide background information to help explain observed events or provide a starting point for **primary data** collection.

Literature review a type of investigation that involves collating and analysing secondary data findings and viewpoints

Secondary data data obtained second hand through research conducted by another person for another purpose

Primary data data collected through first-hand research for an intended purpose

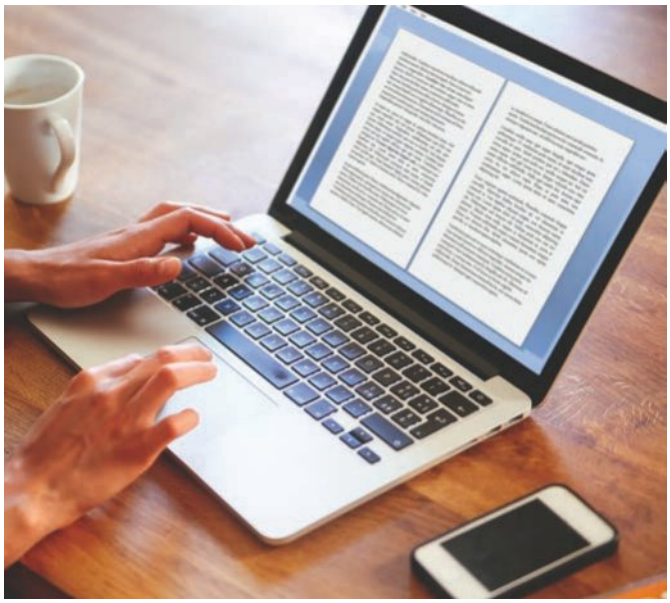


Figure 1B–15 To gather a wide range of information when writing your literature review, you can use a variety of books, publications and scientific journals.

ISBN 978-1-009-25401-4

Literature reviews do not present new research but are comprehensive and critical reviews that provide an overview on current understanding in a particular area of interest. Multiple sources are compared and critiqued, and relevant information is summarised by:

- discussing how knowledge has evolved over time
- acknowledging what research has already been completed
- highlighting the key researchers and evaluating their methodologies
- identifying areas of controversy
- describing what knowledge is currently accepted
- identifying emerging knowledge trends or gaps in current research to justify a proposed investigation.

A literature review is conducted over three main steps in which researchers:

- find the key literature relevant to their topic of investigation
- review and analyse the literature
- synthesise and organise the literature into a logical order so they can then write the review.

Literature reviews can be presented in different ways or for different purposes. They can form part of the introduction section of a larger work or a separate full-length journal article. A stand-alone literature review is usually structured into three main sections: introduction, body and conclusion. The body typically contains subheadings to organise the various parts of the review.

Table 1B–11 Strengths and limitations of literature reviews

Strengths	Limitations
• A literature review can determine what is already known and whether there is a solid foundation of knowledge, based on multiple sources. • They help introduce existing understanding and context for primary research. • They can identify expert researchers in the field. • They identify gaps in current understanding and areas for future research. • They identify methodologies that have been successful or not successful at generating significant findings.	• Key studies may be missed if the search criteria or focus of a review is too narrow, resulting in a review that lacks depth. • A selection bias in the chosen studies may result in the review being unrepresentative of current understanding or provide unbalanced conclusions. • A literature review may not comment on the validity of the original research or how the studies were selected, resulting in the reader being unable to determine the quality of each study within the review, or the review as a whole. • Literature reviews may describe multiple studies but lack a deeper analysis of the individual studies. • Only secondary data is acquired.

Modelling a type of investigation in which a physical or conceptual model is constructed and/or manipulated to simulate a system

Simulation a type of investigation that uses a model to replicate and study the behaviour of a system

2A PROCESSING AND ANALYSING DATA LINK

Modelling and simulation

In psychology, **modelling** is an investigation methodology that involves constructing and/or manipulating a physical or conceptual model of a system. Once a model is made, a **simulation** uses the model to replicate and study the behaviour of a real or theoretical system.

Models are made to replicate a small or large physical object, or to represent a system involving concepts that help people know, understand or simulate the system (Figure 1B–16). Simulations then aim to imitate the real experience. Modelling and simulations are useful for studying psychological concepts that cannot logistically or ethically be tested in controlled experiments because of complexity, size, speed, accessibility or danger.

ISBN 978-1-009-25401-4 Gallagher et al

For example, it is important to know how a new aeroplane pilot responds in emergency situations; however, it would not be ethical to put a new pilot directly into real and dangerous situations. By creating a model of an emergency in-flight situation, a pilot can practise their responses and skills safely. Also, investigators can compare the responses of multiple pilots by using the same controlled simulation testing conditions. Mice and rats are often used as models for the human condition before human trials are possible, such as in the study of neuroscience and addiction.

Simulations can take various formats. For example, virtual reality technology can simulate therapeutic procedures, or simulated people in a simulated environment can be used to create a model of the transmission rates of COVID-19 and then the predicted outcomes can be simulated by various transmission prevention strategies.

Modelling and simulation can precisely replicate events. For example, researchers can construct a computational model of a complex neurological medical case that requires brain surgery, then use simulation technology to safely practise the surgical procedure with the actual equipment. This can help reveal problems in surgical procedures, equipment and techniques before they are used in real life.

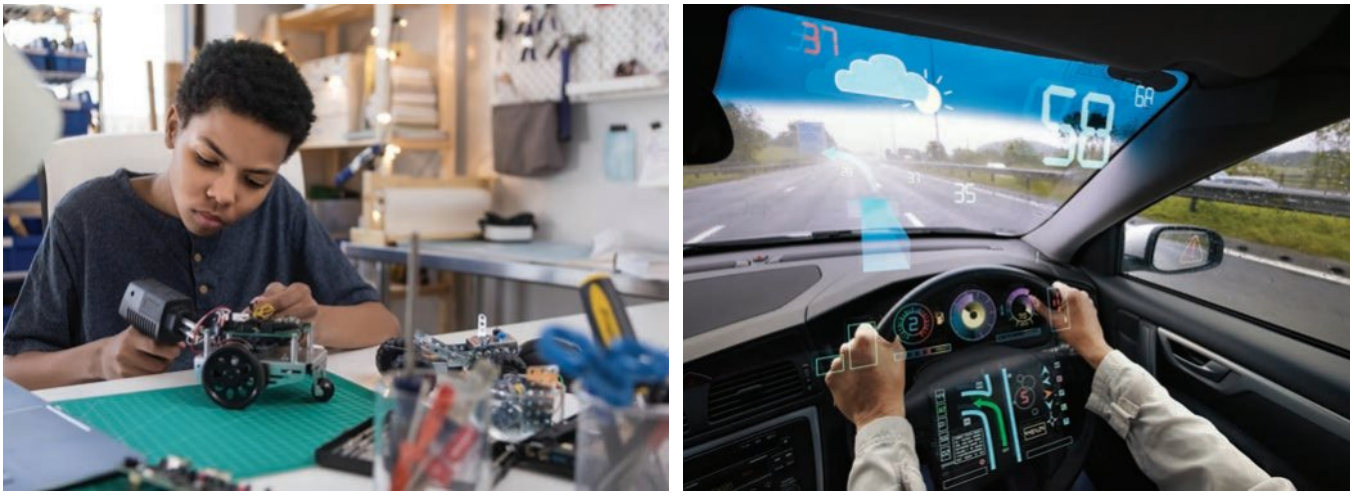


Figure 1B–16 Creating a model and then simulating its use can help to safely investigate new techniques or tools.

Modelling and simulation are useful in psychology because of the complex interaction of factors that influence behaviour that a controlled experiment may not take into consideration. An ongoing study called the Blue Brain Project aims to create the first computer simulation of the entire rodent brain. Researchers have modelled a group of neurons that make up a small functional part of a mouse's brain known as a neocortical column, thought to be responsible for conscious thought. The aim is to expand the model to a full mouse brain which can then be used to simulate the mammalian brain and identify the fundamental principles of brain structure and function.

Models can help advance our understanding of psychology as well as our ability to predict probable occurrences. Researchers created a mathematical model of consciousness and, by using simulations, could anticipate and explain cognitive processes such as decision-making as well as behavioural reactions. The model was used to experiment with different cases of psychological illnesses.

ISBN 978-1-009-25401-4 Gallagher et al

Table 1B–12 Strengths and limitations of modelling and simulation

Strengths	Limitations
• Modelling can allow for unobservable events to be visualised. • Once established, a computer simulation can run quickly with multiple trials in a short amount of time, including events that would usually be long running. • Modelling and simulation can be used to safely study new devices, therapies or treatments that would be too dangerous or unethical or logistically impossible to conduct in controlled experiments. • Simulations can allow us to predict future events and 'what if' situations. • Modelling and simulations can test a product before it is created.	• A large amount of valid source data may be needed in the creation of a model. • Computer simulations require precise, consistent statistical analysis in order to function accurately as a valid, repeatable and replicable measure. • A psychological theory may be well understood but difficult to apply as a working model. • Simulations are not the real thing and people may respond differently in real life, so simulations involve assumptions about behaviour that lower external validity because of artificiality. • Complex models and simulations may be expensive.

2A PROCESSING AND ANALYSING DATA LINK

Product, process and system development

Product, process and system development in research involves the design of a product, a process or a system to meet a human need. These may involve technological applications in addition to scientific knowledge and procedures.

Product, process and system development a type of investigation in which a product, a process or a system is designed to meet a human need

Constant advances in technology and scientific understanding mean that researchers can review the effectiveness of current products, processes and systems in order to find solutions that best aid people to function most effectively. This principle applies to all aspects of life, and some examples of general applications, and applications in psychology, now follow.

Examples of the development of new *products* and improvement of existing ones:

- the continued development of reusable bags, coffee cups and drink bottles have allowed more Australians to reduce their plastic waste and move towards a healthier and safer environment.
- developments in wearable technology mean we can track our sleep and movement 24/7.
- AI-powered chatbots can provide virtual support for our mental wellbeing.
- recent developments in electroencephalography (EEG) technology to produce portable and relatively cheap EEG devices mean a wider range of people can now monitor real-time brain activity. EEG headsets can be used for everyday functions, such as monitoring drowsiness of long-haul drivers or mining machine workers to reduce fatigue-related accidents, or to monitor the brain activity of elite athletes.

The design of a *process* that meets the need of people can help streamline a series of events into a logical order. This can improve repeatability, efficiency and predictability in many aspects of life. For example, reliable processes are important for:

- making laws safely and ethically
- enabling safe and ethical organ donations
- developing and trialling new drugs so they can be safely used by the public.

The development of new processes or refinement of current processes can help fill a gap in providing for people's needs or solve an existing problem.

ISBN 978-1-009-25401-4 Gallagher et al

Systems allow for the structure and organisation of multiple parts working together, in order to have an efficient framework for behaviour. Having 'the right systems in place' improves productivity and enhances the wellbeing of people. For example:

- the *Diagnostic and Statistical Manual of Mental Disorders* gives health professionals a reliable structure for diagnosing mental illness in patients
- in 2021, the World Health Organization created a system for naming the emerging coronavirus strains according to the Greek alphabet instead the places where they were discovered (Figure 1B–17). This system has helped reduce the geographical stigma and discrimination that was observed in the first year of the pandemic.

Figure 1B–17 New products such as prosthetic limbs, new processes such as methods to safely transport organ donations, and new systems such as ways to classifying the coronavirus strains have been developed to meet the ever-changing needs of humans.

Check-in questions – Set 5

1 What is involved in a fieldwork investigation?
2 What can a literature review be used for?
3 Why would a researcher use modelling and simulation?
4 What is involved in product, process or system development?

WORKSHEET 1B–1 INVESTIGATION METHODOLOGIES SUMMARY TABLE

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 1B–2 SUMMARISING INVESTIGATION METHODOLOGIES

Copy and complete the table to summarise the main features of each investigation methodology, including a description of what it involves, one strength, one limitation and a picture, diagram or symbol to represent the methodology.

Investigation methodology	Description	Strength	Limitation	Picture/Diagram/Symbol

VIDEO 1B–4 SKILLS: DESCRIBING STRENGTHS AND LIMITATIONS OF RESEARCH METHODS

1B–3 SKILLS

Describing strengths and limitations of research methods

There is no one perfect choice of sampling technique, investigation design or investigation methodology because it depends on the investigation being conducted. There are advantages and disadvantages of each type.

When describing the strengths and limitations of different research method concepts, it is important to ensure that you:

- describe an advantage/disadvantage of using that choice of research method; do not just define the concept
- describe an advantage/disadvantage of using that choice of research method over another method. Something cannot be a strength or limitation of that method if it applies to all method options.

If a question asks you to compare the strengths or limitations of two methods, make sure you use a comparative term such as 'whereas' and select one feature to directly compare.

Question

Provide a strength of using a correlational study over a controlled experiment.

Attempted answer

A correlational study describes the statistical association and strength of the relationship between two variables. A controlled experiment allows a conclusion to be determined for an investigation.

Marking comments

This response describes what a correlational study involves, rather than providing a strength. The statement for the controlled experiment is actually true for all investigation types, so it is not a strength of controlled experiments alone. This response also does not directly compare the two concepts. This response would receive 0/2 marks.

Suggested answer for full marks

A correlational study does not require extra procedures to control for extraneous variables, whereas a controlled experiment requires strictly controlled conditions to control for extraneous variables.

ISBN 978-1-009-25401-4 Gallagher et al

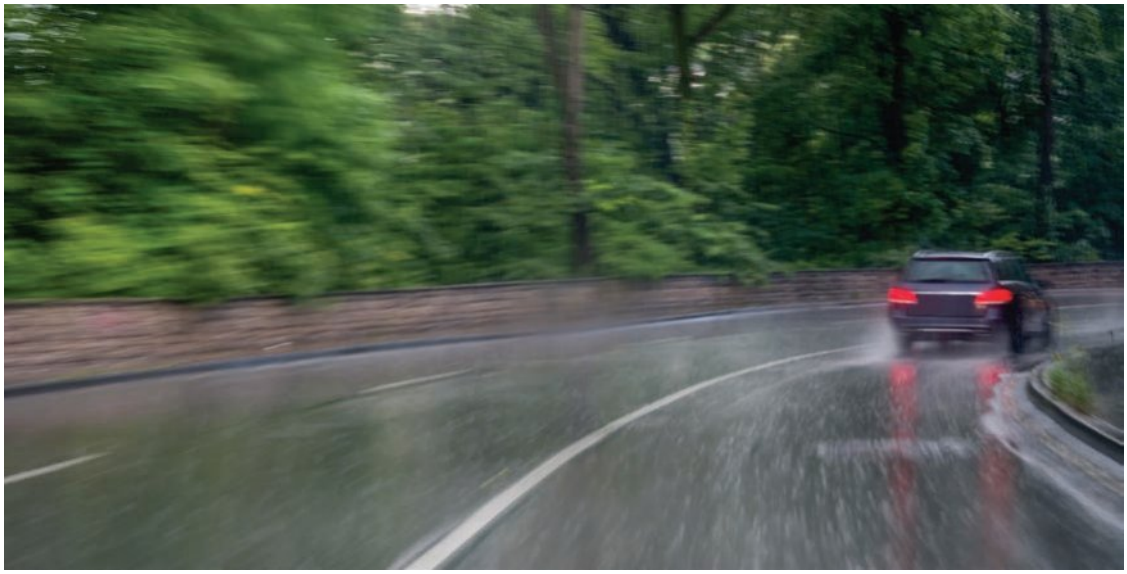
Section 1B questions

1 Describe the population, the sample and the sampling technique used in the following research scenarios.
   - **a** A clinical psychologist at Clinesdale Hospital is researching how schizophrenia impacts the brain's functioning. From the total list of patients at the Clinesdale Hospital who have been diagnosed with schizophrenia, the psychologist uses a random number generator to select 12 people to participate in the study.
   - **b** A Victorian television station is conducting a study on their children's television shows to see which one children prefer the most. They ask the Forest Hill primary school to arrange for their thirty Year 1 students to complete a questionnaire with their parents' permission and help.

2 Mr Sim is a high school Psychology teacher who wants to determine which of two methods is the best way for his students to learn in class: students highlighting and annotating a printout of the class slides presentation, or students writing their own notes in a book from the slides.
   - **a** Mr Sim divides up his Year 11 class, with half using the highlighting method and the other half using the writing method. He then compares the students' results on their topic test. Identify and explain the investigation design that Mr Sim used in this first trial.
   - **b** One of Mr Sim's best students points out that it would be even better if all students trialled both methods of learning. While students are preparing for their second topic test, Mr Sim gets them all to swap methods and complete the one that they have not done yet. He then compares each student's second topic test results with their previous topic test results. Identify and explain the investigation design that Mr Sim used in this second trial.
   - **c** Mr Sim then realises that it would have been better to determine how much each student's learning improved over the course of one topic. For the next topic, he asks students to complete a pre-test on the topic, then assigns each student to one method of learning. After students complete the post-test, he then compares their pre- and post-test results to see which method improved learning the most. Identify and explain the investigation design that Mr Sim used in this third trial.
   - **d** Suggest a limitation of the investigation design used in each of Mr Sim's trials, specific to his study.

ISBN 978-1-009-25401-4 Gallagher et al

3 Millie is a sleep psychologist interested in finding different ways to help her patients. She has heard that scents can aid in relaxation and may help people fall asleep, and she wants to conduct a scientific controlled experiment to test this theory. Millie asks some of her patients to take part in this study. She asks the first group of participants to follow their normal bedtime routine and report on how long it took them to fall asleep. She asks the second group of participants to diffuse lavender essential oil in their bedroom half an hour before they go to bed and report on how long it takes them to fall asleep.
   a Describe the role of a control group in a controlled experiment and explain how it was used in this study.
   b Describe the role of an experimental group in a controlled experiment and explain how it was used in this study.
4 A researcher is studying how the location of items in a shop can influence how often they are purchased. The researcher puts the same small bottles of hand sanitiser on the checkout counter as well as in their regular place in the toiletries aisle. The number of bottles taken from the counter and from the toiletries aisle for purchase are recorded. Information such as the time of day and from the characteristics of the shopper are also recorded as purchases are made. At the end of the week, it is found that the number of bottles of hand sanitiser purchased from the counter was greater than the number of bottles purchased from the toiletries aisle. Identify and explain the investigation methodology used in this study.
5 A researcher is beginning an investigation into the best learning strategies for students completing Year 12. Explain how a literature review might be useful for the researcher to begin this investigation.
6 The Department of Transport want to determine how the weather impacts drivers' likelihood of disobeying the road laws. Explain whether a correlational study or a controlled experiment would be the most useful investigation methodology for this study.



ISBN 978-1-009-25401-4 Gallagher et al

Safety and ethical understanding

Study Design:

Comply with safety and ethical guidelines

- Demonstrate ethical conduct and apply ethical guidelines when undertaking and reporting investigations
- Demonstrate safe laboratory practices when planning and conducting investigations by using risk assessments that are informed by safety data sheets (SDS), and accounting for risks
- Apply relevant occupational health and safety guidelines while undertaking practical investigations
- Analyse and evaluate psychological issues using relevant ethical concepts and guidelines, including the influence of social, economic, legal and political factors relevant to the selected issue

Glossary:

Beneficence
Confidentiality
Debriefing
Deception in research
Ethical concepts
Ethical guidelines
Informed consent procedures
Integrity
Justice
Non-maleficence
Occupational health and safety (OHS)
Respect
Risk assessment
Safety data sheet (SDS)
Voluntary participation
Withdrawal rights

ENGAGE

Examples of unethical research

Psychological and medical research use animal and human subjects and are therefore probably the two disciplines with the most examples of unethical research in the past. In addition to the notoriously cruel experiments carried out by Nazi German and Japanese authorities in the twentieth century, there are many other examples, including in Australia. For example, in 2000 the University of Adelaide apologised for scientific experiments conducted on Aboriginal peoples in the 1920s and 1930s that were deemed 'degrading and, in some cases, barbarous'.

Some of the historical psychological research you may encounter in this course would be considered unethical today, although this may not be apparent until you consider the details of the methodology. Examples are the Little Albert studies, the Bobo doll experiment, the Stanford Prison experiment, and the Milgram experiment. Some of these experiments have been made widely known to the general public through films (Figure 1C–1).

Figure 1C–1 The Milgram experiment was infamous enough for a 2015 movie, Experimenter, to be made about its lead researcher, Stanley Milgram.

Although examples of specific unethical research are not assessed as part of this course, you may be asked questions that require you to determine what might be unethical about certain research scenarios. You may gain some insights by reading about examples of unethical research in psychology. As always, consider the reliability and reputation of any sources you find.

ISBN 978-1-009-25401-4 Gallagher et al

VIDEO 1C–1 ETHICAL CONCEPTS

EXPLAIN

Ethical concepts in psychological issues

Ethical understanding is critical when conducting and analysing research, but also when evaluating psychological issues that are relevant to society. It is important to have an ethical understanding to consider the implications of investigations, use integrity and reach a position on science-related ethical issues. There is a need to recognise the importance of values, and social, economic, political and legal factors in responsible science-related decision-making. For example, when investigating the issue of global mental health, it is relevant to consider factors such as government policies; socio-economic status; the relationship between mental health, poverty and debt; human rights, funding and the economic burden of disease; the various risks for children and youth; and the impact of the criminal justice system.

Ethical concept general ethical considerations used to analyse the ethical and moral conduct surrounding psychological issues and psychological investigations

Integrity an ethical concept involving the commitment to searching for knowledge and understanding and the honest reporting of all sources of information and results

Some general **ethical concepts** can be considered when analysing and evaluating the ethical and moral aspects of conduct in relation to psychological issues. These concepts are general in nature and are separate to any codes, legislation and ethical guidelines that apply to the ethical conduct of psychological investigations. These ethical concepts are integrity, justice, beneficence, non-maleficence and respect.

Integrity

Integrity is the commitment to searching for knowledge and understanding and the honest reporting of all sources of information and results.

Whether results are favourable or unfavourable to the initial intentions of a study, a researcher has an obligation to report them truthfully in a way that permits scrutiny and contributes to public knowledge and understanding. Findings should be published even if they are negative or inconclusive. The actions of researchers and practising psychologists should be consistent with their internal core values, and these practitioners and researchers should maintain accountability for their actions. When reporting the results of an investigation, researchers should provide a complete and accurate representation of the facts, without manipulation, fabrication or misconduct. For example, in 2011, Dutch psychologist Diederik Stapel was found to have manipulated data and fabricated experiments that were then used in at least 30 published, peer-reviewed papers. After this case was investigated, it was recommended that there should be a 'research integrity' moderator within research departments to monitor for such behaviour.

Justice

Justice an ethical concept involving fair consideration of competing claims, no unfair burden on a particular group, and fair access to benefits of an action

Justice involves the moral obligation to ensure that competing claims are considered fairly, that there is no unfair burden on a particular group from an action, and that there is fair distribution and access to the benefits of an action.

Justice means ensuring the right to be treated fairly, such as equal access to psychological treatment regardless of age, place of residence, social status, culture or disability. However, treating all people equally is not always fair, and therefore justice means ensuring people's differences are also accounted for. For example, providing all participants, including those who are blind or have low vision, with a written informed consent form would be 'equal', but providing participants with the form in Braille or having the information read out verbally would be considered fair.

ISBN 978-1-009-25401-4 Gallagher et al

There is a responsibility to ensure all people have the right to access advances in psychology such as knowledge acquired from research and the distribution of benefits and resources. This could mean selecting an appropriate format for reporting the research outcomes. Denying a person a benefit they are entitled to without good reason would be considered unjust.

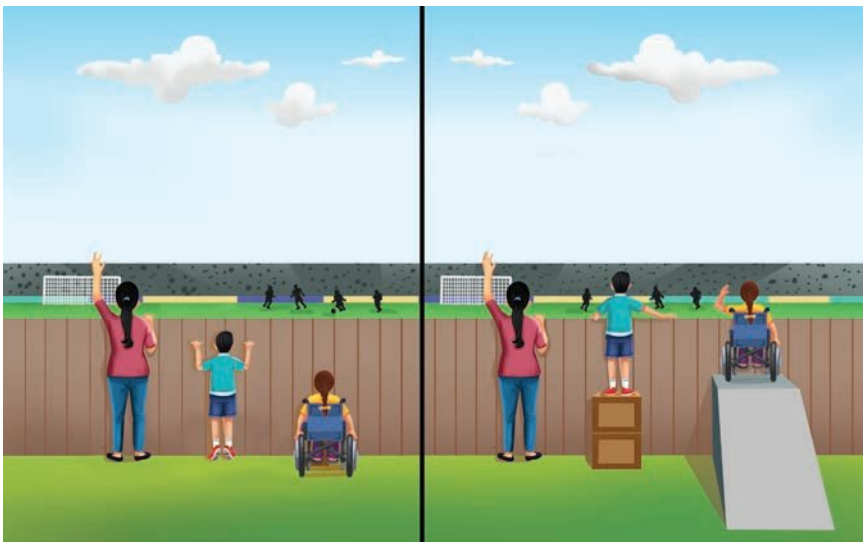


Figure 1C–2 The ethical concept of justice means ensuring people's differences are also accounted for.

The process of recruiting participants should be fair in terms of the selection, exclusion and inclusion of categories of research participants, and there should be no unfair burden on the participant. For example, some groups of people are at risk of being exposed to 'over research' because only a small number of people form that group or because they are easily available, such as those confined to psychiatric hospitals, those who are terminally ill, or those from a small, minority ethnic group.

Beneficence and non-maleficence

Beneficence is the commitment to maximising benefits and minimising the risks and harms. This is important in psychology when taking a particular position or completing a course of action, such as a research investigation. A benefit is something of positive value, such as contributing to psychological knowledge, and improving individual and societal wellbeing, and it is important that all actions are in the best interest of others.

Beneficence an ethical concept involving the commitment to maximising benefits and minimising risks and harms

Non-maleficence an ethical concept involving the avoidance of causing harm

Non-maleficence means to avoid causing harm. Determining a position or conducting scientific research in psychology may lead to a degree of harm or discomfort, so it is necessary that the possible harm resulting from any position or course of action is scientifically justifiable and is not disproportionate to the possible benefits.

Harm can include physical harm such as injury, psychological harm such as distress, social harm such as discrimination, economic harm such as costs, and legal harm such as criminal conduct. The primary concern is to do no harm, and any acceptable level of harm must be kept to a minimum.

The two ethical concepts of beneficence and non-maleficence can be considered together, in an understanding that one must act in a manner that promotes the benefit to others, while also minimising the harm to others.

Before a research investigation starts, an assessment of risk is made. This includes determining the likelihood and severity of the harm, and the short-term and longer-term risks and benefits. The researcher must always prioritise participants' wellbeing. These risks and benefits may affect the participants directly, but also their families, the wider community or particular groups they identify with.

To maintain ethical compliance, the benefit of the research must outweigh or justify any participant discomfort. For example, a person with severe form of an illness might choose to participate in a clinical trial for a new treatment; however, a person with a less severe form might not. In a clinical example, a person considering electroconvulsive therapy for

ISBN 978-1-009-25401-4 Gallagher et al

the treatment of major depression would weigh up the benefits of potentially reducing their symptoms against the risk of memory loss. During an investigation, if the balance tips so that the benefits do not outweigh the risks, then the risks are no longer justified, and the research must be stopped and reassessed.

Respect

Respect an ethical concept involving the consideration of the value of living things, giving due regard, and consideration of the capacity of living things to make their own decisions

The ethical concept of **respect** involves considering the value of living things, giving due regard, and considering the capacity of living things to make their own decisions.

Consideration of the value of living things involves respecting the extent to which a person or animal has an:

- intrinsic value, which is value for its own sake, in its own right
- instrumental value, which is value as a means to an end, resulting in some final intrinsic value.

For example, this would mean understanding that each person has worth in and of themselves, and that their value is not just as a participant in a study without any dignity.

Giving due regard to both an individual and the wider collective involves explicitly considering their welfare, liberty and autonomy, beliefs, perceptions, customs and cultural heritage. This means respecting a person's need to be treated in their best possible interest, according to their individual characteristics and with respect to their cultural sensitivities.

Researchers need to consider the capacity of living things to make their own decisions, such as a person determining their participation in research. When animals are involved, or when people have a diminished capacity to make their own decisions, such as due to age, intellectual ability or level of consciousness, they must be empowered where possible and protected as necessary.

Figure 1C–3 The ethical concept of respect involves considering the value of an individual in their own right. This also includes protecting the welfare of animals.

Check-in questions – Set 1

1 What is integrity as an ethical concept?
2 What is justice as an ethical concept?
3 What is the difference between beneficence and non-maleficence?
4 What is respect as an ethical concept?

ISBN 978-1-009-25401-4 Gallagher et al

Ethical guidelines in research investigations

In Australia, researchers using human participants in an investigation must follow the **ethical guidelines** set out by the National Health and Medical Research Council (NHMRC) in their document the 'National Statement on Ethical Conduct in Human Research', to ensure the protection and welfare of all participants in research. This document can be found and downloaded through an Internet search.

Ethical guidelines guidelines that ensure the protection and welfare of all participants in research

Human research ethics committees are involved throughout all stages of an investigation to ensure that researchers are following the mandated ethical guidelines. Ethics committees are responsible for approving research before it begins. The committee considers the level of risk of harm to participants, including the likelihood and severity of harm. Research is ethically acceptable only when its potential benefits justify any risks in the research. Once a proposal is accepted, an ethics committee will monitor the duration of the study to ensure the researchers continue to follow all ethical responsibilities.

Figure 1C–4 A research ethics committee should include people with a variety of expertise to best represent the ethical interests of the participants.

A researcher must follow the NHMRC guidelines and ensure that their proposed research has merit and reflects the overarching ethical concepts of integrity, justice, beneficence, non-maleficence and respect.

Once an investigation begins, the researcher must follow several additional ethical guidelines that are specifically relevant to research, to ensure participants' rights are met while they are involved. These guidelines include confidentiality, voluntary participation, informed consent, withdrawal rights, use of deception and debriefing.

Confidentiality

Confidentiality means ensuring that the participants remain anonymous, and their personal information is kept private, protected and secure throughout the study. Participants have the right for their details to remain confidential. For example, a participant's name should not be included with their published results. Instead, participants may be de-identified and data should be coded to allow each participant to remain anonymous. The exception to this would be when consent is explicitly given to allow data to be shared; for example, in video recordings where identity cannot be hidden. If researchers plan to share personal data, they should inform participants during the consent process, and let them know how their data will be used.

Confidentiality an ethical guideline that ensures participants remain anonymous, and their personal information is kept private, protected and secure throughout the study

Figure 1C–5 Participant information such as medical tests collected during studies must be de-identified and kept private.

ISBN 978-1-009-25401-4 Gallagher et al

Voluntary participation

Voluntary participation an ethical guideline ensuring that each participant freely agrees to participate in a study, with no pressure or coercion

Voluntary participation ensures that each participant freely agrees to participate in a study, with no pressure or coercion. It is common and acceptable for participants to be paid or receive compensation for their involvement in a study if it is deemed proportionate to the burden of the research. However, the payment must not be used to persuade a person to participate or persuade them to take undue risks. Additionally, participants must not be disadvantaged if they decide not to participate. For example, a university must not force students to be involved in a study in order to pass their university course.

Informed consent procedures

Informed consent procedures an ethical guideline conducted before a study begins – participants agree to participate after they have received all the details of the study, including the purpose, procedures and potential risks

Informed consent procedures are conducted before a study begins, where participants agree to participate in the research after they have received all the details of the investigation, including the nature and purpose, methods of data collection and potential risks. Participants usually receive this information in a written document that they must sign as their agreement to participate. Participant consent should be based on a sufficient understanding of their involvement requirements, and the possibilities for psychological or physical risk.

Informed consent is also the stage when participants are told about their withdrawal rights and confidentiality rights, and a researcher must provide an opportunity for participants to discuss the provided information and ask questions.

Participants who are under the age of 18 or who lack the capacity to consent for themselves, such as someone with a severe intellectual disability, cannot legally give consent for themselves and must have a parent or legal guardian read and sign the informed consent on their behalf. However, researchers must still attempt to obtain informed consent as far as practically possible from these groups. In all cases, it is necessary for informed consent forms to be written in plain language that the participant can understand. See the Interactive Textbook for an example of an informed consent form.

DOCUMENT 1C–1 INFORMED CONSENT FORM FOR PARTICIPATING IN RESEARCH

Withdrawal rights

Withdrawal rights an ethical guideline that ensures the participants are free to discontinue their involvement in a study at any point during or after the conclusion of the study, without receiving any penalty

Withdrawal rights ensure that participants are free to discontinue their involvement in a study without receiving a penalty. Once a participant begins a study, they cannot be forced to continue if they want to stop. They can withdraw their involvement during the study or withdraw their results after the study has concluded. Withdrawal rights should be outlined to participants in the informed consent process so that they are aware of their rights before agreeing to begin the study.

Use of deception in research

Deception in research an ethical guideline involving withholding the true nature of the study from participants, when their knowledge of the true purpose may affect their behaviour and subsequent validity of the investigation

Deception in research involves withholding the true nature of the study from participants if their knowledge of the true purpose may affect their behaviour and the subsequent validity of the investigation. Sometimes it is necessary to not tell the participants exactly what is going to happen in a study. For example, if you tell a group of children that their ability to follow the rules of a game is going to be measured, then this might cause the children to behave in a way that is different from normal. Instead, you could tell the children that the study will be measuring something else inconsequential, such as how often a particular score comes up.

Figure 1C–6 Deception may be necessary in a study when a participant's responses might be influenced by the knowledge that they are being tested on a certain variable.

ISBN 978-1-009-25401-4 Gallagher et al

Deception brings up issues about informed consent and is discouraged in psychological research; however, it is allowed if the benefits are sufficient to justify the deception, when there is no alternative method, when there is no risk of harm to participants, and when debriefing procedures at the conclusion of the investigation clarify the true nature of the study and the reason for deception. Informed consent forms should also outline the possibility of the use of deception in the study.

Debriefing

Debriefing is conducted at the end of the study and is when participants are informed of the true aims, results and conclusions of the study. Debriefing includes answering any questions, clarifying misunderstandings or deception, and providing support to ensure no lasting harm occurs to participants. During debriefing procedures, the participants are told of the findings and conclusions of the study, and informed that they may have access to their own results. It is also an opportunity to provide participants with additional contact details if they want further information and to provide them with counselling services should they need them.

Debriefing an ethical guideline involving provision of information to participants at the end of the study, including the true aims, results and conclusions, and answering any questions, clarifying misunderstandings or deception, and providing support to ensure no lasting harm

Research involving Aboriginal and Torres Strait Islander peoples

In addition to the ethical guidelines already described in this section, any research involving Aboriginal and Torres Strait Islander peoples should also follow additional guidelines to ensure their wellbeing and that they are also able to benefit from the research.

In 2018, the NHMRC developed the document 'Ethical Conduct in Research with Aboriginal and Torres Strait Islander Peoples and Communities: Guidelines for Researchers and Stakeholders'. These guidelines define six core values: spirit and integrity, cultural continuity, equity, reciprocity, respect, and responsibility. These values ensure that all research conducted with or for Aboriginal and Torres Strait Islander peoples is conducted ethically, with the aim of improving the way all researchers work with First Australians, developing and/or strengthening their research capabilities, and enhancing their rights as researchers, research partners, collaborators and participants in research.

WORKSHEET 1C–1 ANALYSING ETHICS IN RESEARCH

Additionally, dedicated ethics committees representing Aboriginal and Torres Strait Islander focused organisations are required to oversee these studies.

WORKSHEET 1C–2 RESEARCH WITH FIRST AUSTRALIANS

Figure 1C–7 The NHMRC's document 'Ethical Conduct in Research with Aboriginal and Torres Strait Islander peoples and Communities: Guidelines for Researchers and Stakeholders' outlines the six core values shown on the left.

ISBN 978-1-009-25401-4 Gallagher et al

Safety in research investigations

In addition to following all ethical considerations, when planning and conducting investigations at school, you must demonstrate safe laboratory practices, follow occupational health and safety guidelines, and account for risks by using risk assessments that are informed by safety data sheets (SDS).

Occupational health and safety (OHS) issues of health, safety and welfare that must be protected in a workplace

Risk assessment a process involving the consideration, identification and reduction of physical and psychological risk

Safety data sheet (SDS) a document that provides all the important information about a substance, such as its ingredients, precautionary statements and first aid measures

Occupational health and safety (OHS) refers to issues of health, safety and welfare that must be protected in a workplace. When conducting investigations in VCE Psychology, you should adhere to the rules and guidelines provided by your teacher to ensure that everyone remains safe.

OHS guidelines should be at the forefront of risk management when planning an investigation. **Risk assessment** is a process that considers, identifies and reduces physical and psychological risk. As with research conducted in real life, teachers and students conducting practical investigations in schools must ensure that there is no harm to participants or other people involved. A risk assessment allows you to assess the likelihood of each possible risk and its consequences before identifying a way to control the risk. Risks could involve things such as hazards in the physical surroundings, hazards formed from the activity or equipment, and hazardous substances such as chemicals. When you are using chemical substances, you should review the relevant **safety data sheet (SDS)** as part of the risk assessment. SDSs are documents that provide important information about the substance, such as its ingredients, precautionary statements and first aid measures. See the Interactive Textbook for examples of a risk assessment template and associated risk matrix chart and an SDS.

DOCUMENT 1C–2 RISK ASSESSMENT TEMPLATE AND RISK MATRIX CHART

DOCUMENT 1C–3 SAFETY DATA SHEET

Figure 1C–8 When conducting scientific investigations, it is important to follow all health and safety guidelines.

Check-in questions – Set 2

1 What is involved in maintaining the ethical guideline of confidentiality?
2 What does voluntary participation mean?
3 When does informed consent occur?
4 What are three things included in an informed consent form?
5 When can a participant withdraw from a controlled experiment?
6 Why might deception be used in research?
7 When does debriefing occur and what is its purpose?

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 1C–1 FOLLOWING ETHICAL GUIDELINES IN INVESTIGATIONS

A researcher is investigating whether primary school children who have siblings are more likely to share their toys and games with other children compared to children who do not have any siblings.

For each of the ethical guidelines in psychological research in the table below, explain what might be seen if the researcher did not follow the guideline correctly, and then explain how the researcher should properly adhere to each ethical guideline.

Ethical guideline	Not followed correctly	Adhered to correctly
Confidentiality		
Voluntary participation		
Informed consent		
Withdrawal rights		
Deception		
Debriefing		

1C SKILLS

VIDEO 1C–2 SKILLS: DEFINING KEY TERMS

Defining key terms

Answering questions in VCE Psychology SACs and exams often requires you to use key terms and their definitions. When defining or describing a key term, avoid using any part of the key term in its own definition.

For example, when describing withdrawal rights procedures, it is not clear enough to say that 'withdrawal rights involve participants having the right to withdraw from a study at any point'.

Try to pick a different word to describe the key term, such as 'withdrawal rights involve participants being able to leave a study at any point'.

This helps show that you understand what the key term actually means.

Question

Explain the ethical guideline of voluntary participation.

Attempted answer

Voluntary participation involves participants participating in an investigation voluntarily.

Suggested answer for full marks

Voluntary participation involves each participant agreeing to take part in an investigation of their own accord and free from any coercion.

ISBN 978-1-009-25401-4 Gallagher et al

Section 1C questions

1 Explain the difference between the ethical guidelines of voluntary participation and withdrawal rights.

2 A researcher is studying the buying habits of families. They select participants who come into a supermarket to be involved in the study over the following few weeks. The participants receive their consent forms and are asked to read all the information before they sign. One of the participants finds the wording very confusing and doesn't really know what they will have to do, but they sign anyway and begin their participation. Over the next four weeks, the shoppers are required to submit their shopping receipts to the researcher. At the end of the study, the researcher tells the participants their findings and thanks them for their involvement. The supermarket asks the researcher for the results and decides to include the results of the study for each participant in their weekly shopper email to show how supportive their customers are.
   - **a** Explain how voluntary participation was maintained in this investigation.
   - **b** Identify and explain one other ethical guideline that was followed correctly in this study.
   - **c** Identify and explain two ethical guidelines that were not followed correctly in this study. Explain what the researcher should do to fix these ethical issues.
   - **d** Explain the ethical guideline of withdrawal rights in relation to this investigation.
   - **e** Explain how the ethical concept of integrity can be applied to this investigation.

3 A student is completing a practical investigation as part of their VCE Psychology coursework. They are conducting a study at school to investigate whether students are likely to help someone who has dropped their books on a staircase. Identify one risk the student would need to consider when completing a risk assessment for this investigation.

4 When writing an article about the mental health challenges of adolescents, the writer should ensure they apply the ethical concept of beneficence. Explain what upholding beneficence means.

Figure 1C–9 Always be sure to review your understanding of the ethical guidelines before beginning any new work.

ISBN 978-1-009-25401-4 Gallagher et al

Chapter 1 review

Summary

Create your own set of summary notes for this chapter on paper or in a digital document. A model summary is provided in the Teacher Resources, which can be used to compare with yours.

Checklist

In the Interactive Textbook, the success criteria are linked from the review questions and will be automatically ticked when answers are correct. Alternatively, print or photocopy this page and tick the boxes when you have answered the corresponding questions correctly.

Success criteria – I am now able to:		Linked questions
1A.1	Identify and research aims and questions for investigation	2☐
1A.2	Construct aims and questions for investigation	11b☐
1A.3	Distinguish between independent, dependent, controlled, extraneous and confounding variables	11c☐
1A.4	Identify the independent, dependent and controlled variables within controlled experiments	12b☐
1A.5	Identify extraneous variables to be controlled in a controlled experiment	12c☐
1A.6	Explain the effect of extraneous and confounding variables on the results of a controlled experiment	12c☐
1A.7	Write a hypothesis to focus an investigation	2☐
1A.8	Predict the possible outcomes of an investigation	10☐, 11a☐
1B.1	Describe and identify examples of the use of different investigation methodologies, including case study; classification and identification; controlled experiment; correlational study; fieldwork; literature review; modelling; product, process or system development; simulation	3☐
1B.2	Describe and identify the use of within subjects, between subjects and mixed designs in a controlled experiment	12a☐
1B.3	Evaluate strengths and limitations of different investigation methodologies and select an appropriate investigation methodology for a proposed investigation	9a☐
1B.4	Evaluate strengths and limitations of different investigation designs for a controlled experiment and select an appropriate design for a proposed investigation	12a☐
1B.5	Describe and identify the use of random and stratified sampling techniques in an investigation	4☐
1B.6	Evaluate strengths and limitations of different sampling techniques and select an appropriate technique to achieve representativeness	9b☐
1B.7	Select and use appropriate equipment and procedures for an investigation, and select an appropriate sample size to achieve representativeness	9b☐
1B.8	Work independently and collaboratively within constraints, adapting or extending processes as required and recording modifications	9d☐
1C.1	Describe and evaluate the use of general ethical concepts to be followed in psychological investigations, including integrity, justice, beneficence, non-maleficence and respect	5☐

ISBN 978-1-009-25401-4

Success criteria – I am now able to:		Linked questions
1C.2	Describe and evaluate the use of the additional ethical guidelines to be followed in psychological investigations, including confidentiality, voluntary participation, informed consent procedures, withdrawal rights, use of deception and debriefing	1☐
1C.3	Consider the ethical implications of investigations when planning an investigation and demonstrate ethical conduct and apply ethical guidelines when recording data, using data and reporting outcomes of investigations	9c☐
1C.4	Demonstrate safe laboratory practices by identifying areas of risk and using risk assessments that are informed by safety data sheets when planning and conducting investigations	8☐
1C.5	Evaluate the use of and apply relevant occupational health and safety guidelines while planning and undertaking practical investigations	8☐
1C.6	Analyse and evaluate psychological issues with reference to the influence of relevant social, economic, legal and political factors	7☐
1C.7	Analyse and evaluate psychological issues using ethical concepts of integrity, justice, beneficence, non-maleficence and respect	6☐

Multiple-choice questions

1 Which of the following is incorrect about the ethical guideline of debriefing?

A Debriefing is a time where participants can be provided with any further information, including offers of counselling where required.

B During debriefing, the true nature of the study is outlined to the participants.

C Debriefing is conducted before the study to inform participants about the procedures and risks involved in the study.

D Debriefing is required following any study involving the use of deception.

The following information relates to Questions 2–5.

A researcher is investigating the drink preferences of children. They ask a local primary school to participate. The school sends information home to parents, who either agree or do not agree for their children to participate in the study.

2 Which of the following would be a correct hypothesis and aim for the investigation?

	Hypothesis	Aim
A	To investigate whether children prefer soft drink or juice.	That children prefer lemonade.
B	That children prefer lemonade.	Do children prefer lemonade, soft drink or apple juice?
C	Do children prefer lemonade, soft drink or apple juice?	That children prefer to drink orange juice compared to a cola soft drink.
D	That children prefer to drink orange juice compared to a cola soft drink.	To investigate whether children prefer to drink soft drink or juice.

ISBN 978-1-009-25401-4

3 The children are provided with four different unlabelled drinks, all presented in white plastic cups. The children try each drink and afterwards are asked questions by a research assistant to determine their favourite drink. Which investigation methodology is being used in this part of the investigation?

A It is using fieldwork, because they are using an interview technique.

B It is using a case study, because they are using a small group of participants.

C It is using product design, because they are trialling different products.

D It is using classification, because each child is classifying their favourite drink.

4 In this investigation, did the researchers use a stratified sampling technique?

A No, they didn't, because the researchers did not allow each child in the population the same equal opportunity to be sampled.

B Yes, they did, because the researchers divided up the population into children and adults before selecting their sample in a proportionate way.

C No, they didn't, because the researchers did not divide the population into subgroups before selecting the sample.

D Yes, they did, because the researchers allocated each child into one of the four different conditions, depending on drink type.

5 During the informed consent procedures, the researchers ask the parents whether their children have any food-related allergies before accepting them as participants. This demonstrates that the researchers are trying to minimise any possible harm to the children. Which ethical concept does this relate to?

A non-maleficence

B respect

C justice

D integrity

6 When analysing ethical issues in Psychology, the ethical concept of justice involves

A avoiding the causation of harm.

B there being no unfair burden on a particular group from an action.

C the commitment to honest reporting of information.

D the maximisation of benefits.

7 An investigation is conducted into the development of high-rise buildings in a beachside town. The local residents are divided on the issue, as many residents feel that the new buildings will ruin the small-town atmosphere. This project has caused a lot of controversy in the town and several fights have broken out on the street among disagreeing residents. The fighting would be considered which type of factor?

A social

B legal

C political

D economic

ISBN 978-1-009-25401-4 Gallagher et al

8 An investigation into taste perception is using PTC taste papers, which are small strips of paper that can test for the genetically controlled ability to taste a substance. Which of the following statements is not correct regarding the ethical and safety considerations that would be needed when using taste papers?

A The safety data sheet for the PTC taste test papers should be reviewed prior to commencement.

B The informed consent form for participants should include a statement about the use of the PTC taste test papers.

C Any risks, such as allergic reactions, should be considered in the risk assessment.

D The participants should not be told in advance about the PTC taste test papers because it could influence their perceptions of taste.

Short-answer questions

9 A plant nursery is looking to begin selling its plants online through its website. Before investing in this process, the nursery wishes to find out whether its customers would like this option.

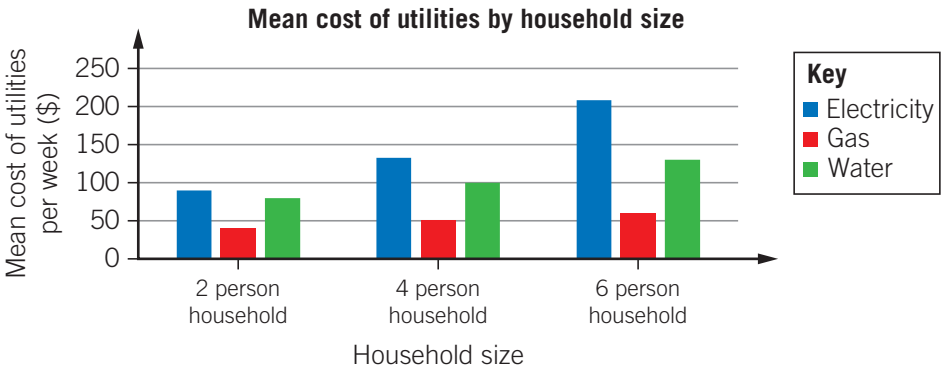
a Identify and explain the investigation methodology that would be most beneficial to the plant nursey to find out this information. (3 marks)

b The nursery surveys customers who come into the nursery over the course of one week. Evaluate the sampling technique that the nursey used and describe a potential limitation of this technique for the conclusion of the nursery's study. (2 marks)

c Describe how the nursery should maintain the ethical guideline of confidentiality while completing this investigation. (1 mark)

d Once the nursery has collected and analysed its customer data, describe how they could extend their investigation using the methodology of product, process or system development. (2 marks)

10 A researcher for a council is collecting data on how household bills change according to the size of the household. They conduct surveys to find the cost of utilities (electricity, gas and water) per week from a variety of households in a local neighbourhood. Their results are shown in the bar graph below.



Predict the likely results if this study was conducted on a household of eight people. (2 marks)

ISBN 978-1-009-25401-4 Gallagher et al

11 A new clothing shop, 'Vines', is monitoring their online customer purchasing habits to see how they compare to their competitors. They tracked their overall sales for their first six months of trading as shown in the table below.

	January	February	March	April	May	June
Number of sales	15	17	25	35	50	105

a Predict the likely results for the month of July. (1 mark)

b Write an aim for this investigation. (1 mark)

c Provide one similarity and one difference between extraneous variables and confounding variables. (2 marks)

12 An educational psychologist wants to test the difference in effectiveness between two strategies for teaching children to read. They sample a group of children aged five years old from a local primary school. The current reading level of the children was assessed using a reading test. All the children were then taught using the first reading strategy for one term before completing a second reading test. Their reading improvement scores were recorded. The children were then taught to use the second reading strategy for one term before completing a final reading test. Their final reading improvement scores were recorded.

a Identify the investigation design used and justify whether it was the most appropriate choice. (2 marks)

b Why would the type of reading strategy be considered the independent variable in this investigation? (1 mark)

c Identify one extraneous variable in this investigation and explain why it should be controlled. (2 marks)

ISBN 978-1-009-25401-4 Gallagher et al

KEY SCIENCE SKILLS

CHAPTER 2 RECORDING AND ANALYSING DATA, DRAWING AND COMMUNICATING CONCLUSIONS

Introduction

In Chapter 1, we began looking into how we can learn about the behaviour and mental processes of humans by conducting scientific research. The first steps of research were discussed, including determining aims and hypotheses, selecting investigation methodology, and understanding the importance of complying with ethical guidelines.

In this chapter, we continue developing key science skills, focusing on those involved in data, including collecting, recording, analysing and presenting the results of an investigation. The final steps of research will then be covered, including concluding the study and communicating the findings of an investigation. Chapters 1 and 2 are both repeated in the Units 3&4 book (with different questions) so they may be deferred or revised in Year 12.

Curriculum

Key Science Skills

Study Design:	Learning objectives – at the end of this chapter I will be able to:
Generate, collate and record data • Systematically generate and record primary data, and collate secondary data, appropriate to the investigation	**2A Processing and analysing data** **2A.1** Distinguish between primary and secondary data **2A.2** Systematically generate and record primary data, and collate secondary data for an investigation
• Design and conduct investigations; select and use methods appropriate to the investigation, including consideration of sampling technique (random and stratified) and size to achieve representativeness, and consideration of equipment and procedures, taking into account potential sources of error and uncertainty; determine the type and amount of qualitative and/or quantitative data to be generated or collated	**2A.3** Determine the type and amount of qualitative and quantitative data to be generated or collected in an investigation **2A.4** Identify potential sources of error and uncertainty when designing and conducting investigations

ISBN 978-1-009-25401-4 Gallagher et al

Study Design:	Learning objectives – at the end of this chapter I will be able to:
• Record and summarise both qualitative and quantitative data, including use of a logbook as an authentication of generated or collated data	**2A.5** Distinguish between the features of qualitative and quantitative data **2A.6** Identify examples of qualitative and quantitative data and evaluate the appropriateness of their use in an investigation **2A.7** Accurately and systematically record and summarise qualitative and quantitative data, including using a logbook
• Organise and present data in useful and meaningful ways, including tables, bar charts and line graphs	**2A.8** Describe the features and uses of tables, bar charts and line graphs to organise and present data **2A.9** Select a meaningful and relevant presentation format, and then organise and present data using tables, bar charts and line graphs **2A.10** Interpret data presented in tables, bar charts and line graphs
Analyse and evaluate data and investigation methods • Process quantitative data using appropriate mathematical relationships and units, including calculations of percentages, percentage change and measures of central tendencies (mean, median, mode), and demonstrate an understanding of standard deviation as a measure of variability	**2A.11** Describe the features and purposes of using percentages, percentage change, measures of central tendency (mean, median, mode), and measures of variability (standard deviation) **2A.12** Select the appropriate mathematical relationships for a set of quantitative data and calculate the percentage, percentage change, mean, median, mode and standard deviation using the correct units of measurement **2A.13** Interpret quantitative data presented as percentages, percentage change, measures of central tendency (mean, median, mode), and measures of variability (standard deviation)
• Identify and analyse experimental data qualitatively, applying where appropriate concepts of: accuracy, prec ision, repeatability, reproducibility and validity; errors; and certainty in data, including effects of sample size on the quality of data obtained	**2A.14** Describe the concepts of accuracy, precision, repeatability, reproducibility, true values, internal and external validity, errors and certainty in relation to a qualitative analysis of data **2A.15** Describe and analyse the effect of sample size on the quality of data obtained **2A.16** Analyse data qualitatively for accuracy, precision, repeatability, reproducibility, true values, internal and external validity, errors and certainty

ISBN 978-1-009-25401-4 Gallagher et al

Study Design:	Learning objectives – at the end of this chapter I will be able to:
• Identify outliers and contradictory or incomplete data	**2A.17** Identify outliers, contradictory data and incomplete data in a data set **2A.18** Analyse the effect of outliers, contradictory and incomplete data on a data set
• Repeat experiments to ensure findings are robust	**2A.19** Explain the benefit of repeating experiments to ensure findings are robust
• Evaluate investigation methods and possible sources of error or uncertainty, and suggest improvements to increase validity and to reduce uncertainty	**2A.20** Evaluate investigation methods and the effect of possible sources of error or uncertainty in an investigation **2A.21** Suggest improvements regarding sources of error or uncertainty in investigation methods to increase validity and to reduce uncertainty
Construct evidence-based arguments and draw conclusions • Distinguish between opinion, anecdote and evidence, and scientific and non-scientific ideas	**2B Drawing conclusions and communicating scientific ideas** **2B.1** Distinguish between opinion, anecdote and evidence, and scientific and non-scientific ideas **2B.2** Evaluate sources of information for the use of opinion, anecdote, evidence, scientific and non-scientific ideas
• Evaluate data to determine the degree to which the evidence supports the aim of the investigation, and make recommendations, as appropriate, for modifying or extending the investigation	**2B.3** Evaluate data to determine the degree to which the evidence supports the aim of an investigation **2B.4** Provide appropriate recommendations for modifications or extensions to an investigation
• Evaluate data to determine the degree to which the evidence supports or refutes the initial prediction or hypothesis	**2B.5** Evaluate data to determine the degree to which the evidence supports or refutes the initial prediction or hypothesis of an investigation
• Use reasoning to construct scientific arguments, and to draw and justify conclusions consistent with the evidence base and relevant to the question under investigation	**2B.6** Construct scientific arguments using reasoning **2B.7** Use reasoning and evidence to draw and justify conclusions for a question under investigation
• Identify, describe and explain the limitations of conclusions, including identification of further evidence required	**2B.8** Identify, describe and explain the limitations of conclusions **2B.9** Identify when further evidence is required, and suggest what further evidence would improve the limitations of an investigation's conclusions

ISBN 978-1-009-25401-4

Study Design:	Learning objectives – at the end of this chapter I will be able to:
• Discuss the implications of research findings and proposals, including appropriateness and application of data to different cultural groups and cultural biases in data and conclusions	**2B.10** Discuss relevant implications of research findings and proposals **2B.11** Evaluate cultural bias in data and conclusions to determine the appropriateness of application to different cultural groups
Analyse, evaluate and communicate scientific ideas • Use appropriate psychological terminology, representations and conventions, including standard abbreviations, graphing conventions and units of measurement	**2B.12** Use appropriate psychological terminology, representations and conventions, including standard abbreviations **2B.13** Use appropriate graphing conventions and units of measurement when presenting data from investigations
• Discuss relevant psychological information, ideas, concepts, theories and models and the connections between them	*This dot point is covered in Chapters 4 to 10*
• Critically evaluate and interpret a range of scientific and media texts (including journal articles, mass media communications, opinions, policy documents and reports in the public domain), processes, claims and conclusions related to psychology by considering the quality of available evidence	**2B.14** Access and interpret the information provided in a range of scientific and media texts including journal articles, mass media communications, opinions, policy documents and reports in the public domain **2B.15** Critically evaluate the quality of evidence provided by a range of scientific and media texts, processes, claims and conclusions
• Use clear, coherent and concise expression to communicate to specific audiences and for specific purposes in appropriate scientific genres, including scientific reports and posters	**2B.16** Identify relevant audiences for specific scientific communications and use clear, coherent and concise expression to communicate for specific purposes in appropriate scientific genres **2B.17** Describe and apply the requirements for writing a scientific report and a scientific poster to an investigation
• Acknowledge sources of information and assistance, and use standard scientific referencing conventions	**2B.18** Locate the required referencing details within scientific and media texts and use standard scientific referencing conventions to acknowledge sources of information and assistance used in research

ISBN 978-1-009-25401-4

Glossary

Abstract
Accuracy
Anecdote
Bar chart
Conclusion
Contradictory data
Discussion section
Evidence
External validity
Implications
Incomplete data
Internal validity
Introduction section
Limitations of conclusions
Line graph
Mean
Measurement error
Measure of central tendency
Measures of variability
Median
Methodology section
Mode
Opinion
Outlier
Percentage
Percentage change
Personal error
Precision
Primary data
Qualitative data
Quantitative data
Random error
References and acknowledgements section
Repeatability
Replicability
Reproducibility
Results section
Scientific poster
Scientific report
Secondary data
Standard deviation
Systematic error
Table
True value
Uncertainty
Validity

ISBN 978-1-009-25401-4

Concept map

Generating, recording, processing, presenting and analysing primary and secondary data in investigations

2A Processing and analysing data

Constructing evidence-based scientific arguments, drawing conclusions based on investigation data and effectively communicating scientific ideas

2B Drawing conclusions and communicating scientific ideas

See the Interactive Textbook for an interactive version of this concept map interlinked with all concept maps for the course.

ISBN 978-1-009-25401-4 Gallagher et al

Processing and analysing data

Study Design:

Generate, collate and record data

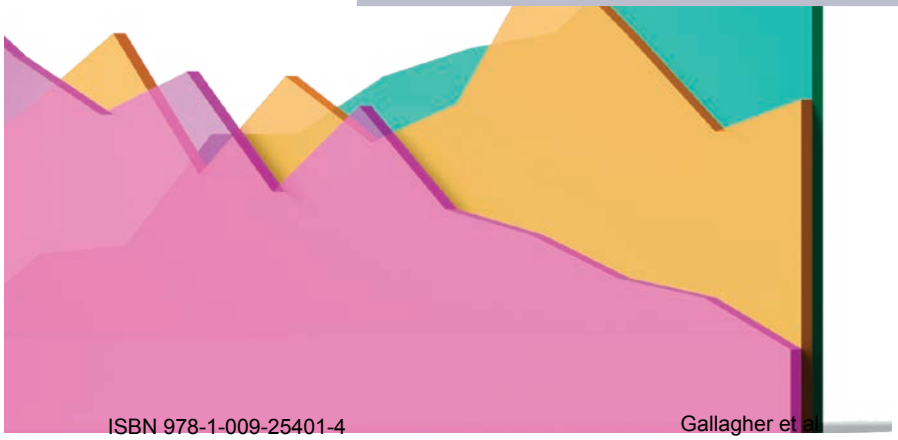
- Systematically generate and record primary data, and collate secondary data, appropriate to the investigation
- Design and conduct investigations; select and use methods appropriate to the investigation, including consideration of sampling technique (random and stratified) and size to achieve representativeness, equipment and procedures, taking into account potential sources of error and uncertainty; determine the type and amount of qualitative and/or quantitative data to be generated or collated
- Record and summarise both qualitative and quantitative data, including use of a logbook as an authentication of generated or collated data
- Organise and present data in useful and meaningful ways, including tables, bar charts and line graphs

Analyse and evaluate data and investigation methods

- Process quantitative data using appropriate mathematical relationships and units, including calculations of percentages, percentage change and measures of central tendencies (mean, median, mode), and demonstrate an understanding of standard deviation as a measure of variability
- Identify and analyse experimental data qualitatively, applying where appropriate concepts of: accuracy, precision, repeatability, reproducibility and validity; errors; and certainty in data, including effects of sample size on the quality of data obtained
- Identify outliers and contradictory or incomplete data
- Repeat experiments to ensure findings are robust
- Evaluate investigation methods and possible sources of error or uncertainty, and suggest improvements to increase validity and to reduce uncertainty

Glossary:

Accuracy
Bar chart
Contradictory data
External validity
Incomplete data
Internal validity
Line graph
Mean
Measurement error
Measures of central tendency
Measure of variability
Median
Mode
Outlier
Percentage
Percentage change
Personal error
Precision
Primary data
Qualitative data
Quantitative data
Random error
Repeatability
Reproducibility
Secondary data
Standard deviation
Systematic error
Table
True value
Uncertainty
Validity



ISBN 978-1-009-25401-4

ENGAGE

Correlation does not equal causation

It is important to understand that even though two variables appear to be correlated, it does not necessarily mean that one causes a change in the other. For example, the first line graph below shows that the yearly consumption of cheese in the US correlates almost perfectly with the yearly total revenue generated by golf courses in the US (r = 0.99). The second line graph shows that honey produced in bee colonies in the US correlates almost perfectly with the number of visitors to SeaWorld Florida. While these two sets of data feature almost perfect correlations, it does not mean an increase in the total revenue generated by golf courses actually causes an increase in cheese consumption in the US, or that the trend of honey produced in bee colonies causes the trend in visitors to SeaWorld Florida.

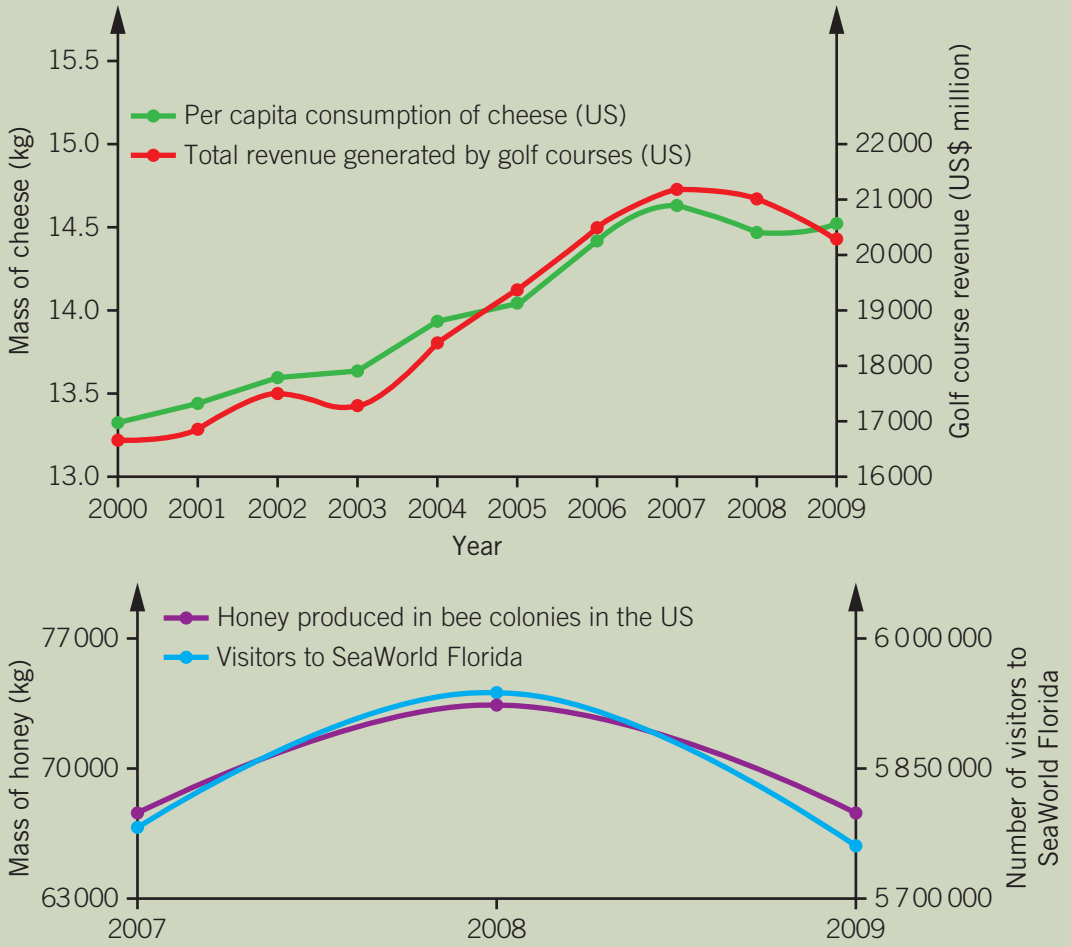


Figure 2A–1 Top: Graphs of yearly consumption of cheese in the United States and yearly total revenue generated by US golf courses. Bottom: Graphs of honey produced by US bee colonies and numbers of visitors to SeaWorld Florida.

EXPLAIN

Working with data

Collecting data is an essential part of research. Not all types of investigations are suited to collecting all types of data; so the type of data collected in a controlled experiment may be different from the data collected in a fieldwork interview. Once you have used an appropriate method, you need to organise the collected data and present it clearly so that you can analyse it and draw conclusions.

ISBN 978-1-009-25401-4 Gallagher et al

1B PLANNING AND CONDUCTING INVESTIGATIONS LINK

Types of data

Primary and secondary data

Primary data data collected through first-hand research for an intended purpose

Secondary data data obtained second hand through research conducted by another person for another purpose

Primary data is collected through first-hand experience; for example, a researcher using a questionnaire to conduct their own study. Primary data is useful because it can be tailored to the specific purpose of the investigation; however, conducting an original investigation to collect primary data can be costly and time consuming.

Secondary data is obtained second hand through research conducted or data collected by another person for another purpose. Secondary data may be used when it is not possible to collect primary data because of time or cost, or if participants are unavailable. For example, a researcher could use Australian Census data to track the amount of crime across time, after the implementation of a particular crime-prevention method in a community. Secondary data can also provide a baseline level to compare current primary data against. It is a cost- and time-effective way of collecting large amounts of data without the need for participants or equipment. Secondary data must be considered carefully because the validity of the original study may not be known.

VIDEO 2A–1 ANALYSING QUALITY OF DATA

Figure 2A–2 Left: Primary data methods involve collecting new data such as measurements from medical equipment. Right: Secondary data methods involve using data from previous research, such as is found in archives.

Qualitative and quantitative data

Qualitative data data that describes characteristics and qualities

Qualitative data describes characteristics and qualities. Qualitative data can be in the form of words, photographs, videos, audio and other recordings that are not measured with a number. For example, in a study on the imaginative play behaviour of children, an observer might collect qualitative data by writing a description of behaviours that they see or recording a video of the child describing their game in their own words. Qualitative data can be collected through many types of investigations, including fieldwork interview questions, questionnaires, and observational methods. The results can be rich in detail and be used to further explain quantitative data. However, the use of qualitative data can be limited because it can be difficult to summarise and then compare, particularly when responses are in the participants' own words.

Quantitative data data that includes measurable values and quantities and can be compared on a numerical scale

Quantitative data involves measurable values and quantities and can be compared on a numerical scale. Quantitative data can be in the form of measurements such as length, weight or time, or in the form of frequencies and tallies. For example, in a study on the imaginative play behaviour of children, an observer could record the number of times they observe a child exhibiting a certain behaviour and the number of minutes that the behaviour was displayed.

ISBN 978-1-009-25401-4 Gallagher et al

Quantitative data can be collected through many types of investigations, such as controlled experiments and fieldwork observations. Unlike qualitative data, quantitative data can be summarised easily in the form of summary statistics, which allows for comparisons between groups.

Qualitative data

This cat:

- has brown spotted fur
- has white whiskers
- is small
- has large ears
- has yellow-green eyes.

Quantitative data

This cat:

- is 5 years old
- weighs 4.5 kg
- has 4 legs
- is 40 cm long
- has 18 claws.

Figure 2A–3 Both qualitative data and quantitative data can be used to describe this cat.

Check-in questions – Set 1

1 What is the difference between primary and secondary data?
2 What is the difference between qualitative and quantitative data?

LINK 2B DRAWING CONCLUSIONS AND COMMUNICATING SCIENTIFIC IDEAS

Processing quantitative data

Large amounts of raw data alone do not tell us much about what a study has found. Once you have collected raw data, you need to summarise and then organise it to find patterns and relationships, compare groups, and interpret the findings. A conclusion can then be reached. Different types of statistics are used to make the raw data meaningful.

Using percentages

A **percentage** is a part of a whole, expressed as a proportion out of 100. For example, 5% means 5 per 100, or 5 parts of 100, and is the same as the fraction $\frac{5}{100}$. Percentages allow us to see differences and make comparisons, and are useful when comparing values that are not out of the same number and that involved different sample sizes. Worksheet 2A–1 provides worked examples and practice questions on how to calculate a percentage.

Percentage
a part of a whole, a proportion out of 100

WORKSHEET 2A–1 CALCULATING SUMMARY STATISTICS

For example, the Australian Bureau of Statistics collects census data on the occupations of people across the country. The 2016 Census found that 42 858 females in the Greater Melbourne region listed their occupation as Technician or Trade Worker, whereas only 15 255 females in the rest of Victoria listed their occupation as Technician or Trade Worker. This looks like a very large difference, but it does not take into account the larger number of people in total in the Greater Melbourne area than in the rest of Victoria. A fairer way of comparing the two groups is to look at the percentages of females working as technicians or trade workers out of the total number of females in each region (Table 2A–1). This shows that there is a similar proportion of females in this occupation group in both regions.

ISBN 978-1-009-25401-4 Gallagher et al

Table 2A–1 Statistics on female technicians and trade workers by region, sourced from the Australian Bureau of Statistics (2019)

	Number of females working as technicians or trade workers'	Total number of females (>15 years old) in the region	Percentage of all females in the region working as technicians or trade workers (%)
Greater Melbourne	42858	998542	4.3
Rest of Victoria	15255	296681	5.1

Percentage change a calculation of the degree of change in a value over time

Percentage change is a calculation of the degree of change in a value over time. It allows you to compare an old value and a new value, and to see how the value has increased or decreased. Percentage change can be calculated for any quantity that has been measured over time to determine how much it has changed. A positive percentage change indicates a percentage increase, and a negative percentage change indicates a percentage decrease. For example, if there were 15 customers in a store on one day, and 20 customers on the following day, then the percentage change is 33%. This means that there was a 33% increase in the number of customers on the second day. Worksheet 2A–1 provides worked examples and practice questions on how to calculate a percentage change.

Measures of central tendency

Measures of central tendency a category of statistics that describes the central value of a set of data

Mean a statistic that is the average value of a set of data

Measures of central tendency are a category of statistics that describe the central value of a set of data. The mean, median and mode are all measures of central tendency.

Mean

The **mean** is the average value of a set of data. It represents a typical, central value and gives an overall idea of the data set. The mean is useful when analysing data because it summarises a large amount of data into a single value. Calculating the mean for each group of data allows you to compare the typical responses from each group. For example, in a study testing whether two new running shoe designs increase the performance of marathon runners, 20 participants use the first design and 20 participants use the second design. The mean time taken to run the marathon is calculated for each group to find the average time taken for each design, in order to see which design was the best. Worksheet 2A–1 provides worked examples and practice questions on how to calculate the mean.

One disadvantage of using a mean to calculate the average of a set of data is that it is vulnerable to extreme values known as outliers. For example, if a very low test score is included in a set of data, the mean is pulled down, which may not reflect the typical score as well. The mean is most meaningful when all the data values are normally distributed and not positively or negatively skewed. Outliers are further explained later in this section.

Median

Median the middle value in an ordered set of data

The **median** is the middle value in an ordered set of data. It is the value that splits the set of data in half. To find the median, you first need to put the set of values in increasing or decreasing order. The median can be useful if a data set has outliers because it is not affected by extreme values. The method to determine the median depends on whether there is an even or an odd number of values. If there is an odd number of values in the data set, the median is the middle value, and there is an equal number of values above and below. If there is an even number of values, then there is not one exact middle value, so the median is found

ISBN 978-1-009-25401-4 Gallagher et al

by calculating the mean of the two middle values (Figure 2A–4). Worksheet 2A–1 provides worked examples and practice questions on how to calculate the median for even and odd data sets.

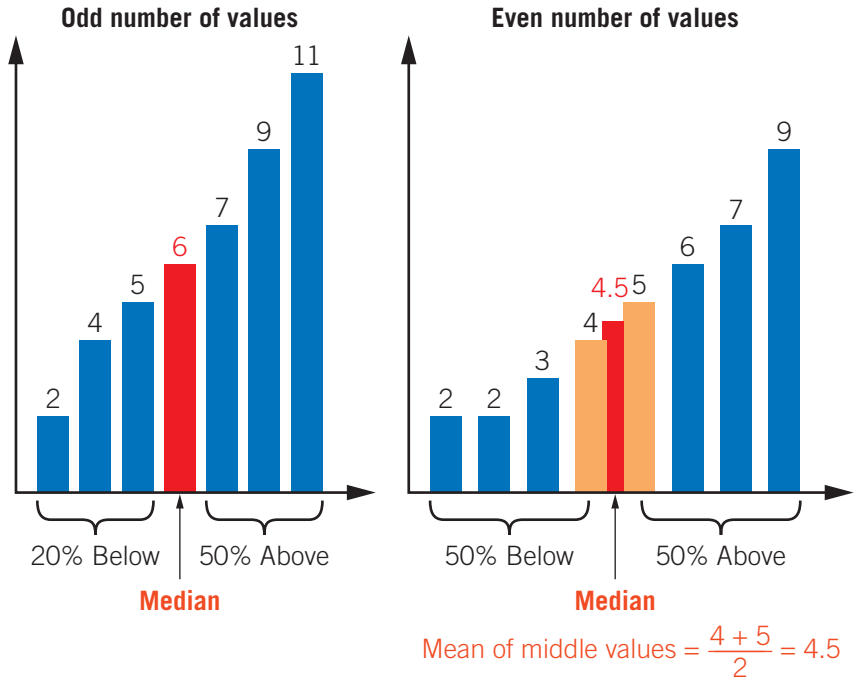


Figure 2A–4 Finding the median. Left: This data set has an odd number of values, which makes it easy to find the middle value once you put the values in order. Right: This data set has an even number of values, with two values in the middle after putting them all in order, so you must take the mean of these middle two values.

Mode
the value that occurs most frequently within a set of data

Mode

The **mode** is the value that occurs most frequently within a set of data. It is the most common value. There may be more than one mode for a set of data, if there are multiple values that have the same highest frequency. There may be no mode, if no one value is repeated in a data set. Worksheet 2A–1 provides worked examples and practice questions on how to calculate the mode.

The mean, median and mode are all measures of central tendency that describe the central location of a set of data. Which statistic should be used depends on the type of data being analysed (Table 2A–2).

Figure 2A–5 In a lottery, the mode is the number that comes out the highest number of times.

Table 2A–2 Uses of different summary statistics

Type of data	Mean	Median	Mode
Qualitative data, including categorical data			✔
Quantitative data that is continuous (e.g. height, weight, time, temperature) with a symmetrical distribution	✔	✔	✔
Quantitative data that is continuous with a skewed distribution		✔	
Data with outliers or small data sets		✔	✔

ISBN 978-1-009-25401-4 Gallagher et al

VIDEO 2A–2 SKILLS: INTERPRETING RESULTS TABLES

2A–1 SKILLS

Interpreting results tables

In the VCE Psychology exam, you will not have access to a calculator, so you will not be asked to calculate a difficult mean, percentage or percentage change. However, you will need to be able to interpret these statistics and relate them to key knowledge.

Table 2A–3 shows how sleep deprivation can affect performance on a cognitive task, including the time taken to complete the task and the percentage of errors occurring during the task.

Table 2A–3 Performance on a cognitive task according to the number of hours slept

	Hours of sleep					
	7	6	5	4	3	2
Mean time taken (min)	6	6	6.2	6.5	7	8.2
Percentage of errors	11	13	18	26	36	50

What does this table tell us? First consider the labels of the columns and rows, including the units of measurement. We can see that the independent variable (IV) of sleep deprivation has six levels, ranging from 7 hours of sleep through to 2 hours. The dependent variable (DV) is performance on a cognitive task, which has been measured by the mean time taken (in minutes) and the percentage of errors.

Once you understand the labels, then read each row and column separately to analyse the data.

In this table, reading across each row shows the trends in the DV (time and errors) as the IV (hours of sleep) changes.

Reading down each column shows how each level of the IV (hours of sleep) affects the DV (mean time taken and percentage of errors).

You can then determine some overall findings. This data shows that as the number of hours of sleep decreases, the time taken to complete the task and the percentage of errors both increase, with 2 hours of sleep resulting in the longest time and the highest percentage of errors.

Measures of variability a category of statistics that describe the distribution of data

Standard deviation a statistic that shows the spread of the data around the mean

Standard deviation as a measure of variability

Measures of variability are a category of statistics that describe the distribution of data. The standard deviation is one measure of variability; others are the range and interquartile range, which are not covered in VCE Psychology.

The **standard deviation** shows the spread of the data around the mean. It shows how close each data value lies to the average, or how far spread out they are – in other words, how much the values vary. The standard deviation has the same unit of measurement as the original data. For example, if a group's running times were recorded in minutes, the standard deviation value is also in minutes.

ISBN 978-1-009-25401-4 Gallagher et al

When comparing two sets of data, a smaller standard deviation shows that the values in that set are quite close together. A larger standard deviation shows that the values in that set are further apart. You do not need to calculate the standard deviation in VCE Psychology but it is helpful to know how to find the standard deviation. The calculation involves using the squares of the differences from the mean, which means that larger differences have proportionately more effect on the value than smaller differences.

For example, Table 2A–4 displays the weights of three samples of dogs. In each sample, there are six dogs. The spread of the weights within the samples differs, as shown by the differences in the standard deviations.

Table 2A–4 The mean weights and standard deviations of three samples of dogs

	Sample A	Sample B	Sample C
Mean weight (kg)	25	25	25
Standard deviation (kg)	0	4.1	12.1

In sample A, all six dogs weigh 25 kg, so the mean is 25 kg, there is no spread and there is no standard deviation because no data value varies from the mean.

In sample B (Figure 2A–6), the six dogs weigh 20, 21, 22, 28, 29 and 30 kg, so the mean is 25 kg. These individual values are all quite close to the mean, so the spread is quite small (from 20 to 30 kg) and the standard deviation is small. The standard deviation is calculated to be 4.1 kg.

In sample C (Figure 2A–7), the dogs weigh 6, 16, 22, 28, 35 and 43 kg, so the mean is 25 kg. The spread of values is quite large (from 6 to 43 kg), so some of these values are further away from the mean, and the standard deviation is large. The standard deviation is 12.1 kg. This is larger than the standard deviation of sample B because sample C has a larger spread of data than sample B.

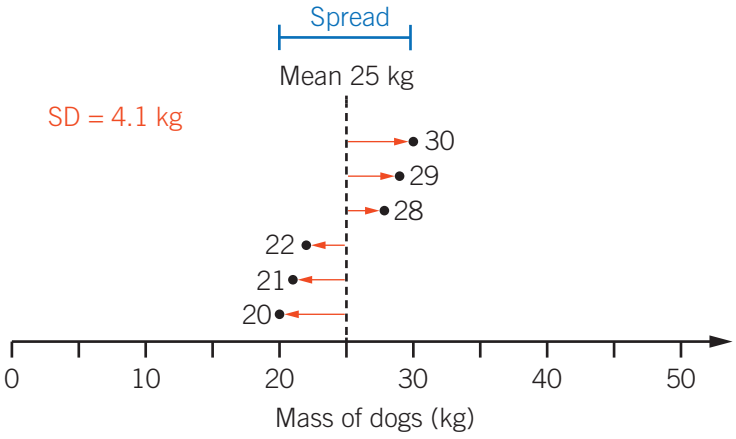


Figure 2A–6 Graph of weights of Sample B dogs. These six dogs are all a similar weight, so their calculated standard deviation is small, which shows that their spread is small.

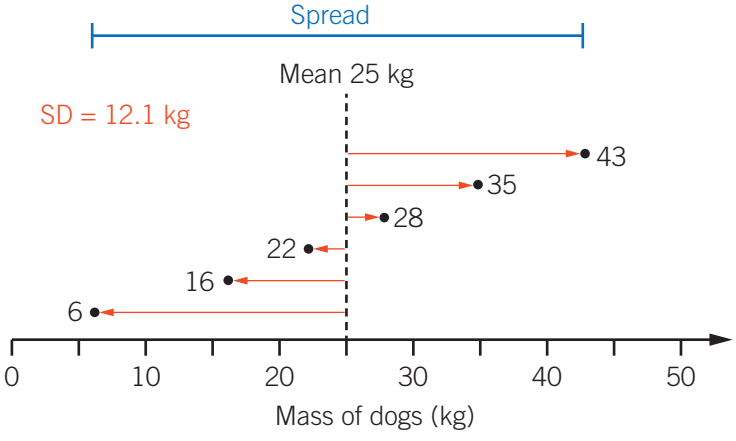


Figure 2A–7 Graph of weights of Sample C dogs. These six dogs are all quite different weights, so the standard deviation of sample C is large, which shows that their spread is large.

ISBN 978-1-009-25401-4 Gallagher et al

VIDEO 2A–3 SKILLS: INTERPRETING STANDARD DEVIATIONS

2A–2 SKILLS

Interpreting standard deviations

In VCE Psychology, you do not need to calculate the standard deviation, but you do need to know how to interpret it.

When given two standard deviations representing two groups of data, the:

- larger value indicates that the spread of that data is larger
- smaller value indicates that the spread of that data is smaller.

Table 2A–5 shows the standard deviations for two groups. The standard deviation for group B is larger than that for group A. From this, we can infer that the individual data values in group B are spread out more than the individual data values in group A. This also tells us that the values in group A are more closely clustered around the mean than in group B, as displayed in Figure 2A–8.

Table 2A–5 Standard deviation for two groups

	Group A	Group B
Standard deviation	12	19

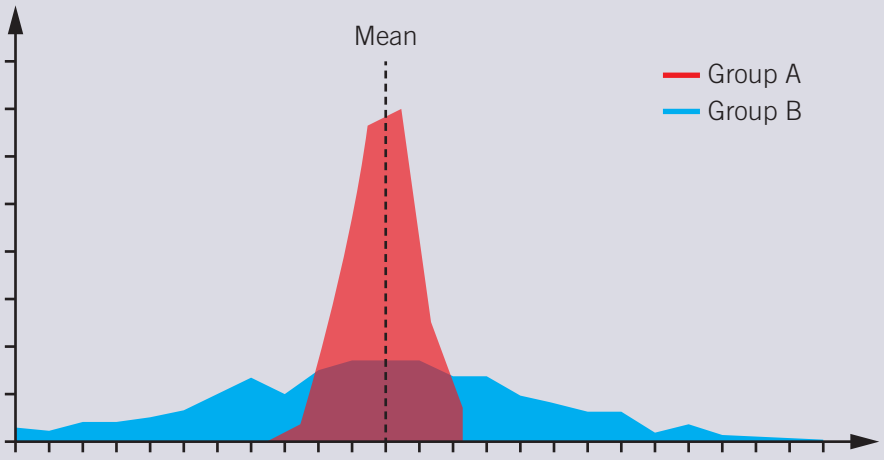


Figure 2A–8 The standard deviation shows the spread of the data. Group B has a larger spread than group A.

Check-in questions – Set 2

1 When is a percentage change used?
2 Name three measures of central tendency.
3 When is the mean not a good choice for determining the central value of data?
4 What does a small standard deviation tell you about the data? What does a large standard deviation tell you about the data?

Organising and presenting data

Large amounts of data can be too complex to explain as text, so summary statistics are presented in tables, graphs and charts for easy and quick visual interpretation.

ISBN 978-1-009-25401-4 Gallagher et al

Tables

Table
a way to display data and/or summary statistics clearly

Tables are a way of organising data and/or summary statistics to clearly compare the results of different groups in a study. If data cannot be presented in one or two sentences, then a table should be used instead of explaining the data in the text of a report. Tables are useful to highlight important data for the reader to find quickly. They are used instead of graphs when showing precise values is more important than showing trends and patterns. In a research report or scientific poster, data in a table should not be also written in the text or repeated in a graph. A table should have the features shown in Figure 2A–10.

Option A: Text

The National Basketball League is the top division in Australian Basketball. With only a few games left of the 2021–2022 season, the league leaders are showing their honed skills with their consistent shooting performances. Bryce Cotton from the Perth Wildcats leads the league statistics with an average of 23.58 points per game, and a field goal percentage of 41.8%. While runner-up in average points per game on 21.33, South East Melbourne Phoenix forward Mitchell Creek had a higher average field goal percentage of 48.7%. Cotton's Wildcats teammate Victor Law has proven to be another consistent performer with a 46.9% average field goal percentage and an average 20.08 points per game. Multiple reliable shooters in the league leaders shows the Wildcats are strong contenders for the upcoming finals. Taking out fourth position in the leader board is Jaylen Adams of the Sydney Kings, with an average of 18.9 points per game and an average field goal percentage of 36.6%

Option B: Table

Player name	Team	Average points per game	Average field goal percentage
Bryce Cotton	Perth Wildcats	23.58	41.8%
Mitchell Creek	SE Melbourne Phoenix	21.33	48.7%.
Victor Law	Perth Wildcats	20.08	46.9%
Jaylen Adams	Sydney Kings	18.9	36.6%

Figure 2A–9 In a report displaying the average shooting performance of National Basketball League players, organising the players' points per game and field goal percentage statistics into a table (option B) makes the data easier to understand and compare than writing them in sentences in one large paragraph (option A).

Table 1 Amount of time new mothers spent exercising per week

A descriptive, numbered title is written above the table and gives a quick, clear indication of what the data is about.

Time spent exercising (minutes)	Number of new mothers
0–29	8
30–59	16
60–89	29
90–119	23

Rows and/or columns should have clear headings to describe the variable that they are representing, including appropriate units.

Figure 2A–10 Features of a table that displays data

ISBN 978-1-009-25401-4

Charts and graphs

Charts and graphs are also ways of organising and presenting data and summary statistics. Charts and graphs are used instead of tables when it is more important to show the trends, patterns, relationships and overall pictures of the data, rather than exact data values. Charts and graphs should have the features shown in Figure 2A–11.

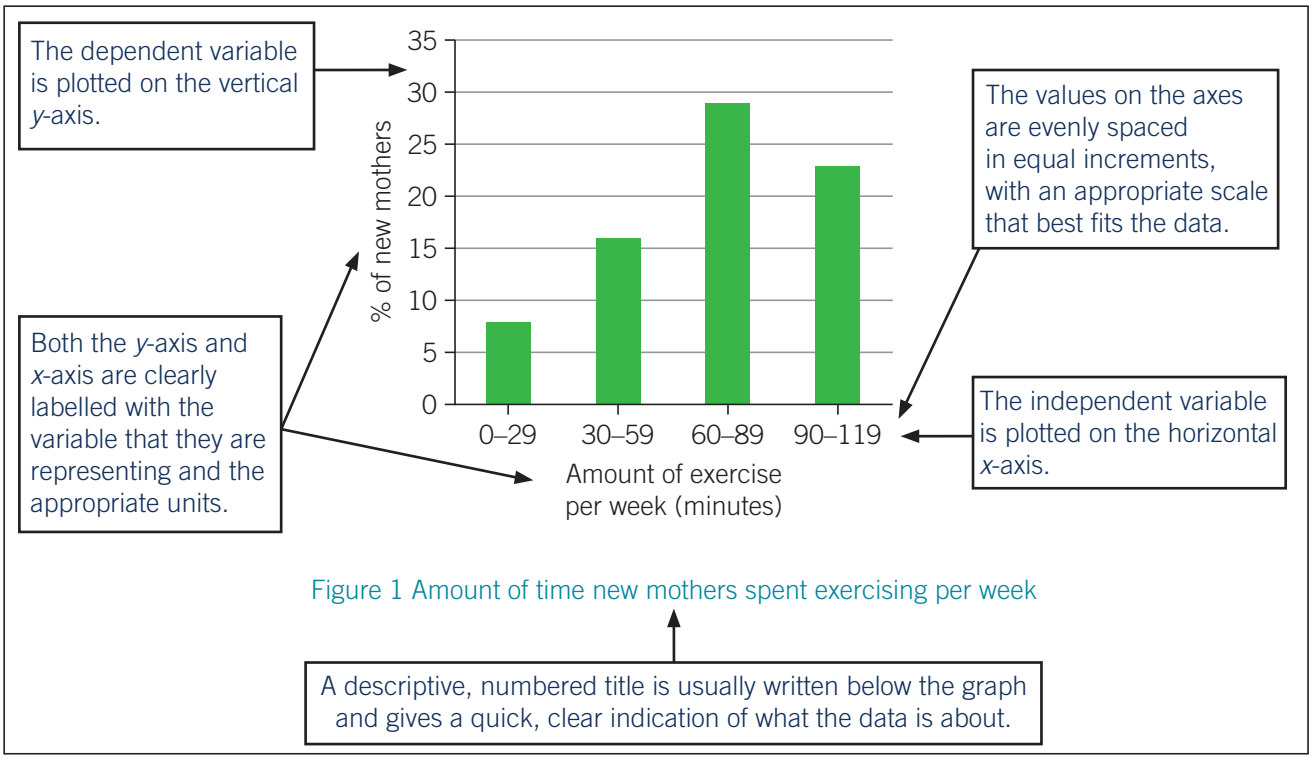


Figure 2A–11 Features of a graph

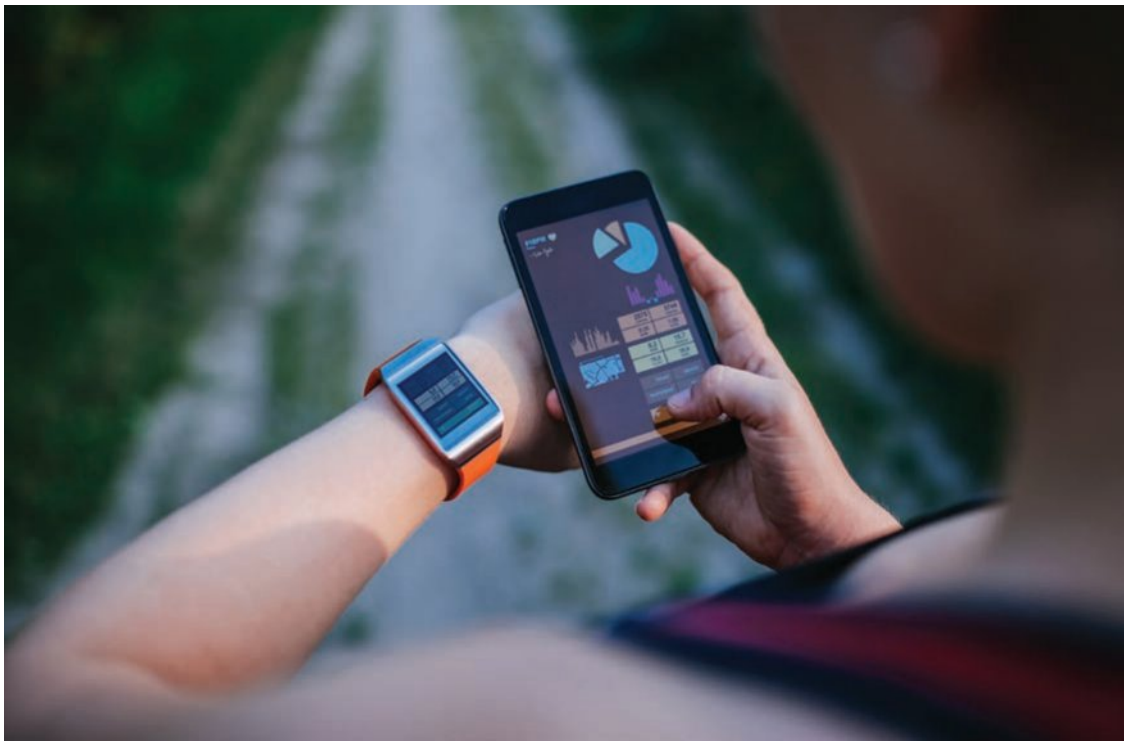


Figure 2A–12 Graphs, such as those in fitness tracking apps, are useful in everyday life to quickly judge trends.

ISBN 978-1-009-25401-4 Gallagher et al

It is important to select an appropriate type of chart or graph for the type of data being displayed; for example, bar charts and line graphs.

Bar charts (also known as bar graphs or column graphs) are used to display data that has discrete categories. The height of each bar represents the measured value of one data category. Bars can be drawn vertically or horizontally and should not touch because they represent separate categories. More complex bar charts can include grouped or stacked data to represent the subsections of a large category, and these types of charts should have a legend or key to clearly show what the subsections represent. You can compare several categories quickly using a bar chart and they are most useful for presenting data that has larger differences among categories.

Bar chart
a way to display data with discrete categories

Line graph
a way to display numerical and continuous data

For example, a maternal health centre is interested in how long new mothers can exercise each week after they have been cleared for exercise by their doctor. The maternal health centre conducted a survey asking new mothers to indicate how many minutes they exercise in a typical week. The results are shown in the vertical bar chart in Figure 2A–11. The results are also shown in the horizontal bar chart in Figure 2A–13, which also displays additional data about the minutes of exercise per week for new mothers both before and after the birth of their baby.

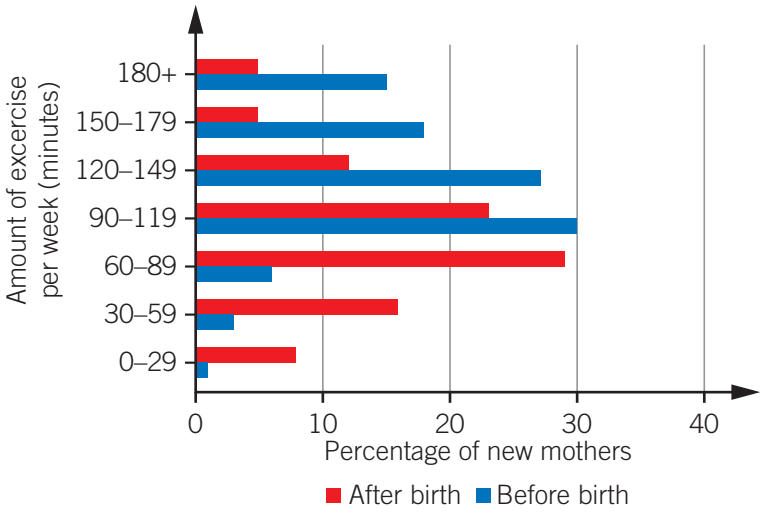


Figure 2 Amount of time new mothers spent exercising per week before and after birth

Figure 2A–13 An example of a horizontal bar chart displaying separate data sets, distinguished by colour, with a key

Line graphs are used when data is numerical and continuous. The straight line shows how one data point continues to the next, and estimates the values between the points. Line graphs are useful in tracking small changes over time to visualise overall trends and patterns in data. The IV should be represented on the horizontal x-axis and the DV on the vertical y-axis. Multiple sets of data can be compared by using multiple lines on one graph.

For example, two shops are tracking their busiest periods of the day by counting how many customers are in each shop on the hour, each hour, over one full day of trading. Their results are presented as a line graph in Figure 2A–14.

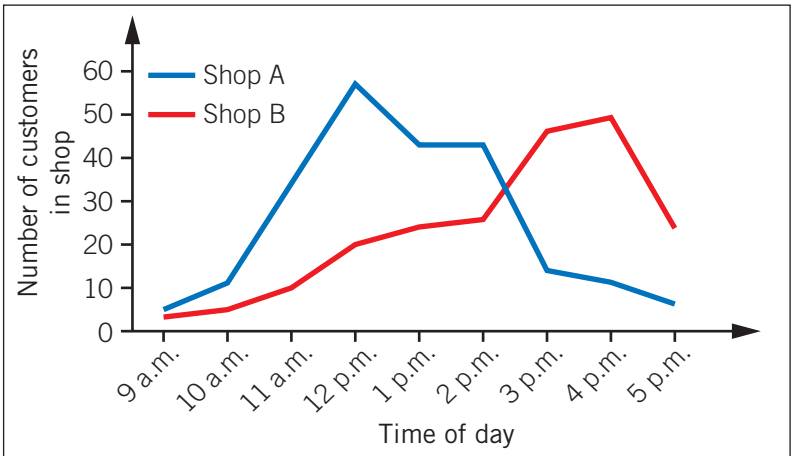


Figure 3 Number of customers in shops A and B by time of day

Figure 2A–14 An example of a line graph with two data sets plotted.

ISBN 978-1-009-25401-4

2A–3 SKILLS

VIDEO 2A–4 SKILLS: INTERPRETING GRAPHS

Interpreting graphs

In the VCE Psychology exam, you may be asked to draw a simple graph; however, more often you will be asked to interpret what is shown in a graph. You may be asked to interpret bar charts or line graphs representing the results from complex investigations.

To understand what the graph is showing, begin by considering the labels of the axes, including any legend or key for multiple data sets on the same graph. The graph in Figure 2A–15 shows the results of an investigation into how students spend their free time according to two variables: the activities and the students' year levels. There are multiple bars in this graph, so you need to understand what each bar represents before you try to interpret it. So look at the legend or key first.

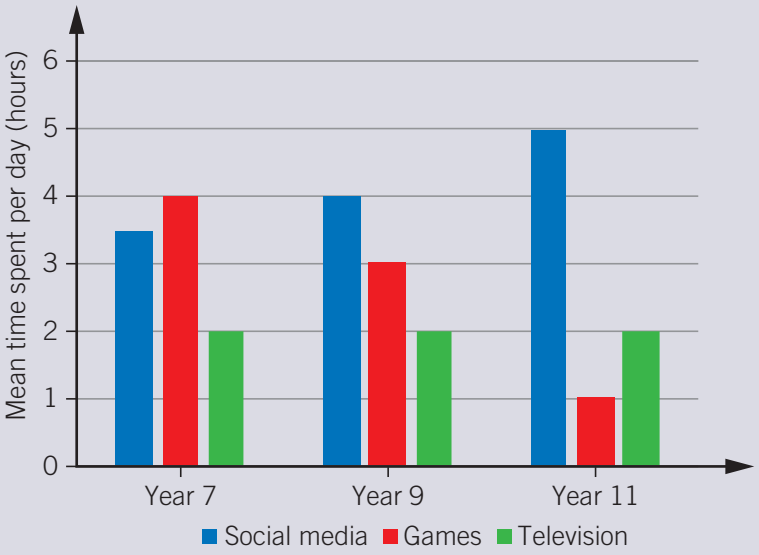


Figure 2A–15 How students spend their free time

When you are interpreting a graph, it is important to consider the scale of the axes. The two graphs in Figure 2A–16 show the same data, but the scales on their *y*-axis are different. In graph A, the differences between the values, and the values themselves, appear to be much larger than those in graph B.

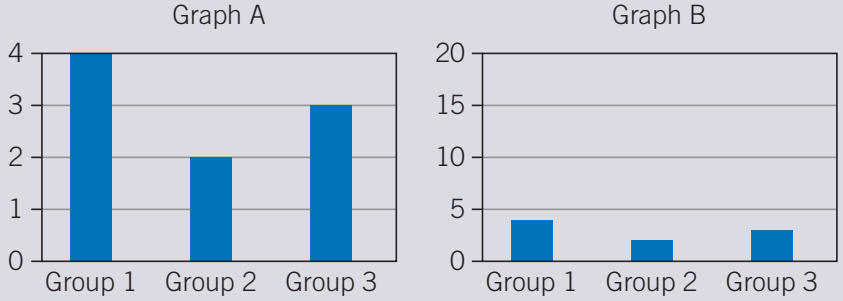


Figure 2A–16 It is important to consider the scale of a graph when interpreting the data presented.

Once you understand the labels of a graph, you can consider the differences between the groups or the overall trends being shown. This can be complex when the data contains multiple variables.

For the graph of how students spend their free time in Figure 2A–15, you could begin by looking at the trends for each of the three activities separately across the year levels, by focusing on one colour at a time. For example, the red bars tell you that as students get older, they spend less time on games.

Then you could compare all three activities in a single year level, by focusing on one group of bars at a time. For example, you can see that Year 11 students prefer to spend more of their time on social media than on games or television.

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 3

1 Why would a researcher use a table to display data?
2 When would a researcher use a bar chart to display their data and when would they use a line graph?

WORKSHEET 2A–2 MISLEADING GRAPHS

Analysing the quality of data

Before researchers can conclude an investigation, they need to analyse the quality and quantity of the evidence they collected. This evidence will be used to make decisions, so researchers need to know how good it is. The data should be analysed for its true value, accuracy, precision, repeatability, reproducibility, validity, errors, certainty, outliers and contradictory or incomplete data.

True value the value, or range of values, that would be found if the quantity could be measured perfectly

Accuracy how close a measurement is to the true value of the quantity being measured

True value

The **true value** is the value, or range of values, that would be found if the quantity could be measured perfectly. Obtaining a true value would require no error to occur when using instruments to take measurements and collect data and when processing and reporting the data. In practice, the true value cannot always be determined because measurements have a degree of uncertainty. Sometimes, instruments can be calibrated against their true value to test whether they are measuring perfectly. For example, a tool using biometric features to determine the age of a person could be compared against the true value of the person's known age as indicated by their date of birth on their birth certificate. Or a new watch could be tested against the true value of time known as 'Coordinated Universal Time'.

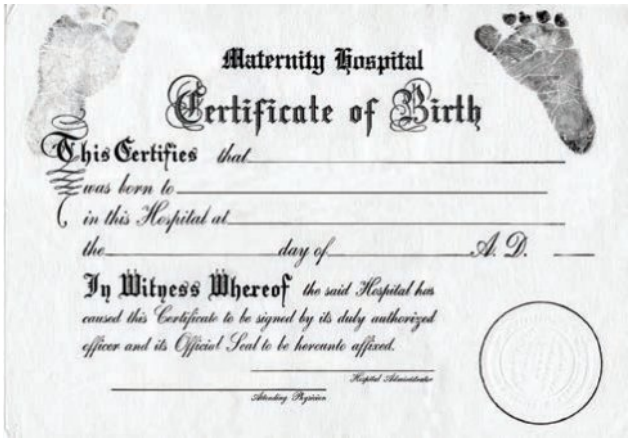


Figure 2A–17 The true value is the perfect measurement of a value, such as finding a person's age as determined by their birth certificate. Measuring a person's age by biometric data may not calculate the true value of a person's age, and its accuracy should be considered.

Accuracy

Accuracy relates to how close a measurement is to the true value of the quantity being measured. In VCE Psychology, accuracy is not quantifiable, and values are described in qualitative terms, such as being 'more accurate' or 'less accurate', or in terms such as 'good', 'expected', or 'poor'. A measured value is accurate if it is determined to be close to the expected, true value, and the level of accuracy can be judged by repeating the experiment.

For example, if a student's true value of their height is 172 cm, but they measure their height as 176 cm by using a small ruler, then their value is not accurate. The student could determine whether their result was accurate by repeating the measurement a couple more times to see how similar the values are.

Precision

Precision refers to how close a set of measurement values are to each other. It describes how exact a measurement is, and how much a value agrees or is consistent within a set of values that were measured under the same conditions. Precision is not the same as accuracy because it does not involve reference to the true value. However, both precision and accuracy can be affected by different types of errors, which are described later in this section.

Precision how close a set of measurement values are to each other

ISBN 978-1-009-25401-4 Gallagher et al

For example, a fridge thermometer is checked every day for a week, and the following temperatures are obtained: 3.1, 3.2, 3.1, 3.1, 3.2, 3.2, 3.1°C. These results can be considered to be precise because the values are close together and quite consistent.

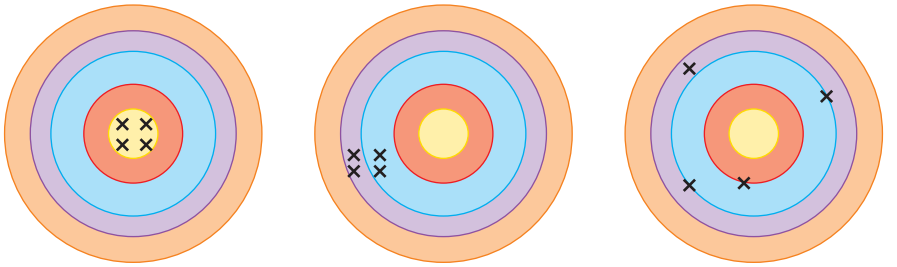


Figure 2A–18 Precise values are not necessarily also accurate values.

Repeatability

Repeatability the closeness of the agreement between successive measurements of the same quantity, carried out under the same conditions

Repeatability is how close successive measurements of the same quantity are when carried out under the same conditions. Repeatability helps researchers verify their findings. If measurements can be repeated by the same investigator using the same method, instruments, location and within a short period of time, the results of a study can be verified and confirmed as true findings. For example, if an intelligence test on a participant produced one set of findings on one occasion and another set of findings on another occasion, it could indicate that the intelligence test was flawed in some way. If the results of a study are to be meaningful, then the study should be repeatable, with the same findings being determined every time the study is repeated under the same conditions.

Reproducibility

Reproducibility the closeness of the agreement between measurements of the same quantity, carried out under different conditions

Reproducibility is how close measurements of the same quantity are when carried out under different conditions. Reproducibility also helps to verify research findings. If the results of an investigation can be reproduced by a different researcher using a different method of measurement, measuring instrument, location, time or culture, the results can be verified and confirmed as true findings. For example, if one research team determined one set of findings and a second research team determined a completely different set of findings despite conducting a similar investigation then the original results are not reproduced. This may be due to an error in one of the studies or an undetected difference in the way the second study was conducted, which should be considered before determining the overall credibility of the investigation.

Replicability giving the same answer to a scientific question when a different method is used and different data is obtained

Another term similar to reproducibility is **replicability**, applied to studies aiming to answer the same scientific question, each with its own methods and data. A study can be considered in terms of whether it is replicable, or whether it lacks credibility because it is irreplicable. If results from a study are to be meaningful, they should be reproducible and replicable, with the same findings being determined when the study is reproduced or replicated under different conditions by a different researcher.

Figure 2A–19 Reproducibility means there is agreement between measurements of the same quantity under different conditions, such as measuring an athlete's swimming performance in a pool and in the ocean.

ISBN 978-1-009-25401-4 Gallagher et al

Validity

Validity refers to whether a measurement measures what it is supposed to be measuring. The validity of a psychological investigation refers to how well the results among the study participants represent true findings among similar individuals outside of the study. These descriptions represent two different types of validity in a study.

Internal validity refers to a study investigating what it sets out or claims to investigate. Internal validity can be affected by the appropriateness of the investigation design, sampling and allocation techniques, and the effect of extraneous and confounding variables. For example, an intelligence test should accurately measure the concept of intelligence, and not measure other traits such as memory ability or education level. If a study does not have good internal validity, such as by determining that confounding variables had influenced the results, the results of the study may not be truthful. This means that you cannot draw any conclusions. Additionally, if a study is found to be not internally valid, then its external validity is not relevant.

External validity refers to whether the results of the research can be applied to similar individuals in a different setting. For example, an intelligence test might determine the intelligence of a white, middle-class person with reasonable accuracy, but if the test does not consider cultural diversity, then it is biased and it cannot be used to accurately describe the intelligence of people from the wider, diverse population. External validity can be improved by using a sampling technique with broad inclusion criteria so that the sample better represents not only the study's population of interest, but also the overall general human population. If a study does not have external validity, the results may not apply or be generalised to individuals who are different from the study population.

Validity whether a measurement measures what it is supposed to measure

Internal validity whether a study investigates what it sets out or claims to investigate

External validity whether the results of research can be applied to similar individuals in a different setting

LINK **1B** PLANNING AND CONDUCTING INVESTIGATIONS

LINK **2B** DRAWING CONCLUSIONS AND COMMUNICATING SCIENTIFIC IDEAS

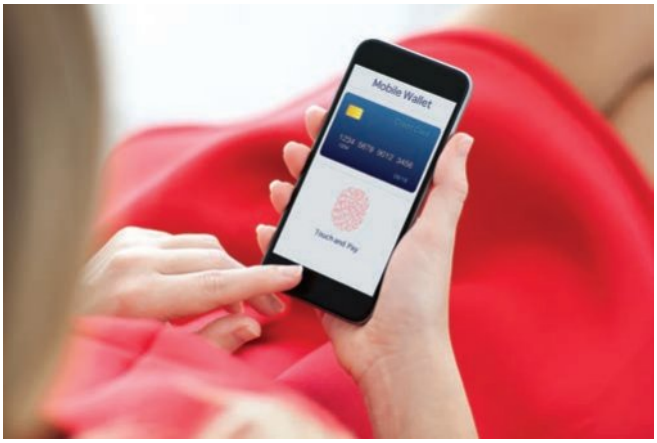


Figure 2A–20 The Touch ID: electronic fingerprint recognition on your mobile phone is a valid measure of authentication because it accurately recognises your specific fingerprint before giving you access to the phone.

Figure 2A–21 Teen magazines often publish 'personality tests' that describe your personality by identifying your favourite things. These tests are not valid measures because they probably do not actually measure personality.

Check-in questions – Set 4

1 What is a true value?
2 What is the difference between accuracy and precision?
3 What is the difference between repeatability and reproducibility?
4 What is the difference between internal and external validity?

ISBN 978-1-009-25401-4 Gallagher et al

Error

Personal error

Personal error a mistake, miscalculation or observer error made when conducting research

Personal errors include mistakes, miscalculations and observer errors made when conducting research. For example, a researcher observing a child and parent's responses during an immunisation incorrectly records when the child was crying (Figure 2A–22). This is a personal error because it was a mistake made by the observer. To remove personal errors, the investigation should be repeated correctly, and the errors should not be included in the reporting and analysis of the data.

Seconds	1									10									20									30
Child crying					✗	✗	✗	✗	✗	✗	✗	✗	✗	✗												✗	✗	✗

Figure 2A–22 A personal error can involve an observer making an incorrect record of the participant's behaviour. For example, a researcher could make an error when recording the times that a child cried during an immunisation procedure.

Figure 2A–23 This investigation needs to be repeated correctly as the researcher recorded the baby's responses incorrectly.

Measurement error the difference between the measured value and the true value

Measurement error

Measurement error is the difference between the measured value and the true value of what is being measured. Two types of measurement error should be considered when evaluating the quality of data: systematic errors and random errors.

ISBN 978-1-009-25401-4 Gallagher et al

Systematic error

Systematic errors affect the accuracy of a measurement by causing readings to differ from the true value by a consistent amount or by the same proportion, each time a measurement is made. All the readings are shifted in one direction from the true value. They may be produced by observational error, imperfect instrument calibration or environmental interference. For example, a thermometer might measure temperature one degree higher than the true value every time the thermometer is used. The accuracy of measurements subject to systematic errors cannot be improved by repeating the measurements because the error is present all the time. For example, continuing to use the thermometer will not improve the accuracy of the thermometer. Most systematic errors can be reduced by being familiar with the limitations of instruments and becoming experienced with their correct use.

Systematic error
an error that causes readings to differ from the true value by a consistent amount each time a measurement is made

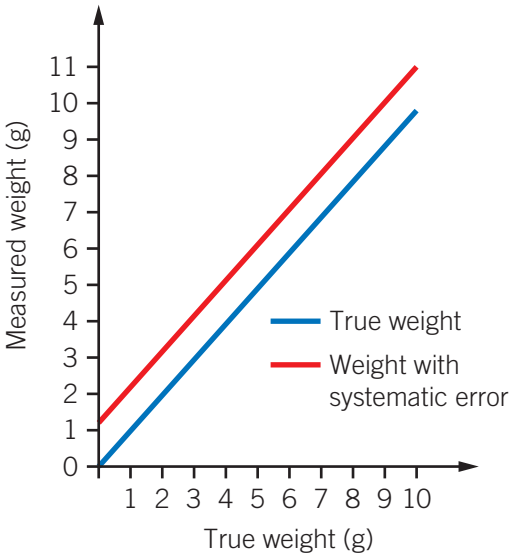


Figure 2A–24 Systematic errors affect accuracy: they cause a consistent shift in the measurements. For example, a weight scale that has not been zeroed will include the container weight each time it is used.

Random error

Random errors affect the precision of a measurement, by creating unpredictable variations in the measurement process; they result in a spread of readings. Random errors are present in all measurements except for those involving counting, and they do not follow a pattern because they cause one measurement to differ slightly from the next. They may be produced by a limitation in the instrument, an environmental factor or a slight variation in the procedure. For example, if a person stands in a slightly different spot on a set of scales each time the researcher measures their weight, it can produce slight variations in their measured weight. The effect of random errors can be reduced, and the precision of measurements improved, by making more or repeated measurements, calculating a new mean, increasing the sample size, or refining the measurement method or technique.

Random error
an error that creates unpredictable variations in the measurement process and results in a spread of readings

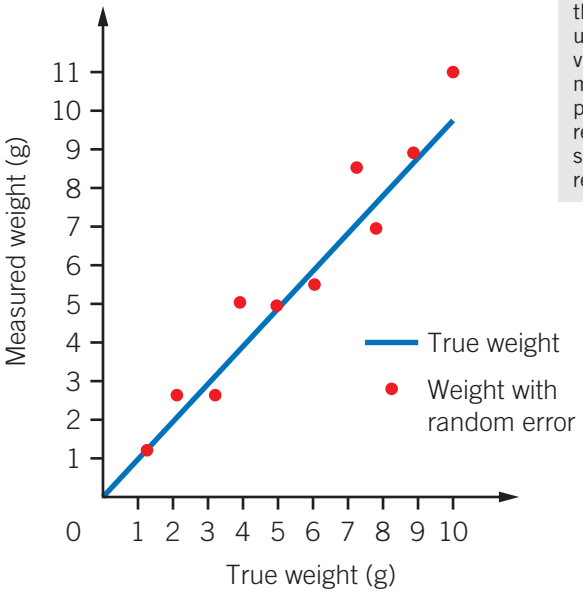


Figure 2A–25 Random errors affect precision: they affect how closely a set of measurements agree with each other. For example, standing on a different section of a weight scale each time may produce different results.

ISBN 978-1-009-25401-4

Uncertainty

Uncertainty
a lack of exact knowledge of the value being measured

Contradictory data
data that appears incorrect

Incomplete data
data that has elements missing

Uncertainty refers to a lack of exact knowledge of the value being measured. All scientific efforts are directed towards reducing the degree of uncertainty about observations, relationships and causes. All measurements are subject to uncertainty and may have many potential sources of variation, and this uncertainty extends to all inferences and conclusions that depend on uncertain measurements. The nature of human behaviour and mental processes measured within psychology often involves psychological constructs that, by their very nature, can increase the degree of uncertainty associated with such measurements.

Uncertainty of the result of a measurement is not the same as error, and in VCE Psychology it does not require calculations. A qualitative treatment of uncertainty involves evaluating the data to identify **contradictory data** (incorrect data) and **incomplete data** (missing data – questions without answers or variables without observations), including possible sources of bias. All measurements have some uncertainty, and it requires the observer to make a judgement.

Outliers

Outlier
a value that lies a long way from other results

Outliers are values that lie a long way from other results. These readings may occur by chance in any given data set and can be real or true, or caused by measurement and recording errors, a skewed distribution or data points from a different underlying distribution. A small number of outliers are expected when there is a larger sample, and their presence alone does not suggest an anomaly. Repeating readings may be useful in further exploring an outlier. In VCE Psychology, data visualisation is used to recognise whether outliers are present in the data. Outliers must be analysed and accounted for, not automatically dismissed, to consider how these outliers would affect the testing efforts and validity of the research.

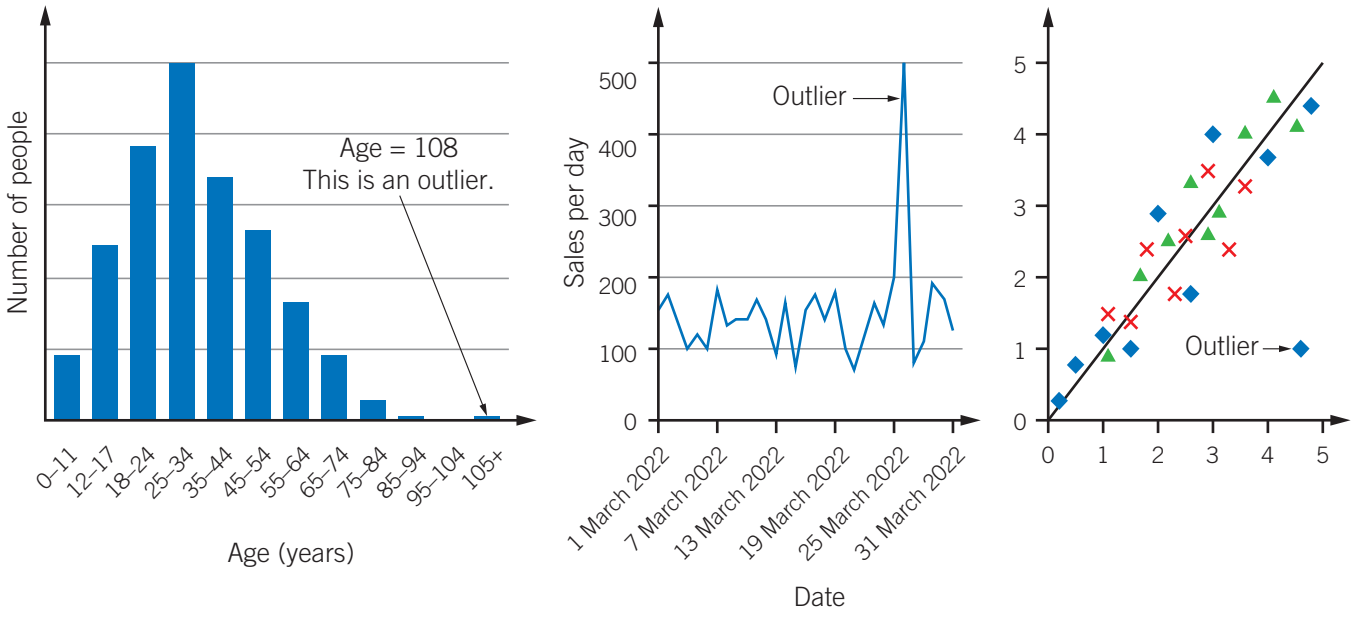


Figure 2A–26 An outlier is a value that lies far away from the rest of the data values.

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 5

1 What is the difference between systematic errors and random errors?
2 What is uncertainty in measurement of data?
3 What are outliers in a set of data?

WORKSHEET 2A–3 ANALYSING DATA

ACTIVITY 2A–1 COLLECTING AND INTERPRETING CLASS DATA

Survey each member of your class (or some people who go to your school). The more participants, the better. Ask each participant to find out how far away from school (in kilometres) they live and how long (in minutes) it takes them to get to school. Record these two values for each person, keeping the values together but without anyone's name attached, to retain their anonymity.

1 Justify whether the data you have collected is qualitative or quantitative. Suggest how you might be able to collect similar results using the other type of data.
2 Justify whether the data you have collected is primary or secondary. Suggest how you might be able to collect similar results using the other type of data.
3 Calculate the percentage of the class that falls within each of the following distances from your school. You can adjust these categories to suit your class data better, if appropriate.
   0–3 km
   3.1–6 km
   6.1–9 km
   9.1–12 km
   12.1–15 km
   15 km+
4 Find the modal distance (in kilometres) your class travels to school.
5 Calculate the mean time (in minutes) it takes your class to travel to school.
6 Once you have found the mean, you could then calculate the standard deviation for your data, to compare the spread of your data to other data sets. Calculation of standard deviations is not required in VCE Psychology, so consider the following standard deviations below as example data.

Standard deviation of distance in kilometres travelled to school		
Your class	Class 1a	Class 2a
1.2	0.4	3.6

   Compare the spread of the data sets based on the standard deviation for each class.
7 Plot the percentage of each category of distances from Question 3 onto a bar chart. Ensure you choose an appropriate scale for each axis, label each axis and give your graph a title.
8 Plot the raw time and distance data collected at the beginning of the study onto a line graph. Begin by plotting each point, and then connect the points with a straight line. Ensure you choose an appropriate scale for each axis, label each axis and give your graph a title.
9 Comment on the accuracy of the collected data and the possibility of any errors or outliers.

ISBN 978-1-009-25401-4 Gallagher et al

Section 2A questions

1 Thinking about yourself as an example, write down three of your characteristics that would be considered quantitative data and three characteristics that would be considered qualitative data.

2 A developmental psychologist was collecting data on the birth weight of twins. One set of twin girls, Ashley and Emily, weighed 2.29 kg and 2.14 kg, respectively. What type of data is this? Justify your answer.

3 A medical researcher is developing a new drug to help improve the symptoms of Parkinson's disease. One group of 10 participants acted as the control group and continued with their normal medication; the experimental group of 10 participants trialled the new medication. Each day, for one month, the participants recorded a description of their symptoms and rated their severity on a scale of one to five. The 20 participants' final month ratings are listed below.

Normal medication final rating of symptoms: 2, 3, 3, 4, 1, 1, 2, 3, 3, 2

New medication final rating of symptoms: 1, 2, 2, 1, 3, 2, 1, 3, 2, 2

a Use summary statistics to summarise the data and present it in a results table. Ensure that your results table has appropriate labels and a descriptive title. Write a sentence explaining the results.

b Explain what it means for these results to have good reproducibility.

c Explain what it means for this investigation to be internally valid.

4 A television streaming service wanted to find out viewers' favourite TV show categories. They pushed out a survey to all viewers to complete the next time they logged onto the streaming service and obtained the data below.

TV show category	Percentage of votes
Reality	14
Cooking	8
Comedy	31
Drama	25
Sports	12
Documentary	10

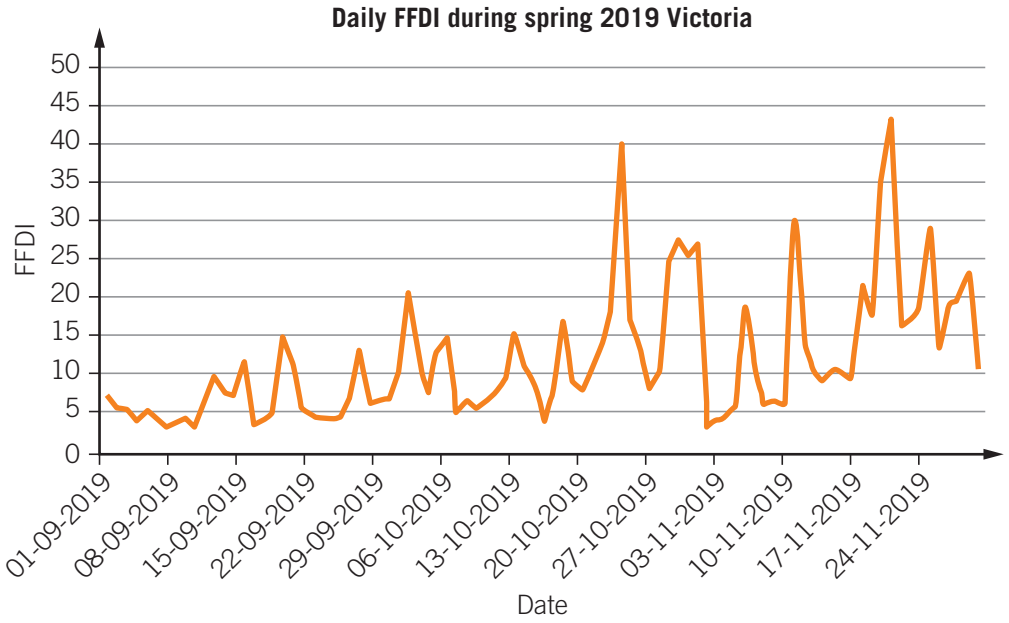
a Select an appropriate type of graph for this data and plot the results obtained from the study. Ensure you give your graph a title, label both axes and consider the scale of the axes.

b Justify your chosen type of graph or chart for this data.

c Describe the results shown in this chart.

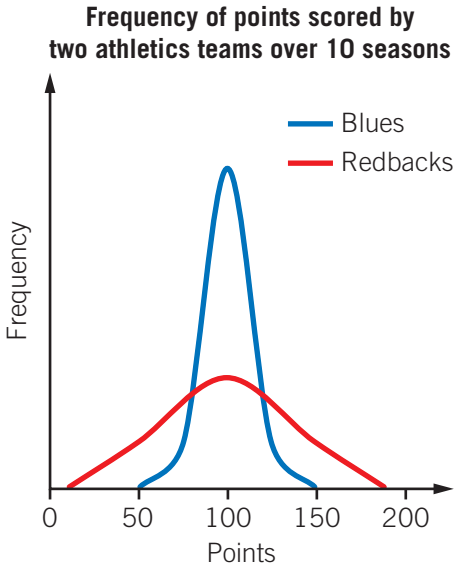
ISBN 978-1-009-25401-4 Gallagher et al

5 The following line graph shows the Forest Fire Danger Index (FFDI) each day during spring in 2019. The FFDI is a measure of fire weather conditions and is used to indicate the level of risk of fires.



a Which month saw the highest FFDI rating?
b Describe the overall trend shown in the line graph.
c Predict the possible FFDI trend that might be seen over the month of December.
d Explain why this data was presented in a line graph instead of a bar chart.

6 The graph below represents the points scored by two athletics teams in their meets over 10 seasons.



Both teams have a mean of 100 points per meeting. Describe how their standard deviations would differ (by indicating which team will have a higher value and which team will have a lower value) and explain what the standard deviations would indicate for each team.

ISBN 978-1-009-25401-4 Gallagher et al

Drawing conclusions and communicating scientific ideas

Study Design:

Construct evidence-based arguments and draw conclusions

- Distinguish between opinion, anecdote and evidence, and scientific and non-scientific ideas
- Evaluate data to determine the degree to which the evidence supports the aim of the investigation, and make recommendations, as appropriate, for modifying or extending the investigation
- Evaluate data to determine the degree to which the evidence supports or refutes the initial prediction or hypothesis
- Use reasoning to construct scientific arguments, and to draw and justify conclusions consistent with the evidence and relevant to the question under investigation
- Identify, describe and explain the limitations of conclusions, including identification of further evidence required
- Discuss the implications of research findings and proposals, including appropriateness and application of data to different cultural groups and cultural biases in data and conclusions

Analyse, evaluate and communicate scientific ideas

- Use appropriate psychological terminology, representations and conventions, including standard abbreviations, graphing conventions and units of measurement
- Discuss relevant psychological information, ideas, concepts, theories and models and the connections between them
- Critically evaluate and interpret a range of scientific and media texts (including journal articles, mass media communications, opinions, policy documents and reports in the public domain), processes, claims and conclusions related to psychology by considering the quality of available evidence
- Use clear, coherent and concise expression to communicate to specific audiences and for specific purposes in appropriate scientific genres, including scientific reports and posters
- Acknowledge sources of information and assistance, and use standard scientific referencing conventions

Glossary:

Abstract
Anecdote
Conclusion
Discussion section
Evidence
Implications
Introduction section
Limitations of conclusions
Methodology section
Opinion
References and acknowledgements section
Results section
Scientific poster
Scientific report

ISBN 978-1-009-25401-4 Gallagher et al

ENGAGE

Should you trust every experiment you read?

Figure 2B–1 Some of the images from the Rorschach inkblot test

What do you see in the images in Figure 2B–1? These images are from the Rorschach inkblot test. The test was originally produced in 1921 by Hermann Rorschach, who aimed to use inkblot pictures such as these to help diagnose mental illness, particularly schizophrenia. However, after his death, they were widely used as a personality test.

The Rorschach inkblot test has been widely criticised for its lack of scientific merit, in particular the lack of consistency when interpreting responses, and the fact that the images are being used for purposes that they were not designed for.

EXPLAIN

Analysing and evaluating scientific ideas

When you read information on a particular topic in scientific or media texts, such as journal articles, mass media communications, opinions, policy documents and reports in the public domain, it is important that you evaluate the source of the information. You should distinguish between information based on opinion, anecdote and evidence, and determine whether it is presenting scientific or non-scientific ideas. **Opinion** is a judgement that is not necessarily based on proof. An **anecdote** is a short personal account of an event. **Evidence** is verified fact. You should evaluate the processes used, and the claims and conclusions drawn according to the quality of evidence provided by the source.

When investigating issues relating to the application of scientific knowledge in society, you should apply your knowledge and skills of ethical understanding to reach an informed stance on the issue, as discussed in Section 1C.

Opinion
a judgement that is not necessarily based on proof

Anecdote
a short personal account of an event

Evidence
a verified fact

LINK 1C SAFETY AND ETHICAL UNDERSTANDING

ISBN 978-1-009-25401-4 Gallagher et al

Figure 2B–2 When reading and interpreting information on psychological issues and research, it is important to distinguish between scientific ideas and non-scientific ideas.

Drawing conclusions

1A INVESTIGATION AIMS, QUESTIONS, HYPOTHESES AND VARIABLES LINK

Once the results collected in an investigation have been analysed for differences, trends and patterns, the final steps in research involve evaluating the data to determine whether the evidence supports the initial aims, hypotheses and predictions of the investigation. You can then determine an evidence-based conclusion for the sample, identify limitations to the conclusions and discuss the implications of the findings.

Conclusion
a statement about the findings of a study, which addresses the aim and hypothesis

A **conclusion** is a statement about the findings of a study. A conclusion addresses the aim of the study and states whether the original hypothesis was found to be supported by the evidence. It is based on whether observed patterns in the results are consistent with the original hypothesis. For a controlled experiment, the major findings are summarised as justification for whether the IV caused a change in the DV. In this way, a conclusion ties the hypothesis and the results together.

For example, one of the conclusions based on the data displayed in Figure 2A–15 (How students spend their free time) is that older students prefer to spend more time on social media than on games or television.

Figure 2B–3 A conclusion is a statement of the final findings that addresses the original aim and hypothesis.

A conclusion based on the analysis of summary statistics such as means may only be determined for the specific sample that was studied, not the wider population. Additionally, findings cannot determine that the hypothesis was proved to be true, only that it is supported or refuted (not supported). You cannot draw a conclusion if the study was found to have poor validity; for example, if the methods were not strongly measuring the research question or if confounding variables were present. To draw conclusions for the wider population, the study must have good external validity.

ISBN 978-1-009-25401-4 Gallagher et al

2B–1 SKILLS

Writing an investigation conclusion

A conclusion for a study should include:

- a reference that it applies to the specific research sample only, and not the wider population of interest
- the direction of the results, such as whether the IV influences the DV to increase, decreases, heighten, lower, etc.
- the relationship between the variables
- a consideration of the investigation design in a controlled experiment.

For example, 'On the basis of the evidence from this sample, the results are consistent with the hypothesis that the consumption of sugar results in a decrease in the attention levels of children, compared to when children did not consume any sugar.'

VIDEO 2B–1 SKILLS: WRITING AN INVESTIGATION CONCLUSION

Limitations of conclusions the faults or flaws in the design of an investigation design that may limit the conclusions of that investigation

A conclusion should include a discussion of the limitations of the conclusions by highlighting any faults in the experimental procedures and how they specifically may have affected the results. **Limitations of conclusions** refer to design flaws in the study that may limit the conclusions of an investigation. These are not the same as extraneous and confounding variables but will include these. For example, the choice of investigation design may have resulted in confounding variables, or the measurement instrument may have produced errors. A researcher can determine whether further evidence is required, and they can suggest improvements and specific recommendations to direct future research.

Figure 2B–4 One part of concluding a study involves discussing how the research will affect the population of interest and how future research could extend the findings.

Another component of concluding research is the consideration of **implications**, which are the impact that the study might have on the population, relevant theory and future research in the chosen area. Implications refer to how the research will affect the population of interest and how the findings will be important for identifying specific areas that require new research. When you discuss the implications of an investigation, consider whether there is any cultural bias in the collected data and final conclusions. If a study is conducted with a sample of participants from a particular cultural group, then the findings may not apply to people from a different cultural group.

Implications the impact a study might have on the population, relevant theory and future research

Check-in questions – Set 1

1 What is a conclusion?
2 What is the difference between a limitation and an implication?
3 What are some of the things that are considered when concluding research?

ISBN 978-1-009-25401-4 Gallagher et al

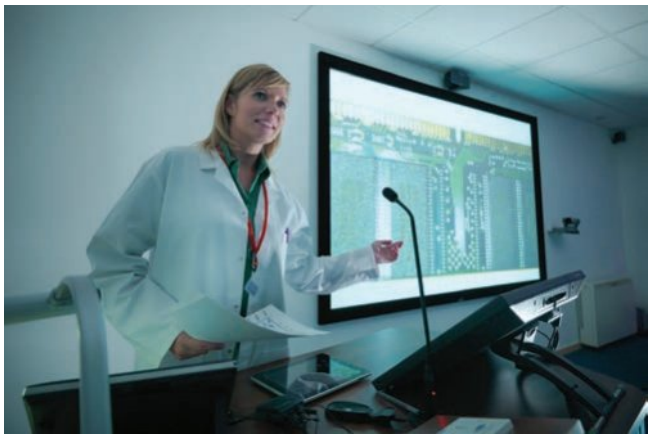


Figure 2B–5 Presenting at a conference is one way a researcher can communicate their ideas and findings.

Communicating scientific ideas

Researchers can communicate the findings of their study in a variety of ways to inform scientists and other interested people about what they discovered during their research. Usually, they will publish their results as an article in a scientific journal or present a scientific poster or talk at a conference. This way, the researcher can share the benefit of their findings.

Scientific journals are periodic publications that report on new primary research. They can be published in physical form, as found in university libraries, or in electronic form, as found online. New issues of journals can be published weekly, monthly or every few months, and each issue contains tens of articles reporting on various research findings. There are hundreds of psychology journals, and thousands of journals across all sciences. Many psychology journals publish on specific topics; for example, the *Journal of Cognitive Neuroscience* or the *Journal of Happiness Studies*.

VIDEO 2B–2 SKILLS: SEARCHING FOR SCIENTIFIC RESEARCH ARTICLES

2B–2 SKILLS

Searching for scientific research articles

Searching for an appropriate scientific research article online can be difficult and time consuming. You can often find lots of blogs, books or website articles dedicated to explaining the topic, but it can be harder to find an appropriate original scientific article that reports the primary data you are looking for.

Here are some tips for finding original scientific reports and journal articles in your chosen topic.

Know what you're looking for.

- Search for original articles written by the researcher(s) who actually completed the investigation.
- Articles outlining controlled experiments should have the main sections of a scientific report (introduction, methodology, results, discussion).

Use the right key words for your search.

- Use the term 'journal article' together with your IV and DV to refine your search.
- The term 'experiment' does not work as well to find scientific research articles.
- Clicking on 'scholarly articles for ...' or using scientific search engines such as Google Scholar, PubMed or PsycINFO refines the search to articles, but the articles will often include very complex research that can be difficult to understand.

Scan through the search listings, looking for:

- anything listed by a scientific journal
- a digital object identifier (doi), which is an identification number restricted to scientific articles
- a listed author shown as 'by (name) (date)'; for example, 'by NM Zuccon 2021'
- an acceptable year of publishing, that is as recent as possible
- 'cited by ...', which shows how many other researchers have mentioned this study in their own research. This can be a good indication of popular and relevant articles.

ISBN 978-1-009-25401-4 Gallagher et al

Once you have found an article, decide whether it is appropriate for your needs. Determine what information the site will let you see.

- 'Full text' is best because it will allow you to read the whole article. You may need to click on a link on the page to take you to the full text if it does not come up straight away.
- 'Limited access' is more common. This means you can only see parts of the article (typically just the abstract) unless you pay or subscribe.
- If there is not enough information provided in the abstract, you might need to keep searching. Sometimes you can find the full text on a different site, by conducting a new search in Google Scholar using the article's full title. You can also try searching for the researcher's personal website where they sometimes publish their own articles. You can even try emailing the researcher directly, and they might share their article with you!
- You can use the article's reference list to lead you to similar research by other people.
- Once you have found a full text article, read the abstract first. This is a summary of the whole investigation and can help you decide whether the article is appropriate and warrants further reading.

Research articles include complete explanations of original research and its findings. They can be very complex and vary in length, some being more than 20 pages. Research articles often follow a standard structure with several main sections in a particular order, depending on the investigation methodology they used. The researcher must follow the writing style determined by the publishing journal.

Scientific report a report outlining why and how some research was conducted, with an analysis of the findings

Abstract a section of a scientific report that is a concise summary of the whole investigation

Introduction section a section of a scientific report or poster that provides an overview of what the investigation is trying to achieve and why it is important

Scientific reports

In VCE Psychology, you may write a **scientific report** that explains your research and includes the following main sections: abstract, introduction, method, results and discussion.

An **abstract** is a concise summary of the whole report, including the aim, hypothesis, procedures or methods, major findings and conclusions.

The **introduction section** includes the information that is required for the reader to understand what the research is trying to achieve and why it is important. It begins broadly by describing the rationale of where the investigation question has come from, including previous research that has been done in the area of interest and other background information, such as psychological concepts, definitions of key terms and theories. As this section progresses, it then becomes more specific, by finishing with the investigation aim, hypothesis or predictions and variables of the study.

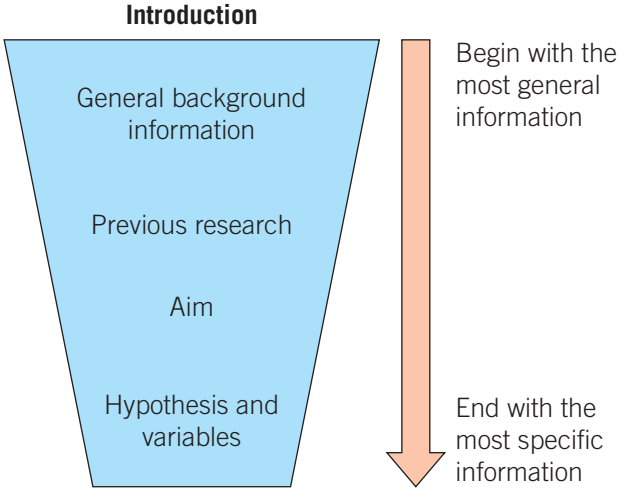


Figure 2B–6 The introduction section of a scientific report can be thought of as funnel shaped. It begins with the most general information about relevant theory at the wider part of the funnel and ends at the narrowest part with the most specific information obtained from the completed study.

ISBN 978-1-009-25401-4 Gallagher et al

Methodology section
a section of a scientific report or poster that describes the participants, materials and procedures used in the study

The **methodology section** of a scientific report describes how the study was undertaken. It often includes three subsections: participants, materials/equipment and procedures.

- *Participants:* This subsection describes the participants, including the number of participants, the population they were drawn from, the sampling technique, and relevant demographic characteristics, such as their gender, age range, and any other necessary characteristics for the research. If relevant, it also includes a statement about which research ethics committee reviewed and approved the study and which ethical frameworks the study was conducted within; for example, the National Health and Medical Research Council's 'National Statement on Ethical Conduct in Human Research'.
- *Materials/equipment:* This subsection lists all materials and equipment used in the study.
- *Procedures:* This subsection lists the steps taken to complete the research. It should be written in past tense as if the procedures have already been completed. The investigation design is included here, as well as the methods used to generate and analyse the data. The degree of detail should allow the reader to understand exactly how the study was done so that it could be easily repeated.

Results section
a section of a scientific report or poster that outlines the evidence and findings of the study

The **results section** displays all the relevant findings and evidence collected in the study. This includes tables, charts and graphs displaying the data and evidence. Generally, the same data should not be presented in a table as well as a graph. Findings may also be described in written text where it can be easily summarised. The results section should not include an explanation for the results. Raw data is not included within the results section but may be included as an appendix.

Discussion section
a section of a scientific report or poster that analyses the findings and concludes the research

The **discussion section** explains the findings and concludes the investigation. The section begins by reminding the reader of the objectives of the research and determines whether the hypothesis was supported, partly supported or refuted, in reference to the main findings. The background research that was discussed in the introduction can be referred to here and compared with the findings of the current research. In the discussion, any limitations of the design of the study are analysed, and any anomalous data that was not predicted and potentially a result of a flaw in the procedure are acknowledged. The discussion includes any suggestions for improvements to the study and future research. In the discussion, the researcher also includes any implications for the real-world application of the findings, as well as comments on the direction of future research. In a scientific report, this section finishes with a final detailed conclusion that links back to the original aim of the study. On a scientific poster, the conclusion is written in a separate section.

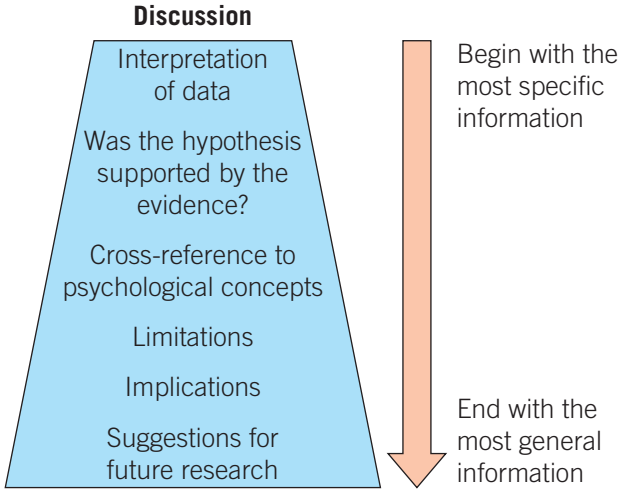


Figure 2B–7 The discussion section of a scientific report can be thought of as pyramid shaped. It begins with the most specific information about the study at the top of the pyramid and ends with the most general information about the future direction of research in the topic at the bottom of the pyramid.

ISBN 978-1-009-25401-4 Gallagher et al

The **references section** contains a complete list of all the sources referred to in the report, including the sources for the background research, theories, concepts, key term definitions or quotes. References in scientific reporting follow different style guides, with APA (American Psychological Association) style being most common in psychology. The style guide describes very specifically exactly what information is required when citing different sources, such as a journal article, book or website, as well as the specific formatting of the reference. You can use an online reference generator to create a reference that follows APA formatting guidelines. In psychology, you may choose to use another referencing format such as Harvard, and it is not required that you remember all the specific formatting rules as outlined in Skills 2B–3.

References section
a list of all the sources used in a scientific report

2B–3 SKILLS

VIDEO 2B–3 SKILLS: REFERENCING SOURCES

Referencing sources using the APA format

When writing a psychology report, the correct referencing of a source involves two parts: an in-text citation and a reference list entry.

In-text citations

Include an in-text citation when your work has been influenced by someone else's work, either when using a direct quote or when paraphrasing. An in-text citation is a shortened form of the reference that you cite in the body of your report. The citation can be at the start, middle or end of the sentence, and always includes the first author's surname and year of publication.

This citation format can be used for all types of sources, including books, journal articles and web documents. The in-text citation briefly identifies the work so that the reader can locate the corresponding entry in the reference list.

Table 2B–1 Citation formats

Number of authors	Information to include	Examples
One author or one organisation	• Author's surname and publication year	• Zuccon (2021) has proposed that ... • … effect was shown in a recent study (Robinson, 2021).
	• Organisation name and publication year • Organisation's full name used in first citation, an abbreviation used thereafter	• In 2018, the National Health and Medical Research Council (NHMRC) produced a document ...
Two authors	• Both surnames every time, and the publication year Use '&' only within brackets.	• (Beddoes & Harrington, 2020) Clark and Dickinson (2020) found that …
Three or more authors	• First author's surname followed by 'et al.' (a Latin abbreviation meaning 'and others') and publication year	• (Checkley et al., 2019). Green et al. (2003) found that …

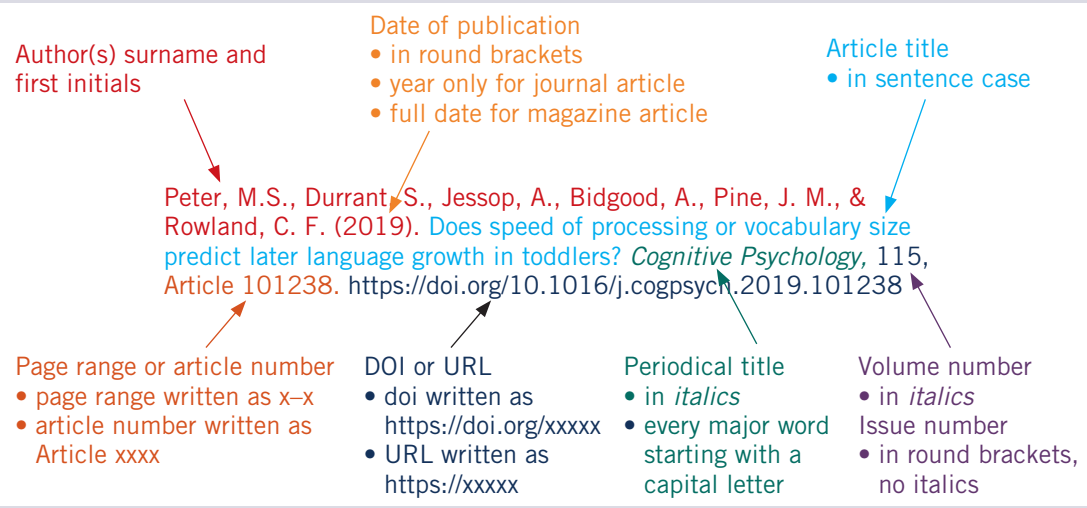
ISBN 978-1-009-25401-4 Gallagher et al

DOCUMENT 2B–1 QUICK REFERENCING GUIDE

Reference lists

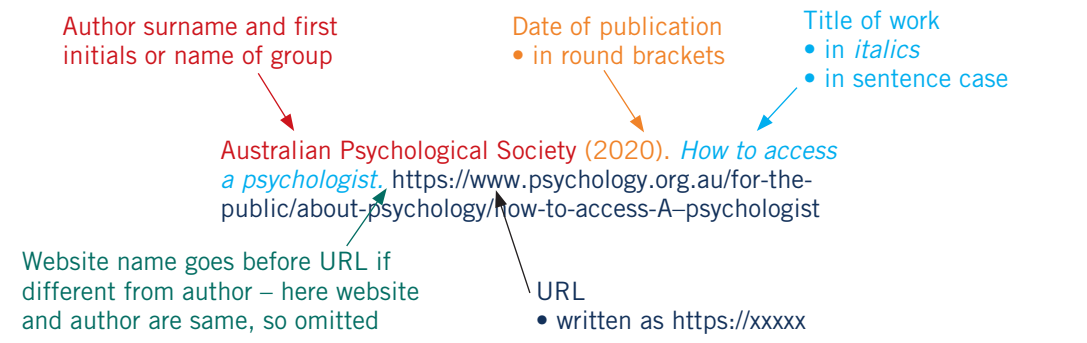
All sources cited in text, such as in the introduction section of a scientific poster, must be included in the reference list. References should be listed in alphabetical order by author surname or organisation name. There are very specific formatting rules for references lists, and different sources require different details. In general, four elements are included in a reference: author, date, title and source. The examples below show a reference entry for a journal article, a book and a website. For more examples and explanations of how to reference other sources such as Wikipedia, organisational reports, films, YouTube clips, TED Talks, and podcasts, a referencing quick guide is provided in the Interactive Textbook.

Periodical (journal, magazine or newspaper article; print or online)



Book

Website



ISBN 978-1-009-25401-4

Scientific posters

VIDEO 2B–4 SCIENTIFIC POSTERS

Scientific poster a way to present the main sections of a scientific report in a brief and visual way

Conventions and conferences are formal meetings where scientists present their research. It is a chance for researchers to come together and share their latest developments with like-minded people. It is also a chance to collaborate and network. The research topics may cover a broad range or be very specific. A researcher will create a large **scientific poster** of their work, often measuring more than a metre wide, which they stand next to during the convention and discuss with the attendees (Figure 2B–8).

A scientific poster includes all the main components of a scientific report summarised to be much more concise and more visually appealing. A scientific poster should not look like a research report condensed onto one page. It can be thought of as an illustrated abstract because it succinctly describes all the main features without the tiny details, in an eye-catching way. Because the researcher will be present at the poster session, they can discuss additional details with the reader.

Figure 2B–8 A researcher can present their findings on a scientific poster at conferences. A scientific poster should include a very brief summary of the research, and it should be visually appealing and easy to read from a distance. A researcher may discuss their research in more detail with anyone attending the poster session.

A good scientific poster contains small blocks of text in a large and simple font, with headings, graphs, tables and images that can be read from a distance. You can reduce the amount of text by using diagrams, bullet points, flow charts and images. All images should be clearly labelled. Use soft colours that do not strain the eyes. Scientific posters in the real world can follow many different templates. The poster may be either in portrait or in landscape orientation, and it can be divided into two, three or four columns, appropriately spaced apart. The sections of a poster should follow a logical order to allow for easy interpretation.

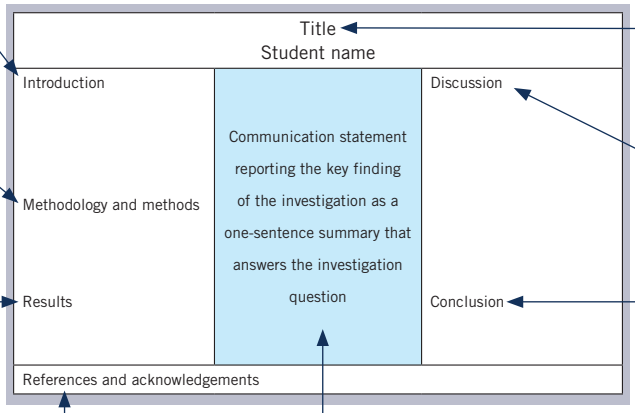
VCE Psychology mandates that the sections must include a title, introduction, methodology and methods, results, discussion, conclusion, references and acknowledgements. You do not need to include an abstract on a scientific poster in VCE Psychology, and the information on the poster should not exceed 600 words in total (excluding text in tables, graphs, image captions, references, which are all not included in the word count).

Figure 2B–9 outlines the template required for a scientific poster in VCE Psychology. You can include photos, illustrations, diagrams, bullet points, flow charts, tables and graphs to make the poster visually appealing and reduce the number of words.

ISBN 978-1-009-25401-4 Gallagher et al

Introduction
- A brief explanation or reason for undertaking the investigation, including a clear aim, a hypothesis and/or prediction and relevant background psychological concepts. Photos and illustrations can be included where relevant.

Methodology and methods
- Brief outline of methodology used to address investigation question
- Summary of methods of data generation and data analysis
- Often includes subsections for participants, materials and procedures
- Materials can be in a bulleted list
- Only include key parts of procedure, in enough detail that study could be repeated
- Figures and flow charts can be used to describe procedures
- A diagram can be used to describe set-up of equipment



Title
- Question under investigation

Discussion
- Interpretation and evaluation of analysed primary data
- Identification of limitations in data and methods, and suggested improvements
- Cross-referencing of results to relevant psychological concepts and previous research
- Linking of results to the investigation question and aim, to explain whether investigation data and findings support the hypothesis
- Implications of investigation and/or suggestions for further investigations

Centre of the poster will feature a simple and engaging communication statement: a one-sentence summary of the major finding of the investigation that answers the investigation question. This section must occupy 20–25% of the poster space.

References and acknowledgements
- Acknowledges any information that has been sourced elsewhere, including quotes, definitions and background research studies
- Sources should be referred to in the body of poster, and a full detailed reference included in reference list
- Reference list should follow APA formatting rules

Results
- Presentation of generated data/evidence in appropriate format to illustrate trends, patterns and/or relationships
- Data presented in a table or graph, clearly labelled and titled, and appropriate to data
- A small amount of text may be included to note key points featured in tables and graphs

Conclusion
- Conclusion that provides a response to investigation question
- Identification of the extent to which the analysis has answered investigation question, with no new information being introduced

Figure 2B–9 The scientific poster template required in VCE Psychology, with the main information required for each mandated section

WORKSHEET 2B–1 EVALUATING SCIENTIFIC IDEAS

Check-in questions – Set 2

1 List the main sections of a scientific report.
2 What is included in the centre column of a scientific poster?
3 Which section includes the final statements of the overall findings and a closing response to the investigation question?

ISBN 978-1-009-25401-4 Gallagher et al

2B–4 SKILLS

VIDEO 2B–5 SKILLS: LANGUAGE IN SCIENTIFIC REPORTS AND POSTERS

Language in scientific reports and posters

A scientific report is a formal piece of writing that should use scientific language and a formal tone.

A scientific report or poster can be written in the first person (e.g. 'I discovered that ...', 'Our experiment showed ...') or the third person (e.g. 'The researcher found ...', 'The participants were instructed to ...') because the scientific community has not reached a consensus, and different scientific journals have different requirements for language use. However, third-person voice helps to maintain an objective tone to your writing and will more likely be recommended by your teachers.

A scientific report or poster may use different tenses in different sections. In general, anything that has already been done (such as the procedure of an experiment) should be written in past tense; for example, 'The participants were divided equally into two groups'. When describing something that still exists (such as a psychological theory), then use present tense; for example, 'The Atkinson-Shiffrin model of memory states that there are three major memory stores'.

ACTIVITY 2B–1 USING TWINS TO STUDY THE EFFECT OF SPACE TRAVEL ON AN ASTRONAUT

In 2015–2016, NASA had the unique opportunity to measure the effect of long-duration spaceflight on humans by using a set of twins. One twin, Scott Kelly, was on board the International Space Station for 340 days, while his twin brother, Mark Kelly, remained on Earth, living a civilian life. The researchers were able to measure many differences between the genetically matched Scott and Mark and identify the environmental impact on the human body of living in space. The differences they found included changes in gene regulation, gut microbiome, retinal thickness and carotid artery dimensions.

Conduct a search online for further information on this study and find an example of:

- an opinion
- an anecdote
- evidence.

Record a full reference for each of the sources you use.

Figure 2B–10 Twin astronauts Mark Kelly (left) and Scott Kelly (right) participated in a landmark study investigating the effect of long-duration spaceflight on humans.

ISBN 978-1-009-25401-4

Section 2B questions

1 List the main information included in the discussion section of a scientific report.
2 Identify two differences between the features and writing of a scientific report and those of a scientific poster.
3 Mr Max is completing an investigation with his Year 12 class to see whether he can condition his students to salivate at the sound of a bell. He sets a 5-minute timer on the board and each time it rings, the students eat a spoonful of sherbet. At the end of the 50-minute lesson, some of the students find that they salivate at the sound of the bell, even without eating any sherbet.
   a Write a conclusion for Mr Max's investigation.
   b This investigation is based on a study conducted by Ivan Pavlov. If the students were to write up a scientific poster on this investigation, in which section would Pavlov's theory be described?
   c One student, Priyanka, found that she did not salivate at the sound of the bell alone, and thought that the experiment did not work. Why might Priyanka's comment be considered an anecdote?
   d At Mr Max's school, there are three other Year 12 Psychology classes. Mr Max also tutors psychology students from another school on the other side of the city. Explain whether it would be appropriate for Mr Max to apply the findings of his investigation to the other Year 12 Psychology classes at his school and his tutoring group.

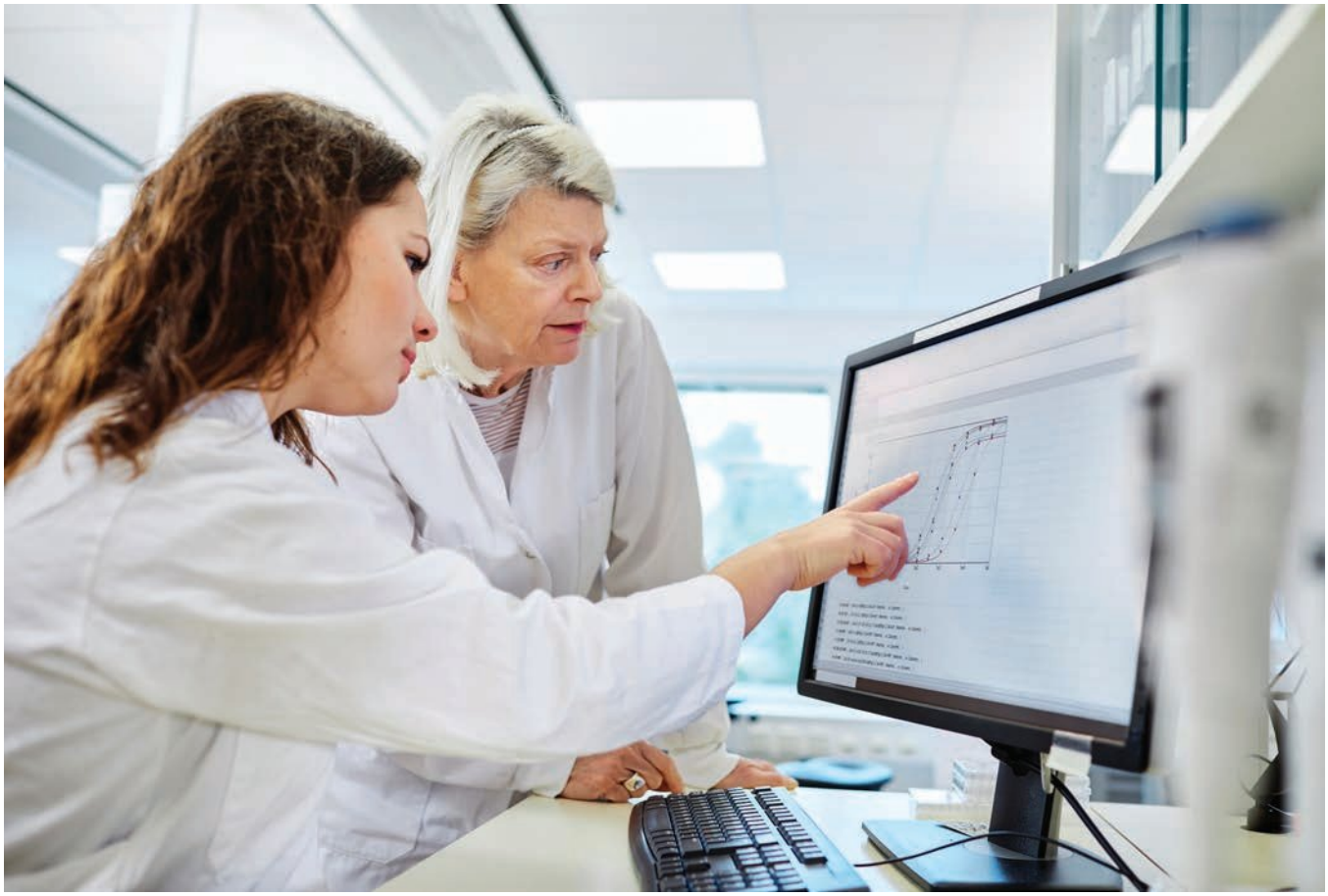


Figure 2B–11 There are many ways to communicate your research.

ISBN 978-1-009-25401-4 Gallagher et al

Chapter 2 review

Summary

Create your own set of summary notes for this chapter on paper or in a digital document. A model summary is provided in the Teacher Resources, which can be used to compare with yours.

Checklist

In the Interactive Textbook, the success criteria are linked from the review questions and will be automatically ticked when answers are correct. Alternatively, print or photocopy this page and tick the boxes when you have answered the corresponding questions correctly.

Success criteria – I am now able to:		Linked questions
2A.1	Distinguish between primary and secondary data	10b ☐
2A.2	Systematically generate and record primary data, and collate secondary data for an investigation	12d ☐
2A.3	Determine the type and amount of qualitative and quantitative data to be generated or collected in an investigation	2 ☐
2A.4	Identify potential sources of error and uncertainty when designing and conducting investigations	12c ☐
2A.5	Distinguish between the features of qualitative and quantitative data	2 ☐
2A.6	Identify examples of qualitative and quantitative data and evaluate the appropriateness of their use in an investigation	2 ☐
2A.7	Accurately and systematically record and summarise qualitative and quantitative data, including using a logbook	9 ☐
2A.8	Describe the features and uses of tables, bar charts and line graphs to organise and present data	11c ☐
2A.9	Select a meaningful and relevant presentation format, and then organise and present data using tables, bar charts and line graphs	5 ☐
2A.10	Interpret data presented in tables, bar charts and line graphs	11a ☐
2A.11	Describe the features and purposes of using percentages, percentage change, measures of central tendency (mean, median, mode), and measures of variability (standard deviation)	1 ☐
2A.12	Select the appropriate mathematical relationships for a set of quantitative data and calculate the percentage, percentage change, mean, median, mode and standard deviation using the correct units of measurement	12d ☐
2A.13	Interpret quantitative data presented as percentages, percentage change, measures of central tendency (mean, median, mode), and measures of variability (standard deviation)	4 ☐
2A.14	Describe the concepts of accuracy, precision, repeatability, reproducibility, true values, internal and external validity, errors and certainty in relation to a qualitative analysis of data	10a ☐
2A.15	Describe and analyse the effect of sample size on the quality of data obtained	3 ☐

ISBN 978-1-009-25401-4 Gallagher et al

Success criteria – I am now able to:		Linked questions
2A.16	Analyse data qualitatively for accuracy, precision, repeatability, reproducibility, true values, internal and external validity, errors and certainty	8☐, 12a☐
2A.17	Identify outliers, contradictory data and incomplete data in a data set	8☐, 12b☐
2A.18	Analyse the effect of outliers, contradictory and incomplete data	12b☐
2A.19	Explain the benefit of repeating experiments to ensure findings are robust	3☐
2A.20	Evaluate investigation methods and the effect of possible sources of error or uncertainty in an investigation	12c☐
2A.21	Suggest improvements regarding sources of error or uncertainty in investigation methods to increase validity and to reduce uncertainty	12c☐
2B.1	Distinguish between opinion, anecdote and evidence and scientific and non-scientific ideas	11d☐
2B.2	Evaluate sources of information for the use of opinion, anecdote, evidence, scientific and non-scientific ideas	11d☐
2B.3	Evaluate data to determine the degree to which the evidence supports the aim of an investigation	12e☐
2B.4	Provide appropriate recommendations for modifications or extensions to an investigation	3☐
2B.5	Evaluate data to determine the degree to which the evidence supports or refutes the initial prediction or hypothesis of an investigation	14a☐
2B.6	Construct scientific arguments using reasoning	11d☐
2B.7	Use reasoning and evidence to draw and justify conclusions for a question under investigation	4☐
2B.8	Identify, describe and explain the limitations of conclusions	14b☐
2B.9	Identify when further evidence is required, and suggest what further evidence would improve the limitations of an investigation's conclusions	14c☐
2B.10	Discuss relevant implications of research findings and proposals	6☐
2B.11	Evaluate cultural bias in data and conclusions to determine the appropriateness of application to different cultural groups	14b☐
2B.12	Use appropriate psychological terminology, representations and conventions, including standard abbreviations	8☐, 10a☐
2B.13	Use appropriate graphing conventions and units of measurement when presenting data from investigations	11b☐
2B.14	Access and interpret the information provided in a range of scientific and media texts including journal articles, mass media communications, opinions, policy documents and reports in the public domain	13a☐
2B.15	Critically evaluate the quality of evidence provided by a range of scientific and media texts, processes, claims and conclusions	13a☐

ISBN 978-1-009-25401-4

Success criteria – I am now able to:		Linked questions
2B.16	Identify relevant audiences for specific scientific communications and use clear, coherent and concise expression to communicate for specific purposes in appropriate scientific genres	13b ☐
2B.17	Describe and apply the requirements for writing a scientific report and a scientific poster to an investigation	7 ☐
2B.18	Locate the required referencing details within scientific and media texts and use standard scientific referencing conventions to acknowledge sources of information and assistance used in research	13c ☐

Multiple-choice questions

1 Which of the following is correct for processing quantitative data?

- **A** The mean is a measure of central tendency, whereas the standard deviation is a measure of variation around the mean.
- **B** The mean is a measure of variation, whereas the median is a measure of central tendency.
- **C** The mean, median and mode are all measures of variation.
- **D** The standard deviation describes the average of a set of data.

The following information relates to Questions 2–3.

Iago wants to collect data regarding the stress levels of VCE students over the course of the year. He wants the students to have the chance to describe their own opinions on their stress levels in their own words while remaining anonymous, and he is now considering how he should collect this data. He will use 10 student leaders to form his sample.

2 Which of the following identifies the type of data Iago wishes to collect?

	Type of data	Explanation
A	Qualitative	The data is describing characteristics and qualities
B	Subjective	The data is factual and collected through observation
C	Quantitative	The data is based on personal interpretation
D	Qualitative	The data is measurable and numerical in nature

3 Iago collects the data, collates it and finds the overall patterns in students' responses. The 10 students reported that their stress levels increased throughout VCE, with their peak in the middle of Year 12. Iago wants to be able to apply his results to the wider population of VCE students in Victoria, so he decides to repeat his study.

What could he do to improve the external validity of his results?

- **A** Include a larger sample of participants who are more representative of the wider population.
- **B** Use only females in the sample, as Iago found they experienced more stress than males in his original study.
- **C** Use a control group who are not interviewed.
- **D** Include a larger sample of female participants from Year 12 only.

ISBN 978-1-009-25401-4 Gallagher et al

The following information relates to Questions 4–7.

Iago studies stress levels of VCE students using a rating scale to collect numerical data during the school year, which he can then collates and describes using descriptive statistics.

He calculates the following results from his data for stress scores at the beginning and end of the year.

	Year 11	Year 12
Mean stress score at the start of the year	2	3
Mean stress score at the end of the year	5	9

4 What do Iago's results indicate?

A The stress levels of all VCE students increased over the year, with Year 11 students reporting a higher stress level than Year 12 students.

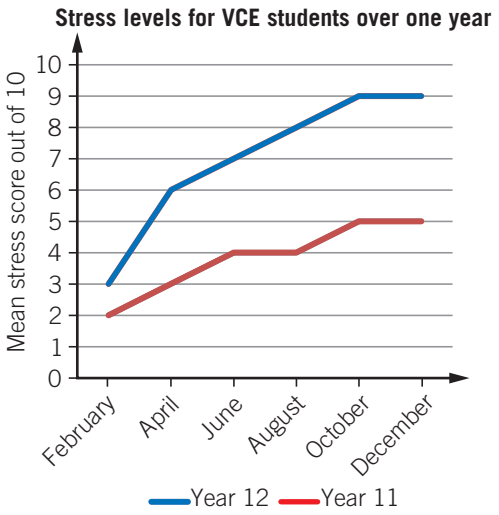
B Year 11 students reported a lower stress level than Year 12 students at the start of the year but a higher stress level than Year 12 students at the end of the year.

C The stress levels of all VCE students increased over the year.

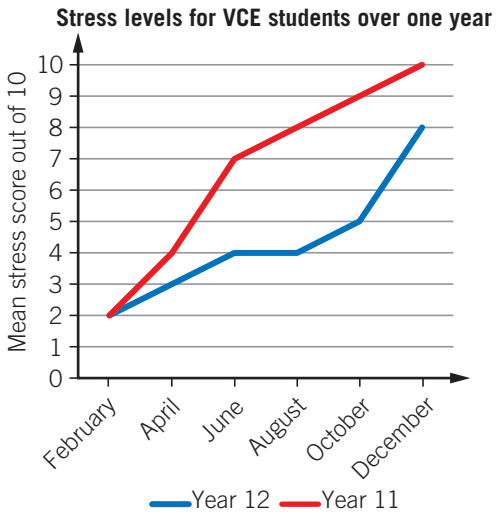
D Year 12 students reported a lower level of stress than Year 11 students at the start of the year but a higher level of stress at the end of the year.

5 Which of the following graphs of stress scores over the year fits Iago's results?

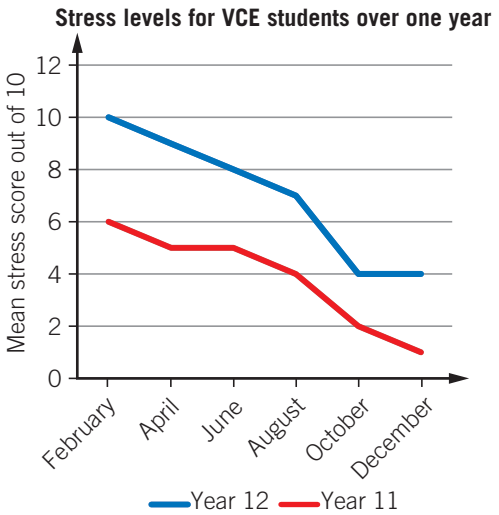
A Graph I



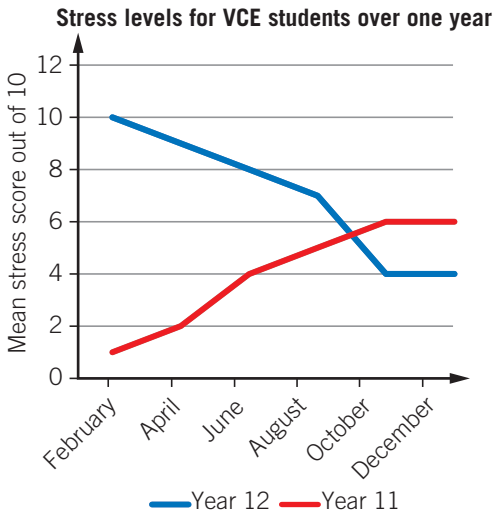
B Graph II



C Graph III



D Graph IV



ISBN 978-1-009-25401-4 Gallagher et al

6 Which of the following is not a possible implication of Iago's investigation?

A Future research could investigate methods to decrease stress levels in VCE students during the year.

B Parents of primary school children could use this information to understand the stress levels of their children.

C Parents could use this information to understand peak times of stress for their child during VCE.

D Future research could investigate whether there are significant differences between the stress levels of male and female VCE students.

7 Details about the implications of this investigation would go into which section of a scientific report?

A Introduction

B Methodology

C Results

D Discussion

8 Which of the following is a correct description of qualitative analysis for a study measuring the effectiveness of a home energy monitor?

A If an energy monitor in a home malfunctions and misses three days of recordings during this month, this would be considered incomplete data.

B A systematic error would be involved if the researcher forgot to check the energy monitor at the desired time during one day of a trial.

C Outliers are always considered systematic errors.

D The measurements of the energy monitor would contain no possibility of uncertainty.

9 Koby is collecting data on drink preferences from his friends as part of a research project. He chooses three soft drink flavours to ask about: Cola (C), Lemonade (L) and Raspberry (R). He asks 10 friends for their preferences and writes down the following data:

C, C, L, R, L, C, C, L, C, L

Which of the following tables accurately collates and summarises Koby's data?

A

Cola	Lemonade	Raspberry
3	3	4

B

Cola	Lemonade	Raspberry
5	4	1

C

Cola	Lemonade	Raspberry
6	3	1

D

Cola	Lemonade	Raspberry
5	4	3

ISBN 978-1-009-25401-4 Gallagher et al

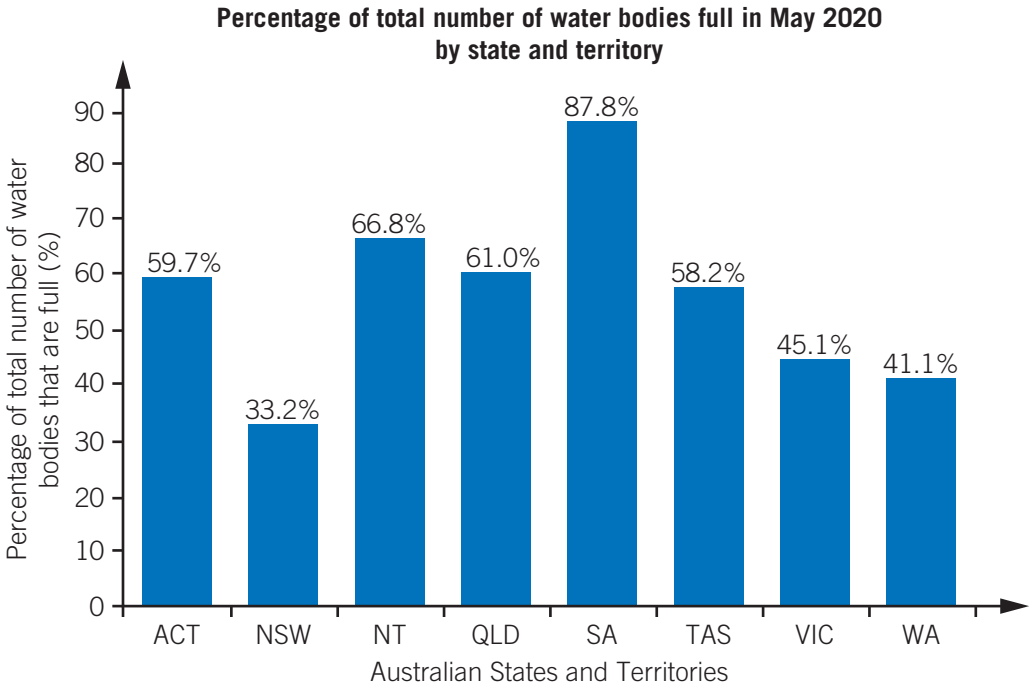
Short-answer questions

10 Philip Zimbardo's Stanford Prison Experiment studied the influence of roles and power, and has since been widely criticised for its lack of scientific merit. In this experiment, participants were assigned the role of either prison guard or prisoner and were left to behave as they saw fit in a mock prison environment. The behaviours shown by the prison guards were violent and cruel, and the behaviours shown by the prisoners were submissive and obedient. Following the study, many of the participants who were assigned the role of prison guard claimed to have behaved heartlessly due to a belief that was what the researchers wanted them to do, rather than because they were assigned the potentially violent role.

a Discuss the validity of Zimbardo's Stanford Prison Experiment. (1 mark)

b Identify whether Zimbardo's investigation collected primary data or secondary data. (1 mark)

11 The following bar chart compares the proportion of water bodies (lakes, reservoirs and weirs) that were full in different Australian states and territories in May 2020.



a Which two states or territories had the most similar proportion of lakes, reservoirs and weirs full? (1 mark)

b When drawing graphs, it is suggested that the IV be presented on the x-axis and the DV on the y-axis. Is this true for this bar chart? (1 mark)

c Explain why this data was shown as a bar chart instead of a line graph. (2 marks)

d Identify whether this data would be considered opinion or evidence, and justify your answer. (2 marks)

ISBN 978-1-009-25401-4 Gallagher et al

12 A refrigerator's internal thermometer is calibrated using another thermometer to determine whether it is measuring the temperature correctly. The fridge's temperature is set to 3.1°C. The additional thermometer is read seven times, giving: 3.1, 3.2, 3.2, 3.1, 3.1, 3.2, 3.1.

- **a** Discuss the accuracy and precision of the thermometer's measurements. (2 marks)
- **b** On the eighth measurement, the thermometer displayed a reading of 15.6°C. Does this recording appear to be an outlier? Explain the effect on the findings if this reading was left in the dataset. (2 marks)
- **c** The eighth measurement of 15.6°C was due to the person not using the thermometer correctly in that trial. Identify the type of error this would be classified as, and suggest what should be done to resolve the error. (2 marks)
- **d** Identify which mathematical relationship would best represent the data collected in this investigation and calculate this measurement. (2 marks)
- **e** Evaluate the data to determine whether the evidence collected supports the aim of this investigation. (1 mark)

13 Fiona is completing a research assignment for school. She needs to find some information about the best habitats for a platypus. She conducts an online search and finds two websites, one called 'Zoos Victoria' and one called 'Paulo's Platypus Facts'.

- **a** Critically evaluate the possible quality of evidence provided by each of these sources to determine which website Fiona should use for her assignment. (2 marks)
- **b** Identify the likely relevant audience for the website 'Paulo's Platypus Facts'. (1 mark)
- **c** Fiona needs to write a reference for the website she chooses to use. Identify three pieces of information that should be included in her reference entry. (1 mark)

14 A researcher is interested in how children learn through observation of their parents. She thinks that children will be more likely to learn and copy the aggressive behaviours demonstrated by their parents compared to the non-aggressive behaviours. The researcher asks a selection of parents from an Under 8s basketball club in Ballarat to choose two aggressive and two non-aggressive behaviours that they will display in view of their child over the month. The parents also keep a record describing whether their children demonstrate the same behaviours and to what degree. The researcher collates the data and determines that children do more often copy the aggressive behaviours of their parents compared to the non-aggressive behaviours.

- **a** Determine whether the researcher's hypothesis was supported by their findings. (1 mark)
- **b** With reference to cultural bias, explain a limitation of the investigation's conclusion. (1 mark)
- **c** Suggest what further evidence would be useful to help overcome the identified limitation. (1 mark)

ISBN 978-1-009-25401-4 Gallagher et al

UNIT 1

HOW ARE BEHAVIOUR AND MENTAL PROCESSES SHAPED?

CHAPTER 3

THE COMPLEXITY OF PSYCHOLOGICAL DEVELOPMENT

Introduction

Have you ever wondered how you are able to do all the things you do daily? These daily tasks could include having a conversation with your friends, performing a calculation in maths class, reading a book, remembering you have an appointment, creating a piece of art, playing a musical instrument or cooperating in a team sport. The development of your ability to do these tasks has been influenced by a complex interaction between biological factors such as the genes that have been passed on to you from your biological parents, psychological factors such as your motivation and thinking patterns, and social factors such as whether you have siblings or are an only child. In this chapter we will take a deep dive into the process of psychological development over the life span, recognising that individuals are not fixed from birth but instead can grow and change psychologically throughout their lives.

Curriculum

Area of Study 1 Outcome 1
What influences psychological development?

Study Design:	Learning objectives – at the end of this chapter I will be able to:	
• The interactive influences of hereditary and environmental factors on a person's psychological development	**3A**	**Hereditary and environmental factors**
	3A.1	Understand that a person's psychological development can be influenced by both hereditary and environmental factors, which interact
	3A.2	Explain what is meant by psychological development
	3A.3	Describe and provide examples of hereditary and environmental factors
	3A.4	Distinguish between hereditary and environmental factors
	3A.5	Discuss the interactive nature of hereditary and environmental factors
	3A.6	Apply my understanding of the interactive nature of hereditary and environmental factors to a person's psychological development

ISBN 978-1-009-25401-4 Gallagher et al

Study Design:	Learning objectives – at the end of this chapter I will be able to:
• The biopsychosocial approach as a model for considering psychological development and mental wellbeing	**3B The biopsychosocial approach** **3B.1** Understand that there are a range of biological, psychological and social factors that influence a person's psychological development and mental wellbeing and that they interrelate **3B.2** Explain the characteristics of mental wellbeing and how it differs from mental health problems and mental disorders **3B.3** Explain how the biopsychosocial approach can be used to consider psychological development and mental wellbeing **3B.4** Identify and describe different biological, psychological and social factors that influence psychological development and mental wellbeing **3B.5** Explain how different biological, psychological and social factors can influence psychological development and mental wellbeing **3B.6** Use the biopsychosocial approach to consider a person's psychological development and/or mental wellbeing
• The process of psychological development (emotional, cognitive and social development) over the course of the life span	**3C The process of psychological development** **3C.1** Understand that development is a psychological process that occurs over the course of the life span and involves three areas: emotional, cognitive and social development **3C.2** Describe emotional development over the course of the life span and provide examples **3C.3** Describe cognitive development over the course of the life span and provide examples **3C.4** Describe social development over the course of the life span and provide examples **3C.5** Understand at least two models or theories from the three areas of development: emotional, cognitive and social **3C.6** Evaluate at least two models or theories from the three areas of development: emotional, cognitive and social
• The role of sensitive and critical periods in a person's psychological development	**3D Sensitive and critical periods in psychological development** **3D.1** Understand the role that sensitive and critical periods play in a person's psychological development **3D.2** Explain sensitive periods and provide examples relevant to psychological development **3D.3** Explain critical periods and provide examples relevant to psychological development **3D.4** Compare and contrast the role of sensitive and critical periods in a person's psychological development **3D.5** Apply my understanding of sensitive and critical periods to a person's psychological development

ISBN 978-1-009-25401-4

Key Science Skills

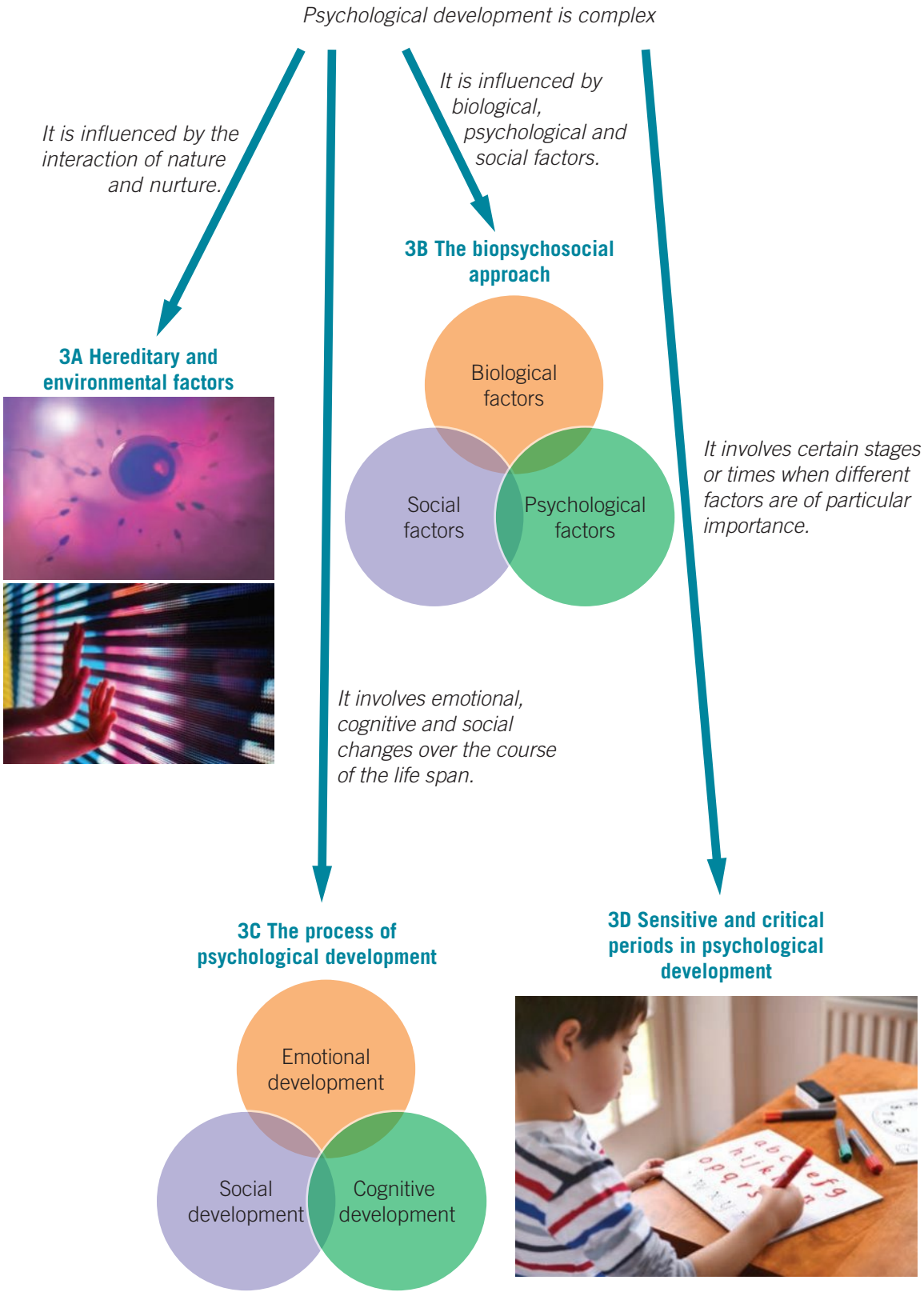
- Identify, research and construct aims and questions for investigation
- Identify independent, dependent and controlled variables in controlled experiments
- Formulate hypotheses to focus investigations
- Predict possible outcomes of investigations
- Design and conduct investigations; select and use methods appropriate to the investigation, including consideration of sampling technique (random and stratified) and size to achieve representativeness, and consideration of equipment and procedures, taking into account potential sources of error and uncertainty; determine the type and amount of qualitative and/or quantitative data to be generated or collated
- Analyse and evaluate psychological issues using relevant ethical concepts and guidelines, including the influence of social, economic, legal and political factors relevant to the selected issue

Glossary

Abstract thinking
Accommodation
Animism
Assimilation
Attachment
Biological factors
Biopsychosocial approach
Biopsychosocial model
Classification
Cognitive development
Conservation
Critical period
Egocentrism
Emotional development
Emotional wellbeing
Environmental factors
Genes
Genetic vulnerability
Genotype
Goal-directed behaviour
Hereditary factors
Heredity
High levels of functioning
Hypothetical-deductive reasoning
Imprinting
Insecure-avoidant attachment
Insecure-disorganised attachment
Insecure-resistant attachment
Life stressor
Maladaptive behaviour
Mental disorder
Mental health problems
Mentally healthy
Mental wellbeing
Modelling
Moral development
Morality
More knowledgeable other
Neuroplasticity
Object permanence
Observational learning
Phenotype
Protective factors
Psychological development
Psychological factors
Resilience
Reversibility
Risk factors
Scaffolding Schema
Secure attachment
Sensitive period
Social development
Social factors
Social wellbeing
Symbolic thinking
Transformation
Wellbeing
Zone of proximal development (ZPD)

ISBN 978-1-009-25401-4

Concept map



See the Interactive Textbook for an interactive version of this concept map interlinked with all concept maps for the course.

ISBN 978-1-009-25401-4 Gallagher et al

Hereditary and environmental factors

Study Design:
The interactive influences of hereditary and environmental factors on a person's psychological development

Glossary:
Environmental factors
Genes
Genotype
Hereditary factors
Heredity
Phenotype
Psychological development

ENGAGE

Identical twins meet on Facebook

In 2012, a friend of Anaïs Bordier, a French university student studying in the UK, sent her a screenshot from a YouTube video that would change her life. The screenshot was of a young American actor called Samantha Futerman, who, like Anaïs, was born in South Korea, had been adopted and shared the same birthday. After Anaïs contacted Samantha on Facebook, they got to know each other online over lots of Skype chats. Eventually, they met in London and underwent DNA testing, which confirmed that they were twins.

Despite growing up on opposite sides of the world, Anaïs and Samantha discovered that they shared lots of similarities. They both hated cooked vegetables, feared being touched by shower curtains and needed to sleep 10 hours a night, plus take naps when they felt stressed. A study was conducted on Anaïs and Samantha by the director of the Twins Studies Centre at California State University. It was established that while they had similar heights, weights and ages of getting their first period, they also had some differences. Although they had similar personalities, Anaïs was less extroverted and had lower self-esteem. Also, there was a 17-point difference between the twins' IQs. Given that Anaïs and Samantha have identical DNA (i.e. a hereditary factor), these variances are probably due to their different upbringings (i.e. environmental factors).

In this section, we will consider how hereditary and environmental factors interact to influence a person's development. Studies of identical twins like Anaïs and Samantha provide us with some insight into this.

EXPLAIN

Factors influencing psychological development

Psychological development the changes in an individual's social, emotional and cognitive abilities from infancy through to old age

The study of psychological development is essential to understanding how humans learn, mature and adapt over time. By observing the changes associated with each stage of the life span and the factors that influence them, psychologists can provide explanations for our thoughts, feelings and behaviours. In addition, if psychologists are aware of the changes that might be expected at different stages of the life span, they can better understand what 'normal' or 'typical' development looks like and identify when something is not normal, or 'atypical'. **Psychological development** refers to the changes in an individual's social, emotional and cognitive abilities, from infancy through to old age.

ISBN 978-1-009-25401-4 Gallagher et al

Figure 3A–1 Developmental psychologists are interested in the changes that occur throughout the life span from infancy through to old age.

ACTIVITY 3A–1 BABY PHOTO LINE-UP

LINK 3C THE PROCESS OF PSYCHOLOGICAL DEVELOPMENT

As a fun introduction to the topic of psychological development, have each member of the class bring in a photo of themselves as an infant 0–2 years of age to share. This could be a print photo or on a device. The teacher could collate these pictures, number them and then get everyone to guess who is in each picture. Afterwards, discuss the obvious physical changes that have occurred since the picture was taken. In addition, note any changes in abilities that you think have occurred in the three main areas of development:

- **Social** – learning how to share and take turns when playing and developing ongoing friendships.
- **Emotional** – identifying different emotions, self-regulating emotions and expressing emotions that are appropriate to the situation.
- **Cognitive** – being able to sort objects by shape and colour, perform increasingly complex mathematical calculations and use a wide vocabulary when talking.

These areas of development are influenced by a variety of complex and interacting factors, which are categorised as hereditary or environmental factors. These concepts will be discussed in detail in this chapter.

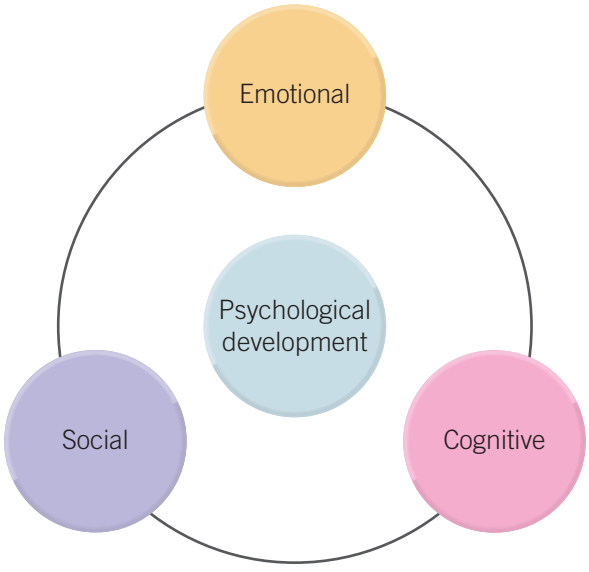


Figure 3A–2 The three main areas of psychological development

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 1

1 What is psychological development?
2 Why are psychologists particularly interested in studying psychological development?
3 List the three main areas of development and provide an example of each.

Hereditary factors

Figure 3A–3 Many of the unique characteristics of these infants were determined before birth, at conception.

Many of the characteristics that make us unique individuals are determined before birth at conception, when sperm meets egg. These characteristics are genetically determined and will remain constant throughout the life span. Examples include your eye colour, bone structure and blood type. At the point of your conception, genetic material from each of your biological parents combined to form a human embryo with the unique set of **genes** that make up your DNA.

VIDEO 3A–1 FACTORS INFLUENCING PSYCHOLOGICAL DEVELOPMENT

Heredity, or inheritance, is the term used to refer to the passing on of genes or genetic information from parents to their offspring. Your genes are referred to as your **genotype** and can determine some obvious physical differences between you and others, such as skin tone, hair colour, eye colour, nose shape and other facial features. But it can also influence other more subtle features, such as aspects of your personality, your likelihood of developing a mental disorder or your level of intelligence. The way that your genotype is expressed is referred to as your **phenotype**.

Genes
the basic units of heredity or inheritance that contain genetic information and form a section of DNA

Heredity
the passing on of genes or genetic information from parents to their offspring

Genotype
all the genes that a person has inherited from their biological parents

Phenotype
how a person's genes are expressed

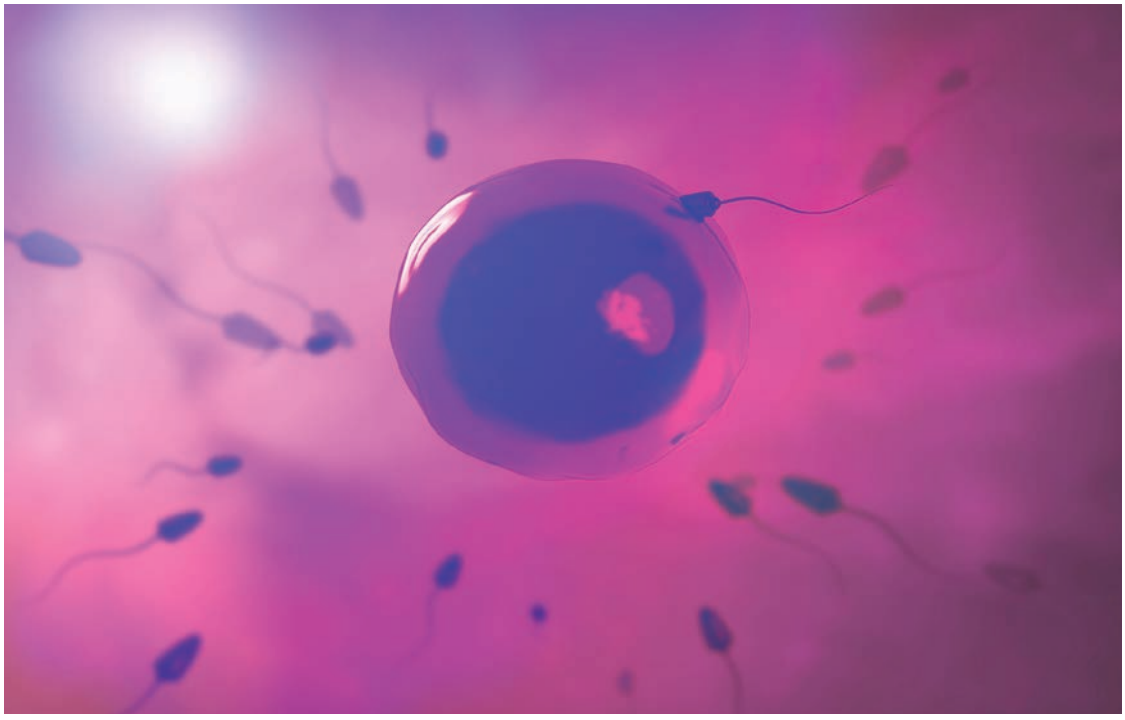


Figure 3A–4 At conception, genetic material from the biological parents combines to form a unique set of genes (a genotype). This is the basic plan for an individual's development, but the actual expression of that plan can be altered by the environment.

ISBN 978-1-009-25401-4 Gallagher et al

NOTE

In biology, gene expression in its strict sense involves the switching on of a gene (which can be influenced by environmental factors) to initiate DNA transcription and translation, leading to protein synthesis. In a separate process after that, the activity of the protein produces the phenotype, and that process can also be influenced by environmental factors. In this course, 'gene expression' may be used in a broader sense to mean how the genotype interacts with environmental factors to express the phenotype.

Figure 3A–5 Despite having the same genes (genotype), Anaïs and Samantha have numerous differences in the expression of their genes (phenotype). This could be due to environmental factors.

Developmental psychologists are interested in these internal, biological influences on development that result from the genetic information passed from biological parents to their offspring. These influences are referred to as **hereditary factors** and are considered to pre-determine some of our characteristics and personal attributes at conception. While a child's genotype may represent a plan for how they should develop, the way that their genes are expressed will determine what they look like. Think of this as a bit like the process of building a house. The same house plan can result in houses that look similar, but they often have different surface finishes, furniture and furnishings. This was also seen with the identical twins Anaïs and Samantha, mentioned earlier. Despite having identical genetic material, the twins had subtle differences in their phenotypes, such as their degrees of extroversion and IQ. This is because environmental factors influence whether genes are expressed or how the proteins they produce operate. For Anaïs and Samantha, these environmental factors included being reared apart, in different countries and in different families.

Hereditary factors biological influences on development that result from the genetic information passed from biological parents to their offspring

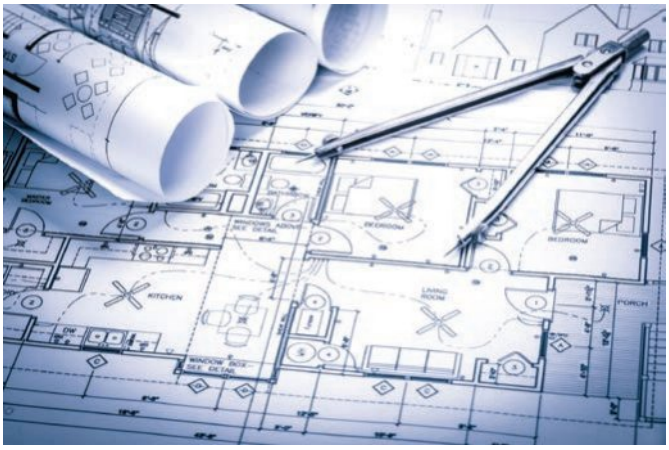


Figure 3A–6 A child's genotype represents a plan analogous to that for building a house. The same plan can result in houses that are quite similar in structure but have different surface finishes, furniture and furnishings, making them unique. In the same way, the expression of a child's genes is their phenotype.

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 2

1 When are some of our individual unique characteristics pre-determined?
2 Provide two examples of characteristics that are genetically determined.
3 What are genes?
4 Explain the relationship between heredity and hereditary factors.
5 Distinguish between a person's genotype and their phenotype.
6 What is a major influence on whether genes are expressed or how the genotype is expressed as the phenotype?

Environmental factors different external influences within a person's environment that can affect their development

Environmental factors

The way that a child is raised, the experiences they have, the relationships they form, the education they receive and the resources they have access to can also play a huge role in their development. These are all examples of **environmental factors** (Figure 3A–7). These are the different external influences within a person's environment that can affect their development.

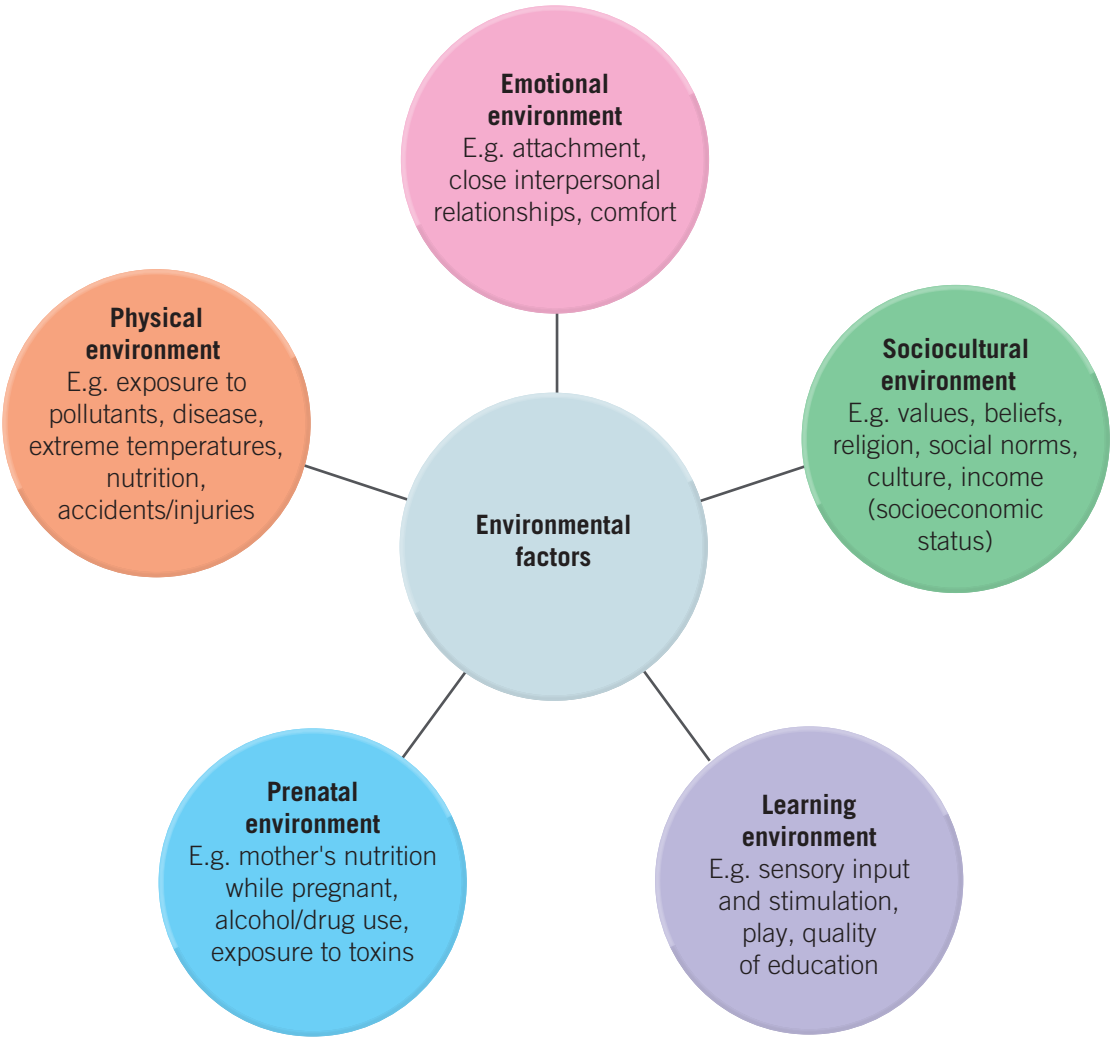


Figure 3A–7 Examples of different environmental influences on development

ISBN 978-1-009-25401-4 Gallagher et al

Let's look at some of these examples and how they may affect a child's psychological development.

Table 3A–1 Examples of environmental factors and their potential influences on development

Environmental factors	Possible impacts on development
Income or socioeconomic status 	Greater income or wealth can impact a child's access to resources. This could include basic needs in the physical environment, such as shelter, clothes and food. It can also influence how much time a parent can spend with a child or must spend working. In addition, it can influence access to private education, opportunities for travel and extra-curricular activities, like piano lessons.
The physical environment 	The living environment in which a child is brought up can impact all aspects of development. If a child has many siblings, the caregiver's attention may be divided between all the children. Further, the quality of the physical environment in which the child lives can influence exposure to disease, pollution or temperature extremes and access to basic resources, such as clean water and food.
Sensory input and stimulation 	Children are born ready to learn and they depend on their caregivers to help them develop the skills needed to become independent and lead healthy and successful lives. Brain growth and development is strongly reliant on sensory stimulation from the environment through experiences with other people and the world.
Attachment and family bonding 	The bonding provided within a family home helps nurture and protect a child, both physically and emotionally. Parents who spend quality time with their child and provide them with comfort and a feeling of safety create a secure bond, or attachment, with their child. The quality of the bond between caregiver and child can influence many aspects of development, particularly the child's social and emotional development.
Alcohol use while pregnant (prenatal environment) 	Alcohol at any stage of pregnancy can damage a developing baby's brain, body and organs and lead to a preventable disability known as Foetal Alcohol Spectrum Disorder (FASD). Alcohol also increases the risk of miscarriage, stillbirth and babies being born smaller or prematurely.

WORKSHEET 3A–1 ENVIRONMENTAL INFLUENCES ON DEVELOPMENT

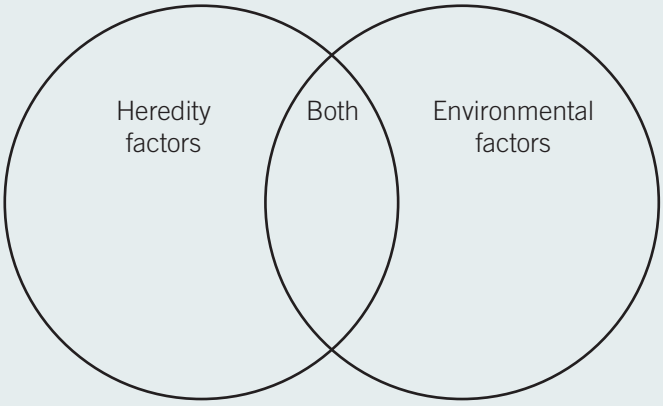
ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 3

1 What are environmental factors?
2 Provide two examples of environmental influences and explain how they could influence a child's psychological development.
3 Provide at least two differences between hereditary and environmental factors.

ACTIVITY 3A–2 HEREDITARY OR ENVIRONMENTAL FACTORS

Using a Venn diagram like the one shown here, create a list of different psychological characteristics and categorise them based on whether you think they are influenced more by hereditary factors, environmental factors or both equally. In small groups or pairs, discuss the lists each of you came up with and identify any similarities or differences. If you change your mind about the relative influence of hereditary or environmental factors on any of the characteristics on your list, make a note about this.



The interactive nature of hereditary and environmental factors

3B THE BIOPSYCHO-SOCIAL APPROACH LINK

Most developmental psychologists today investigate the interrelationship between hereditary and environmental influences using the biopsychosocial approach. This approach (discussed in detail in Section 3B) considers psychological development as being influenced by interacting biological, psychological and social factors.

Even though we are all born with specific genes inherited from our biological parents, there is a complex interaction between these genes and our environment. As you already know, the unique experiences we have within our environment can influence how our genes are expressed – our phenotype. For example, the combination of genes that we receive is associated with our level of intelligence, but this is not set in stone. A diverse range of environmental factors, such as encouragement, access to quality education and opportunities for extension or achievement, will influence the expression of these genes and, therefore, how intelligent we become. This means that, even if our biological parents are highly intelligent, if we lack certain positive environmental factors, such as those pictured in Figure 3A–8, we may not end up being as intelligent as them. Likewise, if our biological parents are not highly intelligent, but we are exposed to enough positive environmental factors, we can grow up to be more intelligent than may otherwise have been the case.

ISBN 978-1-009-25401-4 Gallagher et al

Figure 3A–8 The expression of the genes related to intelligence that we receive from our parents can be influenced by various environmental factors.

This also works in reverse: our genes can influence how we interact with our environment. For example, a person with a genetic disposition towards a particular personality trait, such as shyness or introversion, may be more likely to have certain life experiences, such as spending more time alone, feeling less confident in social situations, having fewer close friendships or receiving fewer positive social responses from peers. By contrast, a person who has a genetic disposition towards extroversion may seek out more social connections with others and have more close friendships and more confidence in social situations. It can also be argued that such environmental experiences reinforce individuals' pre-existing biological traits. Indeed, it is difficult for psychologists to determine the weight of influence that hereditary and environmental factors have on development.

Figure 3A–9 Hereditary factors can also influence how we interact with our environment. For example, shy people may choose to spend more time alone, whereas outgoing people may seek out more social opportunities.

Check-in questions – Set 4

1 Name the approach that considers the influence of both hereditary and environmental factors on development.
2 Use an example to explain the influence of environmental factors on the expression of our genes.
3 Use an example to explain the influence of hereditary factors on our interaction with the environment.

ISBN 978-1-009-25401-4 Gallagher et al

VIDEO 3A–2 SKILLS: THE INTERACTIVE NATURE OF HEREDITARY AND ENVIRONMENTAL FACTORS

3A SKILLS

Applying your understanding of the interactive nature of hereditary and environmental factors to a person's psychological development

Assessment questions about hereditary and environmental factors are usually asked in the context of a scenario in which an individual has a particular psychological characteristic or ability. You may be asked to discuss how both hereditary and environmental factors have influenced the person's development.

Let's look at an example of a question like this:

> **Question (5 marks)**
>
> Finn is a talented pianist. He has been playing since he was around three years of age, when his parents began paying for private lessons. Finn's parents are both talented musicians and they noticed that he was interested in music from an early age. In Year 5, Finn was given a scholarship to a leading music school and began performing regularly in a variety of ensembles and bands as well as solo. He loves the thrill of being on stage and has travelled interstate to play in numerous concerts and competitions. Now in Year 12, Finn is hoping to get a place at the Victorian College of the Arts for university. Explain how one hereditary and one environmental factor could have interacted to influence Finn's development of the ability to play the piano. (5 marks)

Key points to remember

First, given that this question has a large mark allocation (5 marks), it may be useful to plan your answer to obtain full marks. The command term 'explain' requires you to give a detailed account, including reasons or causes. In this case, you need to refer to one hereditary and one environmental factor that you correctly identified from the scenario and clearly signpost (or categorise) them. You would then need to explain the relative influence of each, as well as their combined or interactive effect on Finn's piano playing ability, supported by examples and elaborated with reference to the scenario.

Model answer

One hereditary factor that would have influenced Finn's ability to play the piano is the genes that he received from his parents at conception (when sperm fuses with egg). These are referred to as his genotype. Given that his parents are both talented musicians, it is likely they passed on genes at conception that gave Finn a strong ability to play the piano. An environmental factor that would have influenced Finn's ability to play the piano is the fact that his parents could afford to provide him with private piano lessons from an early age. This would have encouraged him to play and further develop his skills. Without this encouragement and skill development, it is possible that Finn's genes alone may not have led him to become the talented player he is today. The combination of his genes and his environmental experiences have shaped his talents.

Section 3A questions

1. Provide three reasons why it is important for psychologists to study development throughout the life span.
2. Explain how the terms 'genes', 'genotype' and 'heredity' are related.
3. Use an example to explain how your genotype and phenotype differ.
4. Explain what environmental factors are and provide two examples.
5. Briefly explain, with reference to an example, how hereditary and environmental factors interact to influence psychological development.

ISBN 978-1-009-25401-4 Gallagher et al

The biopsychosocial approach

Study Design:
The biopsychosocial approach as a model for considering psychological development and mental wellbeing

Glossary:
Biological factors
Biopsychosocial approach
Biopsychosocial model
Emotional wellbeing
Genetic vulnerability
High levels of functioning
Insecure-disorganised attachment
Life stressor
Maladaptive behaviour
Mental disorder
Mental health problems
Mental wellbeing
Mentally healthy
Protective factors
Psychological factors
Resilience
Risk factors
Secure attachment
Social factors
Social wellbeing
Wellbeing

ENGAGE

Using the biopsychosocial approach

Developmental dyslexia (DD) is a learning disorder that affects around 5–12% of the population. It involves the areas of the brain that process language, and results in difficulty reading due to problems identifying speech sounds and learning how these relate to letters and words. Several biological and environmental risk factors can increase a child's chances of developing DD.

Among the biological risk factors, hereditary factors can play a role. DD may be linked to certain genes that affect how the brain processes reading and language, and these genes can be passed from parent to child. Other biological factors linked to DD include premature birth or low birth weight and exposure to nicotine, drugs, alcohol or infection in the womb, which may alter foetal brain development. Important environmental risk factors include lower levels of parental education, lower socioeconomic status and excessive exposure to stress.

Usually, DD is first detected in children at primary school, and early assessment and interventions result in the best outcomes. Once diagnosed, the biopsychosocial approach can be used by mental health workers, psychologists, psychiatrists and organisations to support the management of DD (along with other conditions) and help to identify and implement appropriate protective factors. For DD, protective factors include tutoring, specialised education programs, counselling and emotional support.

In this section, we delve into how the biopsychosocial approach is used as a model to consider both an individual's psychological development and their mental wellbeing.

ISBN 978-1-009-25401-4 Gallagher et al

VIDEO 3B–1 THE BIOPSYCHO-SOCIAL APPROACH

4A CRITERIA USED TO CATEGORISE TYPICAL AND ATYPICAL BEHAVIOUR

LINK

EXPLAIN

What is the biopsychosocial approach?

In the previous section, you learned about the importance of studying psychological development, as it provides psychologists with an understanding of what 'normal' or 'typical' development looks like and how to recognise instances of 'atypical' development. The same can be said for the current understanding of mental wellbeing. Psychologists can effectively diagnose and manage **maladaptive behaviours** (discussed further in Chapter 4) and mental disorders when they occur because they recognise the various components of mental wellbeing.

Like psychological development, mental wellbeing is influenced by a complex interaction of hereditary and environmental factors that can affect the likelihood of a person developing a mental health problem at some point in their life. Psychologists use the **biopsychosocial approach** as a model to consider both psychological development and mental wellbeing. It acknowledges the interaction between three dimensions: biological (including hereditary factors), social (or environmental factors) and psychological (other internal factors specific to the individual).

Maladaptive behaviour behaviour that is unhelpful, dysfunctional and non-productive, and that interferes with a person's ability to adjust to their environment appropriately and effectively

Biopsychosocial approach considers a person's development and mental wellbeing as influenced by the interactions between biological, psychological and social factors

Biopsychosocial model an interdisciplinary model that looks at the interconnection between biology, psychology and social factors

Risk factors a range of factors that may increase one's chances of developing atypically or having a mental disorder

Protective factors a range of factors that may prevent or decrease the chances of developing atypically or having a mental disorder

Mental wellbeing a state of emotional and social wellbeing in which individuals realise their own abilities, can cope with the normal stresses of life, can work productively and can contribute to their community

The **biopsychosocial model** was first developed by George L. Engel in 1977 and is still used in health care systems around the world today. First, the model acknowledges that there are certain biological, psychological and social **risk factors** in our lives that can increase our likelihood of developing maladaptive and atypical behaviour patterns or a mental disorder over the life span. Second, the model recognises the important role of various biological, social and psychological **protective factors** throughout the life span in reducing these risks. Protective factors that ensure all aspects of a child's developmental needs are being met include adequate sleep (biological), engaging play and intellectual stimulation from the environment (psychological), and emotional support from the child's caregivers (social). Protective factors can also be used to manage an individual's mental wellbeing, including exercise for stress relief (biological), increased resilience (psychological) and social supports (social).

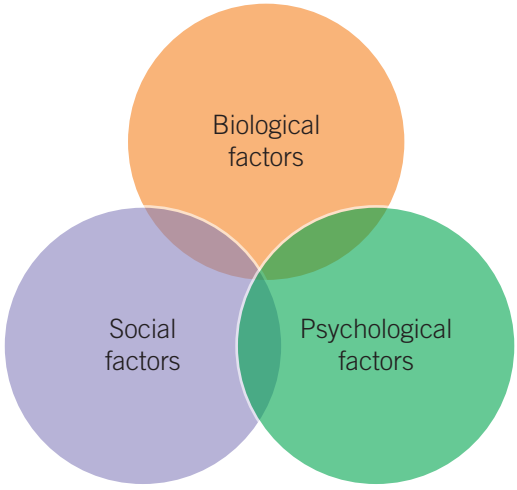


Figure 3B–1 The biopsychosocial model, developed by Engel in 1977

Before we look more closely at each of the dimensions of the biopsychosocial approach, let's consider the characteristics of mental wellbeing and what it means to experience a mental health problem or mental disorder.

Considering mental wellbeing

Mental wellbeing is a state of emotional and social wellbeing in which individuals realise their own abilities, can cope with the normal stresses of life, can work productively and can contribute to their community. A person's mental wellbeing is considered to fall on a spectrum, or continuum, from high to low (Figure 3B–2). A person's position along this spectrum will shift throughout their life, depending on their life experiences and their ability to cope with these. Being mentally 'well' – having high mental wellbeing – is integral to successful psychological development.

ISBN 978-1-009-25401-4 Gallagher et al

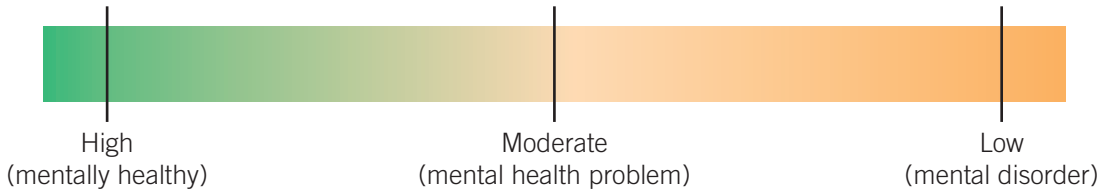


Figure 3B–2 The mental wellbeing continuum from high to low

At the mentally healthy point on the continuum (high), an individual is likely to lack mental impairment; however, this state is more than an absence of problems or disorders. **Mentally healthy** people typically:

- have high levels of functioning
- can form positive relationships with others (high levels of social wellbeing)
- can manage their feelings and emotions (high levels of emotional wellbeing)
- can cope with the normal stresses that arise in daily life – that is, they have the resilience to cope with and manage change and uncertainty
- can think logically and problem solve
- have a reasonable level of confidence in their abilities and positive self-esteem.

Mentally healthy having no difficulty with activities of everyday living, and displaying resilience

ACTIVITY 3B–1 MY MENTAL WELLBEING CONTINUUM

Working with a partner or by yourself, draw a copy of the mental wellbeing continuum. Once you have done this, place a cross on the continuum to show where you see yourself today. Think of a time when you have been at a different point on the continuum and place a cross there too. Take turns explaining to one another what changed in your life to move you up or down the continuum. See if you can link this change to some of the characteristics of people who may be considered mentally healthy or to have mental health problems.

Mental health problems

In the middle of the mental wellbeing continuum, a person may be considered to have a **mental health problem**. This is typically recognised through the disruption that it causes to the everyday functioning of an individual. These problems are typically not as long-lasting as mental disorders and may result in mild and temporary impairment. When a person is experiencing a mental health problem, there is often some disruption to their usual level of social and emotional wellbeing. This may be due to a range of reasons, including relationship or work stressors.

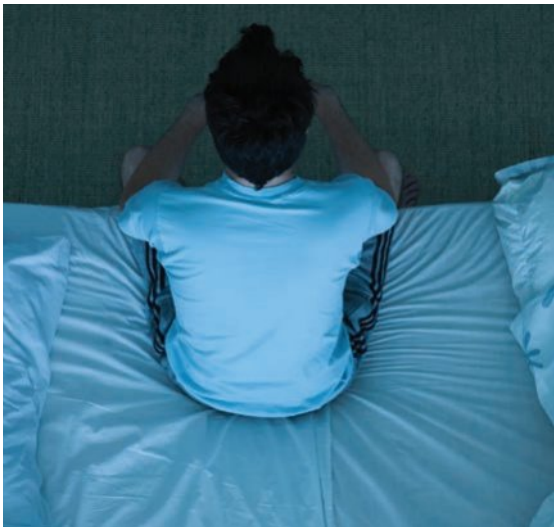


Figure 3B–3 People with mental health problems may have increased or decreased sleep.

Mental health problems relatively short-term disruptions that affect the everyday functioning of an individual

ISBN 978-1-009-25401-4 Gallagher et al

Mental health problems can be considered natural responses to the negative events in life that most people will experience and work through at some point in their lives. Characteristics that indicate an individual may be experiencing a mental health problem include:

- increased or decreased sleep and appetite
- loss of energy and motivation
- difficulty concentrating
- difficulty focusing on or completing work or study tasks
- irritability
- becoming withdrawn.

Mental disorder one of a wide range of usually long-lasting conditions that affect mood, thinking and behaviour

At the low end of the mental wellbeing spectrum is having a **mental disorder**. Approximately 20% of Australians will be experiencing a mental disorder in any given 12-month period. These disorders usually affect a person's mood, thinking and behaviour and are typically diagnosed using set criteria. Some well-known mental disorders are major depression and schizophrenia. These disorders often lead to a person experiencing the three Ds: distress, dysfunction and deviance.

The distress aspect of the three Ds refers to the unpleasant or upsetting emotions typically experienced by someone with a mental disorder (e.g. sadness, anxiety or feeling overwhelmed). The dysfunction aspect refers to the impact the condition has on an individual's ability to cope with everyday life and complete daily activities, such as attending work or school and participating in events with family and friends. Finally, the deviance aspect refers to the tendency for mental disorders to make an individual's thoughts and behaviours inconsistent with the expectations of their culture or society. This could include speaking out of turn, lashing out at others or socially withdrawing.

In addition to the three Ds, other characteristics that indicate someone may be experiencing a mental disorder include:

- reduced levels of day-to-day functioning
- reduced ability to cope with and manage change and uncertainty
- impaired ability to engage in social relationships
- significant changes in thoughts, feelings and behaviours, apathy and a lack of interest
- serious or prolonged changes in one's typical character
- impaired ability to function independently, such as taking care of oneself at home.

Figure 3B–4 People with mental disorders often find it difficult to complete daily activities.

ISBN 978-1-009-25401-4

Table 3B–1 Characteristics of mental wellbeing across the continuum

Mentally healthy	Mental health problems	Mental disorders
• Have high levels of functioning • Can form positive relationships with others (high levels of social wellbeing) • Can manage their feelings and emotions (high levels of emotional wellbeing) • Can cope with the normal stresses that arise in daily life – that is, they have the resilience to cope with and manage change and uncertainty • Can think logically and problem solve • Have a reasonable level of confidence in their abilities and positive self-esteem	• Increased or decreased sleep and appetite • Loss of energy and motivation • Difficulty concentrating • Difficulty focusing on or completing work or study tasks • Irritability • Becoming withdrawn	• Reduced levels of day-to-day functioning • Reduced ability to cope with and manage change and uncertainty • Impaired ability to engage in social relationships • Significant changes in thoughts, feelings and behaviours, apathy and a lack of interest • Serious or prolonged changes in one's typical character • Impaired ability to function independently, such as taking care of oneself at home

Check-in questions – Set 1

1 What is the biopsychosocial approach?
2 Distinguish between risk and protective factors.
3 What is mental wellbeing?
4 Why is mental wellbeing represented on a continuum?
5 List two characteristics of mentally healthy people.
6 Describe the key characteristics of a mental health problem.
7 What percentage of Australians are experiencing a mental disorder in any 12-month period?
8 Explain what is meant by a person experiencing the three Ds when they have a mental disorder.
9 In addition to the three Ds, provide two other characteristics of a mental disorder.

The key characteristics of mental wellbeing

WORKSHEET 3B–1 MENTAL WELLBEING VISUAL SUMMARY

Maintaining high levels of mental wellbeing is fundamental to psychological development and one's ability to go about everyday life activities, such as attending work or school. A range of characteristics are shared by people who are typically considered to have high levels of mental wellbeing. These are:

- high levels of functioning
- resilience to life stressors
- social and emotional wellbeing.

We will now look at each of these in turn.

ISBN 978-1-009-25401-4 Gallagher et al

High levels of functioning

High levels of functioning the ability to carry out a wide range of daily activities, attend to self-care, maintain interpersonal relationships and demonstrate resilience in the face of everyday challenges

A mentally healthy person will typically demonstrate **high levels of functioning** in most areas of their life. These areas may include:

- activities of daily living (e.g. practises self-care and good personal hygiene)
- work or occupational settings (e.g. is productive and achieves targets)
- school settings (e.g. participates and gets along with others)
- within interpersonal relationships (e.g. develops and maintains friendships and relationships).

In addition to this, a person with high levels of mental wellbeing can typically maintain their high levels of functioning when they encounter everyday challenges. They are therefore often referred to as adaptive or resilient.

Resilience to life stressors

Resilience the ability to 'bounce back' to previous normal levels of functioning when faced with adversity

Life stressor an everyday or conceivable event, such as a relationship breakdown, work challenges or failing a test

Resilience is one's ability to 'bounce back' to previous normal levels of functioning when faced with adversity. Even people with high levels of mental wellbeing will experience challenges in their lives that may cause them grief, anger and despair. However, through their capacity to adapt to or overcome these stressful circumstances and continue with day-to-day life, they demonstrate resilience. Examples of **life stressors** that might require resilience include relationship breakdowns, tragedies such as losing a home in a bushfire, the death of a loved one, work challenges and failing at a test or assessment.

Figure 3B–5 This high school student has a high level of functioning as she is productively contributing through a part-time job at a bookshop.

Figure 3B–6 Resilience refers to one's ability to bounce back from setbacks, such as a loved one having cancer.

A person who is mentally healthy may encounter a life stressor and feel equipped to cope with it. In this way, they will demonstrate resilience. Conversely, someone who is not mentally healthy may not feel that they can adequately deal with the stressor. Therefore, the impact of a life stressor on one's mental wellbeing will depend considerably on one's resilience. The resources required to cope with stressors, and which therefore promote resilience, include factors such as one's depth of social support, level of self-efficacy, ability to problem solve, and ability to make and carry out plans. Many of these factors can be learned and developed. This means that people can work to improve their resilience.

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 3B–2 RESILIENCE IN THE NEWS

Take a moment to look through your closest newspaper or go online and browse a favourite news site. Chances are that you will see several stories in which people are demonstrating resilience to life stressors. Read through some of these stories and see if you can identify examples of social and emotional wellbeing, as well as other characteristics of a mentally healthy person.

Social and emotional wellbeing

There are many aspects of **wellbeing**. The Australian Psychological Society references six 'wellness' domains, including social and emotional. It is important to note that wellness is often considered a holistic concept and is difficult to break into separate areas, as there is much interplay between what might be considered different domains. However, mentally healthy people typically display traits associated with social and emotional wellbeing.

Wellbeing the complex combination of a person's physical, social, emotional, mental and spiritual health that is linked to happiness and life satisfaction

Social wellbeing the connections a person makes with other people and their ability to get along with others in a community

Social wellbeing

Social wellbeing relates to the connections you make with other people and your ability to get along with others in a community. It can relate to a person's ability to form meaningful relationships with friends, family, co-workers and an intimate partner. Examples of high levels of social wellbeing include:

- developing positive relationships with family and friends
- respecting and interacting appropriately with people from other ethnic and cultural backgrounds
- being able to work as part of a team, such as in the workplace or on a sports team
- contributing to society in some way, such as through a volunteer organisation.

Figure 3B–7 Working as a member of a sports team demonstrates high social wellbeing.

ISBN 978-1-009-25401-4 Gallagher et al

Emotional wellbeing the ability to feel a range of emotions and express these in a positive way

Emotional wellbeing

Emotional wellbeing refers to your ability to feel a range of emotions and express these in a positive way. All people will experience varied emotions from time to time. It is the ability to manage these emotions and share them in an appropriate manner that is the hallmark of good emotional wellbeing. Examples of high levels of emotional wellbeing include:

- being able to express a range of emotions relevant to the context
- being able to control varied emotions and respond to these in a positive manner
- acting in a positive manner and having a positive affect
- identifying emotions in others and responding appropriately
- responding to setbacks with appropriate emotions.

Figure 3B–8 Being able to express and respond to emotions in a positive manner demonstrates high social wellbeing.

Aboriginal and Torres Strait Islander perspectives on mental wellbeing

Professor Helen Milroy, Australia's first Aboriginal psychiatrist, has been a pioneer in Aboriginal and Torres Strait Islander and child mental health. In 2006, she developed 'The Dance of Life' framework, which recognises the importance of health professionals using a holistic approach when working with Aboriginal and Torres Strait Islander communities. 'The Dance of Life' is a multidimensional model that combines paintings, narrative, theory and existing evidence into a framework designed to assist practitioners in understanding health and wellbeing from an Aboriginal perspective. It identifies five dimensions of life and development: physical, psychological, social, spiritual and cultural. It is published on the website of the Royal Australian and New Zealand College of Psychiatrists (RANZCP) together with Professer Milroy's paintings which should be viewed there to understand the full framework.

The physical dimension

The physical dimension acknowledges that our physical state cannot be separated from the land. This is represented by a human tree, connected to the Earth and being nurtured by Country and its plants and animals. In turn, the tree provides shelter and protection. It exists in perfect harmony with the environment. At the end of its days, it returns to the Earth to be incorporated into the next landscape, providing a continuity to existence.

The psychological dimension

The psychological dimension acknowledges the rich connections we make throughout our lives, as well as the different stimuli we experience via all five of our senses simultaneously. The core of our psychological life is alive and constantly evolving, which is supported and protected by collective layers of experience, knowledge and wisdom. This enables individuals to perceive the external world and be autonomous in their decisions. It also acknowledges that internal psychological struggles can be comforted by a collective consciousness – a cushion on which to rest.

ISBN 978-1-009-25401-4 Gallagher et al

The social dimension

The social dimension begins by acknowledging the importance of family and the presence of past generations. It recognises that family and children are linked together, a part of a shared community that surrounds the family and keeps it safe from adversity. It represents the continuous and intimately connected sense of strength and wellbeing shared by a community and its enduring relationship to the environment.

The spiritual dimension

The tree of life represents the spiritual dimension connecting us to the Earth and the universe. It not only connects us but also protects us from all things outside our earthly existence. It recognises that life is rich and intricate and that, as humans, we are only a very small part of it, but that we are essential and irreplaceable nonetheless. This dimension is thought to be timeless, with an infinite capacity that exists within, but also outside, our physical realm.

The cultural dimension

The cultural dimension takes the form of three figures, symbolising healing, ceremony and traditional law, which overrides all. These three aspects are intimately connected and weave a pattern throughout life that is vibrant and dynamic. A campfire symbolises the community orientation, and the cleansing properties of smoke carry the burdens of life into the universe. The cultural dimension is grounded in the land, as much of the law, ceremony and healing comes from Country.

Check-in questions – Set 2

1 Explain what is meant by a high level of functioning and provide two examples of this.
2 What aspects of a person's health are considered to combine and influence their wellbeing?
3 Give an example of how someone might demonstrate resilience to a life stressor.
4 Explain the difference between social and emotional wellbeing.
5 Copy this table into your notebook and summarise Helen Milroy's 'The Dance of Life' framework.

Dimension of wellbeing	Key features	Draw your own representation
Physical		
Psychological		
Social		
Spiritual		
Cultural		




3A HEREDITARY AND ENVIRONMENTAL FACTORS LINK

Biological factors that influence development and mental wellbeing

The biological dimension of the biopsychosocial approach refers to the influences that relate to the functioning of the body. Hereditary factors, which were introduced earlier in this chapter, are an example of biological factors. Biological factors are often referred to as internal factors, and they are usually outside our control. Your body is complex, and its systems work closely together to ensure that you can function in day-to-day life. However, some aspects of the body can make people more vulnerable to developmental differences, such as autism and attention deficit hyperactivity disorder (ADHD), or mental disorders, such as anxiety and depression. **Biological factors** that can affect both mental wellbeing and psychological development include:

Biological factors a range of factors that relate to the physiological functioning of the body

- genetics (heredity)
- sex
- hormones
- immune function
- nervous system activity
- physical health
- exposure to drugs or alcohol in the womb
- nutrition
- sleep.

A biological risk factor for a mental disorder or developmental condition (e.g. ADHD) is called a **genetic vulnerability**, or genetic predisposition. In this case, the individual's DNA means they have an increased likelihood of developing a particular condition. For example, using studies of identical twins with autism and DNA-coding technologies, researchers have been able to identify that specific genes and genetic changes contribute to autism spectrum disorders. This is also the case for many mental disorders, such as schizophrenia, anxiety and depression. However, having a genetic vulnerability does not guarantee that an individual will develop a certain condition; it only predisposes them to it.

Genetic vulnerability an increased likelihood that an individual will develop atypically or experience a mental disorder due to the DNA that they carry

Figure 3B–9 Genetic (hereditary) factors are biological factors that can influence development and mental wellbeing.

ISBN 978-1-009-25401-4 Gallagher et al

One important biological protective factor for maintaining our mental wellbeing is having a healthy diet. Particularly in childhood, certain nutrients (i.e. calcium and iron) are required for strong growth and development. Getting the right nutrients allows the body to carry out all the processes required to maintain a high level of physical and mental wellbeing. It gives us the energy to go about our daily lives, and better equips us to overcome life stressors. In this way, an adequately healthy diet contributes to the development and maintenance of resilience.

Getting adequate sleep is also a biological protective factor. Quality sleep is a vital restorative process that helps to prepare the body for performing daily activities. People who get enough sleep tend to be less irritable and less likely to get sick. This also means that when life stressors are encountered, the individual is well placed to overcome them. Therefore, getting adequate sleep contributes to the development and maintenance of resilience. We know that children and adolescents require more sleep than adults. This is usually attributed to the energy consumed by the developing brain and body. In children, for example, growth hormones are released at a higher rate during sleep.


Figure 3B–10 A healthy diet and adequate sleep can act as protective factors for our mental wellbeing and development.

Psychological factors that influence development and mental wellbeing

The psychological component of the biopsychosocial approach refers to the influences that relate to the functioning of the brain and mind. This includes cognitive and affective processes, such as thought patterns, memory and emotional responses. Like biological factors, **psychological factors** are also considered internal. Psychological factors that can affect both mental wellbeing and psychological development include:

- ways of thinking
- beliefs and attitudes
- emotions and emotional responses, including stress
- learning and memory
- personality traits.

Psychological factors
a range of factors that relate to the functioning of the brain and the mind, including cognitive and affective processes such as thought patterns and memory

Figure 3B–11 A range of psychological factors can affect development and contribute to the development of a mental disorder.

ISBN 978-1-009-25401-4 Gallagher et al

Figure 3B–12 Chronic stress exposure as a child can affect both psychological development and mental wellbeing.

An example of a psychological factor that can affect both development and mental wellbeing is stress. Stress occurs when an individual encounters a stimulus (e.g. a life event) that challenges their coping mechanisms. The stress response involves biological symptoms, such as increased heart rate and muscle tension, as well as psychological responses, such as feeling overwhelmed or experiencing emotional pressure. Stress that is strong, frequent and/or prolonged (sometimes referred to as toxic stress) during childhood can disrupt the development of brain architecture and lead to cognitive impairments. When this stress exposure occurs continually or is triggered by multiple sources, it can have a cumulative effect on an individual's wellbeing. The more adverse experiences in childhood, the greater the likelihood of developmental delays and later health problems, including heart disease, diabetes, substance abuse and depression. Research also indicates that low exposure to stress because of supportive, responsive relationships with caring adults early in life can act as a protective factor against the potentially damaging effects of stress.

Social factors that influence development and mental wellbeing

The social component of the biopsychosocial approach refers to the influences on development and wellbeing of the conditions in which people live and grow. This includes one's culture and social environment. These factors are considered external. Examples of **social factors** include:

Social factors a range of factors that relate to the conditions in which people live and grow

- family dynamics and relationships
- early life experiences
- access to education
- income level of the family
- social supports
- experiences of abuse or neglect
- cultural values
- social norms.

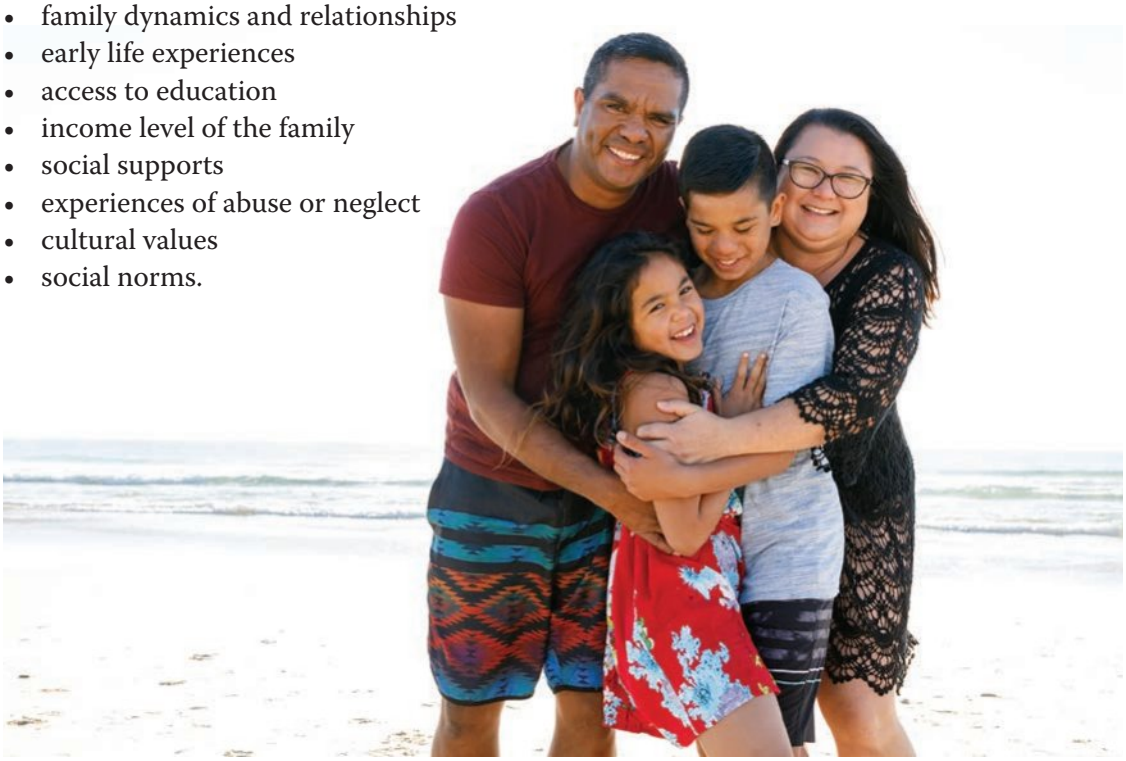


Figure 3B–13 Social factors include the relationships we have with others.

ISBN 978-1-009-25401-4 Gallagher et al

One example of a social factor that can affect both development and mental wellbeing is attachment. This refers to the very first relationship a baby forms with its primary caregivers. Typically, when a child is provided with consistent care and love, they form a **secure attachment** with their caregiver. This acts as a protective factor, providing a strong basis for that individual to form solid, trusting relationships throughout their life. On the other hand, if the child forms an **insecure-disorganised attachment**, this can act as a risk factor for mental health problems and atypical emotional and social development. For example, they may not achieve cognitive milestones at the same rate as more securely attached children, and they may have trouble trusting others and forming intimate relationships as adults.

Figure 3B–14 Psychological factors can include emotions and emotional responses, such as the attachment between a child and their caregiver.

LINK 3C THE PROCESS OF PSYCHOLOGICAL DEVELOPMENT

Secure attachment a positive relationship between caregiver and child, in which the child displays confidence when the parent is present, mild distress when they leave and quickly seeks contact when the parent returns

Insecure-disorganised attachment inconsistent behaviour towards a caregiver, typically arising due to a lack of consistent care or emotional support from a primary caregiver early in life

Check-in questions – Set 3

1 Explain what is meant by biological risk factors.
2 Explain what is meant by genetic vulnerability.
3 Outline how adequate sleep may act as a biological protective factor and help maintain mental wellbeing.
4 Contrast psychological and biological factors and explain whether there are any links between the two.
5 Explain why stress is a psychological risk factor.
6 Identify three examples of social factors.
7 Make a copy of the table below and categorise the risk factors as biological, psychological or social by placing a cross in the appropriate box.

	Biological	Social	Psychological
a Stress			
b Disorganised attachment			
c Adequate sleep			
d Culture			
e Income level			
f Genetic vulnerability			
g Thinking patterns			
h Access to education			
i Healthy diet			

ISBN 978-1-009-25401-4 Gallagher et al

VIDEO 3B–2 SKILLS: BIOLOGICAL, PSYCHOLOGICAL AND SOCIAL FACTORS

3B SKILLS

Questions that address biological, psychological and social factors

In VCE Psychology, you may be presented with case studies involving two different individuals and detailing the various biopsychosocial factors at play in their lives. You may then be asked to outline which of the two individuals you believe is most at risk of atypical development or developing a mental disorder. In this case, it is important to consider the combined effect of the several factors affecting each person's life, to determine which set of factors gives the highest risk.

Scenario

Elena has recently separated from her husband of 15 years. This has contributed to her not feeling motivated to cook for herself. Instead, she has been regularly consuming takeaway meals, such as pizza and fish and chips. She has also found it difficult to sleep. She lies awake at night thinking about what led to her marriage breakdown.

Jack has recently lost his job as an electrician due to not being able to drive. Jack did have a licence but lost it due to several speeding fines. Jack is concerned about having lost his job, but he is comforted that his partner of five years earns a decent wage as a doctor. This means that he can take the time to find a new job where he doesn't require a car.

Question

Using the biopsychosocial approach, assess whether Elena or Jack is at the greatest risk of experiencing a mental disorder. Justify your response.

Attempted answer

Jack is at the greatest risk of developing a mental disorder because losing your job is a stressful life event (psychological factor). This is more significant than Elena separating from her husband.

Key points to remember

- Start your answer by stating whether Elena or Jack is at the greater risk of experiencing low levels of mental wellbeing.
- Use examples from the scenario to support your response.
- Refer to the biopsychosocial approach by categorising the examples from the scenario as biological, psychological or social.
- Keep in mind the cumulative effect of the different risk and protective factors in people's lives on their overall mental wellbeing.

Suggested answer

Elena is at greater risk of experiencing a mental disorder than Jack is. Although Jack lost his job, which has caused him stress (psychological factor), he has the support of his partner (social factor) to find a new job. On the other hand, Elena has experienced a significant life event – a marriage breakdown (psychological factor). She is ruminating over this (psychological factor), leading to poor sleep (biological factor). She is also consuming an unhealthy diet (biological factor) due to a lack of motivation (psychological factor).

ISBN 978-1-009-25401-4 Gallagher et al

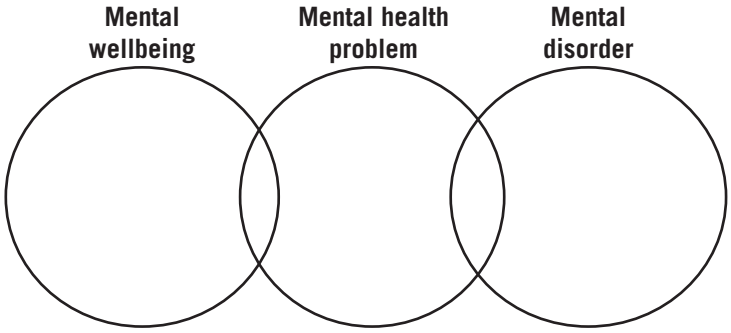
Given the information provided, there is a greater cumulative effect on the mental wellbeing of Elena than Jack, placing her at greater risk of developing a mental disorder.

Extension

Think about two or more people in your life and make a note of any biological, psychological or social factors they may be experiencing. Using your notes, make a judgement, with justification, about which person has the greatest cumulative risk.

Section 3B questions

1 Describe the biopsychosocial approach.
2 Copy the Venn diagram shown here and complete it to show the similarities and differences between mental wellbeing, mental health problems and mental disorders.



3 Define resilience.
4 Outline why resilience to stressors might indicate you are mentally healthy.
5 Outline how a connection to community influences mental wellbeing for Aboriginal and Torres Strait Islander peoples.
6 What is a biological factor according to the biopsychosocial approach? Provide two examples that may influence development.
7 What is a psychological factor according to the biopsychosocial approach? Provide two examples that may influence development.
8 Provide a similarity and a difference between biological and psychological factors.
9 What is a social factor according to the biopsychosocial approach? Provide two examples that may influence development.
10 How can social factors be differentiated from biological and psychological factors?
11 Give an example of the holistic nature of the biopsychosocial approach when considering psychological development.
12 Read the scenario below and outline one biological, one psychological and one social factor that could influence Toby's psychological development and mental wellbeing.

Toby is 9 years old and in Year 4 at primary school. There has been a lot of conflict at home, as his parents are finalising a separation. He has had to pack up his room because he is moving with his mum to another house. Toby has felt very stressed and anxious about the situation. At school, he has found it hard to concentrate and he hasn't been able to complete his homework. He also hasn't been sleeping very well and has lost his appetite. However, the support of his older siblings has been helpful. He has been able to talk to them about how he is feeling and play computer games with them as a distraction.

ISBN 978-1-009-25401-4 Gallagher et al

The process of psychological development

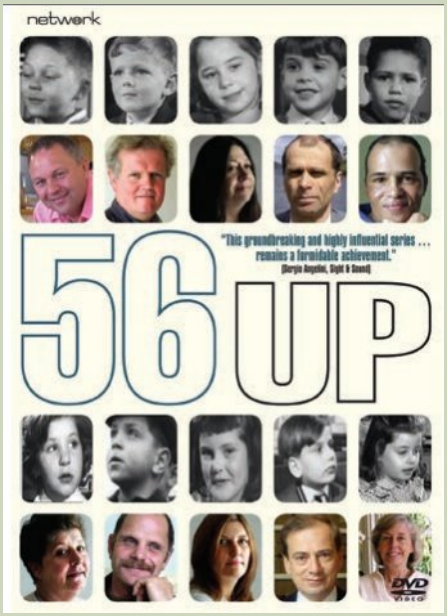
Study Design:
The process of psychological development (emotional, cognitive and social development) over the course of the life span

Glossary:
Abstract thinking
Accommodation
Animism
Assimilation
Attachment
Classification
Cognitive development
Conservation
Egocentrism
Emotional development
Goal-directed behaviour
Hypothetical-deductive reasoning
Insecure-avoidant attachment
Insecure-resistant attachment
Modelling
Moral development
Morality
More knowledgeable other
Object permanence
Observational learning
Reversibility
Scaffolding
Schema
Social development
Symbolic thinking
Transformation
Zone of proximal development (ZPD)

ENGAGE

The use of longitudinal studies in developmental research

A longitudinal study is a type of observational and correlational study that involves monitoring a population over an extended period. In longitudinal studies, researchers do not manipulate any variables or interfere with the environment. Instead, they conduct observations on the same group of subjects over time. One famous example of this kind of study is the 'Up' series, which started following the lives of 14 children in 1964. The study is still going today, with 11 participants remaining actively involved in the project. The first episode of the documentary series, called '7 Up', was broadcast in 1964 and featured the children talking about their hopes and aspirations for the future. Every seven years since, the cameras have returned to document the developmental processes and changes in the lives of the subjects, with the most recent episode, '63 Up', airing in 2019.



The director of the series has been particularly interested in early environmental influences, such as social class, income level, education and personal experiences, and how these affect different aspects of development. Every seven years, the participants share their experiences, explain why they made certain decisions and discuss how they have coped with life's up and downs. These sorts of studies provide much insight into the areas of development we will delve into in this section: social, emotional and cognitive development.

ISBN 978-1-009-25401-4 Gallagher et al

EXPLAIN

Psychological development over the life span

Beginning at conception, psychological development is an ongoing and continuous process. Starting with infancy (0–2 years), we then pass through the stages of childhood (2 years to puberty), adolescence (puberty to 18 years), adulthood (18–65 years) and old age (older than 65 years) before ending with death. Even though we might think that development stops once we become an 'adult', the reality is that this process continues. Infancy, childhood and adolescence are particularly rapid stages of growth and development; however, adults of all ages also go through numerous developmental changes. The changes involved in psychological development tend to be categorised by psychologists into three main areas:

- emotional development
- social development
- cognitive development.

In this section, we will consider and evaluate different models and theories related to these areas of development. Keep in mind that each of these tends to focus on one area of development independently of the others. Given the complexity of psychological development, in which the three areas of development interact and influence each other, these theories have limitations.

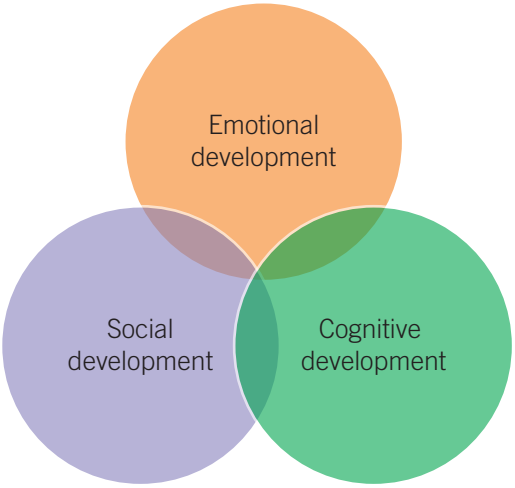


Figure 3C–1 The three main areas of psychological development

Emotional development

Emotional development across the life span

Think about what your life would be like without emotions. Even though there are times when our emotions can get us down and we might feel we would be better off without them, they make our lives vibrant and provide excitement, connection with others and awareness of ourselves. In this way, emotions are vital for understanding the world around us. Emotional development involves changes in how a person experiences, interprets and expresses the full range of emotions, and their ability to cope with them appropriately. This area of psychological development is integral to the others, as strong **emotional development** enables children to build relationships, have social awareness and make responsible decisions. These skills in turn influence success at school, at home and in the community and society.

Figure 3C–2 An example of emotional development is a toddler slowly learning to self-regulate their emotions, so that they have fewer temper tantrums as they get older.

Emotional development changes in how a person experiences, interprets and expresses the full range of emotions, and their ability to cope with them appropriately

ISBN 978-1-009-25401-4 Gallagher et al

Let's look at some examples of emotional development at different points in the life span.

Table 3C–1 Examples of emotional development over the life span

Stage of the life span	Examples
Infancy (0–2 years) 	Infants begin to smile and frown at around 8 weeks of age and to laugh at 3–4 months. By 6 months of age, they can express a variety of emotions, including delight, fear, anger and disgust. They begin to show affection and jealousy at 1–2 years of age.
Childhood (2 years – puberty) 	Rage, in the form of temper tantrums, appears at 2–3 years of age. At this age, children begin to label their own emotions and develop the ability to recognise these emotions in others. In middle childhood, they begin to understand how different situations can affect emotions and understand that what makes one person happy may not make someone else feel the same way. Older children also gain the capacity for empathy and helping behaviours.
Adolescence (puberty – 18 years) 	Adolescents become less emotionally dependent on their parents. They tend to experience more extreme emotions, both negative and positive. As adolescents grapple with increasingly complex social problems, they often seek a stable peer group to help manage their emotions. Identity development is important for adolescents as they approach adulthood. They explore different options and gain a greater understanding of themselves.
Adulthood (18–65 years) 	Developing a stable sense of identity in early adulthood leads to more empathy and success at managing emotions. During adulthood, important life decisions are made about careers and living arrangements. These choices can have profound emotional consequences for one's self-perception. Developing intimate relationships is also important, and marriage and family formation usually occur in early adulthood, with which our emotional wellbeing is often intertwined. A 'mid-life crisis' can occur when middle-aged adults perceive that they have not achieved their life goals and feel dissatisfied with their life.
Old age (65+ years) 	Emotionally, older adults are calmer, more capable of managing emotions and better able to negotiate social situations. They have greater emotional wisdom or the ability to empathise with and understand others. Compared to younger adults, older adults tend to focus more on positive information and less on negative information. A sense that 'time is running out' may also enhance the gratitude older adults experience in the moment and explain why they tend to be less driven by maximising future rewards.

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 1

1 Identify the three main areas of psychological development.
2 List the main stages of development across the life span and their associated age ranges.
3 What is emotional development?
4 Provide an example of emotional development at each stage of the life span.

WORKSHEET 3C–1 STILL FACE EXPERIMENT

3C KEY SCIENCE SKILLS

VIDEO 3C–1 KEY SCIENCE SKILLS: AIMS, VARIABLES AND HYPOTHESES

LINK 1A INVESTIGATION AIMS, QUESTIONS, HYPOTHESES AND VARIABLES

Formulating aims, variables and hypotheses

In VCE Psychology, you may be asked to design a piece of research or an experiment that looks at the relationships between concepts covered within the study design. You could also be asked to identify or design elements for an existing research project. Examples include:

- determining a research question to investigate
- constructing an aim
- identifying the independent, dependent and controlled variables (if it is a controlled experiment)
- formulating a hypothesis to focus an investigation.

Let's consider a typical example.

Question

In 1975, Dr Edward Tronick and his colleagues conducted the 'still face' experiment to investigate whether infants understand the relationship between facial expressions and emotions. In the experiment, the infants and their mothers sat facing each other. In the control condition, the mother engaged in play with the infant for two minutes, during which time she smiled and talked to the infant. The mother then turned away from the infant after the two minutes and the experimental condition started. This time, when the mother turned back to the infant, she showed a still, unresponsive face with a lack of facial expression for two minutes.

Figure 3C–3 The first two images show the positive interactions between an infant and her mother in the control condition. In the second two images, from the experimental condition, the mother is being non-responsive, and the infant is showing frustration by waving her hands and arching her back in discontent.

The infants' behaviours and emotional responses were observed by Dr Tronick. Initially, in the control condition, most babies smiled and happily engaged with their mothers. When the experimental condition ('still face') started, the infants often became confused. They tried to initiate a response from their mothers by looking around the room, smiling and pointing. As the two minutes continued and their attempts to connect were ignored by their mothers, the infants started to show distress and frustration by crying and screeching.

ISBN 978-1-009-25401-4 Gallagher et al

Several infants lost postural control, as their central nervous systems became so overwhelmed that they physically collapsed. Towards the end of the two minutes, some infants became withdrawn and no longer attempted to get their mother's attention. Dr Tronick's observations showed that even very young infants have some understanding of the relationship between facial expressions and emotions (i.e. that an unresponsive facial expression from a caregiver is cause for concern). Further, the infants were able to regulate their own emotions to some extent and perform goal-orientated behaviours when making attempts to engage with their caregivers.

Using the details of the experiment, answer the following questions.

a State a research question for the 'still face' experiment.
b Construct an aim for the investigation.
c Identify the independent variable in the 'still face' experiment.
d Identify the dependent variable in the 'still face' experiment.
e This study is going to be replicated with Australian infants aged 4–6 months old. Use your understanding of emotional development and the results from the 'still face' experiment to predict the possible outcome of this replication.
f Based on your prediction in **e**, state a hypothesis for the study.
g Suggest one control variable that needs to be kept constant and explain why this is important.

Suggested answers for full marks

a Do infants understand the relationship between facial expressions and emotions?
b To investigate whether infants understand the relationship between facial expressions and emotions.
c Whether the mother engaged in play with her infant (control condition) or used an unresponsive, still face with her infant (experimental condition).
d The observations made of the infants' behaviours and emotional responses to their mother.
e Australian infants aged 4–6 months will demonstrate an understanding of the relationship between facial expressions and emotions. For example, if caregivers use a still, unresponsive facial expression, this will cause the infants distress and frustration. The infants may initially appear confused, attempt to initiate a response from their mothers by looking around the room and smiling and pointing, and eventually start to cry. They may even lose postural control, as their central nervous systems become so overwhelmed that they physically collapse.
f When Australian infants aged 4–6 months old are presented with a 'still face' from their caregiver, they will respond with distress compared to when their caregiver is engaged in play with them, when they will show no distress.
g The time of day they are testing each infant for the different conditions should be kept constant. This is because, at different times of the day, an infant may be more or less grumpy and irritable. This is particularly the case if they need a nap or are hungry. For example, let's say an infant is exposed to the control condition (playing with mum) early in the morning, when they are better rested and less grumpy. If the experimental condition is then conducted with the same infant later in the morning when they are due for their morning nap, they are likely to already be grumpier and more distressed. Their increased distress in this case could be explained by the time of day rather than the still face itself.

ISBN 978-1-009-25401-4 Gallagher et al

Emotional development: relevant models and theories

An integral part of emotional development early in life is the formation of a close, social and emotional bond between the infant and their caregivers. This is called **attachment**. There has been great interest in how attachments are formed between infants and their caregivers and why they are necessary for the healthy emotional development of an individual. We will look at three theorists who have been prominent in this area: John Bowlby, Mary Ainsworth and Harry Harlow.

Figure 3C–4 The attachment that an infant forms with their caregiver has been shown to have an important influence on their development of healthy relationships over the life span.

John Bowlby's evolutionary theory of attachment

Attachment theory originated with the influential work of John Bowlby (1958). In the 1930s, John Bowlby worked as a psychiatrist in London, where he treated emotionally disturbed children. Bowlby was deeply touched by a couple of the children in his care, particularly one child who was very isolated, distant and affectionless. The child was expelled from school and had no stable mother figure. In later research, with more cases over several studies, Bowlby established that children who are deprived of a stable mother figure (or caregiver) during the first few years of life:

Attachment
a close, social and emotional bond between an infant and their caregivers

- have a greater likelihood of developing mental disorders, such as depression
- have a reduced IQ compared to a control group
- demonstrate more antisocial behaviour and delinquency
- have more abnormal interactions and may be unable to form healthy attachments to their own offspring.

Bowlby concluded that to grow up mentally healthy and thrive emotionally, an infant requires a warm, intimate and continuous relationship with a caregiver. In this case, the attachment figure represents a safe base for exploration to whom the child can periodically return for 'emotional refuelling'. This is seen when happily playing toddlers suddenly look up to locate their attachment figure. They may then run to them for some comfort, then happily return to their play. The young adult who has recently moved out but makes frequent calls or visits home to get their laundry done or for dinner may be doing a similar thing (and showing similar behaviour).

Figure 3C–5 Bowlby was interested in the effects on children (such as those in orphanages) of not having a stable mother figure in the early years of their lives.

ISBN 978-1-009-25401-4 Gallagher et al

Figure 3C–6 Bowlby believed that infants are programmed to display certain behaviours, such as smiling, cooing and clinging, which lead to an affectionate protective adult response.

As a result of his research with children deprived of these attachments early in life, Bowlby developed his evolutionary theory of attachment. He proposed that the need to form an attachment is innate and enhances the infant's chances of survival. Bowlby believed that attachment has a strong biological basis and that infants are programmed to display certain behaviours, such as smiling, cooing and clinging, which lead to an affectionate protective adult response. In addition, he proposed that adults are innately drawn or attracted to these behaviours, leading them to care for and provide warmth, security and love to infants. Bowlby thought that adults were captivated by these behaviours because of evolutionary forces.

WORKSHEET 3C–2 HARRY HARLOW'S 1958 EXPERIMENT

Harry Harlow's work on infant–mother attachment

At around the same time that Bowlby was developing his evolutionary theory of attachment, Harry Harlow (1958) was undertaking research on attachment in rhesus monkeys. He conducted several experiments to investigate the factors influencing the development of attachment between infant monkeys and their mothers. One of his most famous experiments aimed to determine the role of food provision (breastfeeding) in the formation of infant–mother attachments. The experiment involved separating eight infant rhesus monkeys from their mothers at birth and rearing them individually in cages.

Figure 3C–7 These rhesus monkeys were taken from their mothers to be raised by surrogates in an experiment studying attachment.

Each cage contained two surrogate or 'substitute' mothers that were roughly the same size and shape as a real rhesus monkey mother. One of the surrogates was covered in towel-like fabric or cloth, and the other was left uncovered with exposed wire. A feeding bottle was attached to one of the surrogates in the same area where a breast would be on a real mother. The infants were then assigned to one of two conditions. In half of the monkeys' cages, the cloth mother provided milk with a feeding bottle and in the other half's cages, the wire mother provided milk with the feeding bottle. Harlow predicted that infant monkeys would prefer and become attached to the surrogate mother that provided milk via the feeding bottle, as he believed that infant–mother attachment was based primarily on feeding.

In both conditions, Harlow found that the infant monkeys spent significantly more time clinging to or cuddling the cloth surrogate than they did the wire mother (Figure 3C–8). When the wire mother provided the food, the infant monkeys would simply go to the wire mother to feed but immediately return to cling to the cloth surrogate (Figure 3C–9).

ISBN 978-1-009-25401-4 Gallagher et al

In further work with these infant monkeys, Harlow demonstrated that, when faced with novel and scary situations, the infant monkeys would turn to the surrogate mothers for comfort. He observed that, when placed in a novel environment with a surrogate mother, the infant monkeys would initially explore but run back to the surrogate when startled. Without a surrogate there, the infants were paralysed with fear, and some huddled in a ball, sucking their thumbs. Also, if an alarming, noisy, monster toy was placed in the cage, an infant monkey with a surrogate mother present would explore and attack the toy, but one without a surrogate would cower in fear.

These results contradicted Harlow's original predictions that infant monkeys would prefer and become attached to the surrogate mother that provided milk. He therefore concluded that the 'contact comfort' provided by the cloth surrogate was more important than feeding in the formation of infant–mother attachments in rhesus monkeys. Based on this, he assumed that contact comfort was also likely to be a crucial factor in the formation of human infant–caregiver attachments.

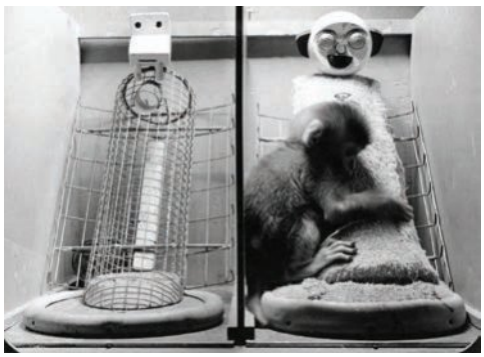


Figure 3C–8 The wire and cloth surrogate mothers used in Harlow's 1958 experiment on infant–mother attachment in rhesus monkeys

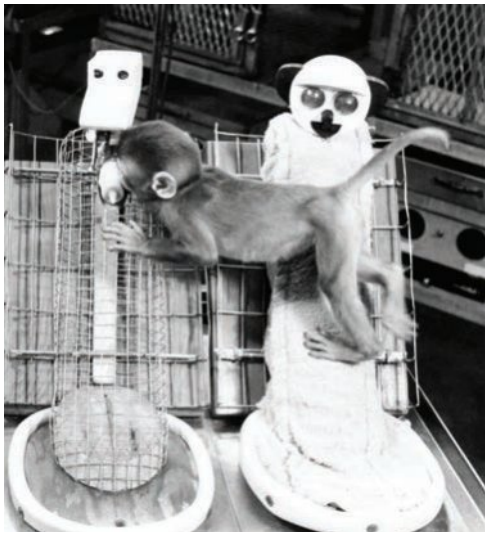


Figure 3C–9 Harlow found that the rhesus monkeys spent more time clinging to the cloth mother.

ACTIVITY 3C–1 WAS HARLOW'S 1958 EXPERIMENT ETHICAL?

Using the ethical concepts of integrity, justice, beneficence, non-maleficence and respect discuss with your class mates whether you believe Harlow's work with baby rhesus monkeys was ethically justified. A class debate could be organised, with the affirmative team arguing that is was ethically justified and the negative team arguing that it was not.

Check-in questions – Set 2

LINK 1C SAFETY AND ETHICAL UNDERSTANDING

1 What is attachment?
2 List two of Bowlby's findings regarding children deprived of a stable caregiver during their first few years of life.
3 What did Bowlby propose children need to thrive emotionally?
4 Describe Bowlby's evolutionary theory of attachment.
5 What was the aim of Harlow's 1958 experiment on attachment?
6 Briefly summarise the procedure involved in Harlow's experiment.
7 Use the results of Harlow's (1958) experiment to determine whether his hypothesis was supported or not.
8 How did Harlow's further work provide additional support for his ideas about contact comfort?
9 What conclusion can be drawn from Harlow's experiment in relation to infant–mother attachment in human infants?
10 Using the ethical concept of respect, justify whether you believe Harlow's 1958 experiment was morally sound.

ISBN 978-1-009-25401-4 Gallagher et al

Figure 3C–10 When in distress, infants show a desire to be comforted and near their caregivers. This is a sign of attachment.

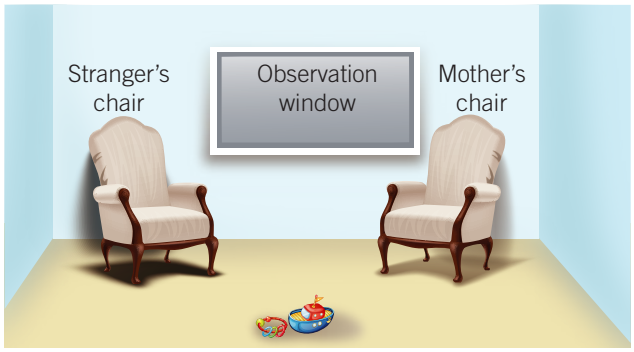


Figure 3C–11 The 'strange situation' was set up in a small room with a transparent mirror that served as an observation window, so that the behaviours of the infant and caregiver could be observed discretely over the eight episodes.

Mary Ainsworth's types of attachment

A consequence of attachment between infant and caregiver is that when their caregiver needs to leave, infants experience distress, as demonstrated by loud protests, agitation and crying. These behaviours have been labelled signs of separation anxiety, which Mary Ainsworth (1970) examined in detail, following on from the work of Bowlby. She proposed that these behaviours were a clear sign that the infant had become attached to either or both of their parents.

Ainsworth developed an experimental procedure called the 'strange situation' to observe the variety of attachment styles exhibited between mothers and infants aged 12–18 months (Figure 3C–11). The experiment was set up in a small room equipped with a transparent mirror as an observation window, to allow the behaviours of the infants and caregivers to be observed discretely over a series of eight episodes, each of which lasted approximately three minutes (Figure 3C–12).

1. Mother, baby and experimenter are together in the room. (This step lasts less than one minute.)
2. Mother and baby play alone.
3. A stranger joins the mother and infant.
4. Mother leaves the infant and stranger alone.
5. Mother returns and stranger leaves.
6. Mother leaves and the infant is left completely alone.
7. Stranger returns.
8. Mother returns and the stranger leaves.

Figure 3C–12 The eight episodes in Mary Ainsworth's 'strange situation', used to observe the attachment responses of infants and their caregivers.

ISBN 978-1-009-25401-4

Initially, because of Ainsworth's experiments, three patterns or types of infant attachment were identified. These were:

- secure attachment (Type B)
- **insecure-resistant attachment** (Type A)
- **insecure-avoidant attachment** (Type C).

Insecure-resistant attachment an anxious attachment that forms because of inconsistent responses to their needs from a caregiver. The child may be clingy around their caregiver, and insecure in themselves or in their interactions with others.

Insecure-avoidant attachment a distant attachment that develops in children who do not experience sensitive responses to their needs from a caregiver. The child appears very independent, both physically and emotionally.

Table 3C–2 A summary of the types of infant attachment according to Ainsworth

Type of attachment observed	% of all infant attachments observed	Key observations	Caregiver responses
Secure attachment (Type B)	65%	These infants play and explore comfortably while their caregiver is present (using them as a base for exploration), although they do become quite upset when the caregiver leaves, and they are not easily comforted by a stranger. These infants quickly calm down when their caregiver returns. Overall, these babies cry less.	In this attachment type, the caregiver responds to infants appropriately and consistently. The infant knows that their caregiver will always be available and responsive.
Insecure-resistant attachment (Type A)	10%	Infants seem quite anxious (clinging, unhealthy attachment) while playing, even when their caregiver is nearby. They become angry when the caregiver leaves and aren't particularly comforted when they return. They do not use their caregiver as a base to explore, instead tending to cling.	The caregiver is typically not consistent in responding to the infant's needs.
Insecure-avoidant attachment (Type C)	25%	These babies seek little contact with their caregiver while playing and are not particularly distressed when they depart. When reunited with a caregiver after a brief separation, these children may be quite distant and avoid contact with the caregiver. They are equally comfortable with their caregiver or a stranger. They cry often.	The caregiver is typically inconsistent in appropriately responding to the infant's needs. Sometimes, they may be very caring, but sometimes they are dismissive.

Ainsworth concluded that these attachment styles were the result of early interactions with the mother. Another insecure attachment style has since been identified, by Main and Solomon in 1990, known as insecure-disorganised attachment (Figure 3C–13). A child with an insecure-disorganised attachment exhibits odd or ambivalent behaviour towards their caregiver (e.g. first running up to them but then immediately pulling away, running away from the caregiver, curling up in a ball or hitting the caregiver). The instinct of the child is to seek comfort, but as they get near their caregiver, they feel fear, demonstrating the disorganised nature of their attachment. This form of attachment is often seen in individuals who have been physically, verbally or sexually abused in their childhood. In adulthood, these individuals tend to be extremely inconsistent in their behaviour and have a hard time trusting others. In fact, insecure-disorganised attachment has been found to be a risk factor for the development of mental health disorders.

ISBN 978-1-009-25401-4 Gallagher et al

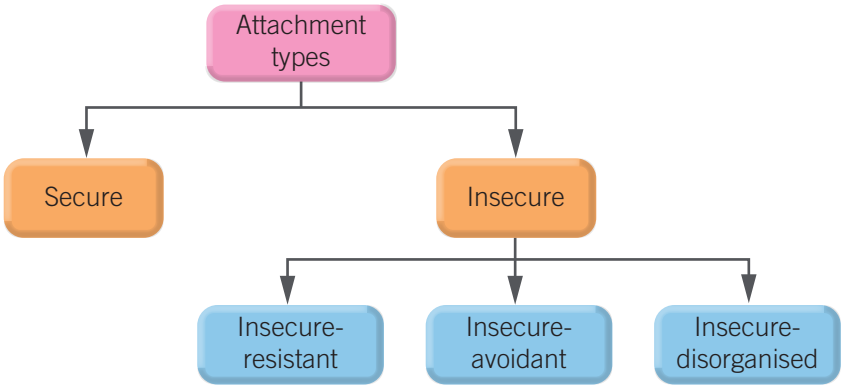


Figure 3C–13 The three types of attachment identified in Mary Ainsworth's 'strange situation', and a fourth attachment style identified by Main and Solomon

ACTIVITY 3C–2 CREATE A VIDEO OR ROLE PLAY OF THE STRANGE SITUATION

In a small group (three students minimum), create a re-enactment of the steps involved in Ainsworth's 'strange situation', using props such as two chairs and some toys. Each group should be allocated one type of attachment, with each member of the group playing the role of either the infant, the caregiver or the stranger. The infant must respond appropriately to the main steps in the experiment, and the class must guess which attachment style the infant is demonstrating.

3C SKILLS

VIDEO 3C–2 SKILLS: EVALUATING MODELS AND THEORIES

2B DRAWING CONCLUSIONS AND COMMUNICATING SCIENTIFIC IDEAS LINK

Evaluating models and theories

In VCE Psychology, you are expected to evaluate the models or theories developed by the psychologists that you study. The command term 'evaluate'means to give an overall assessment of the value of something by weighing up its relative strengths and weaknesses. If providing your own opinion, be sure to justify it with examples and/or evidence.

Here are some of the aspects of a theory, model or investigation that you could consider when evaluating:

- the sampling technique (random or stratified) and size of the sample
- the equipment and procedures used
- whether potential sources of error (personal, random or systematic) and uncertainty have been accounted for
- the type and amount of primary and/or secondary data or qualitative and/or quantitative data that was collated
- the investigation methodology used (e.g. case study; classification and identification; controlled experiment [within subject, between subject or mixed design]; correlational study; fieldwork; literature review; modelling; product, process or system development; or simulation)
- whether it is accurate, precise, repeatable, reproducible, of true value and valid (internal and external).

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 3C–3 EVALUATION OF ATTACHMENT THEORIES

Evaluate the relative contributions of Bowlby, Harlow and Ainsworth's investigations to our understanding of infant–mother (caregiver) attachment. Be sure to weigh the strengths and limitations of each. You may need to do further research to adequately address some of these considerations. To organise your ideas, create a table with rows and columns, like the one below.

Attachment theory	Strengths	Limitations
Bowlby		
Harlow		
Ainsworth		

Check-in questions – Set 3

1 What is separation anxiety?
2 According to Ainsworth, what is separation anxiety a sign of?
3 Briefly describe 'the strange situation'.
4 List the three attachment styles that Ainsworth identified and the percentage of infants that were found to demonstrate each style.
5 For each of the following 'episodes' involved in Ainsworth's strange situation, describe how an infant with these attachment styles would respond. Copy the table below into your notebook to complete this question.

Episode	Secure	Insecure-resistant	Insecure-avoidant
2. Mother and baby play alone.			
4. Mother leaves the infant and stranger alone.			
5. Mother returns (reunion) and stranger leaves.			

6 Briefly describe an insecure-disorganised attachment.
7 Explain the link between insecure-disorganised attachment and mental disorders.

Social development changes in a person's ability to interact with other people and function as a member of society

Social development

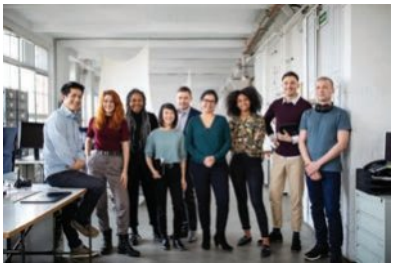
Social development across the life span

Over the course of the life span, the relationships we have with our parents, siblings, peers and romantic partners play an integral role in our social development. **Social development** involves changes in a person's ability to interact with other people and function as a member of society, such as the ability to form and maintain close relationships and acquire related skills such as sharing, language and interpersonal skills. A child's ability to interact in a healthy way with the people around them can impact everything from learning new words as a toddler, to being able to resist peer pressure as a high school student, to successfully navigating the challenges of adulthood.

Figure 3C–14 A child's ability to interact in a healthy way with their peers can impact other aspects of their development, such as their success at school.

ISBN 978-1-009-25401-4 Gallagher et al

Table 3C–3 Examples of social development over the course of the life span

Stage of the life span	Examples
Infancy (0–2 years) 	Infants learn that they can trust others to care for them and meet their needs. They enjoy life with others. This is the start of give and take in relationships. Much of their play is parallel: they play side-by-side, rather than cooperatively, with others (e.g. using the same toys, but not working together).
Childhood (2 years – puberty) 	In early childhood, children learn to share toys and take turns. They show more social independence from their parents and develop friendships with other children. They initiate or join in play with other children, make up games and learn to listen while others are speaking.
Adolescence (Puberty –18 years) 	In adolescence, peer groups become more important, and adolescents spend more time with them than their families. They have more interest in romantic relationships and sexuality. They have a deeper capacity for caring and sharing and for developing more intimate relationships.
Adulthood (18–65 years) 	In early adulthood, individuals are concerned with developing the ability to share intimacy and seek to find intimate love. Long-term relationships are formed, from which marriage and children often result. Adults make career decisions that can affect their friendships, political values, location of residence, child care arrangements, levels of job stress and many other aspects of their life. In later adulthood, individuals develop a genuine concern for the welfare of future generations and contribute to the world through their families and work.
Old age (65+ years) 	Older individuals have had a great deal of experience dealing with different social situations and can be better at reading other individuals' emotions and dealing with conflict. Older people who have seen their social circle shrink due to illness and death may start to feel anxious in certain social situations. They can also feel a greater sense of isolation. However, many older people are happy and engage in a variety of activities.

ISBN 978-1-009-25401-4 Gallagher et al

Social development: relevant models and theories

Erik Erikson's psychosocial developmental theory

In the 1950s and 60s, Erik Erikson conducted in-depth case studies of a variety of people from different backgrounds living in different cultures throughout Europe and America. Based on this work, he established a theory of psychosocial development that emphasised the impact of social experiences on the development of personality throughout the life span. Erikson believed that an individual's personality develops from the combination of the psychological processes within the individual and their external experiences with other people throughout their lives.

He proposed that social development is divided into eight stages over the life span and that the major goal at each stage is to satisfy the individual's social needs at this age. According to Erikson, each of the psychosocial stages is distinguished by two opposing emotional forces, known as contrary dispositions, which result in a 'crisis' needing to be resolved. The stage are usually called after the crises in the form of one emotional force in the pair versus the other, for example, 'trust vs mistrust'. How people deal with these crises has an enormous impact on the personality traits that people display over their lifetimes. Successful resolution of each crisis results in a healthy personality and the attainment of a basic virtue. However, if a crisis remains unresolved, negative traits may appear.

Erikson's eight stages of social development are summarised in Figure 3C–15, showing the crisis in terms of the contrary dispositions, and the age ranges. on the next page, Table 3C–4 shows more details including the social needs met and not met, and the consequences of both.

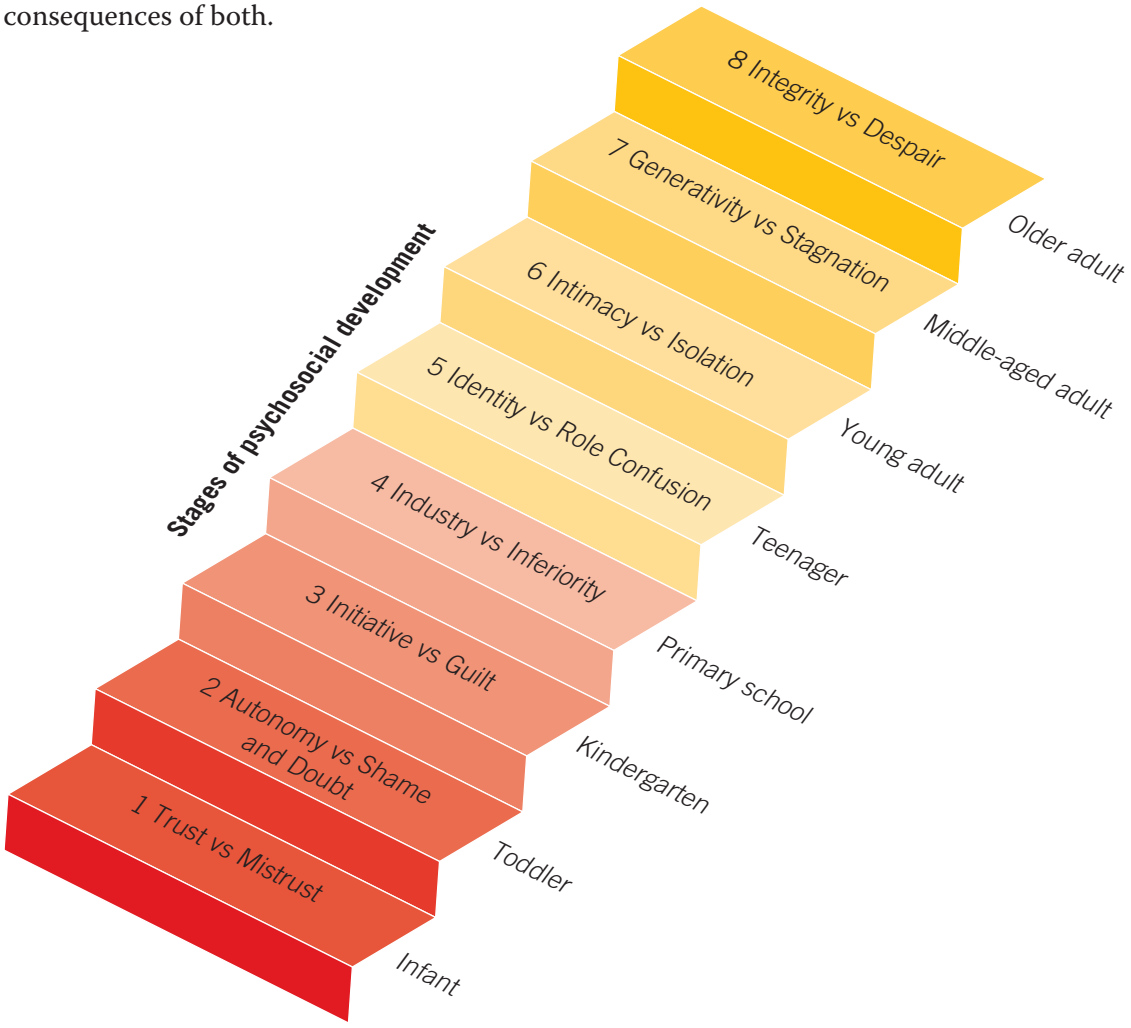


Figure 3C–15 A visual representation of Erikson's stages of psychosocial development

ISBN 978-1-009-25401-4 Gallagher et al

Table 3C–4 The eight stages of Erikson's psychosocial theory of development

Stage	Psychosocial crisis	Age range	Social needs met (crisis resolved)	Social needs not met (crisis not resolved)
1	**Trust vs mistrust**	0–2 years	Infants depend completely on adults to take care of their basic needs, such as food and warmth. If these basic biological needs are catered for and sound attachments are formed, the child will be optimistic and trusting of their world.	If these needs are not met, the child will be more distrusting and insecure.
2	**Autonomy vs shame and doubt**	2–3 years	This stage occurs when parents begin toilet training and make other efforts to regulate their child. The child must begin to take some personal responsibility for things like eating, bathing and dressing. If the child proceeds through this stage with no issues, they acquire a sense of self-sufficiency.	If parents are never happy with the child's efforts during this stage, this can lead to parent–child conflict and the child may develop a sense of shame and self-doubt.
3	**Initiative vs guilt**	3–6 years	The child's challenge at this stage is to function socially within their family. If the child gets along well with others in the family (siblings and parents), their sense of self-confidence should grow.	If the child only thinks about their own needs and desires, then family members' reactions may instil feelings of guilt in the child, lowering their self-esteem.
4	**Industry vs inferiority**	6 – puberty	At this stage, the child is confronted by the challenge of functioning socially outside their families in a broader social context, such as at school and in the local neighbourhood. Children who flourish in this socially less-nurturing environment, where being able to produce (create things) is highly valued, should develop a sense of competence.	Children who struggle with less support socially may find it difficult to produce or create things. This can lead them to feel less competent or inferior compared to others.
5	**Identity vs Role confusion**	Adolescence	The main challenge at this stage is the struggle to form a clear sense of identity. This includes working out a stable concept of themselves as a unique individual and defining their own personal values that provide them with their sense of direction. Those who successfully resolve this challenge tend to develop a healthy and confident sense of identity.	Those who are unsuccessful in this resolution tend to experience a sense of 'role confusion', leading to lower self-esteem, instability and social withdrawal. As with the other stages, a failure to cope with the identity issues of this stage may lead to psychological conditions related to confusion later in life. There is even a risk of developing serious mental disorders, such as borderline personality disorder.

ISBN 978-1-009-25401-4 Gallagher et al

Table 3C–4 *(Continued)*

Stage	Psychosocial crisis	Age range	Social needs met (crisis resolved)	Social needs not met (crisis not resolved)
6	**Intimacy vs isolation**	Early adulthood	In this stage of life, individuals are concerned with whether they can develop the capacity to share intimacy with others and find a meaningful intimate relationship. Successful resolution promotes empathy and openness.	Unsuccessful resolution (without intimacy) can cause feelings of isolation and lead individuals to develop behaviours such as shrewdness and a 'need' to manipulate.
7	**Generativity vs stagnation**	Middle age	The challenge in middle age is to develop worthwhile relationships with the younger generation. It is about having genuine concern for the welfare of future generations (such as concerns about water conservation and the environment). Success at this stage takes the form of providing unselfish guidance to younger people, and a feeling of contentment.	People who are unsuccessful at this stage become self-absorbed and have self-indulgent concerns about meeting their own needs and desires. Typically, such individuals have had nothing to do with the younger generation.
8	**Integrity vs despair**	Old age, 65+	The challenge during the retirement years is to avoid dwelling on the mistakes of the past and on one's imminent death. It is also a time to reflect on and review one's life, thinking about how well one has met life's challenges and lived life. Success at this stage leads to a sense of meaning and accomplishment, satisfaction with one's life and a feeling of contentment.	Those who are unsuccessful at this stage tend to wallow in bitterness, regret, despair and resentment.

Evaluation of Erikson's theory

The strengths of Erikson's theory include:

- The psychosocial conflicts in Erikson's stages do appear to contribute significantly to social and emotional development, and much research has been generated in support of the theory.
- His idea that experiences across the life span are just as important to social and personality development as those in the early years of life is supported by research.
- His theory draws important connections between childhood experiences and aspects of adult personality.

The weaknesses of Erikson's theory include:

- He provided an idealised description of 'typical' developmental patterns that do not adequately explain the enormous personality differences that exist between people. This inability to explain individual differences is a common problem with all theories that propose certain 'stages' in development.
- There are concerns about some of the concepts within the theory (e.g. trust and autonomy), as they are descriptive rather than explanatory, which makes them difficult to test experimentally, verify or refute.
- While there is some evidence that a failure to negotiate an earlier stage can lead to difficulties in later stages, there is no clear evidence that problems actually produce later issues.

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 4

1 What is social development?
2 Provide an example of social development at each stage of the life span.
3 What did Erik Erikson propose about how our personality develops over the life span?
4 Describe the importance that Erikson placed on resolving a 'crisis' at each stage of his psychosocial theory.
5 List the eight stages of Erikson's psychosocial theory of development, naming each crisis and noting down the associated age ranges.
6 Determine which stage of Erikson's psychosocial theory of development the following examples best fit into.
   a Tan has committed himself to different extra-curricular activities, including acting in the school play, competing in debating and playing on the basketball team. He has become so time poor that he needs to quit some of his activities, but he feels it is important to try everything because he is still working out what he likes best.
   b Milly has grown in confidence and is learning to cooperate and get along with her two older siblings, Lucas and Zara.
   c Since her husband passed away, Pamela has been reflecting on her life. Despite missing her husband, she still feels content with the 45 years they spent together.
   d Hudson requires his basic needs, such as food and warmth, to be met by his mum and dad.
   e Karima wants to share her life with an intimate partner and has decided to join an online dating website to find someone with similar interests and goals in life.
7 Provide two strengths and two weaknesses of Erikson's psychosocial theory of development.

Albert Bandura's social learning theory

Observational learning the acquisition of new behaviours as a result of observing the actions of others and the consequences of those actions

As shown by the famous social psychologist Albert Bandura, one of the ways we learn which behaviours to repeat or not to repeat is through **observational learning** (i.e. learning from others). We watch others' behaviour, and then, observing the consequences of their behaviour, we either replicate it or not. If their actions yield positive consequences, then we are more likely to replicate that behaviour. Conversely, if their behaviour has negative consequences, then we are less likely to replicate it. This method of learning is a key component of Albert Bandura's social learning theory. When we learn by observing the actions of others and their consequences, this is also called **modelling**.

Modelling a form of learning whereby we observe the behaviour of others and then replicate it

Figure 3C–16 Learning ballet by watching the actions of the teacher, or model, is an example of social learning.

ISBN 978-1-009-25401-4 Gallagher et al

WORKSHEET 3C–3 BANDURA'S 1965 EXPERIMENT

Bandura's most famous experiment regarding social learning theory was that of the Bobo doll. Bandura and his colleagues were able to demonstrate the powerful effect that observational learning and reinforcement can have on an individual and their willingness to replicate behaviour. In 1965, Bandura and his colleagues showed 66 children (33 boys and 33 girls) a film in which a model knocked down a 'Bobo doll' (an inflatable clown) by punching it on the nose and shouting things like 'sockeroo!' The children were divided into three groups, with each watching a different ending to the film:

- **Group 1** watched the model being aggressive towards the Bobo doll, followed by a researcher praising the model for their behaviour and offering a food reward.
- **Group 2** watched the model being aggressive towards the Bobo doll, followed by a researcher criticising the model for their behaviour.
- **Group 3** was the control group. They watched the model being aggressive towards the Bobo doll, but the model was neither rewarded nor punished for their behaviour.

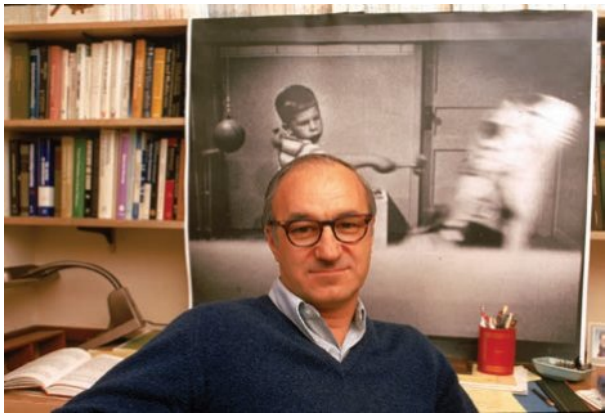


Figure 3C–17 Albert Bandura in front of a still image taken from his 1965 experiment on social learning in children

Afterwards, each child was placed in a room by themselves with various toys, including a Bobo doll. The experimenters scored the children based on the number and variation of aggressive behaviours they demonstrated. The experiment was then repeated a second time, and this time the children were offered various rewards, including candy, juice and stickers, to mimic the behaviour they had just witnessed.

Bandura found that the children in the group that saw the model being rewarded for their behaviour were more likely to act violently towards the doll by mimicking that behaviour. Likewise, when the children themselves were offered a reward for replicating the aggressive behaviour (a piece of candy for every piece of behaviour from the film that they could replicate), the children who had seen the model being punished were even more likely to replicate the aggressive acts on the doll (Figure 3C–18).

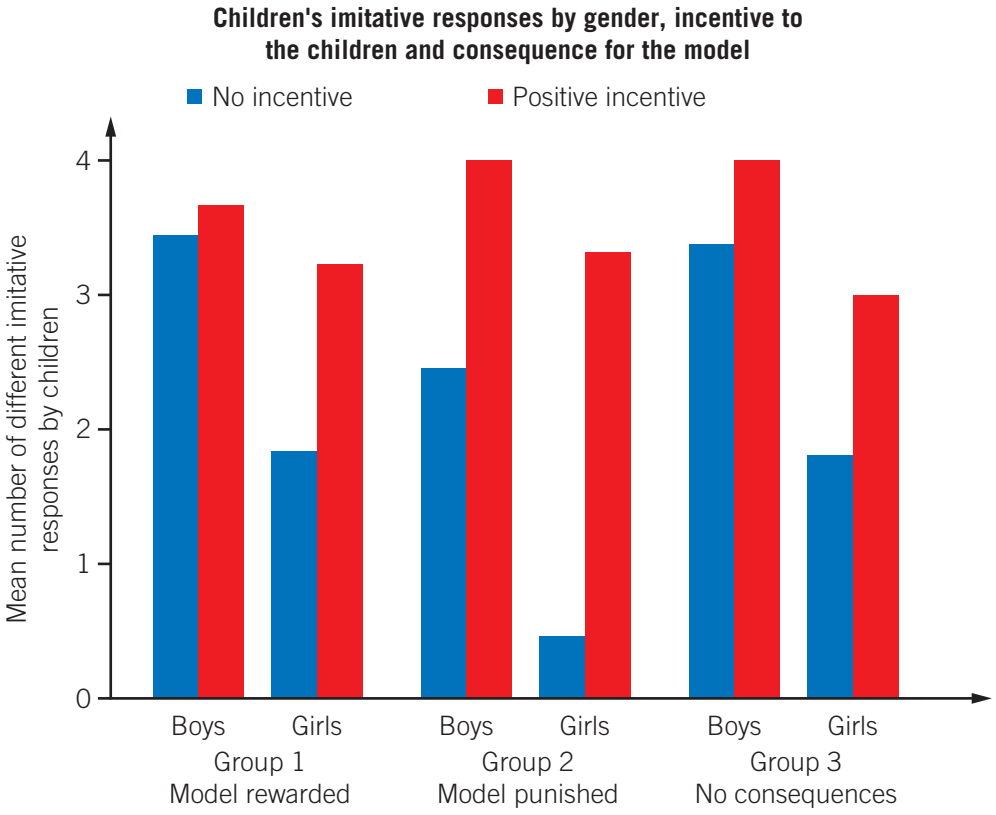


Figure 3C–18 Results from Bandura's 1965 study. The groups are the ones detailed in the text above. The incentive given or not given to the children was a treat to mimic the model's aggression to the Bobo doll in the film, which included the model being rewarded, punished, or having no consequences for their behaviour. The columns show the number of different imitated responses by the children (aggression towards the Bobo doll).

ISBN 978-1-009-25401-4 Gallagher et al

So, what are the implications of these findings? It has been estimated that by the age of 15, the average American child will have viewed approximately 24 000 shootings on television and watched more hours of television than the time they have spent in school. By 2030, Australian children are predicted to have witnessed the same. However, as Bandura has shown, simply observing violence does not mean that the child will go on to perform aggressive acts. Many other factors are involved in determining whether a person will engage in aggressive behaviours and continue to replicate that behaviour in the future.

Evaluation of Bandura's social learning theory

The strengths of Bandura's theory include:

- It provides some explanation of how people's behaviour or learning can differ because of external or environmental influences. This has led to the recognition of different ways of learning, such as through observation or direct experience.
- It considers the thought processes of the individual and emphasises their role in the individual's decision on whether to imitate a behaviour.
- It suggests that behaviour can be modified to replace maladaptive behaviours with more adaptive ones by implementing an optimistic and appropriate consequence. The theory is therefore considered empowering, as it helps individuals identify for themselves appropriate behaviours through observation and practising the desired behaviour.

The weaknesses of Erikson's theory include:

- It does not account for how we develop a whole range of complex responses that also includes thoughts and feelings, not just observable behaviours or actions.
- By placing greater weight on the environment, the theory assumes that a person's behaviour and actions are determined by society rather than by how the person handles or processes information.
- The theory fails to account for all behaviour, especially when there is no apparent role model for the observer to imitate.
- It does not consider individual interpretations of different situations, as it does not account for all behavioural differences; rather, it focuses on what is happening in the situation rather than explaining why the situation is occurring.

Check-in questions – Set 5

1 Use an example to explain how social learning or modelling works.
2 Provide a brief description of the procedure involved in Bandura's 1965 experiment.
3 Using the graph in Figure 3C–18, state two findings from the data comparing the three groups.
4 What did Bandura discover about offering children incentives and reinforcement and social learning?

Cognitive development

Cognitive development across the life span

It was previously thought that infants lacked the ability to think or form complex ideas and remained without cognition until they learned to use language. However, it is now known that babies are highly aware of their surroundings and are interested in exploration from birth. They actively learn, gather, sort and process sensory information from the environment as part of, and supported by, developing their perceptual and thinking skills, which are aspects of cognitive development.

ISBN 978-1-009-25401-4 Gallagher et al

Cognitive development involves changes in an individual's mental abilities, including their thinking, learning, imagination, perception, reasoning and decision-making, memory, ability to problem solve and use of language.

Cognitive development changes in an individual's mental abilities

Table 3C–5 Examples of cognitive development over the life span

Stage of the life span	Examples
Infancy (0–2 years) 	Infants begin by using their senses to explore the world around them. By three months old, infants can recognise faces and respond to familiar sounds. At four to seven months, they can recognise their names. By nine months, they can imitate gestures and actions as well as understand simple words, such as 'no'. At 12 months, infants can speak multiple words, imitate animal sounds and associate names with objects. By 18 months, they can understand about 10–50 words, identify body parts and follow directions that involve two different tasks, like picking up toys and putting them in a box.
Childhood (2 years – puberty) 	By the age of two, children should be able to understand 100 to 150 words and will add about 10 new words to this each day. As they get older, they develop skills in using mental imagery and memory, have an increasing attention span and learn to read. Later in childhood, they develop the ability to use logic and problem-solving. They build on their past experiences, using them to explain why some things happen.
Adolescence (Puberty – 18 years) 	Adolescents have increased independence in thinking through problems and situations. They can use abstract thinking, think about what is possible and think hypothetically. Adolescents also begin thinking about the process of thinking itself, or metacognition, and their thinking tends to become multidimensional, rather than limited to a single issue, allowing them to see things through more complicated lenses.
Adulthood (18–65 years) 	In early adulthood, cognition has stabilised and reached its peak at around the age of 35. Thinking has moved away from black and white ideas of what is wrong or right, to understand that a question can have more than one right or wrong answer. Young adults tend to develop expertise in either their studies or their careers. Older adults' cognitive processing speed slows down, as does their ability to solve problems and divide attention. However, practical problem-solving skills tend to increase.
Old age (65+ years) 	Cognitive processing speed slows down during old age, as does the ability to solve problems and divide attention. However, practical problem-solving skills tend to increase. These skills are necessary to solve real-world problems and figure out how best to achieve a desired goal.

ISBN 978-1-009-25401-4 Gallagher et al

CHAPTER 9 LINK

Cognitive development: relevant models and theories

As mentioned in Table 3C–5, cognitive development in infancy occurs via the senses, by hearing, seeing, smelling, touching and tasting. The process of perception, by which incoming sensory information is organised and made sense of, is integral to cognitive development. Perception is more complicated than simply receiving sensory information; it requires the processing of that information so that it can be used by the brain (i.e. makes sense). It also includes making links between the different perceptions and memories of them that you form to organise them for later use. This is how you can remember what a person's face looks like or what certain foods taste like and whether you liked them or not.

Eleanor Gibson and Richard Walk's work on infant perception

In 1960, Eleanor Gibson and Richard Walk conducted their original controlled experiment on the depth perception abilities of infants. They wanted to determine at what age infants were capable of perceiving depth and distance. Together, Gibson and Walk designed an apparatus called the visual cliff to test infants of crawling age for depth perception (Figure 3C–19).

The visual cliff apparatus consists of two levels: an upper level and a lower level. A piece of thick glass sits across the upper level, appearing to cover two depths of surface. For one half of the upper level of the apparatus (the 'shallow end'), the glass covers a patterned material (the initial surface). For the other half (the 'deep end'), the patterned material is on the lower level, so that there appears to be a drop. This illusion is called the visual cliff. Because the experiment relied on infants being able to move themselves across the visual cliff, only mobile infants (those capable of crawling) could be used for the research.

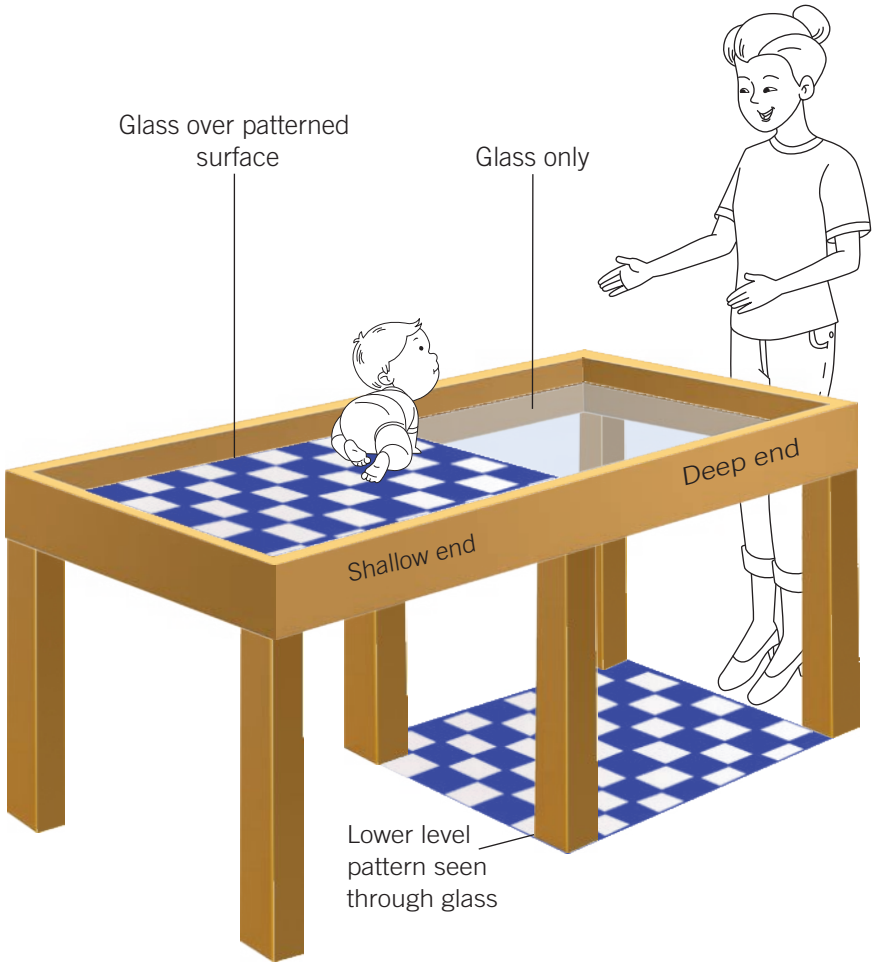


Figure 3C–19 The visual cliff, designed and used by Eleanor Gibson and Richard Walk in 1960

ISBN 978-1-009-25401-4 Gallagher et al

The procedure involved a mobile infant being placed in the middle of the upper level (on the edge of the cliff), with their mother at one end of the apparatus. The mother would then call out to the child and open her arms, waiting for the infant to crawl towards her. When the mother stood at the shallow end of the cliff, the infant crawled across to her. What Gibson and Walk were most interested in was what would happen if the infant were placed in the centre of the apparatus with their mother at the deep end. Would the infant cross the apparent 'drop' to reach the other side? Gibson and Walk predicted that infants who possessed depth perception skills would perceive the drop in the floor beneath them and therefore not cross the cliff. This infant would stay on the centreboard of the cliff and look either down at the drop or up towards their beckoning mother. If the infant had not yet developed depth perception, they would cross to the deep end of the cliff to reach their mother.

ACTIVITY 3C–4 CREATE YOUR OWN VISUAL CLIFF

Using craft materials such as cardboard, coloured paper, clear plastic and cellophane, create your own 3D version of a visual cliff. Record yourself explaining how the cliff could be used to measure the depth perception of an infant. You might like to use a cardboard cut-out of a baby and a caregiver to demonstrate the different responses of infants when called by their caregiver.

Gibson and Walk tested 36 human infants aged 6–14 months, with the results of 27 of the infants able to be included in the final research. The investigation found that all 36 infants who moved off the centre of the apparatus crawled out to the shallow end at least once. Only three crept onto the glass suspended above the deep end. It was observed that some infants would peer down through the glass at the deep end and then back away. Others patted the glass with their hands, felt the solid surface, but still refused to cross. Many of the infants who participated crawled away from their mother when she called to them from the deep end, and other infants cried when they saw their mother standing at the deep end because they knew they could not get to her without crossing the visual cliff.

From this, Gibson and Walk concluded that most human infants can discriminate depth as soon as they can crawl. Studies undertaken on animal infants have yielded similar results (i.e. the infants would not cross the visual cliff). Gibson and Walk suggested that the infants' reaction to the visual cliff experiment relates to the role of vision in the survival of the species – infants are reluctant to climb to places they perceive as high, where they may fall and be injured or even killed. Subsequent studies by researchers Campos, Bertenthal and Kermoian have found that pre-mobile infants (those who cannot crawl on their own) still perceive depth, but it is not until the infant is capable of self-produced motion (either in a walker or by crawling) that they will develop a fear of heights.

WORKSHEET 3C–4 GIBSON AND WALK'S 1960 EXPERIMENT

Evaluation of Eleanor Gibson and Richard Walk's work on infant perception

The strengths of Gibson and Walk's work include:

- The visual cliff procedure was designed to be conducted in a controlled laboratory setting, which is a reliable and safe way to measure infant depth perception.
- The visual cliff was used with a range of different species, including humans and other animal infants, thereby improving the reliability of the findings.
- This research helped to create a timeline for the development of depth perception in infants. This enables newborns and infants' progress to be compared to 'normal' development, helping to identify abnormalities in their perception or vision.

ISBN 978-1-009-25401-4 Gallagher et al

The weaknesses of Gibson and Walk's work include:

- The sample of human infants was quite small, making the findings difficult to generalise to human infants overall.
- From an ethical standpoint, it could be argued that although the mothers were present and gave informed consent, the visual cliff may have caused the infants significant distress, particularly if they had developed their depth perception.
- Certain assumptions had to be made by the researchers about what the infants were thinking and feeling as verbal communication was not possible.
- Although the procedures and instructions were highly standardised, it is possible that the verbal cues (e.g. facial expressions) used by mothers changed depending on whether they were calling their child from the shallow or deep end of the visual cliff. This would have influenced the results.

Check-in questions – Set 6

1 Draw and label a diagram of the visual cliff.
2 How did Gibson and Walk use the visual cliff to test the perceptual abilities of mobile (crawling) infants?
3 What did the results of Gibson and Walk's experiment demonstrate about the depth perception of infants aged 6–14 months?

Jean Piaget's work on cognitive development

The area of cognitive development has been dominated by the work of Jean Piaget. Piaget devoted most of his life to studying cognitive development and carefully observing his own three children, using them as his participants to assess how children use their intelligence. He noticed that children actively explored their environment and believed that cognitive development was dependent on children's ability to adapt to their constantly changing world. According to Piaget, children were able to achieve this through two related cognitive processes: assimilation and accommodation.

Figure 3C–20 Jean Piaget (1896–1980) dominated research in the area of cognitive development.

Assimilation a cognitive process that involves taking a new concept and fitting it into or making it part of a pre-existing mental idea or structure

Schema our pre-existing mental ideas relating to a given concept that help us organise and interpret new information

Children use **assimilation** when acquiring new knowledge, by taking a new concept and fitting it into, or making it part of, the pre-existing mental ideas or structure they have. This mental structure is known as their **schema**. During assimilation, the child's underlying cognitive skills and world views remain unchanged. That is, children interpret the new information to fit it into what they already know.

Let's look at an example of this. Three-year-old Maya currently understands the concept of 'sauce' and especially loves tomato sauce. One day, while in the bathroom with her mum, she points to a bottle of shampoo and calls it 'sauce'. Given that sauce and shampoo do share some qualities (e.g. they are both stored in bottles that usually require squeezing and they have a similar texture), Maya has incorrectly assimilated shampoo into her pre-existing

ISBN 978-1-009-25401-4 Gallagher et al

idea of 'sauce' (i.e. her schema about sauce). More advanced thinking would require Maya to use **accommodation**, which involves changing or adjusting existing ideas to deal with new situations. Eventually, Maya will have to adjust her schema (existing mental idea) about 'sauce' to include other distinguishing features, such as that sauces are edible, they are only used on food and they are stored in the kitchen. Otherwise, she will keep assimilating shampoo incorrectly as sauce. Accommodation forces children to see the world differently and is indicative of a change of stage.

Accommodation a cognitive process that involves changing or adjusting existing ideas to deal with new situations

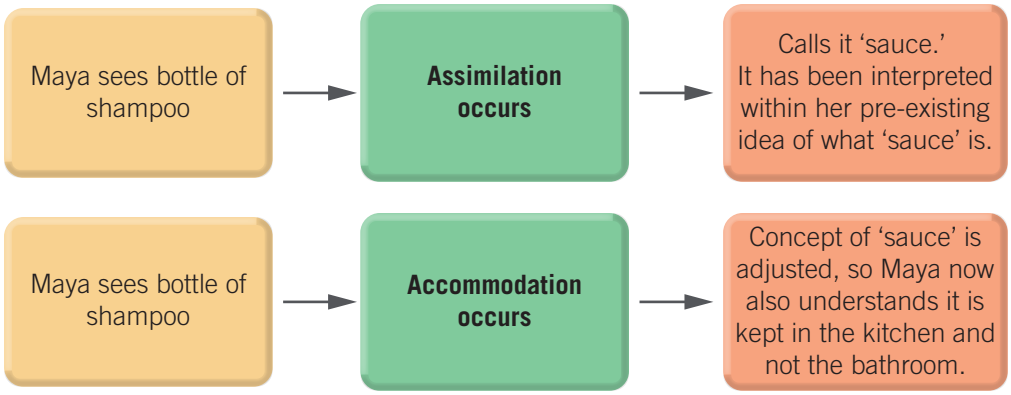


Figure 3C–21 Assimilation and accommodation in action

One of Piaget's most important contributions was his description of four stages of cognitive development, which occur in a predictable sequence and are characterised by several key cognitive accomplishments that individuals must achieve before moving to the next stage. The four stages and their associated age ranges, as proposed by Piaget, are summarised below.

Piaget's sensorimotor stage (0–2 years)

In this first stage, infants are developing their ability to coordinate their sensory input with their motor actions. Their main interactions are via their senses and reflexes, so learning tends to be done by relating sensory and motor information. For example, an infant may knock a rattle and notice a noise, then rattle it to make the noise again, which encourages them to shake everything to get a noise. Piaget also believed that one of the key accomplishments at this stage is that infants learn to use symbols to represent objects, based on an understanding that objects continue to exist even if they can't be touched, seen or heard. He called this **object permanence**, and this usually develops around 5–8 months of age. Before this point, simple games like 'peekaboo' can be very exciting for an infant, as they believe you have disappeared when you cover your face with your hands.

Object permanence an understanding that objects continue to exist even if they can't be touched, seen or heard

Figure 3C–22 A game of peekaboo can be very exciting for an infant who is yet to develop object permanence, as they believe you have temporarily disappeared when they cover their eyes, or you cover your face.

ISBN 978-1-009-25401-4 Gallagher et al

Figure 3C–23 This infant does not appear to have developed object permanence because they are uninterested in the toy that is covered by a blanket, believing that because they cannot see it, it no longer exists.

A classic way of testing whether an infant has developed the key accomplishment of object permanence is to cover a toy with a blanket (Figure 3C–23). If they search for the toy under the blanket, this indicates that they understand that the toy continues to exist even though they can't see it.

In the sensorimotor stage, an infant also develops the ability to perform **goal-directed behaviour**. This means that they become capable of having a thought and carrying out a planned series of actions with a purpose. As the infant's sensory and motor skills become more sophisticated, they can better coordinate their skills and implement a plan of action. For example, if their toy has rolled under the couch, they are able to crawl towards it and reach to obtain it.

Goal-directed behaviour
a planned series of actions with a purpose

Symbolic thinking
a type of thinking that uses symbols, such as words or images, to solve simple problems and to talk about things that are not physically present

Animism
the belief that inanimate objects have feelings and intentions

Piaget's pre-operational stage (2–7 years)

During this stage, children learn to use symbols more confidently, such as words or images, to solve simple problems and to talk about things that are not physically present. This is called **symbolic thinking** and is often evident in pretend play, when a pile of sand becomes a turtle, a box becomes a television and endless numbers of make-believe friends share an imaginary tea party or adventure (Figure 3C–24). Other examples of children engaged in symbolic thought can be seen in their use of language and production of drawings.

Figure 3C–24 Examples of symbolic thinking in pretend play, which is characteristic of children in the pre-operational stage

Figure 3C–25 This child is demonstrating animism as he believes his toy 'feels sick'.

Another characteristic way of thinking for children in the pre-operational stage is **animism**. This is the belief that inanimate objects have feelings and intentions. For example, a child might believe that the footpath is mad at them and made them fall over, or that the stars twinkle in the sky because they are happy.

ISBN 978-1-009-25401-4 Gallagher et al

Egocentric thinking or **egocentrism** is also characteristic of children in this stage. This is where the child has a limited ability to share or appreciate someone else's point of view. Pre-operational children cannot appreciate that other people also have their own viewpoints. For example, if five-year-old Ella was egocentric in her thinking and you asked her if her older sister Zara had a sister, she would probably say 'no'. This is because she is unable to view the idea of sisterhood from her sister Zara's point of view.

One more key accomplishment that is achieved towards the end of the pre-operational stage is called **transformation**. This involves the child understanding that something can change from one state, form or structure to another. For example, if we present a child early in the pre-operational stage with water in various states, such as ice and steam (boiling water), the child might be able to identify that ice and steam are water in different states (i.e. solid, liquid or gas) but they wouldn't be able to explain the process by which these changes of state occur. By the end of the pre-operational stage, they could propose some explanations.

Figure 3C–26 This child would be demonstrating egocentrism if he can't recognise that he is blocking your view of the screen.

Figure 3C–27 When a child develops an understanding of how water turns into steam when boiled, they demonstrate transformation.

Check-in questions – Set 7

1 Using your own example, distinguish between assimilation and accommodation.
2 Identify, explain and provide an example of one key accomplishment in the sensorimotor stage.
3 Identify the key characteristic or accomplishment from the pre-operational stage in the following examples.
   a Dillon is standing directly in front of the television screen. His older brother, Christopher, can't see and calls out to him to move, but Dillon can't understand why Christopher can't see.
   b Hattie is worried that her ice-cream will melt before she finishes it.
   c When George's teddy falls off the chair, he quickly comforts it and checks whether teddy is hurt.
   d Yara loves playing with mud in her outdoor kitchen. She mixes dirt and water together and bakes mud 'cakes', which she gets her dad to 'taste'.

Egocentrism a limited ability to share or appreciate someone else's point of view

Transformation the understanding that something can change from one state, form or structure to another

ISBN 978-1-009-25401-4 Gallagher et al

Piaget's concrete operational stage (7–11 years)

Figure 3C–28 This child is not upset that his ball has deflated because he understands reversibility, and that it can be filled up again with air.

Reversibility the understanding that actions can be undone or reversed

Piaget called this the 'concrete' operational stage because children can now perform several mental operations on real, tangible, concrete objects and actual events. One of these operations is **reversibility**, which refers to the idea that children understand that actions can be undone or reversed. This skill allows children to appreciate that there are several ways of looking at things. For example, Finn can visualise his teddy bear sitting on the ledge of his window and what might happen to his teddy if it was pushed! He can also understand that when his favourite ball deflates, it can be filled up with air to be played with again or that his stained t-shirt can be washed and look like new again.

Conservation the understanding that certain qualities of an object remain the same even when its appearance changes

The ability to understand reversibility leads to a decline in egocentric thinking and a gradual proficiency in **conservation**, which is another key accomplishment of this stage. This is the understanding that certain qualities of an object remain the same, even when its appearance changes. This understanding can be applied to volume, mass, number and length. Let's look at an example of each.

- *Conservation of volume*: this is the understanding that the amount or size (mass) of an object remains the same even when its appearance changes. A common test for this is to present a child with two beakers containing equal amounts of liquid (beaker A and B) (Figure 3C–29). The liquid is then poured from one beaker (beaker B) into a different-shaped beaker (beaker C), and the child is asked which beaker contains more. The child who can conserve volume would know that even though the liquid appears higher in beaker C, it still contains the same amount (volume) of liquid as is in beaker A or was in beaker B.

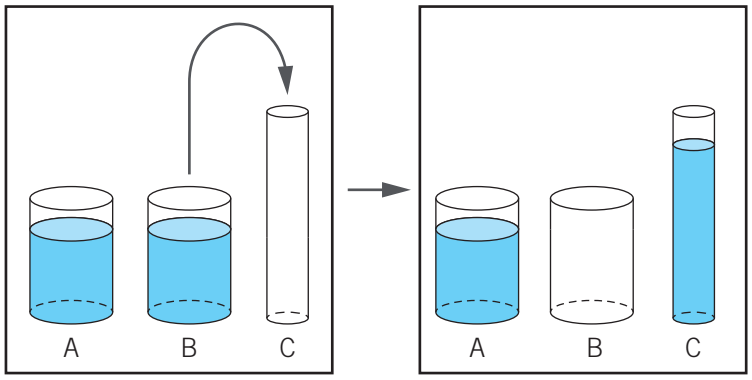


Figure 3C–29 A child with the ability to conserve volume will understand that despite a change in the shape of a liquid, there is still the same amount of it whether it is in beaker B or C.

- *Conservation of mass*: this is the understanding that the weight or mass of an object remains the same, even when its appearance changes. For example, if you present a child with two identically sized and weighted balls of playdough (A and B) and then change the shape of one (B) by flattening it (Figure 3C–30), the child will understand that both balls (A and B) still have the same amount of playdough.

Figure 3C–30 A child who can conserve mass will understand that playdough ball B contains the same amount of playdough as ball A, despite the change in its appearance (having been flattened).

ISBN 978-1-009-25401-4 Gallagher et al

- *Conservation of number*: this is the understanding that the number of objects remains the same despite a change in their appearance. For example, if you present a child with five coins in two equally spaced rows (row A and B), then change row A so that it is more spaced out and longer than row B (Figure 3C–31), a child who can conserve numbers will recognise there is still the same number of coins in both rows A and B.

Figure 3C–31 A child who can conserve number will understand that after the coins in row A have been spaced out, there is still the same number of them as in row B.

- *Conservation of length*: this is the understanding that the length of objects remains the same despite a change in their appearance. For example, if you present a child with two matchsticks that are equal in length (A and B) and then change the positioning of matchstick A (Figure 3C–32), a child who can conserve length will recognise that the matchsticks are still the same length.

Figure 3C–32 A child who can conserve length will understand that despite a change in the positioning of matchstick A, both A and B are still the same length.

Another key accomplishment in the concrete operational stage is the ability to use **classification**. This involves the capacity to sort objects into groups based on features that are similar or different. For example, if a child who can classify is presented with the shapes shown in Figure 3C–33, they will be able to group them based on whether they are a triangle, square or circle, as well as based on size (large, medium or small) and colour (orange, blue or green).

Classification the ability to sort objects into groups based on their features

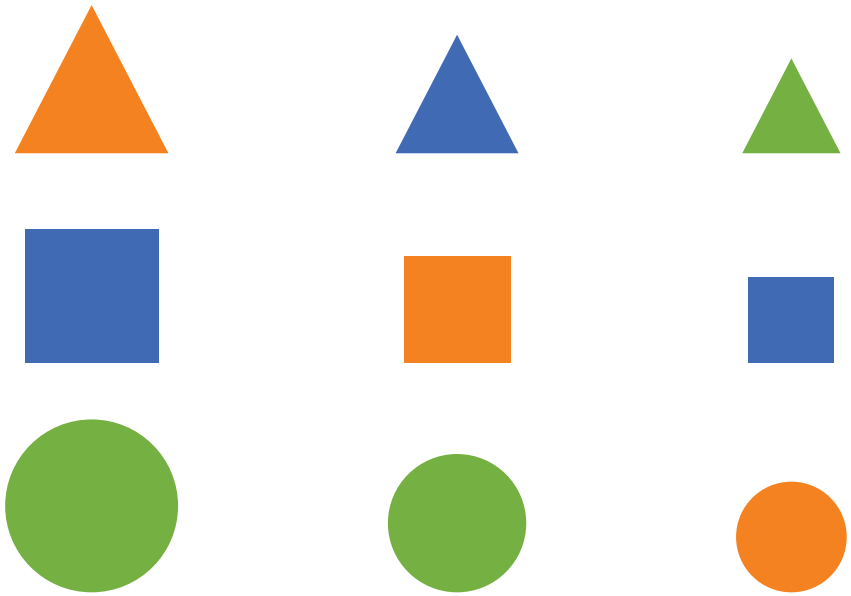


Figure 3C–33 A child who can classify objects would be able to group these shapes based on whether they are a triangle, square or circle as well as by colour and size.

ISBN 978-1-009-25401-4 Gallagher et al

Piaget's formal operational stage (11+ years)

Hypothetical-deductive reasoning a way of thinking that involves developing a hypothesis based on what might logically occur

Abstract thinking a way of thinking that is not reliant on directly observing, visualising, experiencing or manipulating something to understand it

During the formal operational stage, adolescents become more systematic in their problem-solving attempts. In earlier stages, children tackle problems in a haphazard trial and error fashion, but during the formal operational stage, they start to think things through more completely using **hypothetical-deductive reasoning**. This usually involves developing a hypothesis based on what might logically occur. They can think about all the possibilities in a situation beforehand and then test them systematically. This means that they will consider possible courses of action and use logic to determine the likely consequences of their actions before they do something. For example, before conducting an experiment in chemistry, a formal operational student would be able to hypothesise the expected outcome of mixing chemicals based on their understanding of their properties.

Figure 3C–34 This chemistry student in the formal operational stage can use hypothetical-deductive reasoning to explain what will happen when he mixes two substances.

Figure 3C–35 Performing algebraic equations in the formal operational stage requires abstract thinking.

In addition, thought processes in this stage are more likely to be increasingly abstract, systematic, logical and reflective. As such, a key accomplishment is the ability to use **abstract thinking**, which is a way of thinking that is not reliant on directly observing, visualising, experiencing or manipulating something to understand it. This is particularly important for concepts that have no physical reference, such as beauty, love, freedom and morality. The adolescent is no longer limited by what can be directly seen or heard. They are also now able to complete algebraic equations that require the use of symbols and abstract rules to manipulate them.

It should also be pointed out that many people (even adults) do not reach this level of cognitive development. In fact, many people struggle with abstract concepts and often resort to concrete thinking when things become too abstract.

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 3C–5 SUMMARY OF PIAGET'S FOUR STAGES OF COGNITIVE DEVELOPMENT

Using a copy of this table or a graphic organiser, summarise the key characteristics and accomplishments of children at each of the four stages of Piaget's theory of cognitive development.

Stage	Age range	Characteristics and key accomplishments
Sensorimotor		
Pre-operational		
Concrete operational		
Formal operational		

ACTIVITY 3C–6 TESTING PIAGET'S THEORY

Using easily accessible children of different ages, such as relatives or local primary or junior school students, test their cognitive abilities using a few of Piaget's basic tests (e.g. his tests of conservation or object permanence). You would of course need to obtain consent from the children's caregivers, ensure that other ethical guidelines are followed, gather the necessary materials and record any data you collect for analysis.

LINK CHAPTER 1

Evaluation of Piaget's theory

The strengths of Piaget's theory include:

- His theory has inspired countless studies, which have further improved our understanding of children's cognitive development and inspired other theories (including Kohlberg's theory of moral development, discussed later in this section).
- He anticipated issues that others could fault him on, and hoped that future researchers might provide modifications and improvements to further the theory.
- His theory has had an enormous impact on educational practice. It has changed the way children are taught, shaped the modern educational system and improved educational outcomes.

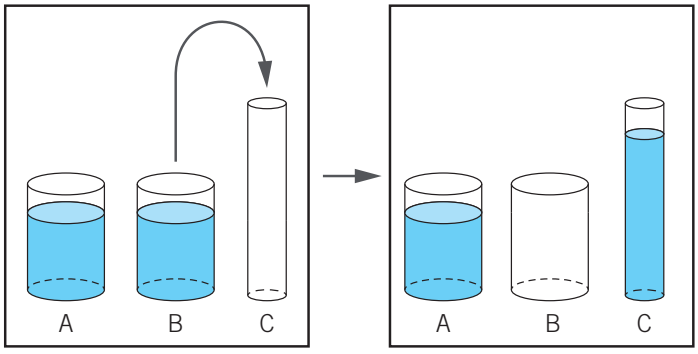
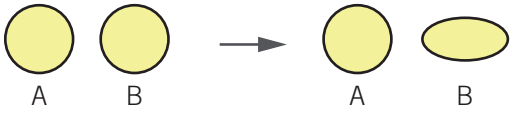
The weaknesses of Piaget's theory include:

- Piaget underestimated children's cognitive development in general. For example, research has found that children understand object permanence much earlier than first thought, at 3–4 months of age; pre-operational children have also been found to have less egocentrism and animism than Piaget believed; and additional research suggests that only 33% of the population reaches the formal operational stage.
- Research has found that while the sequencing of the stages is set, the timing for each stage varies considerably, particularly between cultures. Piaget may have seriously underestimated the powerful influence of cultural factors on cognitive development. In fact, his tests may have been culturally biased, leading to non-Western cultures being misrepresented.
- Piaget's tasks relied on children being able to reflect and report on their own reasoning. Some of his experiments were also overcomplicated. Where tasks have been simplified, children have been found to have cognitive abilities beyond what Piaget expected. This suggests an underestimation of children's competence.
- Piaget's observations were biased as they were of his own children, which is also a very small sample size. He had no controls for comparisons and did not use statistical analysis.
- Piaget may have underestimated the role of relationships and social influences in providing improved understanding of concepts throughout development.

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 8

1 Using your own example, explain how children in the concrete operational stage demonstrate reversibility.
2 Using a copy of this table, show how a pre-operational child and a concrete operational child (who has the ability to conserve) would differ in their responses to the following tests.

Stage	Test	Pre-operational child's response	Concrete operational child's response
Conservation of volume	Two beakers of equal amounts of liquid are presented to a child (beaker A and B) and the liquid is poured from one beaker (beaker B) into a different-shaped beaker (beaker C). Ask the child, 'Which one has more liquid, or are they both the same?' 		
Conservation of mass	Present a child with two identically sized and weighted balls of playdough (A and B) and then change the shape of one (B) by flattening it. Ask the child, 'Which one has more, or are they both the same?' 		
Conservation of number	Present a child with five coins in two equally spaced rows (row A and B), then change row A so that it appears to be more spaced out and longer than row B. Ask the child, 'Which row has more, or are they both the same?' 		
Conservation of length	Present a child with two matchsticks equal in length (A and B), then change the positioning of matchstick A. Ask the child, 'Which one is longer, or are they equal in length?' 		

3 Using your own examples, distinguish between abstract thinking and hypothetical-deductive reasoning in the formal operational stage.
4 Outline two strengths and two limitations of Piaget's theory of cognitive development.

ISBN 978-1-009-25401-4 Gallagher et al

Lev Vygotsky's sociocultural theory of cognitive development

Lev Vygotsky presented his own theory of cognitive development at about the same time that Jean Piaget was formulating his. Both men presented independent theories that have much in common, although there are some important differences between them. Vygotsky's sociocultural theory proposes that cognitive development in early childhood is advanced through social interaction with other people, such as parents, caregivers and peers, particularly those who are more skilled than the child.

Figure 3C–36 Vygotsky was interested in the potential for intellectual growth through social experience.

Unlike Piaget's notion that a child's development must occur first for learning to take place, Vygotsky argued that learning is an essential part of the process of developing and that cognitive development is social in nature. He proposed that to begin with, a child responds to the world only via actions, and then later, society provides meaning for those actions through social interaction. For example, a child may reach for an object and fail to grasp it. His parents may interpret this as a pointing gesture. Their interpretation provides the meaning of the movement to the child (even if this wasn't the reason that he initially made the gesture). According to Vygotsky, learning has its basis in interacting with other people. Once this has occurred, the information is then integrated at the individual level.

One of the most recognised aspects of Lev Vygotsky's sociocultural theory of cognitive development is his concept of the **zone of proximal development (ZPD)**. This is the distance between the child's actual developmental level as determined by independent problem-solving and their level of potential development as determined by problem-solving under adult guidance or in collaboration with more capable peers. The ZPD therefore includes all the knowledge and skills that a child cannot yet understand or perform on their own but is capable of learning with guidance (Figure 3C–37). Often, children can stretch their skills and knowledge simply by observing someone who is slightly more advanced than they are. As they master new skills, children progressively extend their ZPD.

Zone of proximal development (ZPD) the distance between one's actual developmental level as determined by independent problem-solving and one's level of potential development as determined through problem-solving under adult guidance or in collaboration with more capable peers

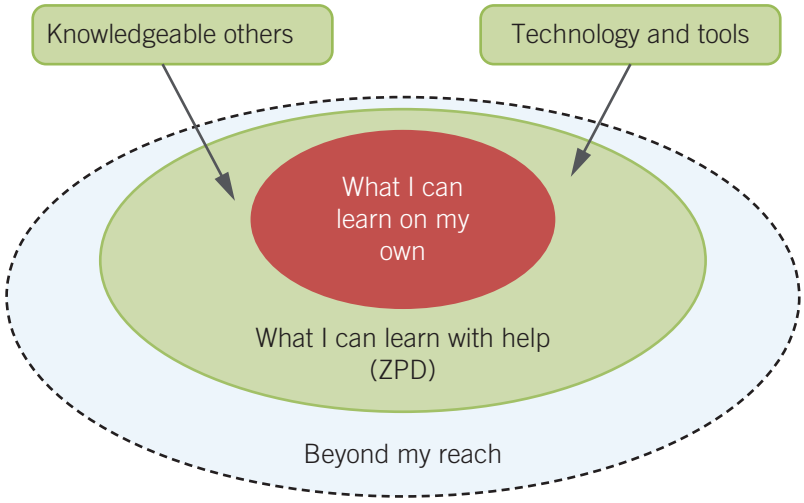


Figure 3C–37 A visual representation of Vygotsky's concept of the zone of proximal development, shown in green

ISBN 978-1-009-25401-4 Gallagher et al

More knowledgeable other a caregiver, teacher or more experienced peer

Scaffolding supports of various kinds that help a child to operate within their ZPD

The concept of the ZPD means that a caregiver, teacher or more experienced peer, referred to by Vygotsky as a **more knowledgeable other**, can explore with the child areas for which the child is cognitively prepared but in which they require support and social interaction to fully develop. This is done by providing the learner with **scaffolding**, or supports of various kinds, to assist in developing their understanding or skills by allowing the child to participate in more complex and competent ways. Indeed, when social interaction is targeted towards the child's ZPD, the child can engage in more advanced cognitive activities than would otherwise be the case. Further, a child's ZPD is constantly changing with the child's increasing level of competence.

Figure 3C–38 Roman's grandfather is helping him work within his ZPD by stabilising Roman's bike as he rides without training wheels.

Let's take the example of five-year-old Roman, who is learning how to ride a bike. His current bike has training wheels, and he can't ride a bicycle without them unless his grandfather holds onto the back of his bike for him. Roman's ZPD is riding the bike without training wheels with his grandfather helping him to stabilise the bike. After some practice, he can ride the bike on his own. Vygotsky's idea of the ZPD highlights the power of social influence in cognitive development, particularly in early childhood.

Figure 3C–39 Vygotsky placed importance on the role of language in cognitive development as children start to understand the meanings associated with social interactions.

Vygotsky also emphasised that language is integral to cognitive development as children start to understand the meanings associated with social interactions. To begin with, preschool children use speech as communication to produce change in others. Later, we see the beginnings of 'private speech', where children talk aloud to themselves to plan and regulate their actions and achieve personal goals. This private speech then becomes more 'internalised' within our own minds rather than aloud, converging with our thoughts and allowing us to direct, control and reflect on our thinking. Eventually, language itself splits into an inner voice for thinking and problem-solving and an outer voice for communicating with others. From this, it is easy to see how language and social interaction play such a prominent role in cognitive development.

Evaluation of Vygotsky's theory

The strengths of Vygotsky's theory include:

- It acknowledges that humans are social beings and that society and the social interactions we have with each other have an enormous impact on a child's cognitive development. It therefore also acknowledges that cultural differences exist in cognitive development.

ISBN 978-1-009-25401-4 Gallagher et al

- It allows for the personalisation of instruction and activities at school so that students' learning needs are addressed in terms of what and how they learn. This has promoted greater flexibility in educational methods.
- It allows learners to monitor and manage their own progress and encourages them to keep striving to do better and improve their learning outcomes.

The weaknesses of Vygotsky's theory include:

- It focuses more on the processes through which children develop rather than the characteristics that children of certain ages are likely to demonstrate.
- It does not give a precise picture of a child's learning needs, present capability level or motivational influences. This is because the role of the individual is given less importance than the role of community and social learning.
- It does not recognise that some individuals (e.g. gifted students or child prodigies) can develop their own personal understandings that allow them to progress beyond what they might be able to learn through social interaction.

Table 3C–6 Comparison of Piaget's and Vygotsky's cognitive development theories

Element	Piaget	Vygotsky
Acknowledgement of social and cultural factors	No, states that cognitive development is mostly universal across cultures. Maintains that cognitive development stems largely from independent explorations in which children construct knowledge on their own.	Yes, assumes cognitive development varies across cultures. Proposes that cognitive development stems from social interactions as children and others co-construct knowledge.
Emphasis on 'stages' of development	States that there are four age-related stages of cognitive development.	Does not state any general stages of cognitive development.
Role of language	The role of language is not emphasised, but it is suggested that it allows children to label things.	Suggests that language plays a powerful role in shaping children's thoughts.
Key processes	Accommodation and assimilation	Zone of proximal development (ZPD) and scaffolding

Check-in questions – Set 9

1 What does Vygotsky's sociocultural theory of cognitive development propose?
2 How does Vygotsky's sociocultural theory differ to what Piaget's theory proposes?
3 Using your own example, explain how Vygotsky's ZPD works.
4 According to Vygotsky, what is the importance of the role of a 'more knowledgeable other'?
5 Explain why Vygotsky believed language is integral to cognitive development.

Lawrence Kohlberg's stages of moral development

Moral development is thought to involve changes in moral behaviour over time, including the values, attitudes and behaviours we adopt towards people in society, based on social and cultural norms, rules and laws. A key component of moral development is the growth of one's sense of **morality**, which is the ability to distinguish right from wrong and behave accordingly. Kohlberg developed a model of moral development to explain how people acquire this sense of right and wrong. He proposed that moral development is directly affected by cognitive development. This is because how we deal with moral issues relies on our ability to think and process information.

Moral development changes in moral behaviour over time, including in the values, attitudes and behaviours we adopt towards people in society, based on social and cultural norms, rules and laws

Morality the ability to distinguish right from wrong and to behave accordingly

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 3C–7 THE HEINZ DILEMMA

Read this scenario and discuss the questions raised with a partner or small group.

Sonya is near death from cancer. One medicine might save her – a form of radium that a pharmacist in her town has recently discovered. The pharmacist is charging $2000 for the medicine, which is 10 times what it costs him to make. Sonya's husband, Heinz, went to everyone he knew to borrow the money for the medicine, but he could only raise about half of what it cost. He told the pharmacist that Sonya was dying and asked him to sell it more cheaply or let him pay later. But the pharmacist refused. Heinz has started to think about breaking into the pharmacy to steal the medicine for his wife.

1 What do you think Heinz should do? Why?
2 Would you have answered the same way four years ago, or when you were six or seven? How might your answer have been different or similar?

Much of Kohlberg's research involved presenting people with a range of different short stories or scenarios, such as the Heinz dilemma, and recording what they thought should be done and why. This allowed Kohlberg to investigate changes in moral development and reasoning over the life span and led to the creation of his stage theory of moral reasoning. This theory is based on the idea that people progress through three levels of moral development, each of which is divided into two stages (or sub-levels) (Figure 3C–40). Each of the six stages represents a different approach to moral thinking, where the individual determines what is 'right' and 'wrong'. Kohlberg believed that everybody went through each of the six stages in order and that no stage could be skipped.

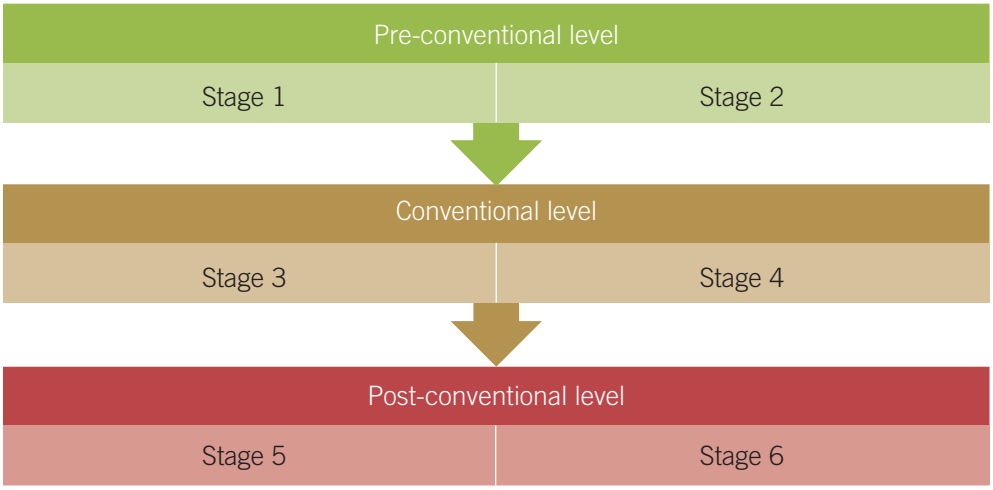


Figure 3C–40 A flow chart showing the three levels and six stages of Kohlberg's theory of moral development

Let's take a closer look at these levels and stages.

Kohlberg's pre-conventional level (childhood)

At this level, children think in terms of an external authority, where behaviours are described as wrong if they are punished and right if they lead to some sort of positive consequence. In *stage 1*, moral decisions are based primarily on fear of punishment or the need to be obedient, whereas in *stage 2*, moral reasoning is guided by satisfying one's own self-interest, which could involve making some sort of bargain. This is demonstrated by younger children, who tend to think in terms of the power exerted by external authorities. There is a clear focus on punishment as an overriding factor influencing behaviour.

ISBN 978-1-009-25401-4 Gallagher et al

Kohlberg's conventional level (many adolescents and adults)

Older children view rules as necessary for maintaining social order. Rules are followed not so much to avoid punishment but to show how virtuous they are and to win approval from others. At this level, moral thinking is somewhat inflexible, as rules are seen as absolute guides that should be enforced rigidly. In *stage 3*, reasoning is guided by conforming to what other important people believe is of value, whereas in *stage 4* moral reasoning is determined by conforming to society's rules and laws.

Kohlberg's post-conventional level (some or few adults)

At this level, adolescents and adults decide on a personal set of ethics. Here, acceptance of rules is less rigid and one's moral thinking tends to be more flexible. At this level, it is accepted that if one's personal ethics and society's rules conflict, then they may choose their own personal beliefs or ethics to guide their behaviour. For example, at the post-conventional level, one might support a news reporter who chooses to go to jail rather than reveal an information source who was promised confidentiality. In *stage 5*, reasoning is determined by careful consideration of all alternatives and then trying to balance one's human rights with the laws of society. In *stage 6*, reasoning is determined by abstract principles while simultaneously emphasising equity and justice.

Table 3C–7 Summary of the stages of moral development according to Kohlberg

Level	Stage	Life span stage	Focus or orientation of thinking	What determines right and wrong?
Pre-conventional level	Stage 1	Childhood	Punishment and obedience	Determined by what is punished, as punishment provides information about what is wrong
	Stage 2	Childhood	Naive; rewards related to themselves	Determined by what is rewarded, as the child follows rules if it is in their interest
Conventional level	Stage 3	Many adolescents and adults	Mutual interpersonal expectations, relationships and conformity	Determined by approval or disapproval from close family and friends
	Stage 4	Many adolescents and adults	Authority; law and order	Determined by society's rules and laws, which are to be obeyed rigidly
Post-conventional level	Stage 5	Some adults reach this level	Social contract and individual rights	Determined by society's rules and laws, which are viewed as fallible rather than absolute
	Stage 6	Very few adults reach this stage	Individual principles and conscience	Determined by abstract ethical principles that emphasise equity and justice

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 3C–8 APPLYING THE LEVELS AND STAGES OF KOHLBERG'S THEORY TO THE HEINZ DILEMMA

Using the scenario from Activity 3C–7, in which Heinz considers stealing a medicine to save his dying wife, outline the response that a person in each stage of Kohlberg's moral development theory would give to the question, 'What do you think Heinz should do?' Be sure to also provide the reasons they may give at each stage.

Evaluation of Kohlberg's theory

The strengths of Kohlberg's theory include:

- A review of over 45 studies demonstrated that people do progress through the stages of moral development in the proposed order. Likewise, as children get older, moral reasoning does change in the predicted directions.
- Cross-cultural studies have found evidence of Kohlberg's first four stages in many cultures.
- It has been found that delinquents operate at lower levels of moral development than non-delinquents, supporting Kohlberg's theory.

Figure 3C–41 Lawrence Kohlberg was an American psychologist best known for his theory of stages of moral development.

The weaknesses of Kohlberg's theory include:

- It has been suggested that most people never reach stage 6, and that some people may actually skip stages or move in reverse order, which contradicts Kohlberg's proposals.
- There has also been some criticism of the dilemmas used by Kohlberg. Specifically, they are difficult for children to relate to, too hypothetical, too culturally biased (or linked) and too biased towards 'male' ideas of morality. Regarding this last concern, Kohlberg's dilemmas focus on what is termed a 'justice orientation' (based on the law, equality and individual rights) at the expense of a 'care orientation' (based on caring, having concern for others and avoiding pain). Although people tend to exhibit a mixture of justice and care orientations depending on the situation regardless of their gender, Kohlberg's focus on justice in his original stages is biased towards what are traditionally considered 'male' ideas of morality. This can be explained by the fact that Kohlberg's theory was based on interviews with men only.
- It also seems that Kohlberg's dilemmas may not actually be valid predictors of moral reasoning in certain cultures. The dilemmas have inbuilt values that are characteristic of Western society to a much deeper level than Kohlberg appreciated.
- The dilemmas he used focused on moral thinking as distinct from actual moral behaviour in real-life situations. Some evidence, however, does suggest that moral reasoning is somewhat predictive of moral behaviour.
- It is possible for people to show signs of several adjacent levels of moral reasoning at the same time.

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 10

1 According to Kohlberg, what is moral development?
2 What did Kohlberg propose about the relationship between cognitive development and moral development?
3 Explain how Kohlberg developed his theory.
4 Read the moral dilemma below and copy and complete the following table with suggested responses for the conventional and post-conventional stages of moral reasoning.

Moral Dilemma: Lifeboat

You are on a cruise and the ship encounters an unexpected storm. The storm continues to rage and eventually you and the other passengers are told you must head to the lifeboats and abandon ship. As people begin to line up, you realise some lines have fewer people, some have families and some seem to have younger adults without children. You know that you are strong and capable. Do you choose to help a group composed of three families with a few young children, a group of seniors who obviously could use your help, or go with the strong-looking young people, with whom you might have a better chance of survival?

Level	Stage	Suggested responses
Conventional	3	
	4	
Post-conventional	5	
	6	

Section 3C questions

1 True or False?
- a Emotional development involves changes in how a person experiences, the full range of emotions and their ability to cope with them appropriately.
- b Social development is a close, social and emotional bond between the infant and their caregivers or parents.
- c Harlow conducted several experiments to investigate the factors influencing the development of attachment between human infants and their caregivers.
- d Harlow discovered that contact comfort was more important than the provision of food in the formation of infant–mother attachment.
- e Mary Ainsworth established four attachment styles in her original study: secure, insecure-avoidant, insecure-resistant and insecure-disorganised.
- f In Mary Ainsworth's original study, 85% of infants demonstrated a secure attachment.
- g The fourth stage of Erikson's psychosocial theory of development is 'industry vs inferiority', which occurs from around six years of age until puberty.

2 According to Bandura, how does social learning occur?
3 What is cognitive development? Provide an example.
4 Describe the findings of Gibson and Walk's experiment in relation to infant depth perception.

ISBN 978-1-009-25401-4 Gallagher et al

5 For each of the descriptions below, identify the characteristic or key accomplishment and corresponding stage from Piaget's theory of cognitive development.

Description	Key accomplishment or characteristic	Stage
a A type of thinking that uses symbols, such as words or images, to solve simple problems and to talk about things that are not physically present		
b The understanding that certain qualities of an object remain the same even when its appearance changes		
c An understanding that objects continue to exist even if they can't be touched, seen or heard		
d The understanding that something can change from one state, form or structure to another		
e A way of thinking that is not reliant on directly observing, visualising, experiencing or manipulating something		
f A limited ability to share or appreciate someone else's point of view		

6 Amy is learning how to write an essay in English for the first time. Her teacher uses Vygotsky's idea of the zone of proximal development (ZPD) to support the students in the class. Use your understanding of the ZPD to explain how the teacher might scaffold Amy's skills to help her write her first essay.

7 Identify the levels and stages of Kohlberg's theory of moral development described in the table below.

What determines right and wrong?	Level	Stage
What is equal and just for all is considered right.		
Punishment tells us what is wrong.		
What is right and wrong is set by society's rules and laws, which must be obeyed.		
What is right is determined by the approval or disapproval of close family and friends.		

ISBN 978-1-009-25401-4 Gallagher et al

Sensitive and critical periods in psychological development

Study Design:
The role of sensitive and critical periods in a person's psychological development

Glossary:
Critical period
Imprinting
Neuroplasticity
Sensitive period

ENGAGE

Genie the abused 'Feral Child'

In 1974, when Genie Wiley was found at the age of 13 and taken into police custody, she was painfully thin, malnourished, unsocialised, emotionally disturbed, illiterate and unable to speak. Genie was unable to stand up straight, could not chew solid foods, had great difficulty swallowing, and was incontinent and mute. This is because, from around 20 months of age, Genie suffered severe physical and social restriction, nutritional neglect and extreme deprivation as a result of being isolated in a small room and tied to a potty chair for most of the day. She was hurriedly fed (only cereal and baby food) and physically punished if she made any sounds.

Once taken into care, Genie began to progress rapidly in specific areas, gaining independence by learning how to use the toilet and dress herself. Given her unique circumstances, Genie was studied closely by a team of researchers at the University of California, Los Angeles. They were particularly interested in her potential for learning language, as it was hypothesised that she may have missed an important window for this, which occurs in the first few years of life. Initial assessments saw Genie quickly adding new words to her vocabulary, first learning single words and eventually putting two words together in the same way that young children do. However, after a year of treatment, she was only just starting to occasionally put three words together. This was the time that most children would have a language explosion, rapidly acquiring new words and putting them together in novel ways. Unfortunately, this never happened for Genie and her language abilities remained stuck at this stage. In addition, she appeared unable to apply grammatical rules and use language in a meaningful way. This is because language development has a sensitive period between birth and six years of age. Therefore, when Genie's brain was expecting to be exposed to language, speech, reading and writing, it was instead deprived of these experiences, which had detrimental effects on her development.

EXPLAIN

The role of sensitive and critical periods in development

So far in this chapter, we have looked at the process of psychological development and the variety of influences affecting it, including heredity, the environment and other biological, social and psychological factors. In this section, we will look at the commonly held belief by developmental psychologists that there are certain times during development when external or environmental factors are more likely to have an impact, positively or negatively, on psychological development. When considering these important periods in development, psychologists usually distinguish between sensitive and critical periods.

ISBN 978-1-009-25401-4 Gallagher et al

6A NEUROPLASTICITY LINK

Sensitive periods

Sensitive periods are generally referred to as periods during development in which the effects of experience on development are particularly strong and sensory experiences have a greater influence on behaviour and brain development. They are sometimes referred to as 'windows of opportunity' because, at these times, the brain and body are both 'primed' and ready to learn. Learning is therefore optimised during a sensitive period; however, it is not necessarily exclusive to that time. This means that if certain skills or knowledge are not attained during a sensitive period, when they are expected, they can still be learned later – it may just take longer and be more difficult.

Sensitive period a period during development in which the effects of experience on development are particularly strong

Neuroplasticity the ability of neural networks in the brain to change as a result of experience

The reason learning is easiest and most efficient during a sensitive period is that these periods are associated with heightened **neuroplasticity** in the brain. This means that the brain's ability to change as a result of experience is particularly strong and rapid at these times. For example, if a child suffers a brain injury or requires brain surgery, they will recover from this more easily and more quickly than someone older, as the child's brain is able to change and adapt its neural pathways in response. In addition, sensitive periods involve the brain being particularly sensitive to specific types of environmental stimuli. If the brain is exposed to these later, it is less responsive and requires longer exposure, slowing down the learning process. For example, it might be more difficult and time-consuming to learn how to read music and play a musical instrument as an adult if you were never exposed to music or taught these skills as a child, when your brain would have been more responsive.

WORKSHEET 3D–1 APPLYING MY UNDERSTANDING OF SENSITIVE PERIODS

Figure 3D–1 The sensitive period for learning to write is around 3.5 to 4.5 years of age.

In humans, the sensitive period for language occurs between birth and around six years of age, with three key phases for spoken language, written language and reading. The sensitive period for spoken language is from around 7 months to 3 years of age and begins when the child first creates sounds by mirroring mouth movements, progressing to form words and then constructing simple sentences. For learning to write, the sensitive period is quite a bit later, from around 3.5 to 4.5 years of age, beginning with learning the alphabet and its associated sounds. The sensitive period for reading comes next, at 4.5 to 5.5 years of age, as reading skills are often developed after a child learns to write, as they must be able to use visual tracking skills. If a child is not exposed to language through social interactions and educational opportunities to learn reading and writing during these sensitive periods, it is likely they will find it more difficult and will be slower to learn these skills later. Sensitive periods also exist for other types of knowledge and skills, such as music, sport, numeracy, art and even social skills.

Check-in questions – Set 1

1 What are sensitive periods in development?
2 Why are sensitive periods referred to as 'windows of opportunity'?
3 What happens if a skill or knowledge that is expected to be learned during a sensitive period does not occur at that time?
4 Why is learning easiest and most efficient during a sensitive period?

ISBN 978-1-009-25401-4 Gallagher et al

Critical periods

In his classic studies on newly hatched goslings, Konrad Lorenz (1935) analysed the development of social bonding and attachments. In one study, he incubated goose eggs and when they were almost ready to hatch, he placed half the eggs under a goose mother, keeping the other half in the incubator. When this second group hatched in the incubator, he made sure he was the only moving thing they saw. Consequently, they followed him like they would their mother, just as the first group followed the goose mother that they saw after hatching. Lorenz used the term **imprinting** to refer to when a newborn animal forms an attachment to a moving object that it sees shortly after hatching or being born.

Imprinting when a newly born animal forms an attachment to the first thing it sees

Critical period a specific period in development during which the individual is most vulnerable to the absence of certain environmental stimuli or experiences

Lorenz investigated how strong imprinting was by putting both groups of imprinted goslings together under a box. When released, those imprinted on the mother goose went with her, while those imprinted on Lorenz followed him. He claimed this showed that imprinting can't be reversed or changed.

Lorenz identified that this important period during which imprinting can occur is limited and severely restricted to an animal's early life. In other words, imprinting has a **critical period**. This was supported by Hess (1958), who showed that imprinting was not necessarily on the first moving thing the newly-hatched sees. The strongest imprinting happened between 12 and 17 hours after hatching, and the earliest was about an hour after hatching. Imprinting was unlikely to happen any later than 32 hours after hatching. This means that if certain environmental stimuli or experiences (e.g. seeing a mother figure) do not occur during this window of time, the opportunity for learning a behaviour or skill (e.g. imprinting) is lost and does not come again.

As Lorenz and Hess showed, critical periods are specific periods in development during which the individual is most vulnerable to the absence of certain environmental stimuli or experiences. When compared to sensitive periods, critical periods have a well-defined beginning and end time. They also tend to be more limited than sensitive periods, which are more gradual and longer. In addition, it is thought that critical periods require specific stimulation to occur during this time; otherwise, the child will never gain the abilities they should have gained in that period. This is different from a sensitive period, in that the learning that is expected during this time can occur later, although it will be less efficient. Deprivation of sensory stimulation during critical periods in development, as compared to sensitive periods, can therefore have more detrimental effects on development.

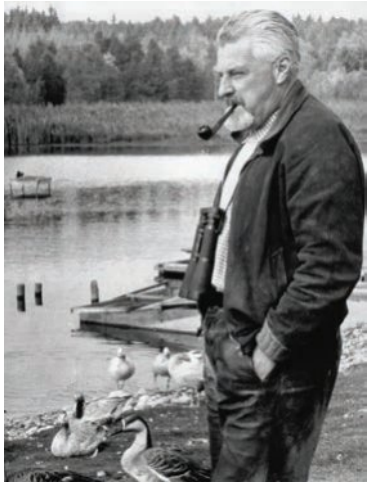


Figure 3D–2 Konrad Lorenz explored animal behaviour, sharing a Nobel Prize in 1973 for his work.

A classic study on the effect of deprivation of sensory stimulation on the development of the visual system in mammals was conducted by Wiesel and Hubel in 1964. Specifically, they deprived newborn kittens of vision in one eye by sewing the eyelid shut for about six months, until they were adult. Then their shut eyelid was opened again, and electrical activity in the nerves of the visual system were recorded. This showed that neurons connected to the eye that had been shut had abnormally low activity, while neurons connected to the open eye had abnormally high activity. Neurons that process visual information had redistributed their connections and activity to the open eye.

However, the researchers also found that if one eyelid of an adult cat was sewn shut, this did not have a similar affect — even after a year, neuron activity was the same for connections to both eyes. The research eventually showed that deprivation of sensory stimuli had to happen in the first three months after birth to have an affect on the neurons of the visual system.

ISBN 978-1-009-25401-4 Gallagher et al

Hubel and Wiesel concluded that there is a critical period during for development of the visual system in mammals. Further, during the critical period any loss of sensory stimuli has a lifelong effect.

In 1981, after working together for more than 20 years, Hubel and Wiesel received the Nobel Prize for Physiology or Medicine for discovering the critical period in the development of the mammalian visual system

ACTIVITY 3D–1 WERE THESE CLASSIC STUDIES OF CRITICAL PERIODS ETHICAL?

1C SAFETY AND ETHICAL UNDERSTANDING LINK

Using the ethical concepts of integrity, justice, beneficence, non-maleficence and respect discuss with your class mates whether you believe the work of Lorenz and Hubel and Wiesel was ethically justified. A class debate could be organised, with the affirmative team arguing that it was ethically justified and the negative team arguing that it was not.

Check-in questions – Set 2

1 What is imprinting?
2 Why is imprinting considered to have a critical period?
3 What are critical periods in development?
4 List two differences between sensitive and critical periods in development.
5 What was the aim of Wiesel and Hubel's 1964 experiment using kittens?
6 What did the results of Wiesel and Hubel's experiments demonstrate about critical periods and vision in mammals?
7 Using the ethical concepts of beneficence and non-maleficence, justify whether you believe the work of Hubel and Wiesel was morally sound.

VIDEO 3D–1 SKILLS: CREATING FLASHCARDS WITH REAL-WORLD EXAMPLES

3D SKILLS

Creating flashcards with real-world examples

You will have noticed that there are a number of key terms and definitions across the area of development that you need to be able to confidently use when responding to questions. One strategy to help you remember these key terms and appropriate definitions is to create flashcards that have the term on the front and definition on the back. It is also recommended that you provide at least one real-world example for each term. This could be made up, be from your own life, or come from an experiment, a model or this textbook. Given that many questions in this topic and throughout the VCE Psychology course require you to apply your understanding to real-world scenarios, this will give you some 'go to' examples to use in your application-based responses. These cards can be used for study, by testing yourself using the look-cover-check technique.

Section 3D questions

1 Use an example to explain how sensitive periods in development work.
2 Explain how Konrad Lorenz demonstrated imprinting.
3 Use an example to explain how critical periods in development work.
4 Provide a similarity and a difference between sensitive and critical periods in development.
5 Explain the procedure involved in Wiesel and Hubel's 1964 experiment using kittens.
6 What were the results of Wiesel and Hubel's experiment?

ISBN 978-1-009-25401-4 Gallagher et al

Chapter 3 review

Summary

Create your own set of summary notes for this chapter on paper or in a digital document. A model summary is provided in the Teacher Resources, which can be used to compare with yours.

Checklist

In the Interactive Textbook, the success criteria are linked from the review questions and will be automatically ticked when answers are correct. Alternatively, print or photocopy this page and tick the boxes when you have answered the corresponding questions correctly.

Success criteria – I am now able to:		Linked questions
3A.1	Understand that a person's psychological development can be influenced by both hereditary and environmental factors, which interact	15☐
3A.2	Explain what is meant by psychological development	16a☐
3A.3	Describe and provide examples of hereditary and environmental factors	1☐
3A.4	Distinguish between hereditary and environmental factors	15☐
3A.5	Discuss the interactive nature of hereditary and environmental factors	15☐
3A.6	Apply my understanding of the interactive nature of hereditary and environmental factors to a person's psychological development	15☐
3B.1	Understand that there are a range of biological, psychological and social factors that influence a person's psychological development and mental wellbeing and that they interrelate	17a☐
3B.2	Explain the characteristics of mental wellbeing and how it differs from mental health problems and mental disorders	17b☐
3B.3	Explain how the biopsychosocial approach can be used to consider psychological development and mental wellbeing	4☐
3B.4	Identify and describe different biological, psychological and social factors that influence psychological development and mental wellbeing	2☐
3B.5	Explain how different biological, psychological and social factors can influence psychological development and mental wellbeing	17a☐
3B.6	Use the biopsychosocial approach to consider a person's psychological development and/or mental wellbeing	17a☐
3C.1	Understand that development is a psychological process that occurs over the course of the life span and involves three areas: emotional, cognitive and social development	16b☐
3C.2	Describe emotional development over the course of the life span and provide examples	3☐, 5☐
3C.3	Describe cognitive development over the course of the life span and provide examples	6☐, 9☐
3C.4	Describe social development over the course of the life span and provide examples	7☐

ISBN 978-1-009-25401-4 Gallagher et al

Success criteria – I am now able to:		Linked questions
3C.5	Understand at least two models or theories from the three areas of development: emotional, cognitive and social	8☐, 9☐, 11☐, 18a☐
3C.6	Evaluate at least two models or theories from the three areas of development: emotional, cognitive and social	18b☐, 20☐
3D.1	Understand the role that sensitive and critical periods play in a person's psychological development	19a☐, b☐
3D.2	Explain sensitive periods and provide examples relevant to psychological development	19a☐
3D.3	Explain critical periods and provide examples relevant to psychological development	19b☐
3D.4	Compare and contrast the role of sensitive and critical periods in a person's psychological development	10☐
3D.5	Apply my understanding of sensitive and critical periods to a person's psychological development	19a☐

Key Science Skills

Skills	Questions and Skills boxes
Identify, research and construct aims and questions for investigation	Chapter review – 11
Identify independent, dependent and controlled variables in controlled experiments	Chapter review – 12
Formulate hypotheses to focus investigations	Chapter review – 14
Predict possible outcomes of investigations	3C Key Science Skills
Design and conduct investigations; select and use methods appropriate to the investigation, including consideration of sampling technique (random and stratified) and size to achieve representativeness, and consideration of equipment and procedures, taking into account potential sources of error and uncertainty; determine the type and amount of qualitative and/or quantitative data to be generated or collated	Chapter review – 13
Analyse and evaluate psychological issues using relevant ethical concepts and guidelines, including the influence of social, economic, legal and political factors relevant to the selected issue	Chapter review – 21

Multiple-choice questions

1 Which of the following is an example of a hereditary factor?

A number of siblings
B socioeconomic status
C hormones
D genes

ISBN 978-1-009-25401-4

2 Which of the following correctly identifies a biological, psychological and social factor that influences development?

	Biological	Psychological	Social
A	hormones	personality	thinking patterns
B	personality	hormones	education
C	resilience	education	genetics
D	genetics	thinking patterns	family

3 Attachment is
- **A** the emotional bond between an infant and their caregiver.
- **B** not related to mental wellbeing later in life.
- **C** the social bond between two infants.
- **D** directly related to intelligence and cognitive ability.

4 Which of the following statements about the biopsychosocial approach is not correct?
- **A** It can be used to consider both development and mental wellbeing.
- **B** It considers all the biological, psychological and social factors in a person's life separately.
- **C** It considers that all the biological, psychological and social factors in a person's life interact.
- **D** It is a holistic approach that can be used for both diagnosis and management of mental disorders.

5 Emotional development involves changes in
- **A** how a person experiences, expresses and interprets a range of feelings.
- **B** how a person interacts with others in different social situations.
- **C** an individual's mental abilities.
- **D** an individual's bodily systems.

6 Cognitive development involves changes in
- **A** how a person experiences, expresses and interprets a range of feelings.
- **B** how a person interacts with others in different social situations.
- **C** an individual's mental abilities.
- **D** an individual's bodily systems.

7 Which of the following is an example of social development?
- **A** learning how to ride a bike
- **B** learning how to read and write
- **C** learning how to share toys and take turns when playing games with others
- **D** learning how to label and describe the different feelings that are experienced.

8 If an individual believes that what is right or wrong is determined by punishment, they are in which stage of Kohlberg's theory of moral development?
- **A** stage 4
- **B** stage 1
- **C** stage 6
- **D** stage 2.

9 The correct order of the stages of Piaget's theory of cognitive development is
- **A** concrete operational, pre-operational, sensorimotor, formal operational.
- **B** formal operational, sensorimotor, pre-operational, concrete operational.
- **C** sensorimotor, pre-operational, concrete operational, formal operational.
- **D** sensorimotor, pre-operational, formal operational, concrete operational.

ISBN 978-1-009-25401-4 Gallagher et al

10 One difference between the critical and sensitive periods in development is that
- **A** sensitive periods have a well-defined beginning and end time, and they tend to be more limited than critical periods, which are more gradual and longer.
- **B** sensitive periods require specific stimulation to occur during this time, otherwise the child will never gain the abilities they should have gained in that period. In contrast, learning that is expected during a critical period can occur later; it will just be less efficient.
- **C** deprivation of sensory stimulation during sensitive periods in development, as compared to critical periods, can have more detrimental effects on development.
- **D** critical periods have a well-defined beginning and end time, and they tend to be more limited than sensitive periods, which are more gradual and longer.

11 The aim of Mary Ainsworth's study using the 'strange situation' was to determine whether
- **A** contact comfort was more important in the formation of infant–mother attachment than the provision of food.
- **B** separation anxiety was a clear sign that the infant had become attached to either or both of their parents.
- **C** children who are deprived of a stable caregiver during the first few years of life would have a greater likelihood of developing mental disorders, such as depression.
- **D** children who are deprived of a stable caregiver during the first few years of life would have higher rates of delinquency.

12 The independent variable in Harlow's experiment with rhesus monkeys was
- **A** whether the infant spent more time clinging to the wire or cloth surrogate.
- **B** which attachment style the infant demonstrated: secure, insecure-avoidant or insecure-resistant.
- **C** whether the monkey was reared by a wire or cloth surrogate.
- **D** whether the food was provided by the wire or cloth surrogate.

13 One result of Gibson and Walk's experiment using the visual cliff apparatus was that each of the 36 human infants, aged 6–14 months, crawled to the shallow end of the apparatus at least once. This data is an example of
- **A** secondary, qualitative data.
- **B** primary, qualitative data.
- **C** secondary, quantitative data.
- **D** primary, quantitative data.

14 If a replication of Bandura's (1965) Bobo doll experiment was conducted with children aged 6–10 years, which of the following would be an appropriate hypothesis?
- **A** Children aged 6–10 will be more likely to replicate the aggressive acts demonstrated by a model even if the model was punished, if they themselves are rewarded with candy for exhibiting this aggressive behaviour.
- **B** Rewarding children aged 6–10 with candy for their behaviour will have no effect on the likelihood of them imitating the model's behaviour.
- **C** Children aged 6–10 will be less likely to replicate the aggressive acts demonstrated by the model even if the model was punished, if they themselves are rewarded with candy for exhibiting this aggressive behaviour.
- **D** Children aged 6–10 will be less likely to replicate the aggressive acts demonstrated by the model if they see the model's behaviour being reinforced.

ISBN 978-1-009-25401-4 Gallagher et al

Short-answer questions

15 Hanh is a talented volleyball player who has just been selected to represent Victoria in the Under 18 state team.
Explain how one hereditary and one environmental factor may have interacted to influence the development of Hanh's talent for volleyball. (5 marks)

16 **a** Explain what is meant by psychological development. (1 mark)
b Identify the three areas of psychological development and provide an example of each from infancy. (6 marks)

17 Corey is 12 years old and in Year 6 at primary school. He has been feeling a bit down recently because his parents told him that they are getting a divorce and that his dad is going to be moving out. Corey has found it stressful and has had difficulty concentrating at school. He has also lacked motivation to play with his friends at lunchtime and has been sitting by himself, doing little but stare into space. Corey's mum is particularly worried about his mental health, as Corey's older brother Heath was recently diagnosed with depression.
a Use the biopsychosocial approach to consider the factors contributing to Corey's mental wellbeing. (3 marks)
b Is Corey's mental wellbeing at its optimum level? Use your understanding of the characteristics of mental wellbeing to justify your response. (3 marks)

18 Amal and Ben are in their 30s and have been dating for a number of months. They both have children from previous marriages. Amal has two and Ben has three. They recently took all their children away for the weekend and Amal noticed that her son Taj, who is 7, struggled to cooperate and take turns when playing with the rest of the children. He also behaved selfishly, not sharing with the others. Amal is worried that any conflict between the children may ruin her and Ben's chances for a successful intimate relationship.
a Using your understanding of Erikson's psychosocial theory of development, identify the stages that Amal and her son Taj are in. Justify your response. (4 marks)
b Evaluate Erikson's theory by providing one strength and one limitation. (2 marks)

19 It is thought that there is a sensitive period between 2.5 and 5 years of age for the development of social skills. Children learn that they are a part of a group and develop an intense interest in social relationships. During this time, children learn to direct their actions, attention and behaviour towards a group of people. This is the stage of development in which children learn to develop friendships and participate in cooperative play.
a Use your understanding of sensitive periods to provide advice to first-time parents of a 3-year-old about how to best develop their child's social skills. (2 marks)
b If this was a critical period for social development instead, explain how this would work. (2 marks)

20 Piaget's theory of the four stages of cognitive development remains highly influential. Evaluate this theory by providing one strength and one limitation. (2 marks)

21 Explain how the following ethical concepts can be applied to Hubel and Wiesel's investigation into the effects of deprivation on the visual perception system of kittens.
a Respect (2 marks)
b Beneficence (2 marks)
c Non-maleficence (2 marks)

ISBN 978-1-009-25401-4 Gallagher et al

UNIT 1

HOW ARE BEHAVIOUR AND MENTAL PROCESSES SHAPED?

CHAPTER 4

TYPICAL AND ATYPICAL PSYCHOLOGICAL DEVELOPMENT

Introduction

This chapter will explore the concepts of normality and neurotypicality in the context of psychological development, and look at how typical or atypical psychological development in individuals is culturally defined, classified and categorised. Normal cognitive variations within society are considered, as is how these can be represented by neurodiversity. Selected developmental differences, such as autism and attention deficit hyperactivity disorder, will be investigated, and the role of mental health workers, psychologists, psychiatrists and organisations in supporting psychological development and the diagnosis and management of atypical behaviour will be outlined.

Curriculum

Area of Study 1 Outcome 1
What influences psychological development?

Study Design:	Learning objectives – at the end of this chapter I will be able to:	
• The usefulness, and limitations, of psychological criteria to categorise behaviour as typical or atypical, including cultural perspectives, social norms, statistical rarity, personal distress and maladaptive behaviour	**4A**	**Criteria used to categorise typical and atypical behaviour**
	4A.1	Understand that there are different psychological criteria used to categorise typical and atypical behaviours
	4A.2	Define typical and atypical behaviours and provide examples of each
	4A.3	Describe the different psychological criteria used to categorise typical and atypical behaviours
	4A.4	Use the different psychological criteria to distinguish between typical and atypical behaviours
	4A.5	Evaluate the usefulness of the psychological criteria used to categorise behaviours as typical or atypical

ISBN 978-1-009-25401-4 Gallagher et al

Study Design:	Learning objectives – at the end of this chapter I will be able to:	
• The concepts of normality and neurotypicality, including consideration of emotions, behaviours and cognitions that may be viewed as adaptive or maladaptive for an individual	**4B**	**Normality and neurotypicality**
	4B.1	Understand the concepts of normality and neurotypicality
	4B.2	Understand that behaviours can be viewed as adaptive or maladaptive for a specific individual
	4B.3	Explain the concept of normality
	4B.4	Explain the concept of neurotypicality
	4B.5	Describe what is meant by adaptive emotions, behaviours and cognitions, and provide examples of each
	4B.6	Describe what is meant by maladaptive emotions, behaviours and cognitions and provide examples of each
	4B.7	Apply the concepts of normality and neurotypicality by considering whether certain behaviours are adaptive or maladaptive for a specific individual
• Normal variations of brain development within society, as illustrated by neurodiversity	**4C**	**Normal variations in brain development**
	4C.1	Understand that normal variations of brain development exist within society
	4C.2	Understand that neurodiversity is an example of these normal variations in brain development
	4C.3	Explain what is meant by normal variations of brain development
	4C.4	Explain neurodiversity and provide examples
	4C.5	Apply my understanding of neurodiversity to brain development
• The role of mental health workers, psychologists, psychiatrists and organisations in supporting psychological development and mental wellbeing, as well as the diagnosis and management of atypical behaviour, including culturally responsive practices	**4D**	**Supporting psychological development and mental wellbeing**
	4D.1	Understand the role of organisations, mental health workers, psychologists and psychiatrists in supporting psychological development and the diagnosis of atypical behaviour
	4D.2	Describe the role of organisations, mental health workers, psychologists and psychiatrists
	4D.3	Distinguish between the roles of mental health workers, psychologists and psychiatrists
	4D.4	Apply my understanding of the roles of mental health workers, psychologists and psychiatrists to the support of psychological development and the diagnosis of atypical behaviour

VCE Psychology Study Design extracts © VCAA; reproduced by permission

ISBN 978-1-009-25401-4

Key Science Skills

- Determine appropriate investigation methodology: case study; classification and identification; controlled experiment; correlational study; fieldwork; literature review; modelling; product, process or system development; simulation
- Work independently and collaboratively as appropriate and within identified research constraints, adapting or extending processes as required and recording such modifications

Glossary

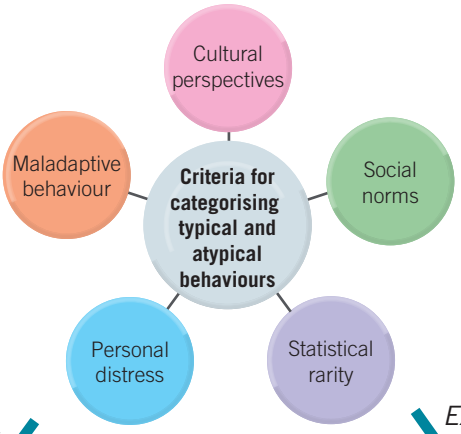
Abnormality
Adaptive
Adaptive cognitions
Alertness
Atypical behaviours
Atypical development
Central coherence
Cognitions
Cognitive behavioural therapy
Cultural perspectives
Cultural responsiveness
Emotions
Executive function
Maladaptive
Maladaptive behaviour
Maladaptive cognitions
Maladaptive emotions
Neurodivergent
Neurodiverse
Neurodiversity
Neurotypical
Neurotypicality
Normality
Personal distress
Social norms
Statistical rarity
Theory of mind
Typical behaviours
Typical development
Working memory

ISBN 978-1-009-25401-4

Concept map

Distinguishing typical and atypical development

4A Criteria used to categorise typical and atypical behaviour

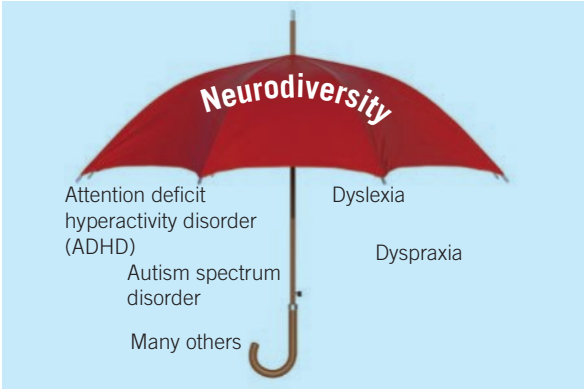


Identification of normal, typical or adaptive behaviours, cognitions and emotions

Explaining differences in behaviours, cognitions and emotions

4B Normality and neurotypicality

4C Normal variations in brain development



Support available for individuals with variations in brain development

4D Supporting psychological development and mental wellbeing

See the Interactive Textbook for an interactive version of this concept map interlinked with all concept maps for the course.

ISBN 978-1-009-25401-4 Gallagher et al

Criteria used to categorise typical and atypical behaviour

Study Design:
The usefulness, and limitations, of psychological criteria to categorise behaviour as typical or atypical, including cultural perspectives, social norms, statistical rarity, personal distress and maladaptive behaviour

Glossary:
Atypical behaviours
Atypical development
Cultural perspectives
Maladaptive behaviour
Personal distress
Social norms
Statistical rarity
Typical behaviours
Typical development

ENGAGE

Can daydreaming be considered atypical or abnormal?

We've all been there, in class when your teacher asks you a question and you realise you have been in another world, daydreaming. In fact, it is estimated that we spend up to half of our waking lives daydreaming. Because daydreaming is a common occurrence, it is considered a standard or typical cognitive process. However, there is a rare mental health problem called 'maladaptive daydreaming', which is a dysfunctional form of imaginative involvement. It can be expressed through excessive book reading, film watching and gaming and is characterised by fanciful, vivid daydreaming for hours on end, often causing the individual to neglect real-life relationships and responsibilities. This results in distress and impairment in social and occupational functioning, which are both criteria used by psychologists to categorise atypical behaviour, as will be discussed in this section.

EXPLAIN

What are typical and atypical behaviours?

Typical development when behaviours, skills or abilities fall within the expected range of development or progress at a similar pace compared to peers of the same age

As you already know from Chapter 3, when considering psychological development, particularly during childhood, it is expected that a child will develop skills and abilities within certain time frames. For example, most babies start to crawl between 6 and 12 months of age, and children usually speak their first word between 10 and 14 months of age. When a child's behaviours, skills or abilities fall within the expected range of development, or progress at a similar pace compared to peers of the same age, this is referred to as **typical development**. This is what we understand as 'normal' when it comes to reaching developmental milestones. The term 'normal' is often used in society, but what does it mean?

ISBN 978-1-009-25401-4 Gallagher et al

This is a difficult question to answer, as definitions of normality vary based on subjective ideas or individual points of view. Also, what we consider normal or **typical behaviours** can be influenced by a variety of factors, including cultural perspectives and social norms. Typical behaviours are broadly referred to as patterns of behaviour that are expected of an individual or that conform to standards of what is acceptable for a given situation. For example, in mainstream Australian culture, it is expected that you would be quiet, sombre or sad at a funeral rather than upbeat and joyous; and in the culture of your school, you would ask your teacher before using the toilet if you needed to go during class time, but not at recess or lunchtime.

Typical behaviours patterns of behaviour that are expected of an individual or that conform to standards of what is acceptable for a given situation

ACTIVITY 4A–1 WHAT IS NORMAL?





Form a pair or small group and discuss the following examples. Determine whether you believe they are normal or not. Compare your decisions with another group or with the rest of the class.

- doing base jumping regularly as a hobby
- having multiple facial tattoos and/or facial piercings
- having a phobia of pickles
- being taller than 6 feet, or 1.82 metres
- preferring to read books and hang out at home, alone
- having an IQ score higher than 130
- having travelled to more than 30 different countries around the world
- laughing hysterically at a funeral
- never stepping on cracks in the footpath because you believe it will break your mother's back.

Was this task difficult? Why/why not?

ISBN 978-1-009-25401-4 Gallagher et al

Atypical behaviours patterns of behaviour that are not expected for an individual or that deviate from the norm and can be harmful or distressing for the individual and those around them

Atypical development when behaviours, skills or abilities fall outside the expected range of development or progress at a different pace compared to similar-aged peers

Atypical behaviours, on the other hand, are patterns of behaviour that are not expected for an individual or that deviate from the norm and can be harmful or distressing for the individual and those around them. These types of behaviours tend to violate what society feels is appropriate. This can obviously include a wide range of behaviours, from excessive violence or aggression to social withdrawal or self-harm. In the context of development, if a child has not spoken their first word by 18 months of age, this could suggest that their language development is atypical and that diagnosis, management and support for the child and their family is needed.

When behaviours, skills or abilities fall outside the expected range of development or progress at a different pace compared to similar-aged peers, this is referred to as **atypical development**. Sometimes, atypical behaviours, such as a delay in speech, are isolated events that have little or no impact on later development. However, at other times, they are an early sign of significant developmental differences, such as those seen with autism. As will be discussed further in the remainder of this section, psychologists use a set of psychological criteria for categorising typical and atypical behaviours.

Figure 4A–1 Generally, young children with an autism spectrum disorder can demonstrate atypical social development, including an aversion to eye contact, delayed language use and muted facial expressions.

Check-in questions – Set 1

1 If a child is experiencing typical development, what does this mean?
2 Distinguish between typical and atypical behaviours.
3 Use an example to explain atypical development.

VIDEO 4A–1 TYPICAL AND ATYPICAL BEHAVIOURS

Psychological criteria used to categorise typical and atypical behaviour

Psychologists use a broad set of criteria to determine whether an individual's behaviour is typical and therefore normal, or atypical and therefore abnormal. These criteria include cultural perspectives, social norms, statistical rarity, personal distress and maladaptive behaviour. These criteria can be used in the context of development to determine whether a child is developing typically and as expected for their age group, as well as in the context of mental wellbeing. For example, if an individual is engaging in a particular

Figure 4A–2 Psychologists use a set of criteria to categorise behaviours as typical or atypical.

ISBN 978-1-009-25401-4 Gallagher et al

behaviour that prevents them from performing their daily tasks and which breaks a societal expectation and is statistically infrequent, then psychologists would categorise this behaviour as atypical and potentially necessitating management or treatment.

In this section, we consider each of the above-mentioned criteria in turn; however, it is important to know that psychologists usually assess an individual's behaviours using a multi-criteria approach. In other words, before categorising a behaviour as atypical and diagnosing someone with a mental disorder, they consider the complete set of criteria together.

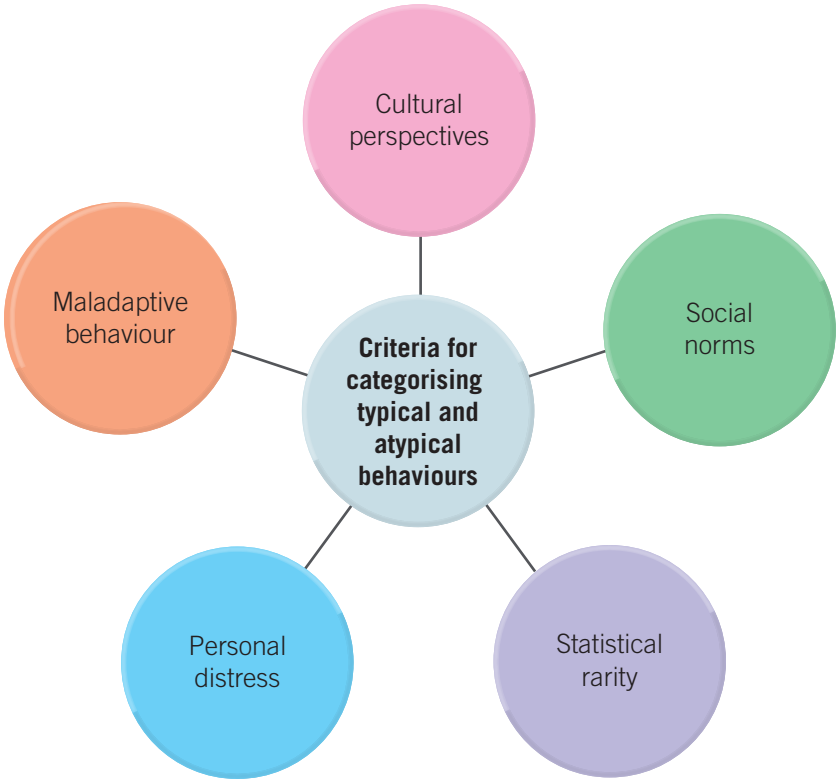


Figure 4A–3 A visual representation of the criteria used by psychologists to categorise behaviours as typical or atypical

Cultural perspectives

Whether a behaviour is typical or atypical is often determined by the culture within which an individual lives. The consideration of **cultural perspectives** involves using cultural norms or standards to determine whether behaviours are acceptable or typical for a certain culture. However, what is often viewed as normal, acceptable or typical behaviour in one culture can be considered atypical in another. Let's look at some examples of this.

Cultural perspectives a criterion for determining whether a behaviour is typical or atypical, by accounting for cultural norms or societal standards

- It is typical to express overt displays of affection in public in many Western cultures, but in Muslim, Asian and other cultures overt displays are generally not socially acceptable.
- In many cultures, including Hispanic, Asian and Middle Eastern cultures, making eye contact is thought to be disrespectful or rude. In Western cultures, however, a lack of eye contact suggests that a person is not paying attention or is uninterested.
- In some African cultures, polygamy (having multiple wives) is commonly accepted, whereas this is socially unacceptable, and even illegal, in many Western cultures.
- Chewing with your mouth open is considered good etiquette in some Asian cultures, but it is seen as impolite and a sign of 'bad manners' in Western cultures.

ISBN 978-1-009-25401-4 Gallagher et al

Figure 4A–4 What is viewed as normal, acceptable or typical behaviour in one culture may be considered atypical in another (e.g. slurping noodles at the dinner table).

- Making slurping sounds with your noodles is expected in Japan, but frowned upon in Western cultures.
- Burping at the table is a sign that you enjoyed your meal in some cultures, but this is considered unpleasant or rude in Western cultures.

Despite this, cultural perspectives are useful, as they provide a broad understanding of social norms and standards for appropriate behaviours within a specific country or culture. They can also provide individual members of the country or culture with guidelines about what is considered acceptable or typical behaviour and therefore what behaviour is unacceptable or atypical.

Limitations of using cultural perspectives to categorise typical and atypical behaviours

- What is considered typical or atypical behaviour differs from one country or culture to another, so there is no universal agreement.
- Within certain countries, there is much cultural diversity. Therefore, there may be many different and conflicting ideas about what should be considered acceptable or typical behaviour.
- It may be difficult to differentiate between behaviour considered atypical or abnormal and behaviour that is simply unusual or unconventional.

Social norms shared standards or social beliefs about what is normal, acceptable or typical behaviour

Social norms

Social norms are shared standards or social beliefs about what is normal, acceptable or typical behaviour. These norms can be informal understandings, such as the expectation that you should turn around to face doors when in a lift, or rules and laws, like wearing a seatbelt when driving. Norms generally function to provide order and predictability in society. Other examples include:

Figure 4A–5 Social norms, such as shaking hands when you meet someone (except in a pandemic!), tend to be viewed as typical behaviours.

- You should shake hands when you meet someone.
- You should be kind to the elderly, such as by opening doors for them or giving up your seat on public transport.
- If there is a queue, you should go to the end instead of pushing or cutting your way to the front.
- If you hit or bump into someone by accident, you should say 'I'm sorry'.

ISBN 978-1-009-25401-4 Gallagher et al

Overall, people want approval; they want to belong, so when an individual violates a social norm, their behaviour is considered abnormal or atypical. If a behaviour deviates enough from accepted social standards, values and norms, then the behaviour is deemed abnormal or atypical. Often, severe violations of a social norm, such as aggressive acts that harm others, cannot be understood by most in society and can cause individuals great discomfort.

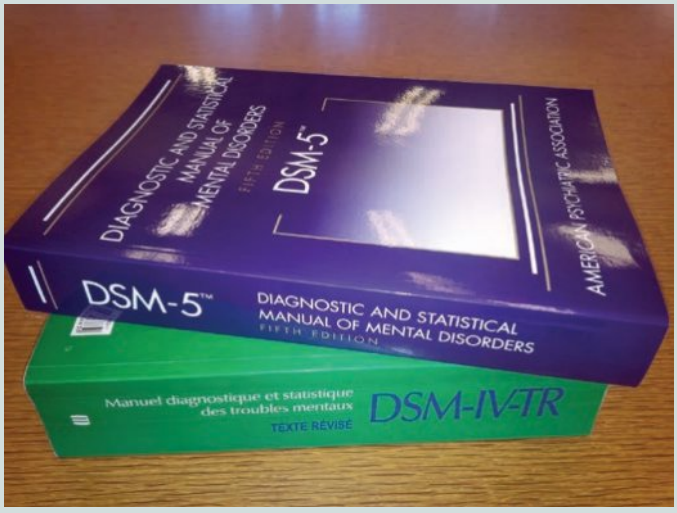
Limitations of using social norms to categorise typical and atypical behaviours

Like cultural perspectives, there is no universal agreement about social norms, as they can differ significantly between individuals and groups, even within the same culture.

Social norms also change over time, along with changes in society itself. Therefore, behaviour that was once seen as atypical may in time become acceptable and vice versa. For example, drink driving was acceptable in the 1970s but is now not only socially unacceptable, but illegal. Conversely, as recently as 1987, homosexuality was listed as a psychological disorder in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM) – a key text in the diagnosis of mental disorders – and being homosexual was illegal in some Australian states until as late as 1997. Now, same-sex couples can legally marry.

Social norms can also change depending on the situation or context in which we find ourselves. For example, cannibalism would usually be considered atypical and is illegal, but in 1972, the survivors of a plane crash in the Andes mountains, who were trapped on the mountain for 72 days, resorted to cannibalism to continue living as long as possible. Given the situation, there is general agreement that what these people did was not atypical or illegal – the context made it acceptable.

THE DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDERS (DSM)



The *Diagnostic and Statistical Manual of Mental Disorders* (DSM) is a handbook that is widely used around the world by general practitioners (GPs), psychologists and psychiatrists to diagnose psychiatric illnesses. It is published by the American Psychiatric Association (APA) and covers all categories of mental health disorders for both adults and children. It contains descriptions, symptoms and other criteria necessary for diagnosing mental health disorders. It also contains statistics, including the typical age of onset, the effects of treatment and common treatment approaches. The DSM has been updated numerous times since it was first published in 1952 and each revision has involved changes. For example, when the DSM-5 was released, four separate autistic disorders that had been listed in the fourth edition of the DSM, including Asperger's syndrome, were combined into a single illness, autism spectrum disorder, for the DSM-5. A new edition titled DSM-5-TR was released in 2022, which is outlined in the 4D Engage box.

LINK 4D SUPPORTING PSYCHOLOGICAL DEVELOPMENT AND MENTAL WELLBEING

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 2

1 Explain how cultural perspectives can influence whether a behaviour is viewed as typical or not.
2 Provide two reasons why using cultural perspectives to categorise typical and atypical behaviours can be problematic.
3 Use an example to explain how social norms can be used to categorise a behaviour as atypical.
4 Why is having social norms in society helpful?

Statistical rarity

Statistical rarity a criterion that views abnormal or atypical behaviours as deviating significantly from the statistical average or mean

According to the criterion of **statistical rarity**, behaviours that are considered abnormal or atypical deviate significantly from the statistical average or mean. In other words, they are statistically rare. Behaviours that are common or that most people 'do' are therefore considered normal or typical. For example, if most people drive or get public transport to work rather than riding a bike or walking, this would be the typical behaviour, and riding or walking would be atypical. The statistical approach is based on a normal distribution curve. If any behaviour of a very large group of individuals is measured and plotted as a graph, the data will tend to fall in a bell shape, as shown in Figure 4A–6.

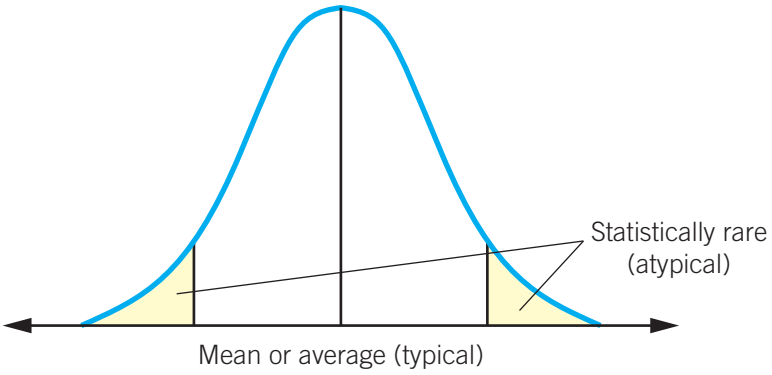


Figure 4A–6 A normal distribution curve, where those characteristics or behaviours that are clustered around the mean are considered typical, and those at either end, furthest from the mean, are considered statistically rare or atypical

On the normal distribution curve, normal or typical behaviour is generally considered to fall in the middle area closest to the average, whereas any behaviour that is atypical or abnormal falls outside this area at each end. For example, if this graph represented how many hours of sleep VCE students get on average per night during a school term, those students who sit closest to the average of 7 hours (between a range of 5.5 and 8.5 hours) would be getting a typical amount of sleep. Those students who fall outside this range – that is, getting less than 5.5 hours or more than 8.5 hours on average – would be getting an atypical amount of sleep.

Limitations of using statistical rarity to categorise typical and atypical behaviours

- Many statistically rare behaviours or characteristics are regarded as atypical or abnormal, even though they are quite frequent or common. For example, 26.3% of Australians aged 16–85 have experienced an anxiety disorder, which makes it common. However, that does not mean having anxiety isn't a problem.
- The decision of where the cut-off point for atypical or statistically rare behaviour sits is subjective. Who makes this decision? How do they decide? For example, if an IQ of 70 is the cut-off point for statistical normality or typical/normal IQ, how are we able to justify that someone with an IQ of 69 is statistically abnormal and has an abnormal/atypical IQ?

ISBN 978-1-009-25401-4 Gallagher et al

- When viewing behaviour according to this criterion, both ends of the normal curve are considered atypical. So, for example, if an individual has very high anxiety and another individual has extremely low anxiety, both situations would be considered atypical. In the real world, however, it is usually only one end of the curve that is viewed as problematic or abnormal. Therefore, individuals with extremely low anxiety would probably not be viewed as demonstrating atypical behaviour, because this would not be problematic for them. By contrast, individuals with extremely high anxiety would be considered to have a mental disorder, even though they are no more deviant from the mean.

Personal distress

Another way of categorising typical or atypical behaviour is to ask whether the behaviour causes **personal distress** to the individual concerned. If it does, then the behaviour would be considered atypical. Personal distress usually involves unpleasant or upsetting emotions, such as sadness, anxiety or feeling overwhelmed, as well as physiological pain or suffering. For example, excessive alcohol consumption might lead someone to have alcohol dependency or associated health problems, which may cause them to feel unpleasant emotions, such as shame, anxiety and sadness.

Figure 4A–7 If a behaviour causes an individual to experience personal distress, including emotions such as anxiety and sadness, then the behaviour is deemed atypical.

Limitations of using personal distress to categorise typical and atypical behaviours

- Sometimes, despite a behaviour being maladaptive or unhelpful for the individual, personal distress may not occur. For example, smoking causes health problems, but the individual who smokes may not feel any negative emotions.
- Personal distress alone is not sufficient to describe behaviour as atypical. For example, if an individual loses a loved one, they will inevitably experience pain and suffering. To take another example, an athlete who experiences a career-ending injury would display significant distress. Suffering is part of life and cannot be avoided, so it often comes down to the severity of the distress.

Maladaptive behaviour

If it is determined that a behaviour is unhelpful, dysfunctional and non-productive, it will be labelled as maladaptive and atypical. **Maladaptive behaviour** tends to interfere with a person's ability to adjust appropriately and effectively to their environment. For example, say you have an assessment that you are stressed about, but rather than studying more or cutting back on your hours at your part-time job, which would be helpful, you avoid studying and binge-watch your favourite show to distract yourself. This behaviour may alleviate your stress in the short term, but it will potentially exacerbate your stress and hinder your ability to perform well on the assessment. Ultimately, this maladaptive behaviour is unhelpful for you and has made you less productive.

Personal distress a state in which a person experiences unpleasant or upsetting emotions, such as sadness, anxiety or feeling overwhelmed

Maladaptive behaviour behaviour that is unhelpful, dysfunctional and non-productive, and that interferes with a person's ability to adjust to their environment appropriately and effectively

ISBN 978-1-009-25401-4 Gallagher et al

Figure 4A–8 Even though binge-watching your favourite show can be a nice distraction from the stress you are experiencing about upcoming assessments, this would be considered maladaptive behaviour because it is unhelpful in the long run.

Limitations of using maladaptive behaviour to categorise behaviours as typical or atypical

- How adaptive or maladaptive a behaviour may be is hard to objectively quantify. In other words, it is subjective and based on the opinion or judgement of a professional, such as a psychologist or psychiatrist.
- Whether a behaviour is maladaptive or not can also depend on the situation. For example, if a person is engaging in coercive behaviours, stealing and lying to others, most people would say those are maladaptive behaviours. But what if this person was using this behaviour to obtain food or get medicine for their sick family? Would that still be maladaptive?
- Culture can also play a significant role in determining the adaptiveness of a behaviour. For example, for many Aboriginal and Torres Strait Islander peoples, it is considered disrespectful to look someone directly in the eye when talking to them. In other cultures, however, it is considered disrespectful not to make eye contact.
- The idea of maladaptive behaviours also being atypical can sometimes clash with the criterion of statistical rarity. This is because some statistically rare behaviours (e.g. having an eidetic or photographic memory or an extremely high IQ) can be highly adaptive, while many maladaptive behaviours (e.g. having a fear of public speaking) are extremely common in the population.

WORKSHEET 4A–1 TYPICAL AND ATYPICAL BEHAVIOURS

Check-in questions – Set 3

1 How is statistical rarity used as a criterion for categorising behaviours as typical or atypical?
2 What is personal distress?
3 What is a limitation of using personal distress to categorise behaviours as typical or atypical?
4 What are maladaptive behaviours and why are they considered atypical?

ISBN 978-1-009-25401-4 Gallagher et al

4A SKILLS

VIDEO 4A–2
SKILLS: COMPARING CONCEPTS

Comparing concepts throughout the course for deeper understanding

In this first section of the chapter, you will have seen that the ability to compare and contrast different concepts can be useful when trying to understand them at a deeper level. Even if a topic in psychology does not explicitly use a word like 'distinguish', it is still a skill you could be asked to demonstrate in assessments within any topic. You might find it useful to put together a summary table, Venn diagram or any other useful tool that allows you to identify the key similarities and differences between important concepts for each topic covered throughout the year. When stating differences, be sure to use words or phrases like 'whereas' or 'in contrast to'. If possible, try to come up with more than one similarity and more than one difference for each comparison. Let's look at an example of a summary table for some of the concepts covered in this section.

Table 4A–1 A comparison table showing the similarities and differences between concepts

Concepts for comparison	Similarities	Differences
Typical development and atypical development	Both involve an assessment of the behaviours, skills and abilities of the child. Both involve an assessment of whether they fall within the expected range of development. Both involve a comparison with peers of the same age.	In typical development, the child's behaviours, skills or abilities fall within the expected range of development or progress at a similar pace compared to peers of the same age. In atypical development, the child's behaviours, skills or abilities fall outside this range and do not progress at the same pace compared to similar-aged peers.
Typical behaviours and atypical behaviours	Both are observable actions or patterns of behaviour. Both can be determined using a range of criteria.	Typical behaviours are those that are expected for an individual, whereas atypical behaviours do not match what is expected. Typical behaviours conform to norms or standards, whereas atypical behaviours deviate from these. Typical behaviours are acceptable, whereas atypical behaviours tend to violate what society considers appropriate. Typical behaviours are helpful and not distressing, whereas atypical behaviours can be harmful or distressing for the individual and those around them.
Cultural perspectives and social norms	Both use norms to determine whether behaviours are acceptable or typical. Both vary from culture to culture.	Cultural perspectives tend to be specific to a country or culture, whereas social norms are dependent on the social group involved or the social norms at play, so may vary greatly within a culture.

ISBN 978-1-009-25401-4 Gallagher et al

Section 4A questions

1 Explain how it would be deemed that a child is experiencing either typical or atypical development.

2 For the behaviours **a**–**j**, (i) categorise them as either typical or atypical, (ii) state the criteria used and (iii) justify your answers.

- **a** David is really stressed and feeling overwhelmed about his wife asking for a divorce. He takes regular naps to avoid dealing with the situation.
- **b** Sienna has just begun her first intimate relationship, which is common for her age.
- **c** Andrew pushes into a queue without asking, to buy tickets for a movie because he is late.
- **d** Maya broke up with her girlfriend via text message because she couldn't bear having a face-to-face conversation. This made her feel extremely anxious and regretful afterwards.
- **e** While travelling in Japan, Elliot remembers to bow when greeting people instead of shaking hands like he would in his home country.
- **f** Fred cannot bring himself to throw anything away. His house is so full of stuff that it is a fire hazard. In fact, he often trips over, and his family is worried that he may break his hip, as he is in his late 70s.
- **g** Clara has a fear of public speaking. When she had to give a class presentation last year, she had a panic attack and now has so much anxiety that she avoids school when she knows she has a presentation to do.
- **h** Lolade was in a rush to catch the school bus when she bumped into someone. She paused, apologised by saying, 'I'm sorry', and then continued on her way.
- **i** Yara has moved houses 12 times in the past 10 years. This is different from most of her friends, who have moved only once, twice or not at all.
- **j** Two women are walking hand-in-hand down the street in a very socially conservative country where this is not socially acceptable.

3 Explain why using each criterion independently of the other criteria is limiting when categorising atypical and typical behaviours, such as in the previous question.

Figure 4A–9 Psychologists will use a broad set of criteria to determine whether a child's development is typical or atypical.

ISBN 978-1-009-25401-4 Gallagher et al

Normality and neurotypicality

Study Design:
The concepts of normality and neurotypicality, including consideration of emotions, behaviours and cognitions that may be viewed as adaptive or maladaptive for an individual

Glossary:
Abnormality
Adaptive
Adaptive cognitions
Cognitions
Cognitive behavioural therapy
Emotions
Maladaptive
Maladaptive cognitions
Maladaptive emotions
Neurodiverse
Neurodiversity
Neurotypical
Neurotypicality
Normality

ENGAGE

I convinced myself I am a killer

It all started with a thought: *What if I killed my husband?*

While many of us have disturbing thoughts when we are holding a knife or walking near a cliff, most of us can dismiss these thoughts and move on. However, for Yvonne, the thought that she could kill her husband, whom she loved very much, was extremely distressing and led to a spiral of obsession and crippling anxiety. In fact, she stopped sleeping, stopped using knives and stopped going to work because she was afraid that she might also harm someone other than her husband. These thoughts were maladaptive for Yvonne, impairing her ability to function in her daily life.

Yvonne was eventually diagnosed with a less well-known form of obsessive-compulsive disorder, called 'purely obsessional obsessive-compulsive disorder', or 'Pure O'. This disorder is marked by maladaptive intrusive, unwanted and uncontrollable thoughts or obsessions. When most of us think of obsessive-compulsive disorder, we think of such behaviours as counting or handwashing, but 'Pure O' involves hidden mental rituals or cognitions that, while invisible, are equally crippling. In this section, we will consider cognitions like Yvonne's and discuss what makes them maladaptive as opposed to adaptive. We will also consider behaviours and emotions and how they may be viewed as adaptive or maladaptive for an individual.

Normality patterns of behaviour that are typical and expected, or that conform to standards of what is acceptable

EXPLAIN

The concepts of normality and neurotypicality

In psychology, **normality** is defined as patterns of behaviour that are typical and expected, or conform to standards of what is acceptable. For example, in the cinema, it is expected that you would put your phone on silent and not talk loudly to your friend during the movie. Further, 'normal' behaviours for an individual are consistent with that individual's usual way of behaving. For example, if you like to socialise regularly with your friends, it would be normal for you to have a busy weekend filled with social events.

Figure 4B–1 Normal behaviour in a cinema includes putting your phone on silent and not talking loudly to your friend during the movie.

ISBN 978-1-009-25401-4 Gallagher et al

Abnormality behaviours that are unusual, bizarre, atypical or out of the ordinary

Neurotypicality standard or typical brain functioning, processing and behaviours

Neurotypical an individual whose neurological development or functioning is within the typical (average) range

Neurodiversity the idea that every human has a unique nervous system with a different combination of abilities and needs

Abnormality is usually defined as behaviours that are unusual, bizarre, atypical or out of the ordinary. For example, if you are normally very social, withdrawing socially and ignoring your friends' phone calls might be unusual for you and thus be considered abnormal. Abnormality also includes behaviours that deviate from societal norms and have the potential to cause distress to the individual or their friends and family. For example, a person deciding to run away from home and live on the streets would deviate from social norms and be very distressing for their family.

More recently, the term **neurotypicality** has been adopted to refer to individuals who have standard or typical brain functioning, processing and behaviours. For example, if a two-year-old infant is progressing normally for their age (e.g. can walk and run, make eye contact, gesture and point, and use multiple words to express what they want), they can be said to be **neurotypical**. That is, their neurological development or functioning is within the typical (or average) range.

While the term neurotypicality refers to brains that are performing in the way society expects, it also acknowledges **neurodiversity** – the idea that every human has a unique nervous system with its own combination of abilities and needs. Consider a two-year-old infant who is progressing atypically for their age. They make eye contact rarely, gesture or point, and they use minimal language. This child may receive an early diagnosis of an autism spectrum disorder and therefore would be considered **neurodiverse**. In other words, the neurodiverse child's brain functions differently in one or more ways compared to what is considered standard or typical. The concept of neurodiversity will be discussed further in Section 4C, along with the conditions of autism spectrum disorder and attention deficit hyperactivity disorder (ADHD).

4C NORMAL VARIATIONS IN BRAIN DEVELOPMENT LINK

Neurodiverse not neurotypical; functioning outside the typical range of neurological development

Adaptive a term used by psychologists to describe emotions, behaviours and cognitions that enable us to adjust to our environment appropriately and cope most effectively

Maladaptive a term used by psychologists to describe emotions, behaviours and cognitions that interfere with our ability to adjust to our environment appropriately and effectively

Distinguishing between the terms adaptive and maladaptive

When psychologists are in the process of determining whether a child is developing typically or atypically for their age group, the individual's emotional responses, behaviours and cognitions are considered. A variety of observations and assessments are made, and the emotions, behaviours and cognitions of the child are categorised as adaptive or maladaptive. Generally, psychologists use the term **adaptive** to describe any behaviours, emotional responses or cognitive processes that enable us to adjust to our environment appropriately and cope most effectively. In contrast, the term **maladaptive** is used to describe emotions, behaviours and cognitions that interfere with our ability to adjust to our environment appropriately and effectively. Let's consider some behaviours, emotions and cognitions and look more closely at examples of each that are adaptive or maladaptive.

Considering behaviours as adaptive or maladaptive

When behaviours are thought to be helpful for us, they are viewed as adaptive. These behaviours allow us to effectively manage and achieve our daily tasks, such as attending school or work, maintaining our personal hygiene and meeting our social responsibilities. For example, if you are feeling stressed about an assessment that you have next week at school, an adaptive behaviour that would help you to meet this challenge would be asking your boss for reduced hours at your part-time job for the week to give you more time to study.

ISBN 978-1-009-25401-4 Gallagher et al

As you learned in Section 4A, if a behaviour is unhelpful, dysfunctional or non-productive, it will be labelled as maladaptive. Generally, maladaptive behaviours interfere with a person's ability to adjust to their environment appropriately and effectively. For example, if a child does not make eye contact with their peers, this may hinder their ability to make friends and socialise. Often, maladaptive behaviours highlight that an individual may be developing atypically, and they are used as criteria for the diagnosis or classification of various conditions, such as mental disorders, neurodevelopmental disorders (e.g. ADHD) or intellectual disabilities.

LINK **4A** CRITERIA USED TO CATEGORISE TYPICAL AND ATYPICAL BEHAVIOUR

VIDEO 4B–1 ADAPTIVE AND MALADAPTIVE COGNITIONS, BEHAVIOURS AND EMOTIONS

Maladaptive behaviours sit on a spectrum from more minor and less impairing behaviours (e.g. nail biting or avoidance when anxious) to more severely impairing behaviours that seriously interfere with our ability to function (e.g. self-harming to cope with anxious feelings). Usually, maladaptive behaviours are associated with abnormal or atypical development and are often the target of interventions. For example, specific maladaptive behaviours are commonly associated with, and used in the diagnosis of, autism spectrum disorders. These include self-injurious behaviours, such as hitting one's head or banging it against the wall, aggression and severe temper tantrums.

Figure 4B–2 Nail biting is considered a maladaptive behaviour for dealing with stress or anxiety, but it is minimally impairing.

Table 4B–1 A comparison of adaptive and maladaptive behaviours

	Adaptive	Maladaptive
Definition	Behaviours that enable us to adjust to our environment appropriately and effectively	Behaviours that hinder us in adjusting to our environment appropriately and effectively
Normal/typical or atypical?	Normal/typical	Atypical
Helpful or unhelpful?	Helpful. They allow us to fulfil our daily tasks.	Unhelpful, dysfunctional and non-productive. They can hinder us in fulfilling our daily tasks.
Relieves stress or anxiety?	Yes	Yes, but only short term
Found on a spectrum?	No	Yes, from minor/less impairing to severely impairing
Examples	Studying for an upcoming assessment that is causing you stress Cutting back your hours in a part-time job to allow for more study	Avoiding studying for an upcoming assessment that is causing you stress Binge-watching your favourite show instead of studying

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 1

1 Why is the concept of normality difficult to define?
2 What is the definition of normality in psychology?
3 Distinguish between the terms neurotypicality and neurodiversity.
4 Distinguish between the terms adaptive and maladaptive.
5 Outline three features of adaptive behaviours.
6 Why are maladaptive behaviours considered to sit on a spectrum?

Considering emotions as adaptive or maladaptive

Emotions feelings that arise from our circumstances, mood or relationships with others

Emotions are feelings that arise from our circumstances, mood or relationships with others. The emotions we experience daily have adaptive or evolutionary value, as they help to ensure our survival. They have functions that make them useful to us, such as enabling us to communicate with others and convey our needs. Emotions can have adaptive benefits, irrespective of whether the emotion is pleasant or unpleasant. For example, an unpleasant emotion such as fear or distress can benefit us if it helps us to respond to a threat or danger (e.g. an aggressive dog).

In most cases, emotions arise in response to a stimulus of some kind, such as an event, a social interaction, or talking about or thinking about a past emotional experience. They enable the body to respond to these stimuli, giving us clues or signals that help us protect or care for ourselves in the moment. Often, emotional responses are unconscious – we don't choose to feel them; they just happen to us automatically. This suggests that they are the product of evolution, enabling us to be sensitive to the external world by interpreting and adapting our emotions to suit the situation.

ACTIVITY 4B–1 UNIVERSAL FACIAL EXPRESSION QUIZ

Figure 4B–3 The seven basic emotions identified by Dr Paul Ekman

ISBN 978-1-009-25401-4 Gallagher et al

Dr Paul Ekman began his research on facial expressions and body movements, including hand gestures, in 1954. Within just over a decade, after extensive research in Papua New Guinea (1968), he amassed strong evidence that facial expressions are universal. This means that, regardless of language or culture, emotions are expressed and recognised in the same way. This supports the idea that emotions are adaptive and have evolutionary value.

Using the following website (http://cambridge.edu.au/redirect/9741), test your ability to read the universal language of emotions. Can you guess which emotion is being expressed in each of the four photographs taken during Dr Ekman's studies in New Guinea?

In groups, discuss:

1. Was it difficult to recognise the emotions? Why or why not?
2. Explain why Dr Ekman's identification of these basic emotions supports the idea that emotions are adaptive.
3. Using the seven basic emotions that Ekman identified (anger, disgust, fear, surprise, happiness, sadness and contempt), discuss which of these emotions could become maladaptive. Use examples to explain how, why and when this might occur.

Maladaptive emotions

Emotions or, more specifically, our emotional responses, can sometimes be maladaptive. This is usually when they are very intense or overwhelming, occur frequently, persist for extended periods of time without interruption or are inappropriate for the situation. For example, emotions typically don't last longer than an hour, so if an emotion persists for an extended period without interruption, it is likely that the emotion would be categorised as a mood or disorder, such as depression or anxiety. **Maladaptive emotions** usually involve dysfunctional or unhelpful emotional responses.

Maladaptive emotions very intense or overwhelming emotions that occur frequently, persist for extended periods of time without interruption or are inappropriate for the situation

Let's take a basic emotion such as anger. Like fear, anger can be adaptive, as it primes our body for an attack and helps us defend ourselves. Millions of years ago, our ancestors would have needed this ability to prepare for dealing with life-or-death situations, like an attack by a hungry lion or an enemy charging towards you with a spear. When anger is mild, infrequent, dissipates quickly and is expressed assertively and without aggression, it is likely to be considered adaptive. However, if anger is more intense, experienced frequently or results in aggressive verbal and physical actions, then it could be considered maladaptive.

Figure 4B–4 If a person's anger is so intense that it results in aggressive verbal and/or physical actions, it would be considered maladaptive.

ISBN 978-1-009-25401-4 Gallagher et al

Figure 4B–5 For this toddler, anger expressed in the form of rage during a tantrum would be considered adaptive, as they haven't yet developed the ability to manage and express their emotions in a more socially acceptable way.

Obviously, your ability to express and manage emotions like anger depends on your age and stage of emotional development. For example, a toddler who is angry and frustrated because they are no longer allowed to play with their favourite toy may throw a tantrum in which they scream and hit things. For an adult, this behaviour would be considered maladaptive, but for the child, it would be considered somewhat adaptive, as they are still developing the ability to manage their emotions effectively.

Considering cognitions as adaptive or maladaptive

Cognitions are cognitive processes or mental actions that involve acquiring, processing and understanding information or knowledge. They include perception, memory, attention, pattern recognition, problem-solving and language. **Adaptive cognitions** are ways of thinking that benefit our survival and wellbeing. For example, if you make a silly mistake in a Maths test, an adaptive thought about this might be, 'It's okay. I know how I made the mistake, and I will make sure I don't do it again next time'. Given that this thought is relatively positive, it should motivate you to practise and do better in the future, therefore benefiting your wellbeing.

Cognitions cognitive processes or mental actions that involve acquiring, processing and understanding information or knowledge

Adaptive cognitions ways of thinking that are of benefit to our survival and wellbeing

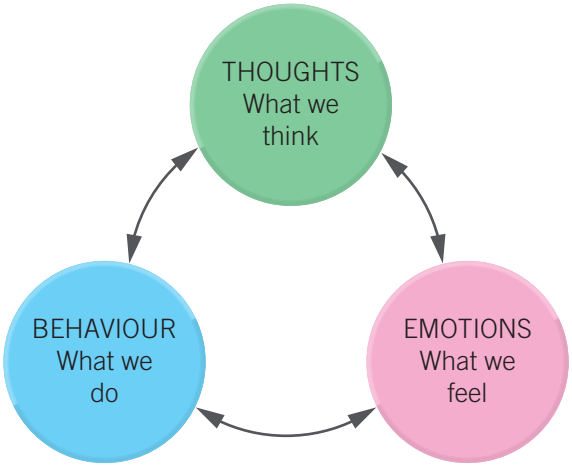


Figure 4B–6 A representation of the multidirectional relationship between behaviours, cognitions and emotions

Often, cognitions involve taking in information from the environment, processing our emotional response to it and then initiating it in the form of behaviour. For example, if your friend is ignoring you (environmental information) and this makes you feel sad and rejected (emotional response), this might lead you to avoid social situations involving this friend (behaviour). This example highlights the interactive relationship between these three aspects of a person's wellbeing.

ISBN 978-1-009-25401-4 Gallagher et al

In fact, one of the most popular and successful psychological treatments, **cognitive behavioural therapy**, targets the relationship between maladaptive thoughts, feelings and behaviours. It helps people to identify and challenge unhelpful thoughts (cognitions), which can improve mood (emotions) and result in changes in a person's daily actions (behaviour). It is important to recognise that this relationship does not just occur in one direction: how we feel can impact what we think and do, and sometimes what we do can affect how we feel and think.

Maladaptive cognitions usually involve cognitive distortions or irrational inflated thoughts or beliefs that distort a person's perception of reality, usually in a negative way. For example, an individual with depression might have ongoing negative thoughts about themselves, such as 'I am not good enough' or 'I am not likeable'. These negative thinking patterns, or maladaptive cognitions, can become automatic, meaning that the individual doesn't even notice when their judgement is irrational or unfair to themselves. Cognitive behavioural therapy helps people with depression by giving them tools to challenge their negative thoughts and change them into more realistic and positive ones, such as 'I am enough' or 'I am likeable'. This has a flow-on effect on their emotions by improving their mood, leading to changes in their motivation and behaviour.

Cognitive behavioural therapy psychological treatment that targets the relationship between maladaptive thoughts, feelings and behaviours

Maladaptive cognitions cognitive distortions or irrational, inflated thoughts or beliefs that distort a person's perception of reality, usually in a negative way

Check-in questions – Set 2

1 What are emotions?
2 Explain why emotions are considered adaptive for humans.
3 When would our emotions be considered maladaptive?
4 Using an example, distinguish between adaptive and maladaptive cognitions.

WORKSHEET 4B–1 DISTINGUISHING ADAPTIVE AND MALADAPTIVE RESPONSES

4B KEY SCIENCE SKILLS

Determining appropriate investigation methodologies

When you are asked to design an investigation in VCE Psychology, it is important to remember that there are many options available and that it is often about choosing the most appropriate one for the context.

Investigation methodologies were discussed in detail in Chapter 1.

Here, we review these methodologies, which include the following:

- **Controlled experiment** – tests the cause-and-effect relationship between an independent variable (sometimes more than one) and a dependent variable under controlled conditions (there may be more than one of each type of variable in complex experiments)
- **Case study** – an in-depth investigation into an individual or small group of people
- **Classification and identification** – involves the arrangement of phenomena, objects or events into manageable sets, and the recognition of phenomena as belonging to a particular set
- **Correlational study** – involves observing and recording behaviour to understand the relationship between variables that have not been manipulated or controlled
- **Fieldwork** – the collection of information through observation and interaction with a selected environment
- **Literature review** – involves collating and analysing secondary data findings and viewpoints

VIDEO 4B–2 KEY SCIENCE SKILLS: INVESTIGATION METHODOLOGIES

1B PLANNING AND CONDUCTING INVESTIGATIONS

ISBN 978-1-009-25401-4 Gallagher et al

- **Modelling** – involves the construction of a physical or conceptual model that can be used to simulate a system
- **Simulation** – involves the use of a model to replicate and study the behaviour of a system
- **Product, process or system development** – involves the design of an artefact, process or system to meet a human need.

Let's look at how each of these might be used appropriately in relation to investigating normality and neurotypicality and whether emotions, behaviours and cognitions are adaptive or maladaptive for an individual.

Table 4B–2 Examples of investigation methods related to normality and neurotypicality

Investigation methodology	Examples
Controlled experiment	• Design a replication of Ekman's study to determine whether different cultures are able to recognise universal emotions. • Design an investigation to determine whether thinking about stress in a more positive way influences a person's coping ability.
Case study	• Interview an individual or small group about the emotions, behaviours or cognitions they feel are maladaptive or adaptive for them. • Develop a script of follow-up questions to determine why interview respondents considered certain behaviours maladaptive or adaptive.
Classification and identification	• Collate data on people's emotions, behaviours or cognitions in response to various potentially stressful events. Design criteria to categorise these as adaptive or maladaptive. Then, calculate the proportion of people who demonstrated emotions, behaviours or cognitions that were adaptive or maladaptive.
Correlational study	• Determine the relationship between the identification or categorisation of maladaptive behaviours, cognitions and emotions and the occurrence of mental disorders.
Fieldwork	• Conduct an observational study in a school setting on the prevalence of particular maladaptive behaviours in teenagers.
Literature review	• Determine the relationship between particular mental or neurodevelopmental disorders and maladaptive emotions, cognitions and behaviours.
Modelling and simulation	• Create a simulated stressful event using virtual reality with human participants to investigate the types of maladaptive cognitions, behaviours and emotions that occur.
Product, process or system development	• Develop an idea of how wearable technology, such as a Fitbit or smartwatch, could be used to regulate maladaptive emotions or change maladaptive behaviours. This could include heart rate, breathing exercises, step counting or sleep quality. • Develop an idea of how an online 'chatbot' function or phone app could be used to change people's cognitions from maladaptive to adaptive.

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 4B–2 APPLYING THE KEY SCIENCE SKILLS

Working independently or collaboratively with a few classmates, choose one of the applied investigation methodology examples from the 4B Key Science Skills box on the previous page.

- Plan and design the methodology.
- If possible, collect and interpret some data using this methodology.
- Consider how you could adapt or extend this investigation by making modifications.

4B SKILLS

VIDEO 4B–3 SKILLS: ADAPTIVE AND MALADAPTIVE COGNITIONS, BEHAVIOURS AND EMOTIONS

Categorising cognitions, behaviours and emotions as adaptive or maladaptive

When answering questions that require you to determine whether the cognitions, behaviours or emotions of an individual are adaptive or maladaptive, you will need to justify your response using key terminology and features. Let's look at an example of this.

Question

Since being in a car crash several months ago, Glenda has not been able to get back in a car, as she has felt too anxious and worried that she will have another crash, even as a passenger. This makes it difficult for her to complete her daily tasks, such as grocery shopping or going to the doctor. She has to ask her son to help her. Glenda has also been having traumatising flashbacks and nightmares, making it difficult for her to sleep. She is now worried about how hard her life has become and keeps thinking that her circumstances will never get better. Glenda's son suggested that she see a psychologist.

Identify a behaviour, cognition and emotion that the psychologist may categorise as maladaptive for Glenda. Explain why. (6 marks)

Key points to remember

This question requires you to select examples of a maladaptive behaviour, cognition and emotion (one for each). These should be taken from the scenario. Given that psychology is a science, it is essential to use key terminology when explaining why each behaviour, cognition and emotion is maladaptive. Further, to ensure that your answer remains on topic and is precise, you could use bullet points to clearly differentiate the parts of your answer.

Model answer

- **Behaviour** – avoiding driving. The psychologist would categorise this as maladaptive behaviour for Glenda because it interferes with her ability to complete her daily tasks, such as grocery shopping or going to the doctor.
- **Cognition** – keeps thinking that her circumstances will never get better. The psychologist would categorise this as a maladaptive cognition for Glenda because it is irrational and distorts her perception of reality in a negative way.
- **Emotion** – anxiety. The psychologist would categorise this as a maladaptive emotion for Glenda, as it is dysfunctional or unhelpful and leads her to avoid driving or getting in a car. Her anxiety has also persisted for an extended period (several months).

ISBN 978-1-009-25401-4 Gallagher et al

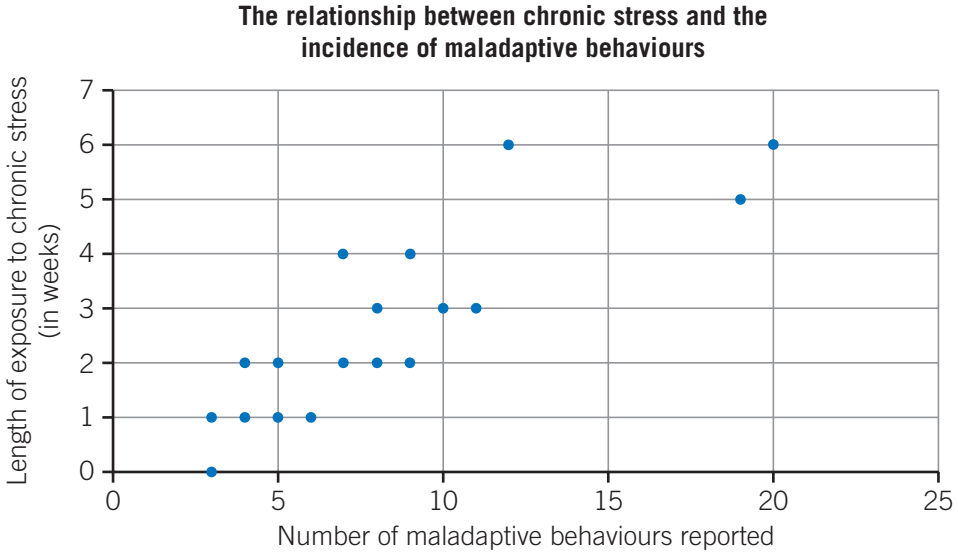
Section 4B questions

1 How are the terms normality and neurotypicality similar?

2 For the scenarios **a**–**f**, (i) determine whether each illustrates an emotion, cognition or behaviour, (ii) categorise it as either adaptive or maladaptive and (iii) justify your answer.
   - **a** Agustin is feeling overwhelmed and anxious about his workload and is finding it hard to concentrate. He loves his job, but he is dealing with several deadlines at the moment.
   - **b** Agustin writes a to-do list and starts working his way through the list, relieving some of his stress.
   - **c** Eloise has a phobia of dogs. She avoids leaving the house in case she encounters a dog. She has to work from home, get her groceries delivered and have her friends come around to visit, instead of leaving the house.
   - **d** Eloise doesn't leave her house because she believes that any dog that she encounters will attack her and she will die.
   - **e** Vera is feeling excited as they have just gotten a part-time job and are looking forward to saving money for their first car.
   - **f** Farouk has a fear of public speaking, so he avoids going to school when he has a presentation.

3 A teacher wants to investigate the effect of stressful events for VCE students on their behaviours, emotions and cognitions and whether this is associated with an increase in maladaptive rather than adaptive patterns. Outline how the teacher could use questionnaires and interviews to source data for their investigation.

4 A researcher is studying the link between the length of chronic stress exposure and the number of reported maladaptive behaviours. They gathered data via a questionnaire from 20 participants who had recently been exposed to chronic stress. They plotted their data on the following graph.



   - **a** Identify and explain the investigation methodology that was used in this study.
   - **b** Describe the relationship the researcher has established between the two variables.
   - **c** Suggest a modification that the researcher could implement to extend this investigation and gain further insight.

ISBN 978-1-009-25401-4 Gallagher et al

Normal variations in brain development

Study Design:
Normal variations of brain development within society, as illustrated by neurodiversity

Glossary:
Alertness
Central coherence
Executive function
Neurodivergent
Theory of mind
Working memory

ENGAGE

Judy Singer and neurodiversity

Judy Singer is an Australian sociologist. She is recognised as being instrumental in the development of the concept of neurodiversity, which she developed while completing an Honours Degree at the University of Technology Sydney in the late 1990s. Her study was the first sociological work to inquire into the social context of the emergence of a new kind of disability, the 'autistic spectrum'. Her research was based on her experiences 'in the middle of 3 generations of women somewhere on the Autistic Spectrum' and participation in or creation of early online Australian and international autistic spectrum support groups. Online, she founded the world's first support group for the (adult) children of autistic parents. In Sydney, Judy co-founded ASteen, Sydney's only family-run social club for Asperger teenagers and devoted herself to advocacy for public housing and social security rights. In the 1990s, Judy devised the term 'neurodiversity'. The intention was for the term to be used politically to argue for the importance of recognising all neurotypes as part of a thriving human society. For Singer, neurodiversity 'refers specifically to the limitless variability of human cognition and the uniqueness of each human mind'. Her work began to gain recognition a dozen years after publication, and she began to be invited to speak at conferences in 2017. Some critics of the neurodiversity movement argue that neurodiversity is not a scientific term. Singer says it was never intended to be, but simply provides a name for the fact that no two human minds are exactly alike.

EXPLAIN

What is neurodiversity?

Why do different people think differently? As covered in Section 4B, the concept of neurodiversity explains that differences in our thinking are accounted for by differences in culture or life experiences, and also by the fact that each individual's brain is uniquely wired. This concept underpins the approach to learning and disability that diverse neurological conditions are the result of normal variations in the human genome. Neurodiversity emphasises that there is no normal or healthy type of brain, or one correct style of neurocognitive functioning. It points to the fact that every human has a unique nervous system with its own combination of abilities and needs.

LINK 4B NORMALITY AND NEURO-TYPICALITY

The term 'neurodiversity' is associated with a shift in thinking away from seeing conditions like autism as involving only deficits and impairments, towards viewing them more positively as normal human differences, because we all have our own unique combination of abilities and needs. An associated term is '**neurodivergent**', which refers to people whose brains function differently to others' (e.g. people with autism or ADHD). However, most people with these conditions prefer the term 'neurodiverse', which has developed as a positive term that embraces differences in brain function and behaviours.

Neurodivergent a term that is sometimes used to refer to people whose brains function differently to others'

ISBN 978-1-009-25401-4

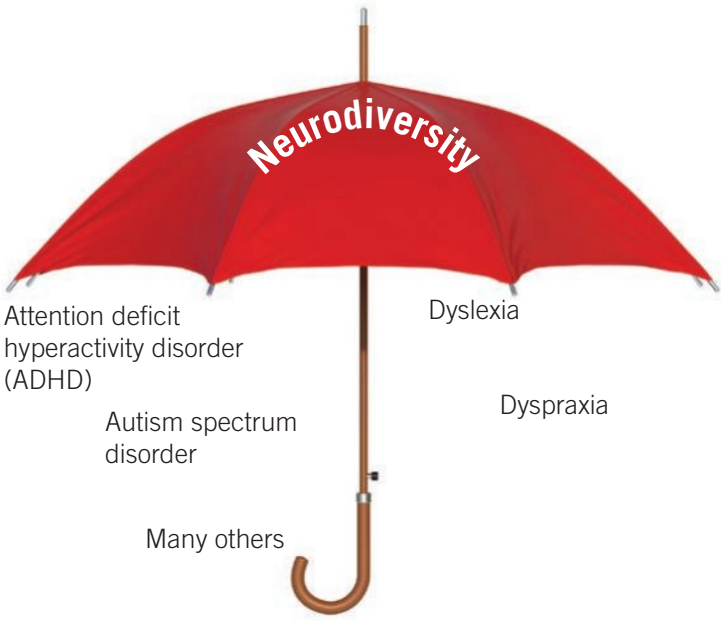


Figure 4C–1 Neurodiversity is an umbrella term that includes all neurodevelopmental disorders, as well as all instances of unique nervous system and brain functioning.

ACTIVITY 4C–1 CONDITIONS THAT ARE CONSIDERED NEURODIVERSE

Individually or with a partner, choose a neurodiverse condition (other than autism and ADHD, as we will consider these in detail in this section). Possible choices include dyslexia, dyspraxia or dyscalculia, among others.

Research to answer the following questions:

- Why is this condition considered neurodiverse?
- What differences are there in the brain for a person with this condition compared to neurotypical individuals?
- What variations occur in the thinking or cognitive processes of people with this condition when compared to neurotypical individuals?

Autism spectrum disorder

According to the Australian Institute of Health and Welfare, autism spectrum disorder is a persistent neurodevelopmental disorder characterised by symptoms evident from early childhood. The symptoms used in the diagnosis of ASD are usually as follows:

- The person has poor communication and social skills across different social contexts (both familiar and unfamiliar).
- The person lacks the ability to understand emotional and social cues, which can range from struggling to hold a normal conversation, to an inability to respond to social interactions or share emotions, and being non-verbal.
- The person has poor non-verbal communication skills, such as a lack of eye contact, using the wrong gestures or not understanding them, and has reduced facial expressions.
- The person struggles to form and maintain relationships, which can include difficulty adjusting behaviour for different social contexts, struggling to make friends and having a lack of interest in their peers.

ISBN 978-1-009-25401-4 Gallagher et al

The severity of symptoms (mild, moderate, severe) relating to social communication impairments and restrictive, repetitive patterns of behaviour determines where the individual would be placed within the autism spectrum (Table 4C–1) once a diagnosis is made.

Table 4C–1 Severity levels for autism spectrum disorder (ASD)

Severity level	Social communication	Restrictive and repetitive behaviours
Level 3: Severe Very substantial support required	• Severe impairment of verbal and non-verbal communication • Does not initiate or respond to social interactions (unless for specific wants/needs) • Speaks very little, often does not make sense	• Restricted and repetitive behaviour prevents normal functioning • Does not cope well with change • Changing focus causes distress
Level 2: Moderate Substantial support required	• Noticeable impairment of verbal and non-verbal communication and social skills, even with support in place • Limited initiation or response to social interactions • Speaks in simple sentences	• Inability to adapt behaviour is noticeable and affects normal function in a variety of situations • Difficulty coping with change • Some difficulty and/or distress changing focus or action
Level 1: Mild Some support required	• Noticeable impairment of communication without supports in place • Some difficulty initiating and responding to social interactions • Decreased interest in social interactions and struggles to make friends • Speaks in full sentences, but to-and-fro conversation with others is atypical	• Inability to adapt behaviour inhibits function in some situations • Switching between activities causes distress. • Struggles with organisation and planning, which affects independence

In 2018, Autism Spectrum Australia estimated that 1 in 70 people in Australia were autistic, which equates to 353 880 people. Autism is most often identified in children aged 3–14 years, with 83% of those diagnosed under the age of 25. The causes of autism are complex and include a variety of genetic and environmental factors, as well as other neurological or mental conditions, such as epilepsy and ADHD. Unfortunately, the brain itself does not indicate any clear-cut causes and cannot be used conclusively in diagnosis.

While neuroimaging techniques allow us to observe and measure structural and functional differences in the brain, it is difficult to distinguish an autistic brain from a neurotypical brain. This is because many of the differences are subtle and come from studies that have averaged findings across a large number of individuals. Indeed, the differences between the brains of two neurotypical individuals are more dramatic than the subtle brain differences associated with autism. Further, some of the structural differences seen in people with autism also appear in the brain scans of neurotypical individuals and those with other neurodiverse conditions, such as ADHD. This highlights the variability and diversity that exist in the human nervous system.

LINK 5A UNDERSTANDING THE ROLE OF THE BRAIN

ISBN 978-1-009-25401-4 Gallagher et al

It is more helpful to compare the cognitive variations between neurodiverse individuals with autism and neurotypical individuals. Three key variations can be seen in theory of mind, executive function and central coherence. We will now look at these in turn.

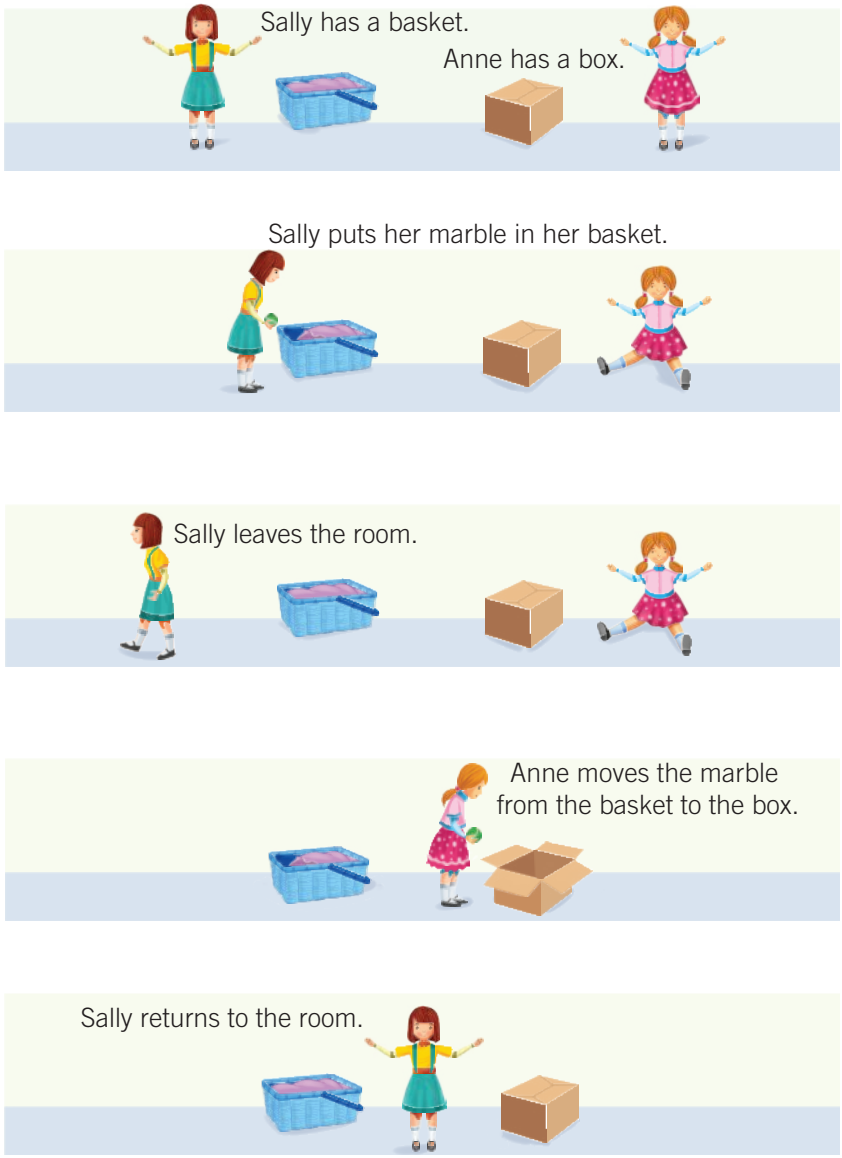
Theory of mind

Theory of mind a cognitive ability that allows us to make judgements about other people's mental states

Theory of mind is a cognitive ability that allows us to make judgements about other people's mental states. It usually develops in children between the ages of three and five, and it allows us to use our understanding of others' beliefs, intentions and desires to predict their behaviour.

Several studies have established that individuals with autism spectrum disorder have an impaired theory of mind. In their 1985 study, Baron-Cohen, Leslie and Frith used their Sally–Anne test (Figure 4C–2) to evaluate theory of mind in neurotypical children and neurodiverse children with an autism spectrum disorder or Down syndrome.

In the Sally–Anne test, the child is presented with this little story of two dolls, Sally and Anne.



1 Where will Sally look for her marble? (The *belief* question)
2 Where is the marble really? (The *reality* question)
3 Where was the marble at the beginning? (The *memory* question)

The child is now asked the three questions shown on the left.

Figure 4C–2 The drawings and story used in the Sally–Anne test to assess the cognitive ability called theory of mind, developed by Baron-Cohen and colleagues.

ISBN 978-1-009-25401-4 Gallagher et al

In the test, the children are shown the drawings of two dolls, Sally and Anne, in Figure 4C–2, and told the little story that goes with them, starting with Sally putting her marble in her basket. The rest proceeds as shown in the figure, and at the end, the child is asked the three questions at the bottom.

WORKSHEET 4C–1 THEORY OF MIND SALLY ANNE TEST

The critical question in this assessment is the 'belief' question. If a child answers by pointing to the basket, they are demonstrating an appreciation that Sally's understanding of the world doesn't reflect what happened. If the child points to the box instead, then they fail the task because they haven't considered that they have knowledge that Sally doesn't have access to. The 'reality' and 'memory' questions are control questions. If they are answered incorrectly, this suggests that the child hasn't understood the task.

In the original study by Baron-Cohen and colleagues, they found that 85% of the neurotypical children and those with Down syndrome correctly answered the belief question. However, only 20% of the autistic children answered correctly, with the remaining 80% pointing to the actual location of the marble.

Further studies have revealed that neurotypical four-year-olds tend to have developed theory of mind, so they understand that Sally will look in the basket, whereas three-year-olds point to the box. This suggests that four-year-olds have an understanding that other people have different knowledge to them, which enables them to adjust their behaviour accordingly. It may be that the cognitive ability to infer the mental states of others is vital to the development of social communication. This may provide a cognitive explanation for autistic children's struggle with social communication.

Executive function

Executive function is a cognitive process that helps us to set goals, organise and plan, focus our attention and ultimately get things done. Executive functioning involves complex cognitive processes like working memory, problem-solving and flexible thinking.

Executive function a cognitive process that helps us to set goals, organise and plan, focus our attention and ultimately get things done

Studies have established a relationship between executive dysfunction and the social and non-social symptoms associated with autism. For example, children with autism score worse than neurotypical children on tests of short-term memory, mental processing speed and impulse control. They also tend to prioritise accuracy over speed on tests of reaction time, compared to neurotypical children who balance accuracy with speed.

Central coherence

Central coherence is the term given to a human's ability to derive overall meaning from a mass of details. A person with strong central coherence, looking at an endless expanse of trees, would perceive it to be a 'forest'. A person with weak central coherence, on the other hand, would see only a large number of individual trees.

Central coherence the ability to derive overall meaning from a mass of details

The 'weak central coherence theory', developed by Frith in 1989, proposes that people with autism have a particular cognitive style that leads them to focus on the details rather than the global idea. In other words, they can't see the bigger picture and instead get caught up in the details, which can often cause them to miss meaning. However, some individuals with autism benefit from their ability to focus on fine details and extract these from a mass of complex data, which is recognised as a potential strength associated with the condition. For example, people with autism may excel in disciplines such as mathematics or engineering, where details are extremely important. Therefore, the weak central coherence observed in people with autism can be both a deficit and a strength.

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 4C–2 WEAK CENTRAL COHERENCE AND SAVANT SYNDROME

Individually or with a partner, find a case study of a savant and briefly summarise your case study for the class.

Research to answer the following questions:

- What is the individual's name?
- What is their area of expertise?
- How has having weak central coherence been an advantage to them?
- What other cognitive variations do they experience because of their autism?

Check-in questions – Set 1

1 Why are people with conditions such as autism or ADHD considered neurodiverse?
2 What are the four main deficits that may indicate autism, according to the DSM-5-TR?
3 Why is it difficult to distinguish a neurotypical brain from an autistic brain?
4 Explain which cognitive variation in theory of mind can be seen when comparing neurotypical children and neurodivergent children with autism.
5 How can the tendency to have weak central coherence in those with autism be considered a strength?

Attention deficit hyperactivity disorder

ADHD is a neurodevelopmental disorder that can affect some areas of brain function. It affects about one in 20 Australians – about one million people – but is frequently misunderstood and underdiagnosed. Key symptoms of the disorder include inattention, distractibility, hyperactivity and impulsivity. ADHD is diagnosed using the criteria outlined in the DSM-5-TR. To be diagnosed with ADHD, the symptoms of inattention (e.g. difficulty concentrating, forgetting instructions and moving from one task to another without completing anything) and/or hyperactivity and impulsivity (e.g. talking over the top of others, having a short fuse and being accident prone):

Figure 4C–3 Children with ADHD can have difficulty with impulsivity and hyperactivity.

- need to be excessive for the developmental age of the individual
- need to be present before the age of 12
- must have persisted for longer than 6 months
- must contribute to impairment across multiple settings (e.g. home, school, child care and/or work).

ISBN 978-1-009-25401-4 Gallagher et al

Many studies have reported brain structural differences in individuals with ADHD, but they have yet to achieve consensus. Nevertheless, several cognitive variations are known to occur in individuals with ADHD. These include, but are not limited to, differences in executive functioning, working memory, arousal and alertness, and time estimation. These are outlined below.

Executive function

As with autism, individuals with ADHD have deficits in executive function. This includes organising, prioritising and activating tasks; focusing, sustaining and shifting attention to tasks; regulating alertness, sustaining effort and processing speed; managing frustration and modulating emotions; using working memory; and accessing recall.

Overall, this results in ADHD affecting a person's ability to self-regulate, because executive functions usually enable a person to control their thoughts, words, actions and emotions. Executive function also helps us perceive and manage time, and direct and manage our behaviour over time. In neurotypical children, executive functioning abilities are thought to develop sequentially, with each new skill building on previous ones. This usually starts at around two years old, with full development achieved at around age 30. In neurodiverse children with ADHD, these skills are significantly delayed, by approximately 30% or three to six years. Further, most individuals with ADHD only develop up to 75–80% of the executive functioning capacity of their neurotypical peers, meaning that this lag continues throughout life.

Working memory

Individuals with ADHD have dysfunctions in their **working memory**. This is the kind of memory that allows us to process incoming sensory information. For this reason, people with ADHD can have difficulty dealing with visual and spatial information and/or processing auditory information.

Working memory memory that allows us to process incoming sensory information

Alertness the ability to be vigilant and to sustain focus

Arousal and alertness

Alertness is the ability to be vigilant and to sustain focus. Children with ADHD tend to be under-alert or have problems with alertness. For example, individuals with ADHD are more likely to respond quickly and carelessly to tasks, indicating a tendency to act impulsively, which then interferes with learning or achievement.

Time estimation

Individuals with ADHD show variations in how they estimate time. Specifically, in contexts in which time judgement is relevant to learning or decision-making, individuals with ADHD tend to overestimate even very short time intervals.

Check-in questions – Set 2

1 How common is ADHD in Australia?
2 Explain some cognitive variations associated with executive functioning that occur for individuals with ADHD.
3 Explain the cognitive variations associated with arousal and alertness that occur for children with ADHD.

ISBN 978-1-009-25401-4 Gallagher et al

VIDEO 4C–1 SKILLS: VARIATIONS IN BRAIN DEVELOPMENT

4C SKILLS

Questions discussing variations in brain development

It is important that you can explain why conditions such as autism are considered neurodiverse. Let's look at an example of a question that requires an explanation of this in relation to different cognitive variations.

Question

With reference to two different cognitive variations, explain why autism is considered a neurodiverse condition.

Key points to remember

- Ensure you directly address the command terms in the question. In this case, there are two: 'explain why' and 'with reference to'.
- Naming or identifying is not sufficient in questions that require explanation.
- Ensure you can explain why conditions such as autism and ADHD are considered neurodiverse.

Attempted answer

Autism is considered a neurodiverse condition, as it involves symptoms that are related to an individual's cognitive abilities. These are theory of mind and weak central coherence.

Analysis

This answer has simply identified the relevant cognitive variations without explaining why each contributes to autism being considered neurodiverse.

Suggested answer

Autism is considered a neurodiverse condition, as it involves symptoms that are related to an individual's cognitive abilities. These are theory of mind and weak central coherence. Theory of mind is the ability to understand another person's thoughts or point of view. Individuals with autism usually have a delayed development of theory of mind or struggle to develop this skill at all. This results in them having difficulty understanding what others are thinking. Central coherence is another cognitive ability and involves being able to establish meaning from a mass of information. This ability is usually weakened in those with autism. As such, they may get caught up in minute details and find it difficult to establish the broader meaning of the information.

Section 4C questions

1 Why did Judy Singer propose the term neurodiversity?
2 Briefly describe the procedure involved in the Sally–Anne test developed by Baron-Cohen, Leslie and Frith (1985).
3 Explain the purpose of the 'belief' question in the Sally–Anne test.
4 Briefly describe the results of Baron-Cohen, Leslie and Frith's original 1985 study.
5 Amanda's son Will is five years old and has just been diagnosed with autism. In light of Will's neurodiverse diagnosis, describe two cognitive variations that he may have because of his having autism.
6 a List three key symptoms of ADHD.
  b Use your understanding of two cognitive variations in ADHD to explain at least one of these symptoms.

ISBN 978-1-009-25401-4 Gallagher et al

4D Supporting psychological development and mental wellbeing

Study Design:
The role of mental health workers, psychologists, psychiatrists and organisations in supporting psychological development and mental wellbeing as well as the diagnosis and management of atypical behaviour, including culturally responsive practices

Glossary:
Cultural responsiveness

ENGAGE

Cultural responsiveness in the DSM-5-TR

The *Diagnostic and Statistical Manual of Mental Disorders*, Fifth Edition, Text Revision (DSM-5-TR), released in 2022, is the most up-to-date manual for use by physicians and health professionals, including psychiatrists, psychologists and mental health workers, in diagnosing mental disorders. It includes a common language for clinicians involved in the diagnosis and study of mental disorders and helps them make an unbiased, objective assessment of the symptoms of the individual. It can be used in a variety of settings, including hospitals and private practice.

The DSM-5-TR, like its earlier editions, provides information on each mental disorder, including its prevalence, development and course, and its risk and causal factors. However, this latest edition also incorporates greater cultural sensitivity. This includes criteria that reflect cross-cultural variations in presentations, more detailed and structured information about cultural concepts of distress, and a clinical interview tool to facilitate comprehensive, person-centred assessments. These are important practices for providing culturally responsive mental health care, which is discussed in this section.

EXPLAIN

The role of psychologists, psychiatrists, organisations and mental health workers

When an individual is diagnosed with a neurodevelopmental disorder like autism or ADHD, a mental disorder like depression or anxiety, or if they are demonstrating atypical behaviours of concern, a wealth of support is available for both the person and their family. These supports include psychologists, psychiatrists, mental health workers and various organisations. Let's look at the roles these supports play in individuals' psychological development and mental wellbeing.

ISBN 978-1-009-25401-4 Gallagher et al

The role of psychologists

To register as a psychologist in Australia requires the completion of at least six years of education and training in psychology. While their study is in psychology, not medicine, psychologists are able to diagnose mental disorders and associated atypical behaviours. However, instead of focusing on medical or biological causes, such as chemical imbalances in the brain or hormonal issues, they focus on the thoughts and emotional state of the individual. Further, because psychologists do not have a medical degree, they cannot prescribe medications, nor can they perform medical procedures. What psychologists can do is assess an individual's mental health overall and provide management plans and treatments for mental disorders. They can also provide counselling or psychotherapy, which can involve changing thinking patterns and behaviours to improve mental wellbeing. Often, in the case of mental disorders, psychologists work closely with a psychiatrist who handles the medical treatment of a patient's mental disorder, while the psychologist handles counselling and psychotherapy.

In supporting psychological development, a psychologist may help a child with learning, behaviour, emotions or mental health. If a child has health, development or wellbeing concerns, psychologists can help the child and their family understand the diagnosed condition and treatment. Specifically, they can perform educational and developmental assessments, such as intelligence testing and tests to assess memory and cognitive processing speed. In addition, they can provide support with learning difficulties, neurodevelopmental disorders (e.g. ADHD), defiant or difficult behaviours, and social skills development (e.g. in children with autism).

Figure 4D–1 The role of psychologists in supporting psychological development can include helping a child with their learning, behaviour, emotions or mental health.

Figure 4D–2 As well as providing psychological support, psychiatrists can prescribe medications, admit a patient to hospital if needed and administer some medical treatments.

The role of psychiatrists

Psychiatrists complete approximately 12 years of study to qualify and register with the Royal Australian and New Zealand College of Psychiatry. This involves obtaining a medical degree (4–6 years), doing on-the-job training in a hospital (1 year) and completing specialist training in psychiatry (5 years). Psychiatrists are therefore medical doctors who are experts in mental health. They specialise in diagnosing and treating people with mental disorders. Like a psychologist, they can assess mental and physical symptoms, make a diagnosis and work with the individual to develop a management plan for treatment and recovery. They also provide psychological treatment; however, unlike psychologists, they can also prescribe medications and perform medical procedures (e.g. deep brain stimulation). They can admit a patient to hospital if required.

When supporting psychological development, psychiatrists can be particularly useful when a child or adolescent has persistent atypical

ISBN 978-1-009-25401-4 Gallagher et al

behaviours, mental health problems or neurodevelopmental issues. They can help diagnose behavioural and emotional problems, neurodevelopmental disorders and intellectual disabilities. They can prescribe medications to help, admit a child or adolescent to the hospital if needed, and provide psychological support for the child and their family.

Table 4D–1 Similarities and differences between the role of psychologists and psychiatrists in diagnosing and managing atypical behaviours

Psychologist	Similarities	Psychiatrist
Study for six years, not including a medical degree	Specialise in mental wellbeing	Study for 12 years, including a medical degree
Focus on the thoughts and emotional state of the individual	Can assess mental health, diagnose and manage mental disorders and associated atypical behaviours	May focus more on medical or biological causes for mental disorders, like chemical imbalances in the brain or hormonal issues
Tend to provide counselling or psychotherapy, which can involve changing thinking patterns and behaviours to improve mental wellbeing	Can provide psychological treatments such as counselling or psychotherapy and perform psychological testing	Can prescribe medications, perform some medical procedures and admit someone to hospital if required

Check-in questions – Set 1

1 How can a psychologist help an individual with a mental health problem or disorder?
2 How can a psychologist help an individual with developmental problems or disorders?
3 How can a psychiatrist help an individual with a mental health problem or disorder?
4 How can a psychiatrist help an individual with a developmental problem or disorder?

The role of organisations

An enormous range of services are made available by not-for-profit and government-based organisations at no cost to those diagnosed with atypical behaviours, mental disorders and/or developmental issues. These services can be particularly helpful for those individuals and families who cannot afford to see a psychiatrist or psychologist, which can be costly, despite being subsidised by Medicare. Many organisations also provide access to support for those living in remote areas or areas that lack resources. Let's look at some examples of these organisations and the services they provide.

SANE Australia

SANE Australia is committed to providing affordable access to quality clinical and psychosocial support services that can support the recovery of people diagnosed with mental disorders, enabling them to lead better lives. This includes people and their families who are currently living with complex mental health issues such as schizophrenia spectrum disorders, bipolar and related disorders, obsessive-compulsive and related disorders, personality disorders, trauma-related disorders, eating disorders and severe depression and anxiety. SANE Australia offers a range of free services, including factsheets and guides with easy-to-read information and containing personal stories of hope and recovery; opportunities for peer connection and learning through supportive peer groups and an anonymous online forum; and compassionate support from mental health counsellors via phone, chat and email.

ISBN 978-1-009-25401-4 Gallagher et al

Beyond Blue

Beyond Blue provides information and support to help everyone in Australia achieve their best possible mental health, whatever their age and wherever they live. It has been providing support and services to people in Australia for 20 years, focused on supporting those affected by anxiety, depression and suicide. Beyond Blue provides a 24/7 free phone service, online chat service and anonymous forums. In addition, it provides trusted information about maintaining mental health, preventing suicide and steps for recovery.

headspace

headspace is the National Youth Mental Health Foundation. It began in 2006 and provides early intervention mental health services for young people aged 12–25 years. headspace supports young people with mental health, physical health (including sexual health), alcohol and other drug services, as well as work and study support. With a focus on early intervention, headspace works with young people to provide support at a crucial time in their lives – to help get them back on track and strengthen their ability to manage their mental health in the future. Services offered include counselling in person in their centres, online and over the phone; interactive self-help information online; as well as work and study programs.

Autism Spectrum Australia (Aspect)

Autism is often diagnosed at an early age, so Autism Spectrum Australia (Aspect) provides support to prepare parents and families with young children diagnosed with autism for the next stage of their lives as they become a 'different brilliant'. They provide resources and services for children at all stages of the life span, from the early years (0–4) through primary school and adolescence. Specifically, Aspect provides assessments for autism across the life span, which can identify developmental difficulties and determine which strategies and supports will assist someone to achieve their goals and reach their full potential. Through Aspect@nywhere, therapy services provided include speech pathology, occupational therapy, psychological support, education and skills development, positive behaviour support, telehealth services and parent training, all of which are delivered in an environment that best suits the individual, family and goals for intervention.

ADHD Australia

ADHD Australia is a registered national, independent, non-profit organisation committed to removing barriers to wellbeing for those living with ADHD. It aims to create positive public awareness and improved understanding through evidence-based information and by reducing the stigma associated with ADHD. They provide a regular newsletter and information on evidence-based research findings, and they work closely with a number of ADHD parent and carer support groups around Australia.

ACTIVITY 4D–1 LOCAL ORGANISATIONS THAT SUPPORT MENTAL WELLBEING AND PSYCHOLOGICAL DEVELOPMENT

Find an organisation in your local area that provides support for either mental health or psychological development. List the services that people in your area can access from this organisation that would help them maintain their mental wellbeing.

ISBN 978-1-009-25401-4 Gallagher et al

Figure 4D–3 Mental health support workers can be an integral part of a support and recovery plan.

The role of mental health support workers

Mental health support workers work with people who have mental disorders, as well as their carers families, and friends. Mental health support work does not involve counselling or specific treatment but more general support, which is guided by other mental health practitioners such as psychiatrists.

Their role involves providing everyday support and helping clients:

- to develop individual recovery plans
- to review their recovery plans
- to monitor their own progress
- to meet their goals
- to manage their daily activites
- to connect with their local community
- to obtain health and social services.

Mental health support workers work with outreach programs and mental health groups as well as individuals. They also provide referrals to health, social and community services.

Culturally responsive practices in the diagnosis and management of atypical behaviour

As Australia's cultural diversity continues to grow, mental health services must understand and respond to cultural differences within the community. This is because cultural beliefs about what constitutes a mental disorder or neurodiversity, and how to respond to it, affect how people seek help and whether they will choose to access services. In 2005, the National Health and Medical Research Council of Australia recognised that:

> All Australians have the right to access health care that meets their needs. In our culturally and linguistically diverse society, this right can only be upheld if cultural issues are core business at every level of the health system – systemic, organisational, professional and individual.

ISBN 978-1-009-25401-4 Gallagher et al

Cultural responsiveness respect for, and relevance to, the health beliefs, health practices, culture and linguistic needs of diverse populations and communities

Cultural responsiveness requires that health care services be respectful of, and relevant to, the health beliefs, health practices, culture and linguistic needs of diverse populations and communities. This includes communities whose members identify as having specific cultural or linguistic needs as a result of, for example, their place of birth, ancestry or ethnic origin, religion, preferred language or language spoken at home. In Australia, these communities include, but are not limited to, Aboriginal and Torres Strait Islander peoples; people from culturally and linguistically diverse backgrounds; refugees and displaced peoples; people with different abilities, including intellectual and cognitive disabilities; and LGBTQIA+ people.

To accommodate these needs when managing and diagnosing atypical behaviours associated with developmental issues or mental disorders, mental health professionals employ culturally appropriate practices. This ensures that the health care provided is targeted to individuals, empowering them to manage their own mental health, irrespective of their social or cultural group.

Evidence shows that when there is a lack of cultural responsiveness, wellbeing outcomes tend to be much poorer. In 2020, Victorian Transcultural Mental Health (VTMH), the leading transcultural and intersectional mental health service for Victoria, created a set of cultural responsiveness principles and practices. These principles guide the provision of mental health care in Victoria and include the need for cross-cultural perspectives, cultural safety and cultural humility in mental health care, and the importance of culturally responsive approaches to recovery. Let's look at these a little closer.

Cross-cultural perspectives

This principle emphasises the importance of mental health professionals recognising that what constitutes a mental disorder, and its key characteristics (e.g. distress), are not universal. Further, social groups and cultural contexts can influence whether and how someone will seek help. Culturally responsive practices that accommodate varied perspectives include:

- listening to communities
- acknowledging differences and injustices
- finding broad agreement on issues and identifying collective priorities
- pursuing universal goals, such as zero deaths from suicide, which should include targeted strategies and programs.

Cultural safety

The principle of cultural safety involves acknowledging that there is often a power dynamic in mental health service systems that favours the professionals involved, rather than the patients, who have less power. This is especially true for people from culturally diverse backgrounds, including those identified previously (e.g. Aboriginal and Torres Strait Islander peoples, refugees and displaced people). Mental health professionals can use a range of culturally responsive practices to help meet diverse clients' needs, including:

- avoiding imposing their own cultural values on others
- encouraging patients to communicate, ensuring that they listen and treat them with respect
- allowing trusted family or friends to be involved or informed about a patient's diagnosis or treatment plan
- acknowledging and accommodating the fact that a client or patient has little power when accessing mental health services, particularly if they are admitted against their will for their own safety, and that this can be a source of lasting harm and distress.

ISBN 978-1-009-25401-4 Gallagher et al

Cultural humility

Having cultural humility involves the willingness and ability to listen to and learn from people's lived experiences. We need to move beyond concepts of cultural sensitivity and cultural competence towards understanding power imbalances and institutional discrimination, as they apply to health care. Mental health professionals who practise cultural humility will:

- make a lifelong commitment to self-reflection and self-critique
- recognise and challenge the power imbalances in client/patient and professional relationships
- develop partnerships with communities that are mutually beneficial and not overly protective.

Cultural responsiveness and recovery

This last principle recognises that culture shapes the expression of mental health problems, how they are experienced, preferred modes of coping, pathways to care and the effectiveness of treatment and prevention, as well as the processes of resilience and recovery. Culturally responsive recovery-based practices can include:

- respect for the health beliefs, practices, culture, language and faith of diverse populations
- the provision of services that are accessible, approachable, acceptable, accommodating, affordable and appropriate
- finding ways to work with people in the context of their lives.

WORKSHEET 4D–1 CULTURALLY RESPONSIVE PRACTICES

ACTIVITY 4D–2 ORGANISATIONS THAT PROVIDE CULTURALLY RESPONSIVE SUPPORT

Choose one of the organisations mentioned in this section. Visit the organisation's website to establish whether the services they provide are culturally responsive.

Is there any evidence that this organisation uses practices in line with VTMH's cultural responsiveness principles and practices? Provide examples.

If not, provide examples of practices they could implement to improve their cultural responsiveness.

Check-in questions – Set 2

1. Why is it important that organisations provide services for mental wellbeing in the community?
2. Provide an example of one organisation that supports mental wellbeing in the community and describe some of the services it offers.
3. What is meant by cultural responsiveness in health care?
4. Provide three examples of different social or cultural groups that exist in Australia.
5. How can mental health care professionals make sure that they consider different cultural perspectives when providing health care?
6. How can mental health care professionals incorporate cultural humility into their provision of health care?

ISBN 978-1-009-25401-4 Gallagher et al

VIDEO 4D–1 SKILLS: CONCEPT MAPPING

4D SKILLS

Concept mapping

In Chapter 3, you read about the importance of keeping a glossary or set of flashcards to help remember key concepts. It is also important to be able to draw links between concepts to show how they are related. This can be done using concept maps.

3D SENSITIVE AND CRITICAL PERIODS IN PSYCHOLOGICAL DEVELOPMENT LINK

Try writing all the key terms from this chapter onto sticky notes or small pieces of paper. Then move them around and position them on a poster or A3 page. Place the heading for the chapter ('Typical and Atypical Development') in the middle of the page, then draw lines outwards from this central idea to the main concepts covered by the chapter and then to each concept's related ideas. These lines should represent the relationships between the different concepts and should be annotated to explain the link.

You could also do this electronically, using a mind-mapping app or website. You can then use your concept map when trying to predict the sorts of questions you might be asked about a topic.

Section 4D questions

1 Both psychologists and psychiatrists support psychological development and mental wellbeing, and the diagnosis and management of atypical behaviour. For each role **a**–**k** below, state whether this is typically done by a psychologist, a psychiatrist or both.
   - **a** Focus on the thoughts and emotional state of the individual.
   - **b** Prescribe medications and perform medical procedures.
   - **c** Assess an individual's mental health overall and provide management plans and treatments for mental disorders.
   - **d** Provide counselling or psychotherapy, which can involve changing thinking patterns and behaviours to improve mental wellbeing.
   - **e** Help a child and their family understand a diagnosed condition and treatment.
   - **f** Perform educational and developmental assessments, such as intelligence testing and tests to assess memory and cognitive processing speed.
   - **g** Specialise in diagnosing and treating people with mental disorders.
   - **h** Provide support with learning difficulties, neurodevelopmental disorders, defiant or difficult behaviours and social skills development.
   - **i** Diagnose behavioural and emotional problems, neurodevelopmental disorders and intellectual disabilities.
   - **j** Perform procedures such as deep brain stimulation.
   - **k** Admit an individual to hospital if required.
2 Explain the role of organisations in supporting psychological development and mental wellbeing.
3 Describe the role of mental health workers in supporting psychological development and mental wellbeing.
4 Why is providing culturally responsive mental health care particularly important in a country like Australia?
5 You are a psychologist offering mental health support to people from cultural backgrounds different to your own. How might you implement the principles of cross-cultural perspectives, cultural safety, cultural humility and cultural responsiveness and recovery in your practice?

ISBN 978-1-009-25401-4 Gallagher et al

Chapter 4 review

Summary

Create your own set of summary notes for this chapter on paper or in a digital document. A model summary is provided in the Teacher Resources, which can be used to compare with yours.

Checklist

In the Interactive Textbook, the success criteria are linked from the review questions and will be automatically ticked when answers are correct. Alternatively, print or photocopy this page and tick the boxes when you have answered the corresponding questions correctly.

Success criteria – I am now able to:		Linked questions
4A.1	Understand that there are different psychological criteria used to categorise typical and atypical behaviours	1☐, 2☐, 3☐
4A.2	Define typical and atypical behaviours and provide examples of each	4☐
4A.3	Describe the different psychological criteria used to categorise typical and atypical behaviours	2☐, 12a☐
4A.4	Use the different psychological criteria to distinguish between typical and atypical behaviours	2☐, 3☐ 12a☐
4A.5	Evaluate the usefulness of the psychological criteria used to categorise behaviours as typical or atypical	12b☐
4B.1	Understand the concepts of normality and neurotypicality	5☐
4B.2	Understand that behaviours can be viewed as adaptive or maladaptive for a specific individual	13b☐
4B.3	Explain the concept of normality	13a☐
4B.4	Explain the concept of neurotypicality	5☐
4B.5	Describe what is meant by adaptive emotions, behaviours and cognitions and provide examples of each	6☐
4B.6	Describe what is meant by maladaptive emotions, behaviours and cognitions and provide examples of each	13c☐
4B.7	Apply the concepts of normality and neurotypicality by considering whether certain behaviours are adaptive or maladaptive for a specific individual	13d☐
4C.1	Understand that normal variations of brain development exist within society	7☐, 14a☐
4C.2	Understand that neurodiversity is an example of these normal variations in brain development	7☐, 14a☐
4C.3	Explain what is meant by normal variations of brain development	14a☐
4C.4	Explain neurodiversity and provide examples	14a☐, b☐
4C.5	Apply my understanding of neurodiversity to brain development	14a☐
4D.1	Understand the role of organisations, mental health workers, psychologists and psychiatrists in supporting psychological development and the diagnosis of atypical behaviour	8☐, 10☐, 13c☐
4D.2	Describe the role of organisations, mental health workers, psychologists and psychiatrists	8☐, 11☐, 14c☐

ISBN 978-1-009-25401-4 Gallagher et al

Success criteria – I am now able to:		Linked questions
4D.3	Distinguish between the roles of mental health workers, psychologists and psychiatrists	14d ☐
4D.4	Apply my understanding of the roles of mental health workers, psychologists and psychiatrists to the support of psychological development and the diagnosis of atypical behaviour	14c ☐

Key Science Skills

Skills	Questions and Skills boxes
Determine appropriate investigation methodology: case study; classification and identification; controlled experiment; correlational study; fieldwork; literature review; modelling; product, process or system development; simulation	4B Key Science Skills Activity 4B–2 Section 4B questions – 3, 4a, 4b Chapter review – 9
Work independently and collaboratively as appropriate and within identified research constraints, adapting or extending processes as required and recording such modifications	Activity 4B–2 Section 4B question – 4c Chapter review – 10

Multiple-choice questions

1 If the acceptability of a behaviour is considered with reference to cultural norms or standards, which criterion is being used?

A maladaptive behaviour
B social norms
C cultural perspectives
D personal distress

2 Alex drinks a bottle of wine alone every night to cope with her divorce, and this is having an impact on her ability to keep her life in order, see her friends and show up to work on time. According to which criterion is her behaviour atypical?

A statistical rarity
B maladaptive behaviour
C social norms
D personal distress

3 Alex is also experiencing unpleasant or upsetting emotions, including sadness, anxiety and feeling overwhelmed. According to which criterion is her behaviour atypical?

A statistical rarity
B maladaptive behaviour
C social norms
D personal distress

4 Which of the following is not a feature of typical behaviours?

A They are patterns of behaviour that are expected for an individual.
B They conform to standards of what is acceptable in the situation.
C They include skills and abilities that fall within the expected range of development.
D They occur at a different pace compared to similar-aged peers.

ISBN 978-1-009-25401-4 Gallagher et al

5 Neurotypicality refers to
- **A** standard or typical brain functioning, processing and behaviours.
- **B** behaviours that are typical and expected or that conform to standards of what is acceptable.
- **C** atypical brain functioning, processing and behaviours.
- **D** behaviours that are not typical and expected or that do not conform to standards of what is acceptable.

6 Which of the following is not a feature of adaptive behaviours?
- **A** They are helpful for us.
- **B** They allow us to effectively manage and achieve our daily tasks.
- **C** They are unhelpful for us.
- **D** They allow us to do things like attend school or work.

7 Which of the following is not a cognitive variation that occurs because of ADHD?
- **A** dysfunctional executive functioning
- **B** weak theory of mind
- **C** limited time management
- **D** dysfunctional working memory

8 Which of the following best describes the role of a mental health worker in supporting those with mental disorders?
- **A** diagnosing mental disorders and prescribing medication
- **B** conducting psychological testing and conducting psychotherapy
- **C** providing day-to-day support to help clients meet their individual goals and navigate health services
- **D** admitting individuals to hospital if and when required

9 Consider the study by Baron-Cohen and colleagues using the Sally–Anne test of theory of mind. If the study looked at the responses of only one or a few children in-depth, this would be an example of a
- **A** classification and identification method.
- **B** controlled experiment.
- **C** correlational study.
- **D** case study.

10 How could Baron-Cohen and colleagues extend their case study design to gain further insight into the responses of Australian children diagnosed with autism spectrum disorder?
- **A** complete another case study with Australian children
- **B** conduct the Sally–Anne test of theory of mind with a larger sample size of Australian children
- **C** change the aim of the study to include Australian children
- **D** design another test of theory of mind

11 Why are organisations such as Beyond Blue important for providing support to those living with mental health problems or mental disorders?
- **A** They can provide accessible and affordable counselling and support.
- **B** They can diagnose people with a mental disorder.
- **C** They can conduct medical testing or procedures on individuals with mental disorders.
- **D** They can conduct psychological testing and assessments.

ISBN 978-1-009-25401-4

Short-answer questions

12 Omari has always been able to pick up a book and memorise word-for-word all the information on the page. This skill, which was diagnosed as eidetic memory or photographic memory, served him well at high school, where he excelled and achieved the highest possible ATAR of 99.95.

a Using the statistical rarity criterion, determine why Omari's ability would be deemed atypical as opposed to typical. (2 marks)

b Provide a limitation of using statistical rarity to determine whether Omari's behaviour is atypical. (2 marks)

13 Anoushka is usually an outgoing, social teenager, who achieves good marks and enjoys school. However, she has been feeling down and sad recently, as she had an argument with her best friend, and they haven't been in contact for over a week. Anoushka has found it stressful, has had difficulty concentrating at school and lacks motivation. She has also withdrawn socially from her other friends and has been skipping school, as she feels anxious and believes that she doesn't have any friends anymore and no one is on her side.

a According to the definition of normality, would you consider Anoushka's recent patterns of behaviour normal? Justify your response. (2 marks)

b Describe what is meant by maladaptive cognitions, behaviours and emotions, and provide an example of each for Anoushka. (6 marks)

c Anoushka sees a psychologist to help her develop more adaptive cognitions and emotions. Define what adaptive cognition is, and describe a more adaptive cognition that the psychologist might help Anoushka to have, in response to her argument with her friend. (2 marks)

d In part **c** above, your answer describes an adaptive cognition that a psychologist helps Anoushka with. Identify an adaptive emotion that she might have in response to this adaptive cognition, and describe how it would be adaptive for her. (2 marks)

14 Hannah's son Jacob has recently been diagnosed with autism.

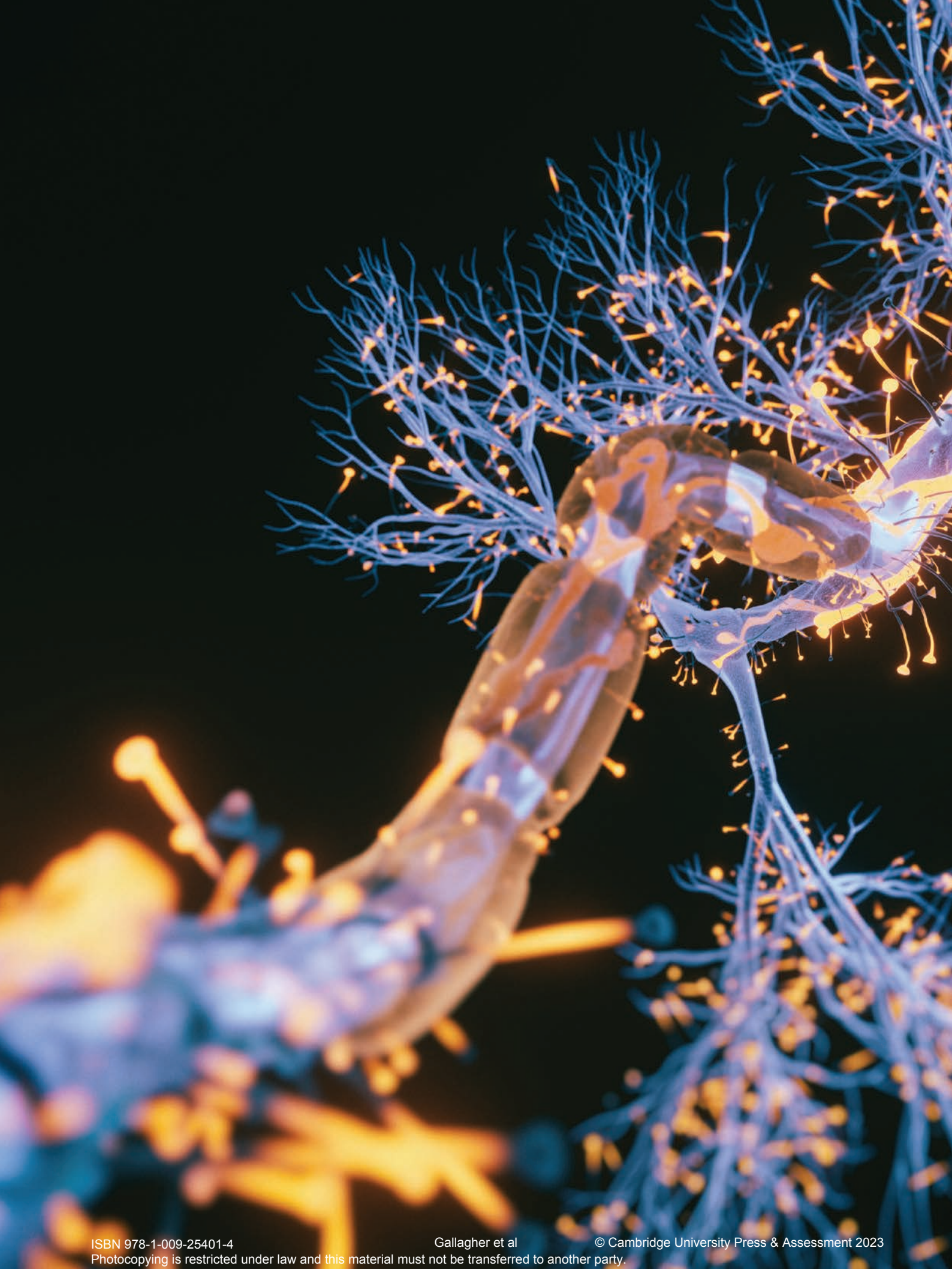
a According to the concept of neurodiversity, why would Jacob be considered to have a normal variation in brain development? (2 marks)

b Describe two different cognitive variations that Hannah may observe in her son Jacob that are associated with autism. (4 marks)

c Hannah sought the help of a psychiatrist to diagnose her son Jacob. Besides diagnosing him, outline two other ways the psychiatrist could help Hannah and/or Jacob. (2 marks)

d Hannah has also been feeling depressed and anxious since her son's diagnosis, so she has started seeing a psychologist to work through her feelings. How would the psychologist differ in the support they provide, compared to a psychiatrist? (1 mark)

ISBN 978-1-009-25401-4 Gallagher et al



ISBN 978-1-009-25401-4
Gallagher et al

UNIT 1

HOW ARE BEHAVIOUR AND MENTAL PROCESSES SHAPED?

CHAPTER 5

ROLE OF THE BRAIN IN MENTAL PROCESSES AND BEHAVIOUR

Introduction

Have you ever stopped to think about all the complex work that your brain carries out in a day, let alone in your lifetime? If you do stop to ponder this, you may consider the multitude of roles the brain plays to keep you alive and allow you to go about your day-to-day tasks. This includes regulating the beating of your heart, playing a role in the breakdown and digestion of food you eat, ensuring you receive an adequate supply of oxygen, focusing your attention on objects in your field of view as you move about, filtering and processing all the noises you pick up through your ears and giving meaning to the words and symbols you see on a page as you read – just to name a few!

This chapter will consider how humans' understanding of the role of the brain has evolved over time and will detail our most recent understanding of how particular structures are involved in behavioural and mental processes.

In Section 5B, we look closely at the different roles of the parts of the brain. However, at the start of that section, you have the opportunity to complete an optional review of the components of the nervous system, which also serves as a scientific foundation for Units 3&4. This knowledge is not required by the Study Design until Year 12, so your teacher may decide to introduce it here or leave it until Units 3&4.

Curriculum

Area of Study 2 Outcome 2
How are mental processes and behaviour influenced by the brain?

Study Design:	Learning intentions – at the end of this chapter I will be able to:
• Different approaches over time in understanding the role of the brain in behaviour and mental processes	**5A Understanding the role of the brain** **5A.1** Understand and describe the influence of different approaches over time to understanding the role of the brain in behaviour and mental processes **5A.2** Distinguish between different approaches over time to understanding the role of the brain in behaviour and mental processes **5A.3** Outline how neuroimaging reveals the role of the brain in behaviour and mental processes

ISBN 978-1-009-25401-4 Gallagher et al

Study Design:	Learning intentions – at the end of this chapter I will be able to:
• The roles of the hindbrain, midbrain and forebrain, including the cerebral cortex, in behaviour and mental processes	**5B The hindbrain, midbrain, forebrain and cerebral cortex** **5B.1** Understand the role of the hindbrain, midbrain and forebrain, including the cerebral cortex, in behaviour and mental processes **5B.2** Describe the role of the hindbrain, midbrain and forebrain, including the cerebral cortex, in behaviour and mental processes **5B.3** Distinguish between the role of the hindbrain, midbrain and forebrain, including the cerebral cortex, in behaviour and mental processes **5B.4** Apply my understanding of the roles of the hindbrain, midbrain and forebrain, including the cerebral cortex, in behaviour and mental processes

Key Science Skills

- Demonstrate ethical conduct and apply ethical guidelines when undertaking and reporting investigations
- Demonstrate safe laboratory practices when planning and conducting investigations by using risk assessments that are informed by safety data sheets (SDS), and accounting for risks
- Apply relevant occupational health and safety guidelines while undertaking practical investigations

Glossary

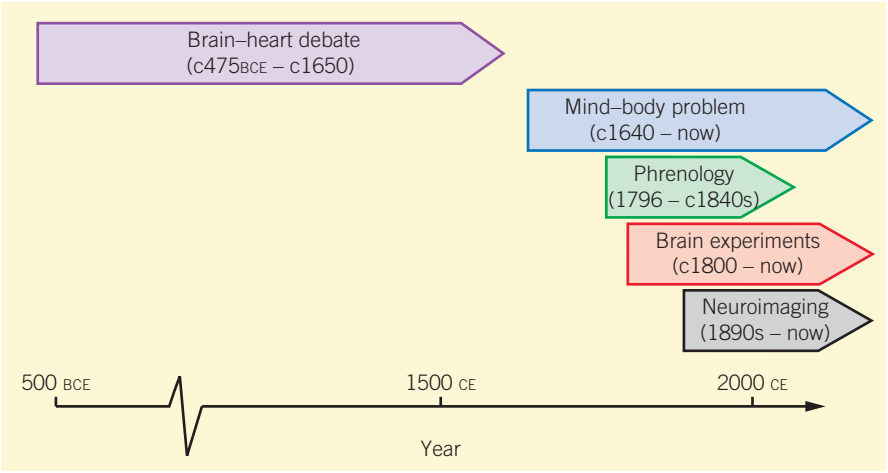
Ablation
Autonomic nervous system
Axon
Axon terminals
Brain–heart debate
Broca's area
Central nervous system (CNS)
Cerebellum
Cerebral cortex
Cerebral hemispheres
Cerebrum
Computerised tomography (CT)
Dendrites
Electrodes
Equipotentiality
Forebrain
Frontal lobe
Functional magnetic resonance imaging (fMRI)
Hemispheric specialisation
Hindbrain
Homeostasis
Hypothalamus
Lesioning
Limbic system
Magnetic resonance imaging (MRI)
Mass action
Medulla oblongata
Midbrain
Mind–body problem
Motor information
Myelin
Nerve impulse
Neurons
Neurotransmitter
Occipital lobe
Parasympathetic nervous system
Parietal lobe
Peripheral nervous system (PNS)
Phrenology
Pons
Positron emission tomography (PET)
Reticular activating system (RAS)
Reticular formation
Sensory information
Somatic nervous system
Substantia nigra
Sympathetic nervous system
Synapse
Temporal lobe
Thalamus
Wernicke's area

ISBN 978-1-009-25401-4

Concept map

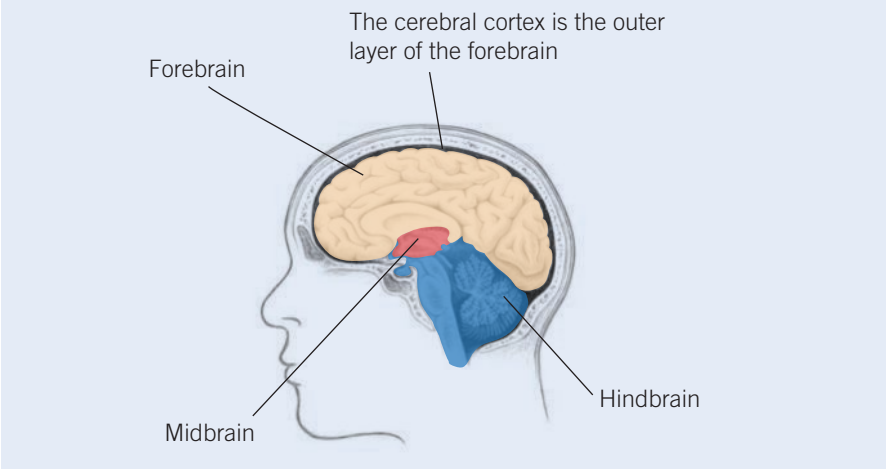
Our evolving understanding of the role of the brain in behaviour and mental processes

5A Understanding the role of the brain



Revealing the brain structures responsible for behavioural and mental processes

5B The hindbrain, midbrain, forebrain and cerebral cortex



See the Interactive Textbook for an interactive version of this concept map interlinked with all concept maps for the course.

ISBN 978-1-009-25401-4 Gallagher et al

Understanding the role of the brain

Study Design:
Different approaches over time in understanding the role of the brain in behaviour and mental processes

Glossary:
Ablation
Brain–heart debate
Computerised tomography (CT)
Electrodes
Equipotentiality
Functional magnetic resonance imaging (fMRI)
Lesioning
Magnetic resonance imaging (MRI)
Mass action
Mind–body problem
Phrenology
Positron emission tomography (PET)

ENGAGE

Why is understanding the brain challenging?

Given the sophisticated modern world in which we live, you may assume that we know all there is to know about the inner workings of the brain. This is not the case. Although much time and effort have been spent studying the brain to understand it better and to help diagnose and treat its associated health conditions, there are still many things about the brain that remain unknown. One of the most amazing things about the brain is its ability to reroute and alter the way in which it functions in response to injury, weakness or change. This adaptability and the interconnectedness of the different parts of the brain make it challenging to study, as changes in one area can have far-reaching implications. In this section, we discuss some of the different approaches over time that have helped humans extend their understanding of the role of the brain.

EXPLAIN

Features and functions of the brain

The brain is made up of about 100 billion neurons, or nerve cells, and is connected to the remainder of the body via the spinal cord and associated peripheral nerves. The nervous system is described in Section 5B. There are also interactions between the brain and the endocrine, or hormonal, system that allow the brain to have a hand in virtually all bodily processes. Not only does the brain contribute to bodily processes, but it also contributes to what we consider our 'humanness', or what sets us apart from other animals. Our brain contributes to our ability to imagine, develop complex languages and communication tools, problem solve and reason, and have hopes and dreams for the future.

Figure 5A–1 The complex networks and structures that make up the brain are more apparent from below than from above.

VIDEO 5A–1 THE ROLE OF THE BRAIN

LINK **5B** THE HINDBRAIN, MIDBRAIN, FOREBRAIN AND CEREBRAL CORTEX

ISBN 978-1-009-25401-4 Gallagher et al

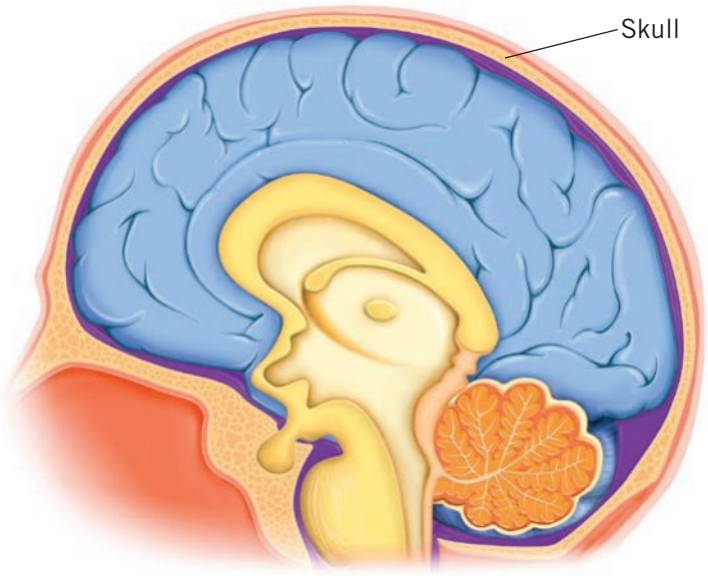


Figure 5A–2 The brain is surrounded by the protective layers of the skull (beige) and the meninges and cerebrospinal fluid (shown combined as the purple layer).

The average adult brain takes up approximately 1300 cm^3 of space and weighs around 1.4–1.5 kg. If you were to bore through the hard, bony case enclosing the brain (the skull), you would encounter three layers of membrane, referred to as meninges, which protect the soft, squishy inner organ. In addition to these two layers of protection, the brain is surrounded by cerebrospinal fluid, which circulates between the meninges and acts as an additional cushion should the brain encounter any sudden movements or knocks. Finally, a network of arteries supplies a rich blood flow to the billions of neurons and other cells that make up the brain so that they can carry out their vital work.

In this section, we will explore the influence of different approaches over time to understanding the role of the brain (Figure 5A–3). Then, in the next section, we will explore in greater detail the structure and function of parts of the brain.

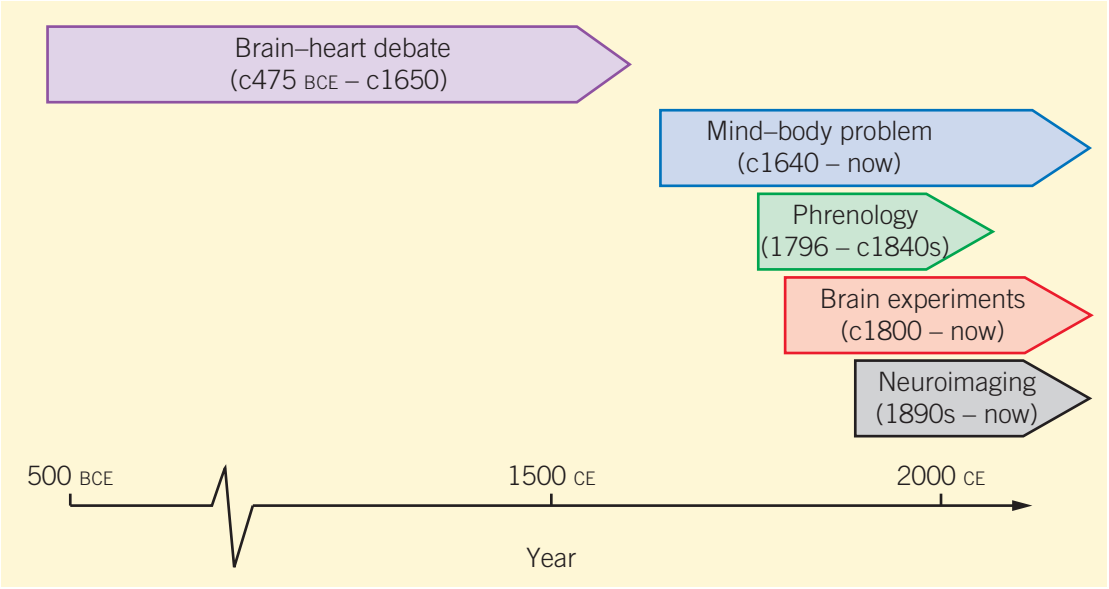


Figure 5A–3 Our understanding of the role of the brain and the techniques used to investigate it have changed over time.

The brain–heart debate

Over time, there have been many advances in the ways in which people have studied and come to understand the role of the brain. As technology has evolved, these approaches have become more complex and our ability to gather data to support our understanding of the role of the brain has improved.

Brain–heart debate the question of whether our thoughts, feelings and behaviours originate from our brain or our heart

The **brain–heart debate** considers whether or not our thoughts, feelings and behaviours originate from our brain or our heart. In today's world, this might seem like an easy question to answer, but as seen in some of the earliest recorded documents by Greek

ISBN 978-1-009-25401-4 Gallagher et al

philosophers, it has historically been a hotly debated topic. One Greek philosopher who engaged actively in this debate was Alcmaeon (approximately 475 BCE), one of the first known writers to identify mental processes as being housed in the brain and conclude that sensory organs, such as the eye, were connected to the brain. On the other side of the debate, Greek philosophers such as Empedocles (approximately 494–430 BCE) and Aristotle (384–322 BCE) argued that mental processes were located in and around the heart, and Empedocles also argued that perceptions were formed in the blood. This contributed to the brain–heart debate among philosophers. It is worth mentioning that Aristotle's ideas dominated scientific thought in Europe and neighbouring regions until the seventeenth century.

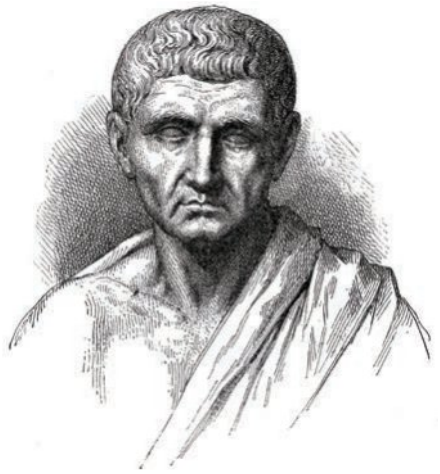


Figure 5A–4 One Greek philosopher who believed mental processes were located around the heart was Aristotle.

In addition to Alcmaeon, other Greek physicians, such as Hippocrates (460–375 BCE) and Herophilus (335–280 BCE), believed that mental processes and emotion arose from the brain. Much of their thinking came from their work dissecting the bodies of animals and some humans and then detailing their findings in notes for their colleagues and the wider world.

Another influential Greek physician who supported the brain hypothesis was Galen (129–216 CE). Galen made many of his discoveries through treating Roman gladiators. Through this work, he observed that injury to the head and brain affected behaviour, while gladiators who had injuries to their hearts were still able to think and reason. Galen concluded that this demonstrated that such processes did not lie within the heart, and through additional tests, he determined that they were housed in the brain. Although some of Galen's ideas about the brain and its functions were inaccurate, he was correct about many things. Nevertheless, incorrect ideas about the role of the brain and heart persisted into the nineteenth century, although they underwent refinement over time.

Figure 5A–5 The Greek physician Galen's work was influential on the brain side of the brain–heart debate.

Although there is a two-way connection between the heart and the brain, with the heart having an influence how we think, feel and behave, and vice versa, in the twenty-first century, with overwhelming amounts of data collected from thousands of studies, it is accepted that the brain houses the body's mental processing and is where the instructions to carry out behaviours are processed and dispatched.

Mind–body problem
the extent to which the mind and the body are the same or separate things

The mind–body problem

You may have never stopped to consider the deep connections between the mind and the body, but there are many. The **mind–body problem** concerns the extent to which these two entities are the same or separate things. Questions that arise from this problem include, 'Is the mind part of the body?' or 'Is the body part of the mind' and 'Who is in charge: the mind or the body?'

To engage in this discussion, it is useful to understand that when referencing the mind, we are referring to a non-physical entity – the conscious 'thinking' you that experiences your thoughts – whereas the body, including the brain, is the physical entity that carries out biological processes.

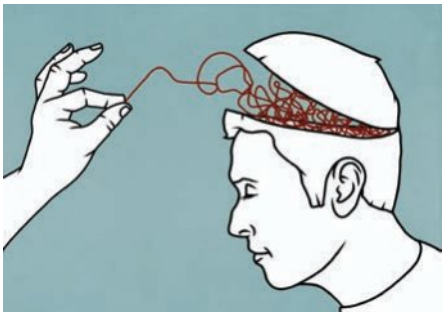


Figure 5A–6 The influence of the body on the mind has been deeply considered over time.

ISBN 978-1-009-25401-4 Gallagher et al

Figure 5A–7 French philosopher Rene Descartes outlined a theory called 'dualism'.

Prior to the view set forth by the seventeenth-century French philosopher Rene Descartes, most Western philosophers, influenced by Aristotle, considered the mind and body to be one and the same. Aristotle believed that the soul (roughly equivalent to what we refer to as the mind) was the living essence of a person's physical body. In the seventeenth century, Descartes outlined his theory of 'dualism', in which he suggested that the mind and the body were separate entities, one physical in nature and one non-physical. He contended that they interacted via the pineal gland, a small structure located deep in the brain. Descartes believed that the body could influence the mind and the mind could influence the body, and that this two-way interaction contributed to our thoughts, sensations and bodily emotions.

Although he was wrong about the pineal gland, which we now know plays a key role in regulating the body clock, Descartes moved human understanding and discussions forward regarding the interaction between mind and body. Over time, scientists have come to understand that the mind and the body can influence one another in myriad ways, and there is no one central structure that forms a link between the two. Indeed, the vast array of linkages, interactions and how we might be able to influence these remains an active, and fascinating, area of scientific research.

In addition to continuing to study mind–body interactions, modern science continues to devote a great deal of attention to one specific part of the body – the brain. Much research is being conducted on our conscious experience and the activity of our brain. Questions posed include, 'Is our mind aware of our brain activity' and 'Can we be consciously aware without experiencing brain activity?' Questions such as these are likely to keep scientists interested in the mind and the body, including the brain, for many years to come.

Phrenology

Phrenology the study of the shape of the skull as an indicator of the extent of one's mental faculties and character traits

Although now discredited by science, **phrenology** was the study of the shape of the skull as an indicator of the extent of one's mental faculties and character traits. Through his studies and comparisons of animal and human skulls and brains, German doctor Franz Joseph Gall (1758–1828) became convinced that each part of the cerebral cortex was enlarged or reduced depending on the individual's mental faculties, traits and personality, and that these differences resulted in subtle changes in the contours of the skull that could be felt externally. Gall believed that certain areas of the brain were responsible for specific functions and that bumps and indentations on the head could be linked to the personality, character and abilities of the individual.

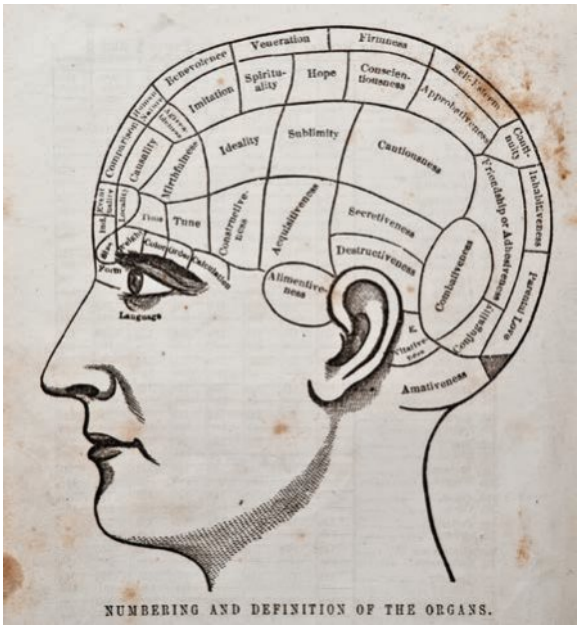


Figure 5A–8 Science has come a long way in its understanding of the brain and how it functions. This phrenology chart was published in 'Phrenological Journal and Life Illustrated' by Samuel Wells in 1865.

ISBN 978-1-009-25401-4 Gallagher et al

Assisted by his colleague Johann Spurzheim (1776–1832), Gall sought evidence for his ideas by examining the skulls of people in places such as prisons and hospitals, based on which he developed a system of 27 'faculties', each of which he believed belonged to a different region of the head.

These were:

- reproductive instincts
- the love of one's offspring
- affection and friendship
- self-defence, courage and fighting
- carnivorous or murderous instincts
- guile, acuteness and cleverness
- sense of property and the tendency to steal
- pride, arrogance, haughtiness, love of authority and loftiness
- vanity, ambition and love of glory
- circumspection and forethought
- aptitude for being educated
- sense of locality and place
- recollection of people
- verbal memory
- language ability
- sense of colours
- sense of sound and musical talent
- mathematical abilities
- mechanical abilities
- intelligent choices and good judgement
- metaphysics
- satire and wit
- poetic talent
- kindness, compassion, sensitivity and moral sense
- imitation and mimicry
- religiosity
- perseverance and firmness of purpose.

Spurzheim went on to promote phrenology in the United States and the United Kingdom, where it became quite popular. Over time, the method began to be exploited for making behavioural and personality assessments, and by the 1850s it had become discredited.

Although phrenology as a science has been discounted, Gall's idea that particular areas of the brain play a significant role in the functioning of different areas of the body was accurate. This is now referred to as localisation of function. However, in reality, many areas of the brain are involved when we think, feel and act.

Check-in questions – Set 1

1 Describe the brain–heart debate in understanding the role of the brain.
2 Explain how phrenology described the role of the brain.
3 Describe the mind–body problem.

The first brain experiments

Many experiments that were once conducted on the brains of humans and animals would be considered unethical by today's standards. However, exploring some of these approaches helps us to understand how we have come to ascertain many of the functions of the brain.

Some of the earliest known experiments on the brain involved removing brain tissue using a procedure called **ablation** to determine whether this caused any changes in behaviour or function. Pierre Flourens (1794–1867) was a French physiologist who performed brain ablation by **lesioning** on animals (e.g. rabbits and pigeons) to determine what effect this would have. His work challenged the notions of phrenology and established the idea of 'holistic' brain function. He found that removing small sections of the cortex initially resulted in a loss of movement, but that this loss could be recovered over time. He believed that the remaining areas of the cortex were able to take up the function that was initially lost.

Ablation the surgical removal or destruction of tissue (e.g. brain tissue) by lesioning or using electrodes

Lesioning the creation of small areas of damage (lesions) in the brain

ISBN 978-1-009-25401-4 Gallagher et al

Figure 5A–9 Early brain experiments involved lesioning the brain. This kind of neurosurgery is now done only very rarely and under strict controls.

Equipotentiality the ability of healthy areas of the cortex to take over the functions of injured parts

Mass action the involvement of large areas of the brain in functioning as a whole in order to carry out complex functions

Electrodes small wires used to electrically stimulate biological tissues or measure electrical activity in these tissues

The American psychologist Karl Lashley, building on the work of Pierre Flourens, used ablation on chimpanzees, monkeys and rats in an effort to locate the part of the brain responsible for learning and memory. Lashley taught his animal subjects tasks and then used brain lesioning to see whether memory loss occurred. From this, he was able to conclude that learning and memory are situated throughout the brain rather than in a single location. The experiments that Lashley conducted led him to develop the two brain function principles of equipotentiality and mass action. **Equipotentiality** is the idea that healthy areas of the cortex can take over the function of injured parts, while the concept of **mass action** holds that complex functions are often carried out by large areas of the brain that function as a whole, and that if part of the brain is destroyed, then impairments in function will depend on the amount of tissue lost.

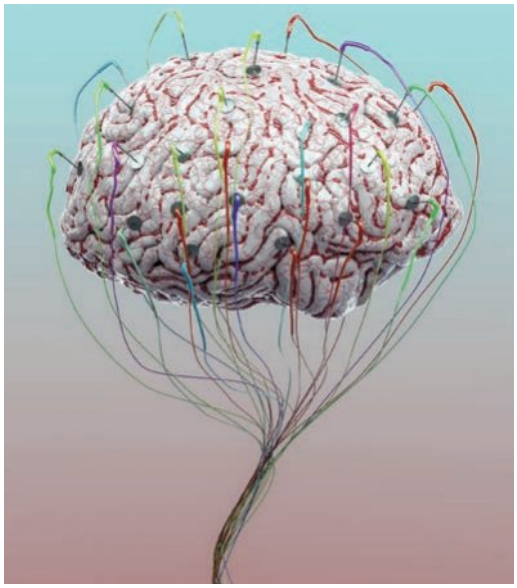


Figure 5A–10 An artist's impression of the concept of electrodes to stimulate the brain and record brain activity.

In addition to ablation and lesioning, another technique used in some of the earliest known brain experiments was direct electrical stimulation of the brain. As you may know, the nerve cells in the brain (the neurons) generate weak electrical signals. These signals can be picked up by **electrodes**, which are small wires used to electrically stimulate biological tissues or to measure electrical activity in these tissues. If an electrode is placed on or into a specific area of the brain and stimulation leads to a bodily response (e.g. muscle activation), it can be assumed that area of the brain is responsible for that action.

ISBN 978-1-009-25401-4 Gallagher et al

Early use of electrical stimulation of the brain was reported by two German doctors: Gustav Fritsch (1838–1927) and his colleague Eduard Hitzig (1838–1907). Using electrodes on the brain of a dog, they discovered that stimulating areas in the motor cortex led to movements on the opposite side of the dog's body.

Experiments using electrical stimulation with humans, as opposed to animals, are far fewer and have mostly focused on understanding conditions such as epilepsy. For example, Canadian neurosurgeon Wilder Penfield (1891–1976) sought to remove the sections of the brain that contributed to epileptic seizures. To achieve this, he needed to locate abnormally and normally functioning brain tissue. He therefore set about electrically stimulating different areas of the human brain using an electrode and recording the responses of his patients, most of whom were conscious during the procedure. As a result of his work, Penfield was able to pool data collected over more than 20 years with other colleagues and create a 'brain map', linking brain areas and functions. Such maps are still in use today.

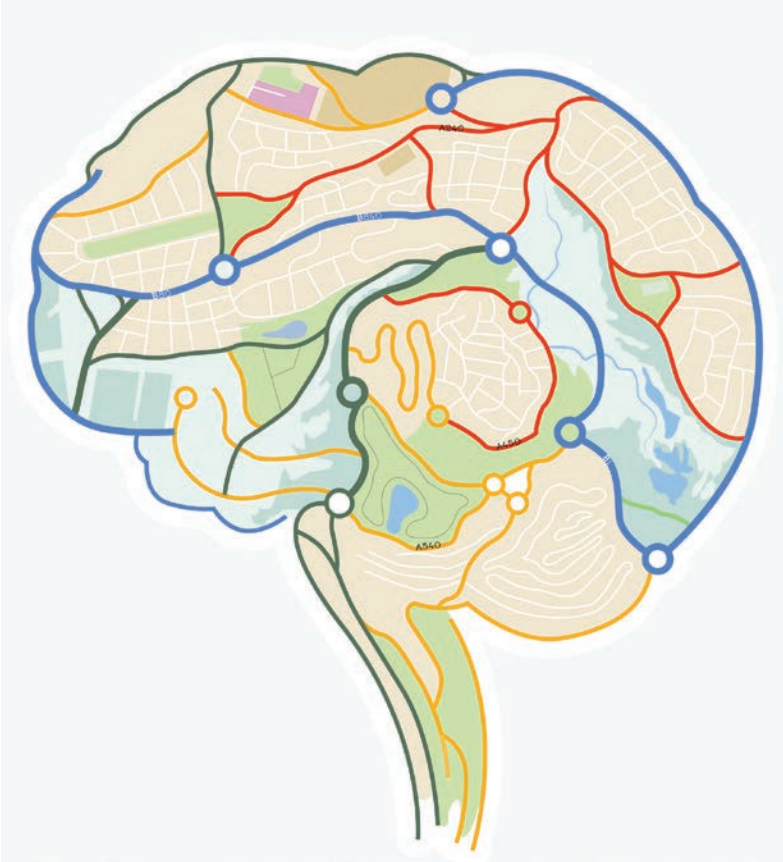


Figure 5A–11 Some of the earliest brain experiments created brain maps that are still in use today.

Techniques using human subjects for research are virtually unheard of today. They are often high risk and very invasive, and the risk of harm is ethically unacceptable, according to current standards for human research. However, modern variants of ablation, lesioning and electrical stimulation are all still used occasionally in brain surgery to treat serious disorders, such as epilepsy.

Neuroimaging techniques

A neuroimaging technique is one that captures an image of the brain. A range of neuroimaging techniques were developed in the twentieth century, mostly for medical diagnostic purposes, and these are much less invasive than previous techniques, which required the brain to be exposed. When neuroimaging techniques are used in research, a participant is typically asked to think, feel or behave in a certain way and a concurrent image of the brain is obtained.

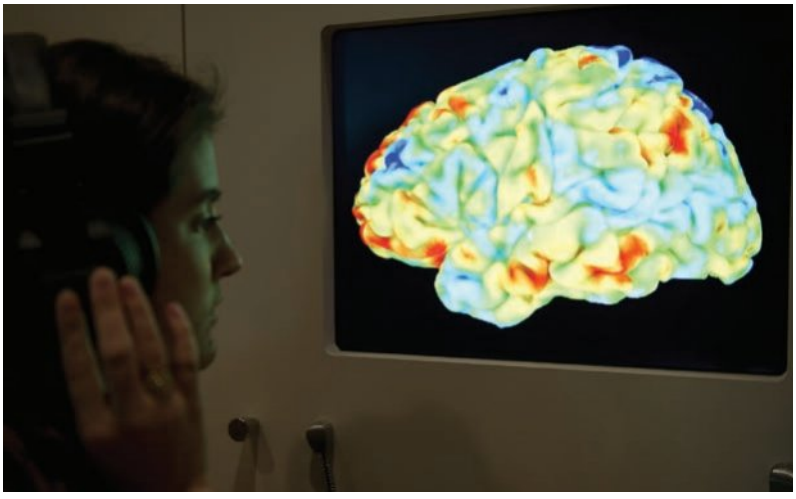


Figure 5A–12 There are many ways to view and study the brain.

ISBN 978-1-009-25401-4 Gallagher et al

Neuroimaging techniques can be categorised as structural or functional. Structural neuroimaging techniques, such as MRI and CT, obtain images of the anatomy of the brain. Functional neuroimaging techniques, such as PET and fMRI, view the brain 'live' during a response and provide information about both function and structure. Let's explore these techniques.

Computerised tomography (CT) an imaging technique that combines a series of x-ray images taken from different angles to create cross-sectional images of the body

Computerised tomography (CT) combines a series of x-ray images taken from different angles to create cross-sectional images of the body. The patient may be required to take or be injected with a substance referred to as 'contrast'. This is a dye that helps to make certain structures more visible, thereby assisting with the interpretation of the images. These images can be used to locate a brain tumour, observe changes in the brain from conditions such as Alzheimer's or Parkinson's disease or determine the degree of brain injury following an injury or stroke.

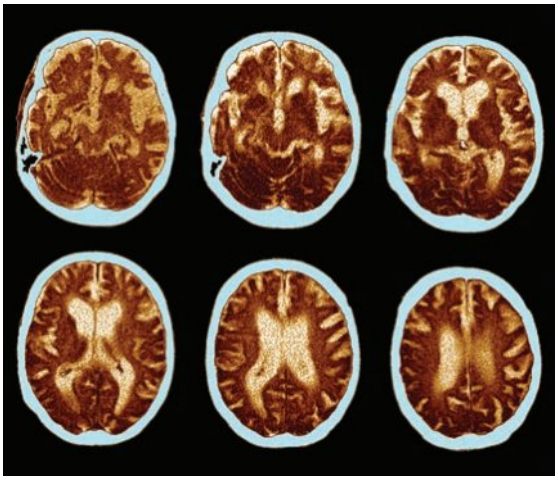


Figure 5A–13 An example of images produced by a CT scan

Magnetic resonance imaging (MRI) an imaging technique that uses magnetic fields to activate atoms in the brain, which then allows a computer to generate an image of the brain

Magnetic resonance imaging (MRI) is a technique that uses magnetic fields to activate atoms in the brain, which then allows a computer to generate an image of the brain. This can be used to diagnose structural abnormalities in the brain. The images produced by MRI are more detailed and clearer than those produced by CT. This imaging technique is used to identify cancerous tissue, signs of a stroke or more subtle abnormalities, such as those seen in multiple sclerosis and other neurological disorders.

Figure 5A–14 An MRI machine

Positron emission tomography (PET) an imaging technique that provides information not only about brain structure but also activity and function by recording the use of glucose by cells in the brain

Positron emission tomography (PET) is a technique that provides information not only about brain structure but also about the brain's activity and function, in full colour. The participant is typically asked to engage in some kind of activity, while images are taken of the 'live brain' at work. Before performing the activity, patients are injected with a glucose solution containing a radioactive tracer. The amount of glucose used by areas of the brain during the task can then be recorded, as it is assumed that active neurons will have increased blood flow. PET scans use a colour code to indicate areas of high and low brain activity, which allows researchers to determine which areas of the brain are more closely aligned to certain tasks.

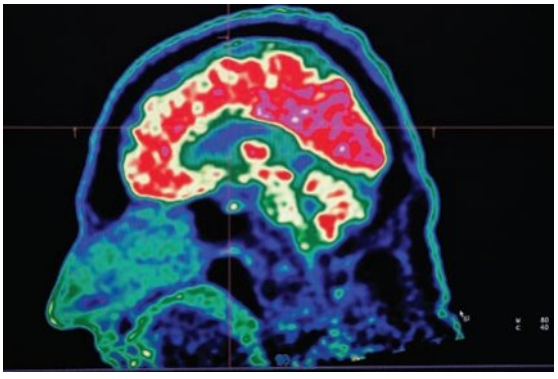


Figure 5A–15 A PET scan image

ISBN 978-1-009-25401-4 Gallagher et al

Another technique used to indicate brain activity is **functional magnetic resonance imaging (fMRI)**. fMRI, available since the 1990s, works by measuring oxygen consumption in the brain with the assumption that blood is more oxygenated in active areas of the brain. An advantage of this technique over PET is that it does not expose participants to radioactive tracers. As with PET, coloured images are produced showing areas of higher (red) and lower (blue) activity. fMRI produces more detailed and accurate pictures than PET and can produce more images in rapid succession, making it the preferred imaging technique in psychological research.

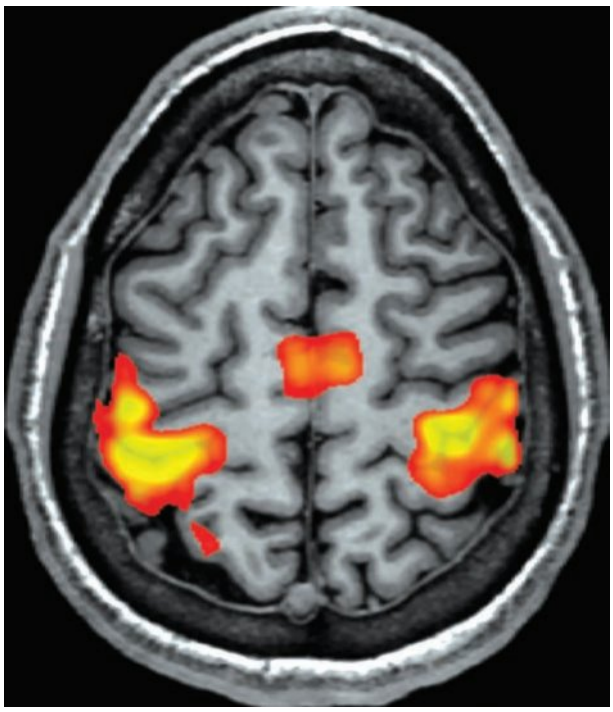


Figure 5A–16 An fMRI image of the brain

Functional magnetic resonance imaging (fMRI) a type of MRI that shows brain activity by measuring oxygen consumption in the brain, with the assumption that active areas consume more oxygen

WORKSHEET 5A–1 ADVANCES IN NEUROIMAGING

Table 5A–1 Main features of neuroimaging techniques

CT	MRI	PET	fMRI
A combination of a series of x-ray images taken from different angles to create cross-sectional images of the body.	A technique that uses magnetic fields to activate atoms in the brain, which then allows a computer to generate an image of the brain.	A technique that provides information not only about brain structure but also brain activity and function, in full colour, by observing the use of glucose by cells in the brain.	A technique that shows brain activity by measuring oxygen consumption by cells in the brain.

ACTIVITY 5A–1 NEUROIMAGING SIMULATIONS

There are some amazing websites where you can view a simulation of a neuroimaging technique in action. Use the link below to deepen your understanding of how MRI is used to gain a greater understanding of the structure and function of the brain. You can even choose to add a tumour to the patient and see how the MRI technique detects this: http://cambridge.edu.au/redirect/9740.

Check-in questions – Set 2

1 Outline the difference between MRI and CT in imaging the brain.
2 Outline the two brain function principles of equipotentiality and mass action.

ISBN 978-1-009-25401-4 Gallagher et al

5A SKILLS

VIDEO 5A–2 SKILLS: EVALUATING PROPOSITIONS

Questions asking you to evaluate a proposition and justify your evaluation

In VCE Psychology, you may be asked to answer questions of a higher order than simply recalling information. For example, you may be asked to evaluate a proposition or stance and justify your answer. You will need to consider what you have learned in your VCE Psychology studies and how you can use this information to support your evaluation. To help you prepare, an example of this kind of question and a sample response are provided below.

Question

Justify whether neuroimaging techniques or the first brain experiments are likely to have made the greatest contribution to understanding the role of the brain over time.

Attempted answer

The first brain experiments occurred before neuroimaging techniques. Therefore, they are more likely to have made the greatest contribution to understanding the role of the brain over time.

Key points to remember

- Start your answer by stating whether you are supporting the position that neuroimaging techniques or the first brain experiments made the greatest contribution to understanding the role of the brain over time.
- Use examples of the information collected by these techniques to support your stance.

Suggested answer

Neuroimaging techniques, such as PET and fMRI, have provided more detailed information regarding the structure and function of parts of the brain than did the first brain experiments. The information provided by PET and fMRI includes detailed information regarding the location in the brain of specific functions of the body and the extent to which different parts of the brain are active during certain activities. Although the first brain experiments provided some insights in this respect, this information was less detailed and objective.

5A KEY SCIENCE SKILLS

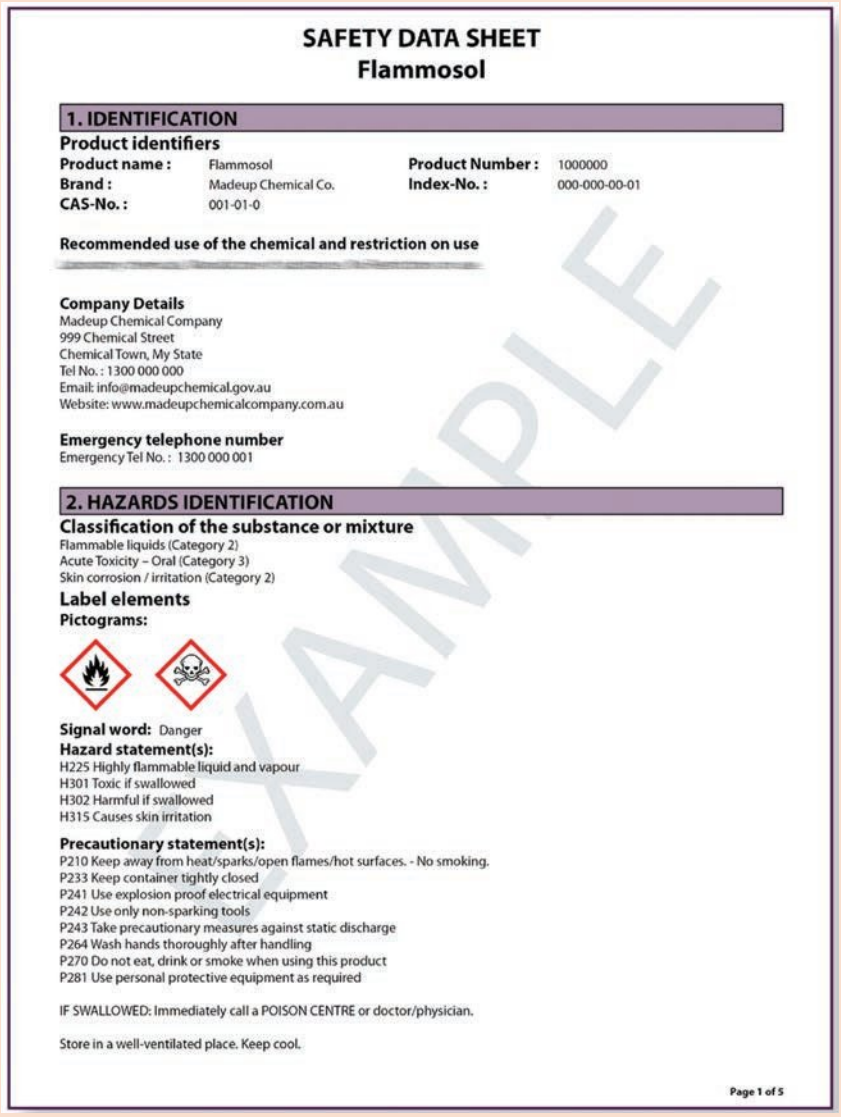
VIDEO 5A–3 KEY SCIENCE SKILLS: LAB SAFETY, OHS AND ETHICAL CONDUCT

Lab safety, OHS and ethical conduct

The process of conducting a psychological experiment, such as a practical investigation in VCE Psychology, typically involves conducting a risk assessment to ensure that consideration has been given to any potential risks that may arise when the experiment is carried out, and for which you therefore need to plan. These risk assessments are often a non-negotiable requirement for an experiment to go ahead, and they are often informed by safety data sheets (SDS). These documents provide health and safety information about products, substances or chemicals that are classified as hazardous substances or dangerous goods. If one of these products is purchased, it should come with an SDS. An SDS that complies with Victoria's Occupational Health and Safety Regulations should contain 16 separate sections, each of which needs to have specific information relating to how the chemical should be used, handled, stored, transported or disposed of.

On the following page is the first page of an SDS for a product called 'Flammosol'. Let's review this SDS carefully and consider the following questions.

ISBN 978-1-009-25401-4 Gallagher et al



SAFETY DATA SHEET
Flammosol

1. IDENTIFICATION

Product identifiers

Product name : Flammosol
Product Number : 1000000
Brand : Madeup Chemical Co.
Index-No. : 000-000-00-01
CAS-No. : 001-01-0

Recommended use of the chemical and restriction on use

Company Details
Madeup Chemical Company
999 Chemical Street
Chemical Town, My State
Tel No. : 1300 000 000
Email: info@madeupchemical.gov.au
Website: www.madeupchemicalcompany.com.au

Emergency telephone number
Emergency Tel No. : 1300 000 001

2. HAZARDS IDENTIFICATION

Classification of the substance or mixture
Flammable liquids (Category 2)
Acute Toxicity – Oral (Category 3)
Skin corrosion / irritation (Category 2)

Label elements
Pictograms:

Signal word: Danger
Hazard statement(s):
H225 Highly flammable liquid and vapour
H301 Toxic if swallowed
H302 Harmful if swallowed
H315 Causes skin irritation

Precautionary statement(s):
P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P233 Keep container tightly closed
P241 Use explosion proof electrical equipment
P242 Use only non-sparking tools
P243 Take precautionary measures against static discharge
P264 Wash hands thoroughly after handling
P270 Do not eat, drink or smoke when using this product
P281 Use personal protective equipment as required

IF SWALLOWED: Immediately call a POISON CENTRE or doctor/physician.

Store in a well-ventilated place. Keep cool.

Page 1 of 5

1 What information on the SDS regarding 'Flammosol' indicates that it could be a potential hazard in an experiment?

To answer this question, look at the 'Hazard statement(s)'. Flammosol is identified as 'highly flammable liquid and vapour' and 'toxic/harmful if swallowed'.

2 For a product such as 'Flammosol', what steps could be taken in an experiment to overcome the potential hazard it poses?

To answer this question, consider the type of hazard posed by the chemical or product that you wish to use in your experiment and consider whether steps can be taken to overcome the risk posed.

For example, for Flammosol, you could ensure that the chemical is not exposed to an open flame, as it is highly flammable, and ensure that appropriate warnings and supervision are provided so that nobody involved in the experiment places the substance near their mouth or swallows it.

3 Practical investigations also require that relevant occupational health and safety guidelines are followed. List three examples of occupational health and safety guidelines that may be relevant to a psychological investigation.

ISBN 978-1-009-25401-4 Gallagher et al

To answer this, consider what health, safety and welfare issues may become apparent in, or result from, the experiment.

Examples could include psychological injury; slip, trip or fall hazards; injury from physically demanding tasks; noise, chemical or electrical hazards; and infectious disease hazards.

4 Ethical guidelines when undertaking and reporting investigations cover the issues of **confidentiality**, **voluntary participation**, **informed consent**, **withdrawal rights**, **deception** and **debriefing**. Match each of these issues with one of the statements below.
   - a Participants are free to discontinue their involvement in a study at any point during or after the conclusion of the study, without receiving any penalty.
   - b The true nature of the study is withheld from participants, when their knowledge of the true purpose may affect their behaviour and subsequent validity of the investigation.
   - c At the end of the study, participants are informed of the true aims, results and conclusions of the study, including clarifying any questions, misunderstandings or deception and providing support to ensure no lasting harm.
   - d The participants' identities are kept anonymous, and their personal information is kept private, protected and secured throughout the study.
   - e Each participant freely agrees to participate in a study, with no pressure or coercion.
   - f Participants agree to participate in the research after they have received all the details of the study including the nature and purpose, methods of data collection and potential risks.

Suggested response

a: withdrawal rights; b: deception; c: debriefing; d: confidentiality; e: voluntary participation; f: informed consent

ACTIVITY 5A–2 CREATE A TIMELINE

To help organise your thinking about how our understanding of the role of the brain has evolved over time, get a piece of A3 paper and create a timeline that lists the major contributors to this process and what they contributed. Once you have created your timeline, spend some time learning it and then see if you can write it out from scratch without referring to any notes.

Section 5A questions

1 Identify an idea from phrenology that remains valid today, and explain how our developing understanding of that idea helped to discredit phrenology as a field of study.
2 In more recent times, the development of what factor has greatly influenced our understanding of the role of the brain? Justify your answer.
3 List and describe two pieces of technology that provide information about the function of the brain.
4 Why are brain experiments involving direct electrical stimulation virtually unheard of today?

ISBN 978-1-009-25401-4 Gallagher et al

The hindbrain, midbrain, forebrain and cerebral cortex

Study Design:
The roles of the hindbrain, midbrain and forebrain, including the cerebral cortex, in behaviour and mental processes

Glossary:
- Autonomic nervous system
- Axon
- Axon terminals
- Broca's area
- Central nervous system (CNS)
- Cerebellum
- Cerebral cortex
- Cerebral hemispheres
- Cerebrum
- Dendrite
- Forebrain
- Frontal lobe
- Hemispheric specialisation
- Hindbrain
- Homeostasis
- Hypothalamus
- Limbic system
- Medulla oblongata
- Midbrain
- Motor information
- Myelin
- Nerve impulse
- Neurons
- Neurotransmitter
- Occipital lobe
- Parasympathetic nervous system
- Parietal lobe
- Peripheral nervous system (PNS)
- Pons
- Reticular activating system (RAS)
- Reticular formation
- Sensory information
- Somatic nervous system
- Substantia nigra
- Sympathetic nervous system
- Synapse
- Temporal lobe
- Thalamus
- Wernicke's area

ENGAGE

Is there a neuroscience institute in Melbourne?

You may have heard of neuroscience as the scientific study of the nervous system, but did you know that in Melbourne there is an institute dedicated to the study of neuroscience and mental health? The Florey Institute of Neuroscience and Mental Health (Figure 5B–1) is staffed by over 600 medical researchers, who are discovering the secrets of the brain. Their quest is to prevent illness, advance treatment and bring to light cures for the one in four people affected by brain-related health conditions. In this section, we will consider what many of these researchers dedicate their careers to – neurons and the central and peripheral nervous systems. Who knows, you might be inspired to join them one day!

Figure 5B–1 The Florey Institute of Neuroscience and Mental Health

ISBN 978-1-009-25401-4 Gallagher et al

UNITS 3&4 LINK

EXPLAIN

Basics of the nervous system – optional subsection

This optional review of the nervous system revises material that you may recall from your previous science courses. This knowledge is not required by the Study Design until Year 12, so your teacher may decide to introduce it here or leave it until Units 3 and 4.

The role of neurons

Neurons cells that make up the brain and the nervous system and which receive and transmit information

Before delving more deeply into the two divisions of the human nervous system, the central and peripheral nervous systems, first consider the cells these comprise – **neurons**. At this stage of your school science journey, you are most likely aware that the nervous system of your body is a communication system that receives information from the external environment and the outside world and interprets and responds to this information as required, through the vast network of nerves that run the entire length of your body. These nerves are made up of neurons and receive information, process it and help the body to organise a response.

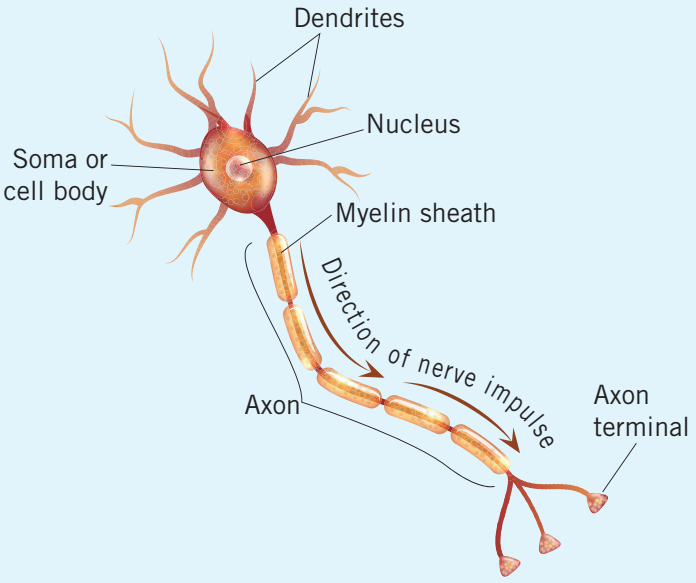


Figure 5B–2 The features of a typical neuron

A neuron is a single nerve cell. Your body contains about 100 billion neurons, which form what are referred to as neural pathways. In these pathways, neurons link up to transmit information throughout the body. Neurons can be considered the building blocks, or primary functional units, of the nervous system; without them, the system could not function. Neurons do not all carry out exactly the same role. Many have specialised functions, such as receiving information, transmitting information between different neurons and sending information to the cells and muscles of the brain.

Dendrites

Dendrite a projection of a neuron that typically branches from the cell body and is able to receive information from other neurons

A **dendrite** is a projection of a neuron that typically branches from the cell body and can receive information from other neurons. Some dendrites also contain what are referred to as dendritic spines, which are additional small projections off the dendrite that can also receive information from other neurons. These dendritic spines are believed to play a role in learning and memory. Dendrites and dendritic spines allow one neuron to potentially have thousands of interactions with other neurons.

ISBN 978-1-009-25401-4 Gallagher et al

Soma or cell body

The soma or cell body receives information from the dendrites, which then passes down the axon. It also contains the nucleus with the neuron's genetic code, which enables it to reproduce through mitosis. The soma or cell body can therefore be considered the coordinating centre of the nerve cell.

Axon

The **axon** is sometimes referred to as a nerve fibre. It transmits signals, allowing the neuron to send information to multiple other cells. The signals that travel along the axon are often referred to as electrical messages, **nerve impulses** or action potentials.

Myelin

Covering most of the axons in the human body is a fatty substance referred to as **myelin**. It can be thought of as a form of insulation that helps to speed up information transmission in the nervous system.

Axon terminals, synapses and neurotransmitters

The information transmitted through a neuron always travels in the same direction, from the dendrites to the cell body, down the axon and to the **axon terminals** at the end of the axon. These store and release a chemical messenger called a **neurotransmitter**. This chemical messenger takes the information from one neuron to be transmitted to another. This occurs across a gap between neurons, referred to as the **synapse**. On one side of the synapse is the axon terminal, and on the other is the dendrite or cell body of the next neuron in the pathway.

The release of neurotransmitters, their travel across the synapse and how they are received at the dendrites of the next neuron is controlled in a variety of complex ways that are very important to behaviour and mental processes. You will learn about this in Units 3 and 4.

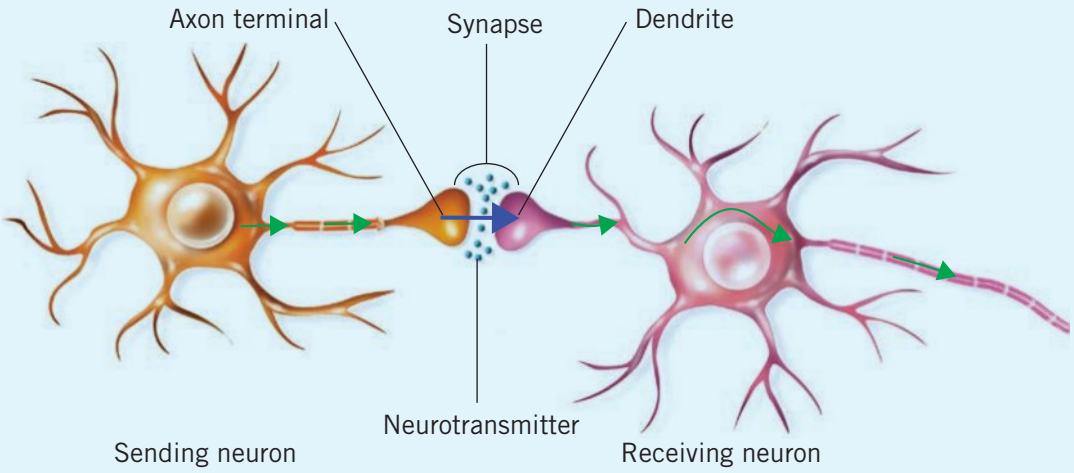


Figure 5B–3 Neurons can communicate with one another using neurotransmitters that move across synapse gaps and activate receptors on the receiving neuron's dendrite terminal. The green arrows show the direction of transmission of a nerve impulse, and the blue arrow shows the direction of neurotransmitter movement.

Axon
a fibre that transmits nerve signals

Nerve impulse
an electrical message that travels along the axon of a neuron

Myelin
a fatty substance that acts as an insulator to stop nerve signals leaking out, and which also helps speed up the flow of information

Axon terminals
structures at the end of the axon that store and release neurotransmitters

Neurotransmitter
a chemical produced by a neuron that carries a message across the synapse to another neuron; produced within the nervous system, including muscles, organs and glands

Synapse
the point of communication between two neurons or between a neuron and a target cell, such as a muscle or gland cell

ISBN 978-1-009-25401-4 Gallagher et al

The nervous system

Central nervous system (CNS) the brain and spinal cord; transmits information to, and receives information from, the peripheral nervous system

Peripheral nervous system (PNS) carries messages to and from the central nervous system

As mentioned previously, there are two main branches of the nervous system: the **central nervous system (CNS)** and the **peripheral nervous system (PNS)**. The CNS is composed of the brain and spinal cord, while the PNS comprises all the neurons outside the brain and spinal cord.

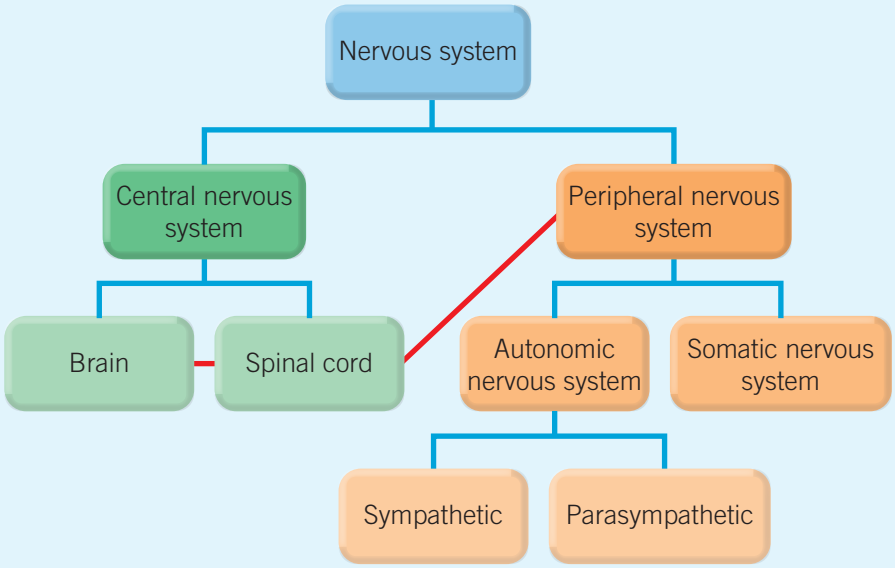


Figure 5B–4 The organisation of the human nervous system. The blue lines show how the components of the nervous system are organised into different systems. The red lines show the physical links, from the brain to the spinal cord to the peripheral nervous system.

The central nervous system

The central nervous system (CNS) is so called because of the central position of the brain and spinal cord within the body. The CNS is so vital to the body that it has its own protective armour – the brain case of the skull, which protects the brain, and the vertebral column, which protects the spinal cord. The main function of the CNS is to receive information from the PNS, process this information and activate the appropriate area of the body required to respond.

Motor information information that is transmitted along sensory neural pathways from the CNS to the relevant organs, glands and muscles to bring about bodily actions

Sensory information information that is detected by sensory receptors from the internal and external environment and transmitted along sensory neural pathways to the CNS

The brain will be considered in detail in the rest of this chapter.

The spinal cord is a tightly packed column of nerves that extends from the base of the brain, an area called the brainstem, down to the lumbar region of the spinal column. The spinal column's main function is to carry sensory and **motor information** between the brain and the periphery. Typically, the spinal cord transmits **sensory information** that it has received from the PNS and passes it upwards into the brain, and it sends information received from the brain downwards via the PNS to the relevant organs, glands and muscles of the body so that they can carry out the required bodily functions.

Figure 5B–5 The brain and spinal cord make up the central nervous system.

ISBN 978-1-009-25401-4 Gallagher et al

The peripheral nervous system

The peripheral nervous system (PNS) refers to all the nerves located outside the CNS, including those that run the length of the upper and lower limbs. The role of this nervous system is as important as that of the CNS – the PNS is responsible for relaying information from the sense organs, muscles and glands regarding changes in the external and internal environments and delivering this information to the CNS, where a decision regarding a bodily response can be made. The PNS has two subdivisions: the somatic and autonomic nervous systems.

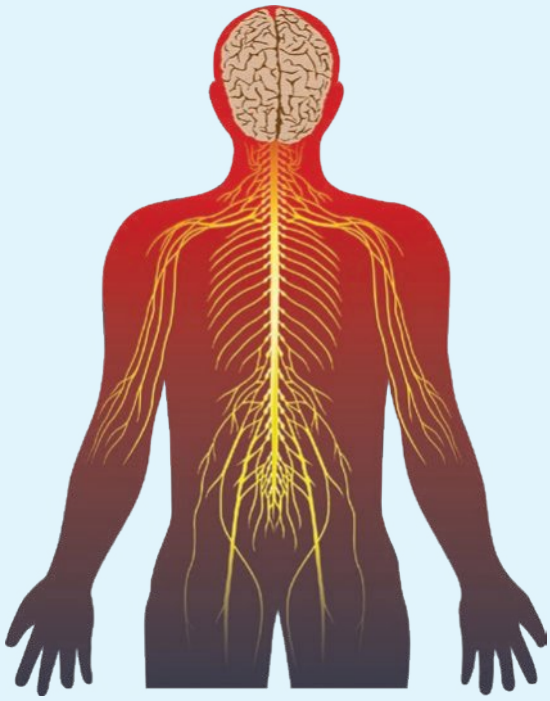


Figure 5B–6 The major peripheral nerves extending from the spinal cord

Somatic nervous system

When considering the CNS, we mentioned that the brain receives sensory information from nerves in the PNS and transmits information through the PNS to the relevant organs, glands and muscles of the body – this is a role of the **somatic nervous system**, to carry sensory information to the CNS and transmit information from the CNS.

Sensory neurons respond to information that is detected by sensory receptors at sites around the body, including in muscles, joints, tendons and the skin. When information is detected, such as a change in temperature at the skin surface, it is relayed along sensory neural pathways to the spinal cord and brain. Motor neurons are then activated as the brain seeks to initiate a response, such as the movement of a limb in the body. This information is sent from the brain down motor neural pathways to the relevant muscles to bring about the response.

Autonomic nervous system

The **autonomic nervous system** is a network of neurons within the PNS that receives information from the CNS and acts to control a range of internal organs and glands. This is done unconsciously, which means you do not have to think about initiating the actions – they are involuntary. Examples of these responses include the actions of digestion, breathing, heartbeat and perspiration. There are two subdivisions of the autonomic nervous system: the sympathetic nervous system and the parasympathetic nervous system.

The **sympathetic nervous system** activates what is often termed the fight-or-flight-or-freeze response. This is the body's rapid, involuntary response to dangerous or stressful situations, which includes raising your heart rate and directing blood to your major muscle groups. The **parasympathetic nervous system**, on the other hand, activates what is often termed the rest and digest response, which is a range of actions that essentially undo the work of the sympathetic nervous system after a stressful situation. This includes actions such as slowing the heart rate, constricting the pupils and redirecting blood flow back to intestinal activity to assist in digestion.

Somatic nervous system carries messages from sensory neurons to the CNS and then transmits information from the CNS along motor neurons

Autonomic nervous system connects the CNS to the organs and glands of the body

Sympathetic nervous system activates the fight-or-flight-or-freeze response in dangerous or stressful situations

Parasympathetic nervous system activates the rest and digest response after a dangerous or stressful situation has passed

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 1

1 Draw and label a typical nerve cell.
2 Draw a flow chart to show how the human nervous system is organised into different systems. You do not need to include the physical connections – just how the different components of the nervous system are organised.

The mandatory Unit 1 content required by the Study Design starts here.

VIDEO 5B–1 REGIONS OF THE BRAIN

Regions of the brain

The brain is divided into four major regions – the hindbrain, midbrain, forebrain and cerebral cortex (Figure 5B–7).

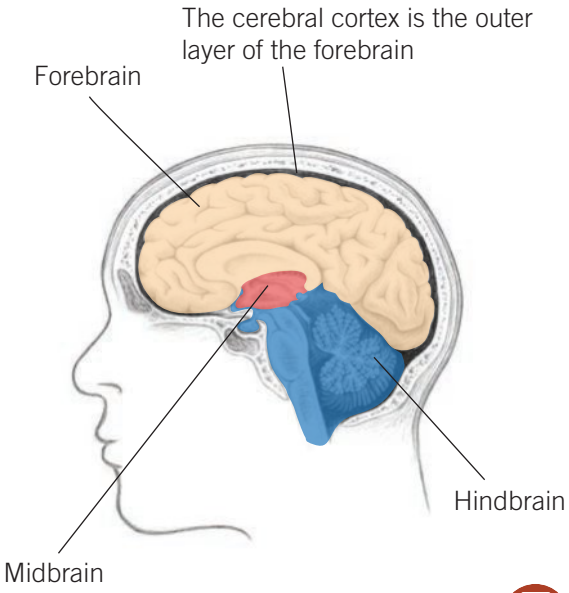


Figure 5B–7 The major regions of the brain

The hindbrain

Hindbrain a region of the brain composed of the cerebellum, medulla oblongata and pons and which is involved in supporting vital bodily processes, such as breathing and sleep

Cerebellum an area of the hindbrain involved in coordinating movements and in learning and memory

The **hindbrain** is located in the lower back part of the brain and is made up of three main structures: the cerebellum, medulla oblongata and pons (Figure 5B–8). This region of the brain is involved in supporting vital bodily processes, such as breathing and sleep.

Cerebellum

The **cerebellum** (not to be confused with the cerebrum or cerebral cortex) is a very important part of the hindbrain that receives commands from the cerebral cortex and is involved in helping to carry those out. The cerebellum is involved in a range of bodily functions, such as coordinating voluntary movements, balance, posture and movements associated with speech and vision.

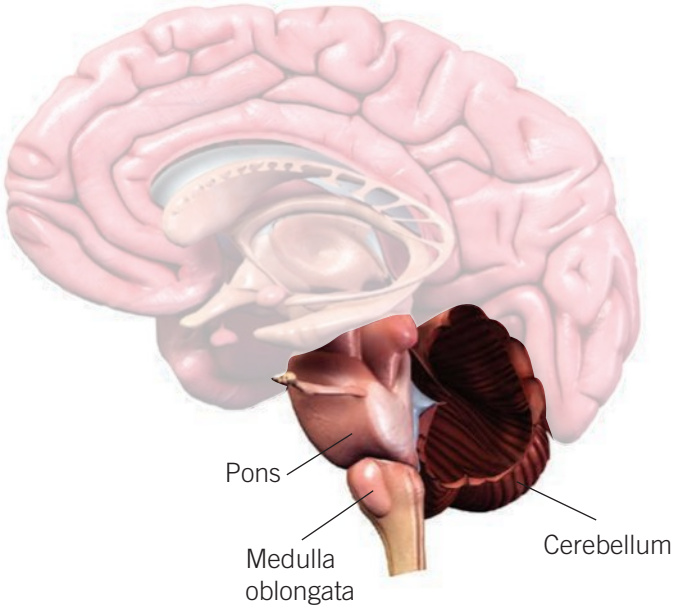


Figure 5B–8 The three main structures of the hindbrain: the cerebellum, medulla oblongata and pons

ISBN 978-1-009-25401-4

The cerebellum ensures that when we make a movement that involves multiple muscle groups, like picking up a cup, this occurs smoothly and is well coordinated. This happens almost without conscious thought, with the cerebellum activating the required muscles and the degree to which they are engaged. The cerebellum is also involved in learning and memory, as it helps us to develop motor skills by storing the necessary control information, such as what movements are required to play an instrument or to ride a bike.

Damage to the cerebellum can lead to issues with balance, challenges associated with detecting visual motion and loss of muscle coordination.

Medulla oblongata

The **medulla oblongata** is located at the base of the brain, where the brainstem attaches to the spinal cord. This area contains the control centres for many of the autonomic functions of the body, such as heart rate, breathing, salivating, blood pressure, swallowing, vomiting and sneezing. Given the vital role many of these functions play in survival, damage to this area of the brain can cause death or lead to severe health problems.

Pons

The **pons** is located above the medulla oblongata and below the midbrain. The pons acts as a 'bridge', connecting the cerebellum and cerebral cortex, but it is also involved in sleep, arousal, facial expressions and hearing.

Figure 5B–9 The pons is one area of the brain that plays a role in sleep and arousal.

The midbrain

The **midbrain** is in the centre of the brain and sits at the topmost part of the brainstem. It works to connect the upper and lower areas of the brain. The midbrain is involved in auditory and visual processing and plays a role in motor control, pain inhibition and reward-based learning patterns. The midbrain is home to the important structures of the substantia nigra and reticular formation.

Substantia nigra

The **substantia nigra** is one of the largest collections of dopamine-producing neurons in the brain. Dopamine is a neurotransmitter involved in movement and coordination. Parkinson's disease, which is characterised by tremors and difficulty with movements, is linked to nerve cell damage in the midbrain.

Reticular formation

The **reticular formation** is a complex arrangement of neuron clumps in the midbrain, which are connected to a network that runs from the hindbrain to the forebrain. The neurons of the reticular formation play a significant role in maintaining arousal, consciousness and motor control.

Medulla oblongata
an area of the hindbrain involved in the autonomic functions of the body, such as heart rate and breathing

Pons
an area of the hindbrain that acts as a bridge between the cerebellum and the cerebral cortex

Midbrain
an area of the brain at the topmost part of the brainstem, involved in auditory and visual processing, motor control, pain inhibition and reward-based learning patterns

Substantia nigra
one of the largest collections of dopamine-producing neurons in the brain

Reticular formation
an area of the midbrain that plays a role in maintaining arousal, consciousness and motor control

ISBN 978-1-009-25401-4 Gallagher et al

Reticular activating system (RAS) an area in the midbrain that is responsible for alertness and awakening

The reticular formation contains a specialised system called the **reticular activating system (RAS)**, which, when stimulated, causes alertness and awakening. The RAS has both ascending and descending pathways, and these extend into a range of areas of the brain and spinal cord. The groupings of neurons that together make up the RAS are ultimately responsible for attention, arousal, control of muscles and the ability to focus.

One function of the RAS is to filter out unnecessary information, so only the important stuff gets through. For example, the RAS is the reason you may learn a new word and then start hearing it everywhere. Your RAS takes what you focus on and creates a filter for it. It then sifts through incoming information and presents you with only those pieces that are important to you.

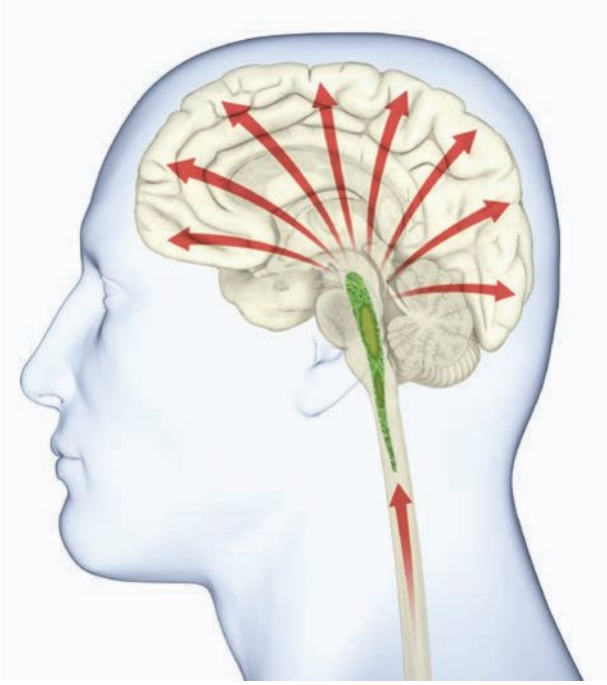


Figure 5B–10 Signals are sent to the cerebral cortex via the reticular activating system.

Figure 5B–11 The forebrain plays a key role in learning.

The forebrain

Forebrain the area of the brain that includes the cerebrum, thalamus, hypothalamus, pineal gland and limbic system, and which is involved in coordinating brain activity

Hypothalamus an area of the forebrain that connects the hormonal and nervous systems and helps the body to maintain homeostasis

Homeostasis the condition of maintaining a stable internal environment of the body that is necessary for survival

The largest region of the brain is the **forebrain**. The neurons in the forebrain connect with both the midbrain and hindbrain and play an important role in coordinating brain activity. The forebrain is made up of many important structures, including the entire cerebrum, the thalamus, the hypothalamus, the pineal gland and the limbic system. The forebrain is involved in a wide range of bodily functions, as well as in learning, memory, thinking and perception.

Hypothalamus

As you may already know, 'hypo' means 'under', so as the name suggests, the **hypothalamus** can be found right under the thalamus. This structure is about the size of an almond and is involved in connecting the hormonal and nervous systems via the pituitary gland. It regulates the release of many hormones that play a role in maintaining **homeostasis** (the constant internal environment of the body) through the control of bodily temperature, hunger, thirst and sleep.

Different systems and parts of the body send signals to the brain when they encounter changes in the environment. The brain then alerts the hypothalamus to any unbalanced factors that need to be addressed. The hypothalamus then responds by releasing or sending signals to release the right hormones into the bloodstream to balance the body.

ISBN 978-1-009-25401-4 Gallagher et al

The hypothalamus is part of the **limbic system**. This system is a set of interconnected brain structures that play a role in how we experience emotions, such as sadness and anger. In addition, the limbic system plays a role in behaviour control and the formation of long-term memories.

Limbic system interconnected brain structures in the centre of the forebrain, next to the midbrain, that play a role in emotions, behaviour control and the formation of long-term memories

Damage to the hypothalamus can lead to issues with controlling body temperature, continuing to feel hungry after eating (which can result in developing an eating disorder), problems sleeping and a change in libido, or sex drive.

Thalamus

The **thalamus** has two halves, located side-by-side but each in a separate hemisphere of the brain. The thalamus is located within the forebrain, near the centre of the brain. The thalamus has various functions; however, its most significant function is to relay information to the relevant sections of the cerebral cortex for additional processing. In particular, sensory information (except smell) comes via the thalamus, where processing and relay occur.

Thalamus an area of the forebrain that processes and relays sensory information

The thalamus also plays a major role in regulating arousal, with connections to the reticular formation and RAS system. Damage to this area of the brain may cause an individual to go into a coma.

The thalamus also plays a role in attention and assists us in focusing on important information. In particular, it helps to filter the vast amount of sensory information to which we are exposed, allowing us to focus on the information most required at that time.

The issues arising from damage to the thalamus depend on the part of the structure affected. Examples include numbness, hypersensitivity, visual field loss and decreased taste.

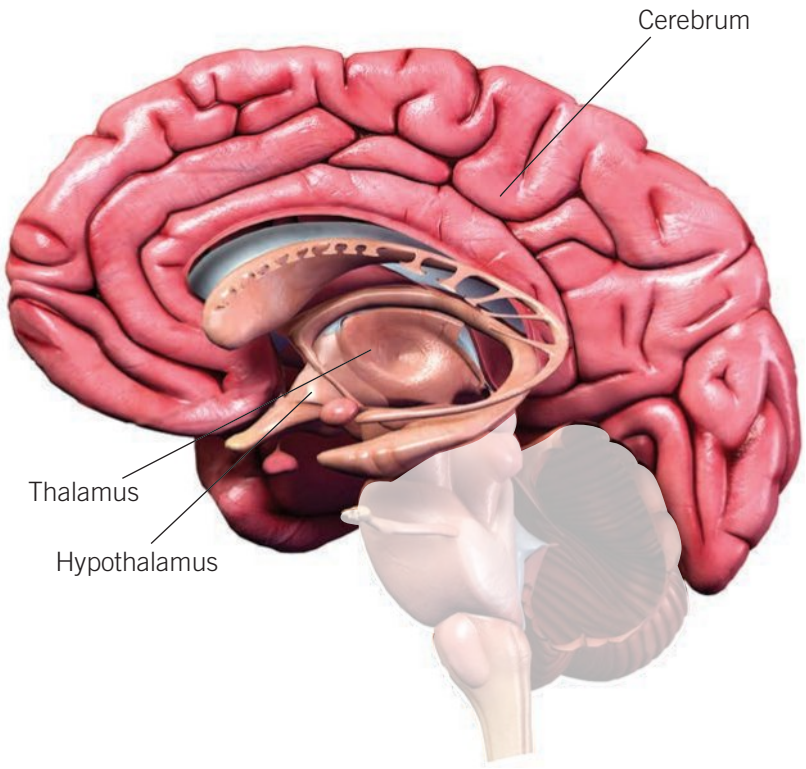


Figure 5B–12 The position of the thalamus and hypothalamus in the forebrain, under the cerebrum

Cerebrum

The largest part of the forebrain, the **cerebrum**, is the uppermost part of the brain and contains two cerebral hemispheres, which are separate but partially joined by the corpus callosum. The corpus callosum allows information to be exchanged between the two cerebral hemispheres. The cerebrum is responsible for directing the conscious motor activities of the body, as well as for receiving and processing a range of sensory information. The outer layer of the cerebral hemispheres is referred to as the cerebral cortex. The role of the cerebral cortex will be explored in more detail next.

Cerebrum an area of the forebrain that directs conscious motor activity and receives and processes sensory information

Check-in questions – Set 2

1 List the three main structures of the hindbrain.
2 Describe the role of the reticular activating system.
3 Contrast the role of the thalamus and the hypothalamus.

ISBN 978-1-009-25401-4 Gallagher et al

The cerebral cortex

Cerebral cortex the thin layer of neurons covering the outer region of the cerebrum, characterised by extensive folding

The **cerebral cortex** is the thin layer of neurons that covers the outer region of the cerebrum. It accounts for approximately half the weight of the brain and is primarily made up of grey matter. The surface of the cerebral cortex is extensively folded, which gives room for additional neurons. Specific areas of the cerebral cortex are dedicated to specific functions – that is, there is localisation of function (e.g. the visual cortex is involved in receiving and processing information from the eyes). However, most areas of the cerebral cortex perform a wide array of functions. As mentioned previously, the cerebral cortex is divided into two hemispheres.

The cerebral cortex forms extensive connections with the areas below it – the subcortical areas. It therefore plays a role in a range of brain functions, including the processing of complex sensory information, the initiation of voluntary movements, language, symbolic thinking and the regulation of emotion. To assist with understanding the role of this large portion of the brain, it is often simplified into three areas: the sensory, motor and association areas.

Cerebral hemispheres located on the left and right sides of the brain, these areas control motor and sensory functions on opposite sides of the body

The sensory areas are involved in receiving and processing sensory information, while the motor areas initiate voluntary movement. The association areas are extraordinarily important as they integrate information from multiple brain regions, facilitating complex cognitive processes such as language, creativity and decision-making.

Cerebral hemispheres

The two **cerebral hemispheres** extend from the front to the back of the brain, and although they look alike and perform many of the same functions, they are not identical. They are often referred to as the left and right brain hemispheres.

Figure 5B–13 A top view of the brain showing the left and right cerebral hemispheres, which make up the cerebral cortex. The two hemispheres are separated by a gap running from the front of the brain to the back, and they are joined in the middle of the base of the cerebrum, above the midbrain. Examples of roles in which each hemisphere tends to be dominant are given.

ISBN 978-1-009-25401-4 Gallagher et al

Each hemisphere controls motor and sensory functions on the opposite side of the body. For example, the left hemisphere receives sensory information from the right side of the body and controls movement on that side. The opposite is true of the right hemisphere. The positions of these sensory and motor areas are similar for both hemispheres.

Each hemisphere has a number of areas in which it is dominant (Figure 5B–13). One hemisphere having a specialised function that is not possessed, or controlled to a lesser extent, by the other is called **hemispheric specialisation**. However, while hemispheric specialisation occurs, both hemispheres play at least some role in all functions, acting in a coordinated manner.

Hemispheric specialisation when one cerebral hemisphere has a specialised function that is not possessed, or is controlled to a lesser extent, by the other

Cortical lobes of the cerebral cortex

Both cerebral hemispheres are made up of four cortical lobes: the frontal, parietal, temporal and occipital lobes. These are each made up of motor, sensory and association areas. We will explore each lobe and its functions in the following sections.

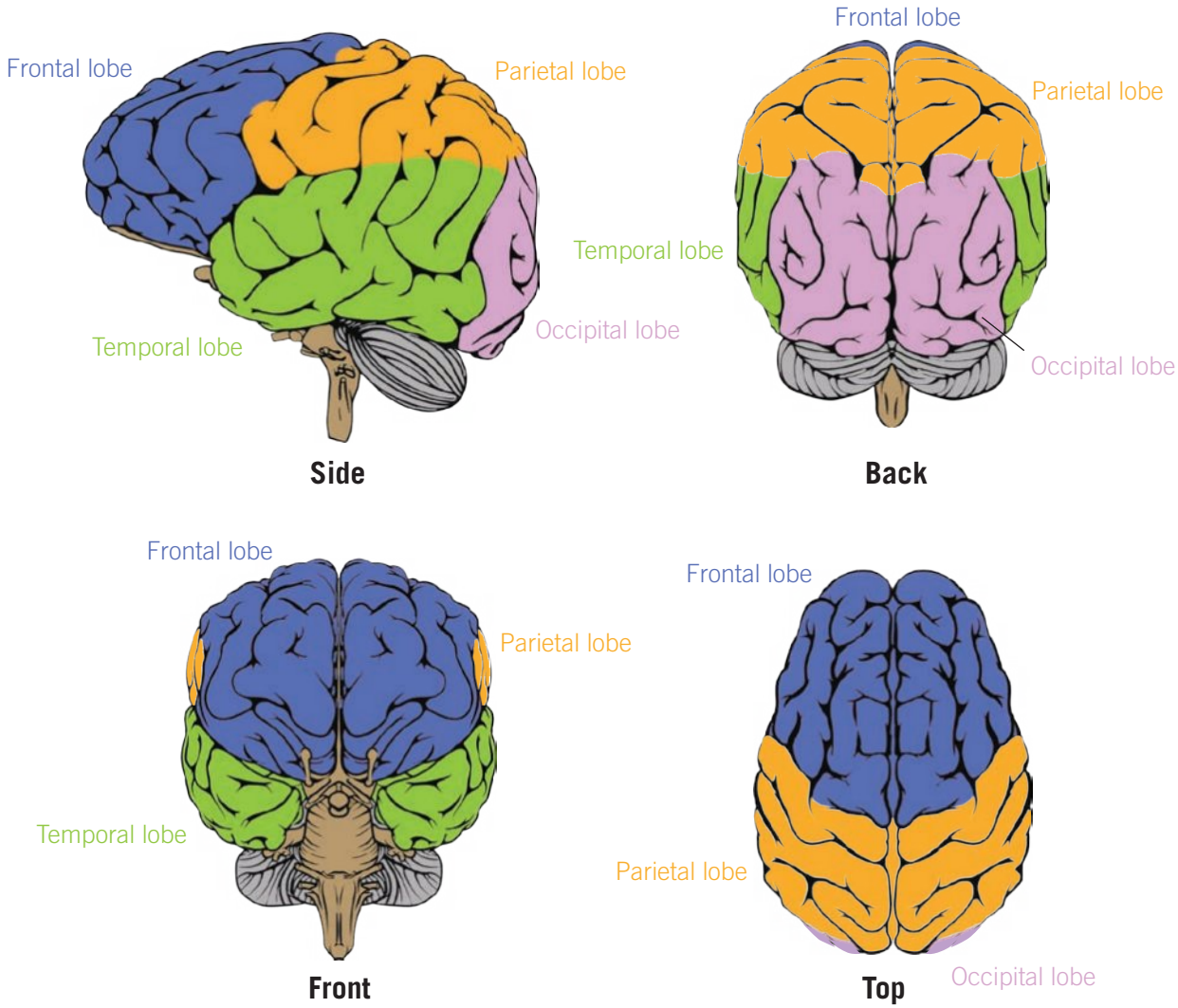


Figure 5B–14 The cortical lobes of the cerebral cortex

ISBN 978-1-009-25401-4 Gallagher et al

Frontal lobe

Frontal lobe an area of the brain that plays an important role in planning, sequencing and executing voluntary movement

Broca's area an area of the frontal lobe that is responsible for clear and fluent speech

The **frontal lobe** is located in the upper forward half of both the left and right cerebral hemispheres. This area of the brain is particularly important in the planning, sequencing and executing of voluntary motor activity. There are three areas of the frontal lobe that play a role in each of these functions: the prefrontal cortex, premotor cortex and primary motor cortex.

The prefrontal cortex is an important association area that is involved not only in planning the required motor sequence to carry out a voluntary movement, but also in various other brain functions, such as reasoning, problem-solving, emotional regulation, attention, symbolic thinking, and initiating and inhibiting behaviours. Once a motor sequence has been planned by the prefrontal cortex, it is passed onto the premotor cortex, which is just behind the prefrontal cortex, in the frontal lobe.

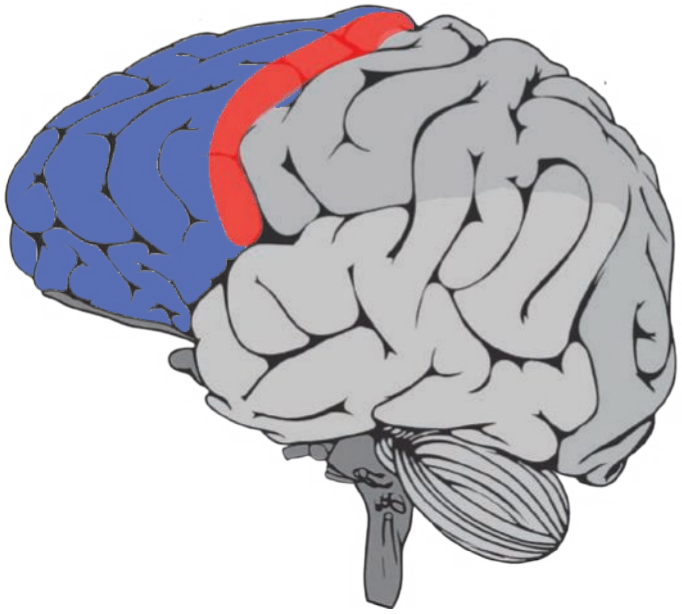


Figure 5B–15 The primary motor cortex, highlighted in red, is located at the back of the frontal lobe of the cerebral cortex.

The premotor cortex prepares the sequence of movements and sends this information to the rear portion of the frontal lobe, the primary motor cortex. The primary motor cortex sends neural messages to the skeletal muscles and is therefore involved in the initiation and execution of voluntary movements. As mentioned previously, the left primary motor cortex is responsible for controlling voluntary movements on the right side of the body, and the right controls movements on the left side of the body.

Different regions of the primary motor cortex are responsible for movements associated with different areas of the body. Areas of the body that require precision movements and over which we have significant control, such as our fingers and thumbs, are devoted a greater area of the motor cortex. Less space is allotted to areas of the body requiring coarse or uncomplicated movements or to areas over which we have less control, such as the back or thigh muscles.

Broca's area is another part of the frontal lobe, in the left hemisphere, next to the primary motor cortex. This area of the brain contributes to clear and fluent speech by coordinating the movements of the muscles involved in this process. Broca's area also sends and receives messages from other areas of the brain involved in language, such as those that assist with understanding the meaning of words, which contributes to overall speech production.

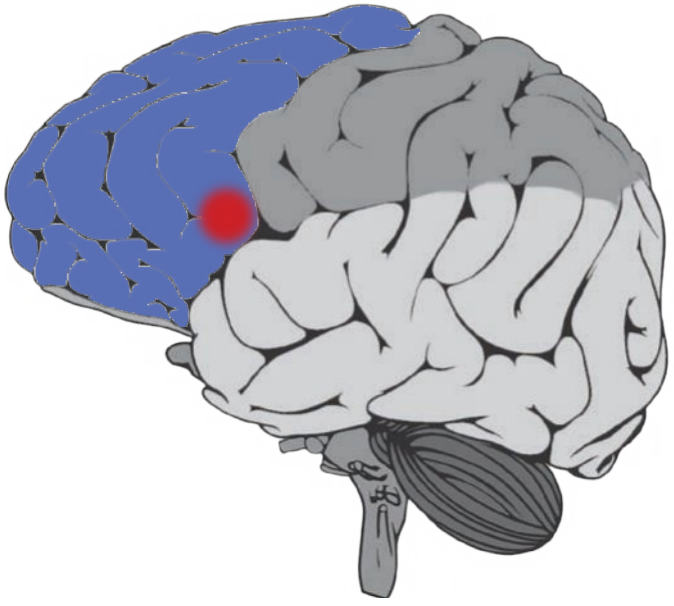


Figure 5B–16 Broca's area (in red) is in the left frontal lobe.

ISBN 978-1-009-25401-4 Gallagher et al

Temporal lobe

Located below the frontal and parietal lobes of the brain is the **temporal lobe**. This lobe sits just above the ear and plays a significant role in receiving and processing sounds from the ears, as well as in memory, emotional responses to sensory information and some visual perception, such as our ability to recognise faces and identify objects.

The primary auditory cortex, which is found in the temporal lobe, assists us in identifying and responding to sound, with different parts of the cortex responding to different types of sound, such as a high or low pitch.

Temporal lobe an area of the brain that plays a significant role in receiving and processing sounds from the ears

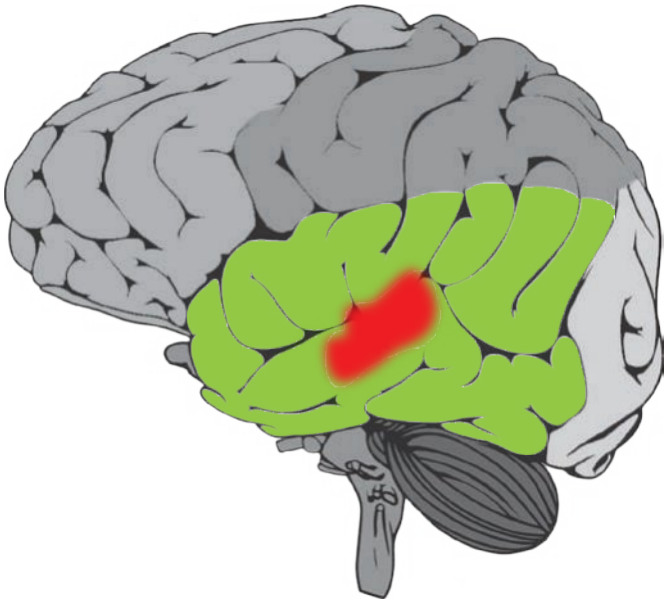


Figure 5B–17 Wernicke's area is located in the left temporal lobe.

Wernicke's area is a specialised area of the left temporal lobe that plays a critical role in understanding the sounds involved in speech. This helps us to understand the words we are hearing. Wernicke's area also plays a role in speech production and has connections to Broca's area in the frontal lobe.

Wernicke's area an area of the temporal lobe that plays a critical role in understanding the sounds involved in speech

Parietal lobe an area of the brain involved in attention, spatial awareness and reasoning, and receiving and processing somatosensory information

Table 5B–1 Main features of Broca's and Wernicke's areas

Broca's area	Wernicke's area
Responsible for contributing to clear and fluent speech through coordinating the movements of the muscles involved in this process.	Involved in understanding speech through processing the meaning of sounds.

Parietal lobe

The **parietal lobe** is found behind the frontal lobe but does not extend all the way to the back of the brain (see the 'Side' and 'Back' views of the brain in Figure 5B–14). This lobe comprises areas involved in spatial awareness (judging our body's position in space), spatial reasoning, attention and receiving and processing somatosensory information. The parietal lobe contains the primary somatosensory cortex, located just behind the primary motor cortex, and at the front of the parietal lobe in the left and right hemispheres, as shown in Figure 5B–18.

Figure 5B–18 The location of the primary somatosensory cortex, in red

ISBN 978-1-009-25401-4 Gallagher et al

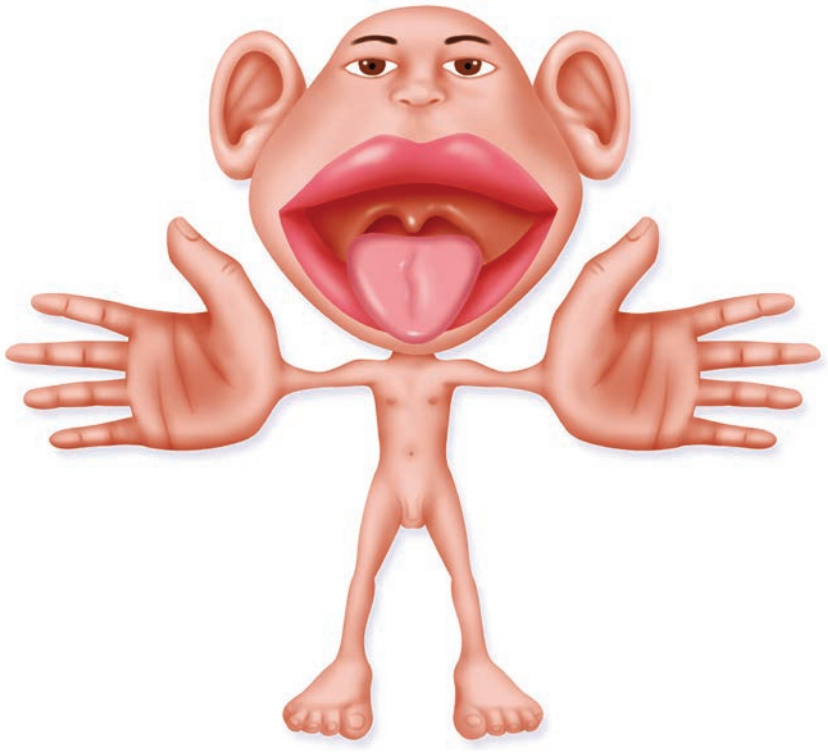


Figure 5B–19 The somatosensory homunculus

The role of the primary somatosensory cortex is to receive and process sensory information from a range of body areas, including the fingers, hands, arms, feet, legs, face, lips, tongue and genitals. Similar to the primary motor cortex, the left primary somatosensory cortex is responsible for receiving and processing sensory information from the right side of the body and vice versa.

Areas of the body that are more sensitive than others are devoted more area in the primary somatosensory cortex than others (e.g. the fingers are allotted a greater area than is the knee). Figure 5B–19 shows a somatosensory homunculus – that is, a human body modified so that body regions are given sizes in proportion to the corresponding area they have in the primary somatosensory cortex.

Occipital lobe

Occipital lobe an area of the brain involved in receiving and processing information related to vision

The **occipital lobe** of the brain plays a crucial role in vision. Located at the rear of each cerebral hemisphere, this area of the brain is divided into multiple areas associated with vision, including the primary visual cortex.

The primary visual cortex receives and processes information from visual sensory receptors in the retina of both eyes, with the left half of each eye sending information to the visual cortex in the left occipital lobe and the right half of each eye sending information to the visual cortex in the right occipital lobe. In this way, each hemisphere receives and processes half of the visual information.

Table 5B–2 Summary of the roles of the lobes of the brain

Frontal lobe	Temporal lobe	Parietal lobe	Occipital lobe
Important in the planning, sequencing and executing of voluntary motor activity.	Plays a significant role in receiving and processing sounds from the ears, as well as in memory and emotional responses to sensory information.	Involved in spatial awareness (judging our body's position in space), spatial reasoning, attention and receiving and processing somatosensory information.	Plays a crucial role in vision.

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 3

1 Describe the role of the cerebral cortex.
2 List the four lobes of the brain.
3 Describe the differences between the motor, sensory and association areas of the cerebral cortex.

WORKSHEET 5B–1 FUNCTIONS OF REGIONS OF THE BRAIN

ACTIVITY 5B–1 MAPPING THE PRIMARY SOMATOSENSORY CORTEX

You have been tasked with mapping the body of an elephant to the primary somatosensory cortex. Draw a map showing what you would expect to find.

5B SKILLS

VIDEO 5B–2 SKILLS: QUESTIONS ABOUT CONNECTIONS

Questions asking about connections or linkages

In VCE Psychology, you may be asked to make links between multiple concepts. This may be between Units, or within Units. It is important to be able to look at the 'larger picture' and understand how various aspects of the course are connected. The question below is an example of how you could be asked to demonstrate this key skill.

Question

Outline how the brain is connected to the spinal cord.

Attempted answer

The brain sits on top of the spinal cord and nerve fibres run from the spinal cord into the brain.

Key points to remember

- Start your answer by demonstrating your anatomical knowledge of the brain.
- Use examples of structures within the brain to describe the connection between the brain and spinal cord.

Suggested answer

The brainstem connects various parts of the brain to the spinal cord. The brainstem is made up of the midbrain, pons and medulla oblongata. It connects the cerebrum to the spinal cord and cerebellum. The brainstem is involved in many functions, including regulating heart rate, breathing, sleeping and eating.

Section 5B questions

1 Following a stroke, Mary was struggling to understand speech and grasp the meaning of spoken words and sentences. What area of the brain is likely to have been impacted by her stroke? Justify your response.
2 Dinesh was having difficulty in his spontaneous speech following a brain injury. What area of the brain is likely to have been impacted? Justify your response.
3 Draw a simple diagram of the brain indicating the position of the hindbrain, midbrain and forebrain.
4 Explain how the cerebellum helps to keep movements smooth and controlled.

ISBN 978-1-009-25401-4 Gallagher et al

Chapter 5 review

Summary

Create your own set of summary notes for this chapter on paper or in a digital document. A model summary is provided in the Teacher Resources, which can be used to compare with yours.

Checklist

In the Interactive Textbook, the success criteria are linked from the review questions and will be automatically ticked when answers are correct. Alternatively, print or photocopy this page and tick the boxes when you have answered the corresponding questions correctly.

Success criteria – I am now able to:		Linked questions
5A.1	Understand and describe the influence of different approaches over time to understanding the role of the brain in behaviour and mental processes	2☐, 3☐, 4☐, 5☐
5A.2	Distinguish between different approaches over time to understanding the role of the brain in behaviour and mental processes	4☐, 5☐
5A.3	Outline how neuroimaging reveals the role of the brain in behaviour and mental processes	1☐, 6☐
5B.1	Understand the role of the hindbrain, midbrain and forebrain, including the cerebral cortex, in behaviour and mental processes	9☐, 12☐, 15☐
5B.2	Describe the role of the hindbrain, midbrain and forebrain, including the cerebral cortex, in behaviour and mental processes	8☐, 11☐, 16☐, 17☐
5B.3	Distinguish between the role of the hindbrain, midbrain and forebrain, including the cerebral cortex, in behaviour and mental processes	7☐, 14☐
5B.4	Apply my understanding of the roles of the hindbrain, midbrain and forebrain, including the cerebral cortex, in behaviour and mental processes	10☐, 11☐, 13☐

Key Science Skills

Skills	Questions and Skills boxes
Demonstrate safe laboratory practices when planning and conducting investigations by using risk assessments that are informed by safety data sheets (SDS), and accounting for risks	5A Key Science Skills
Apply relevant occupational health and safety guidelines while undertaking practical investigations	5A Key Science Skills
Demonstrate ethical conduct and apply ethical guidelines when undertaking and reporting investigations	5A Key Science Skills

ISBN 978-1-009-25401-4

Multiple-choice questions

1 Which neuroimaging technique involves monitoring glucose uptake by cells in the brain?
- **A** MRI
- **B** PET
- **C** CT
- **D** fMRI

2 Who was one of the first known writers to identify mental processes as being housed in the brain?
- **A** Alcmaeon
- **B** Aristotle
- **C** Galen
- **D** Descartes

3 Descartes outlined a theory called 'dualism'. What did this theory suggest?
- **A** The mind and body are the same thing and work in unison.
- **B** The mind and body are different things, and they do not interact.
- **C** The mind and body are different things, but they interact via the pineal gland.
- **D** The mind and body are the same thing, and they are coordinated by the pineal gland.

4 Although phrenology became discredited, what idea remains true?
- **A** The size of particular bumps on the head indicates the degree of intelligence of an individual.
- **B** Particular areas of the brain play a significant role in certain bodily functions.
- **C** The observable size of the head can be linked to the efficiency of certain bodily functions.
- **D** The degree of emotion that one experiences can be attributed to indentations on the forehead.

5 What did some of the first brain experiments teach scientists about learning and memory?
- **A** Learning and memory are situated in a single brain area.
- **B** Learning and memory are not located in the brain.
- **C** Learning is located throughout the brain, but memory is not.
- **D** Learning and memory are situated throughout the brain, rather than in a single location.

6 Neuroimaging techniques can typically be categorised as
- **A** either structural or functional.
- **B** structural.
- **C** functional.
- **D** neither structural nor functional.

7 The hindbrain, midbrain and forebrain
- **A** only play a role in mental processes in the body.
- **B** only play a role in behavioural processes in the body.
- **C** play the same role in mental and behavioural processes in the body.
- **D** all play a role in mental and behavioural processes in the body.

8 The forebrain is
- **A** involved in coordinating survival functions, such as breathing.
- **B** involved in a wide range of bodily functions, as well as in learning, memory, thinking and perception.
- **C** important in motor functions, such as movement of the eye.
- **D** the smallest area of the brain.

ISBN 978-1-009-25401-4 Gallagher et al

9 Hemispheric specialisation refers to
- **A** the two brain hemispheres having separate, unique functions.
- **B** one hemisphere carrying out a particular function before the other.
- **C** one hemisphere having a specialised function that is not possessed, or is controlled to a lesser extent, by the other hemisphere.
- **D** each hemisphere controlling the opposite side of the body to which that hemisphere is located.

10 Which lobe plays a significant role in receiving and processing sounds from the ears?
- **A** temporal
- **B** occipital
- **C** parietal
- **D** frontal

Short-answer questions

11 Myelin is found throughout the brain. Explain the importance of myelin in conducting electrical impulses. (2 marks)

12 Draw a diagram of the brain and label the following: frontal lobe, parietal lobe, temporal lobe, occipital lobe, cerebellum and brainstem. (6 marks)

13 Explain how the prefrontal cortex, premotor cortex and primary motor cortex are connected in the frontal lobe of the brain in the action of picking up a glass. (3 marks)

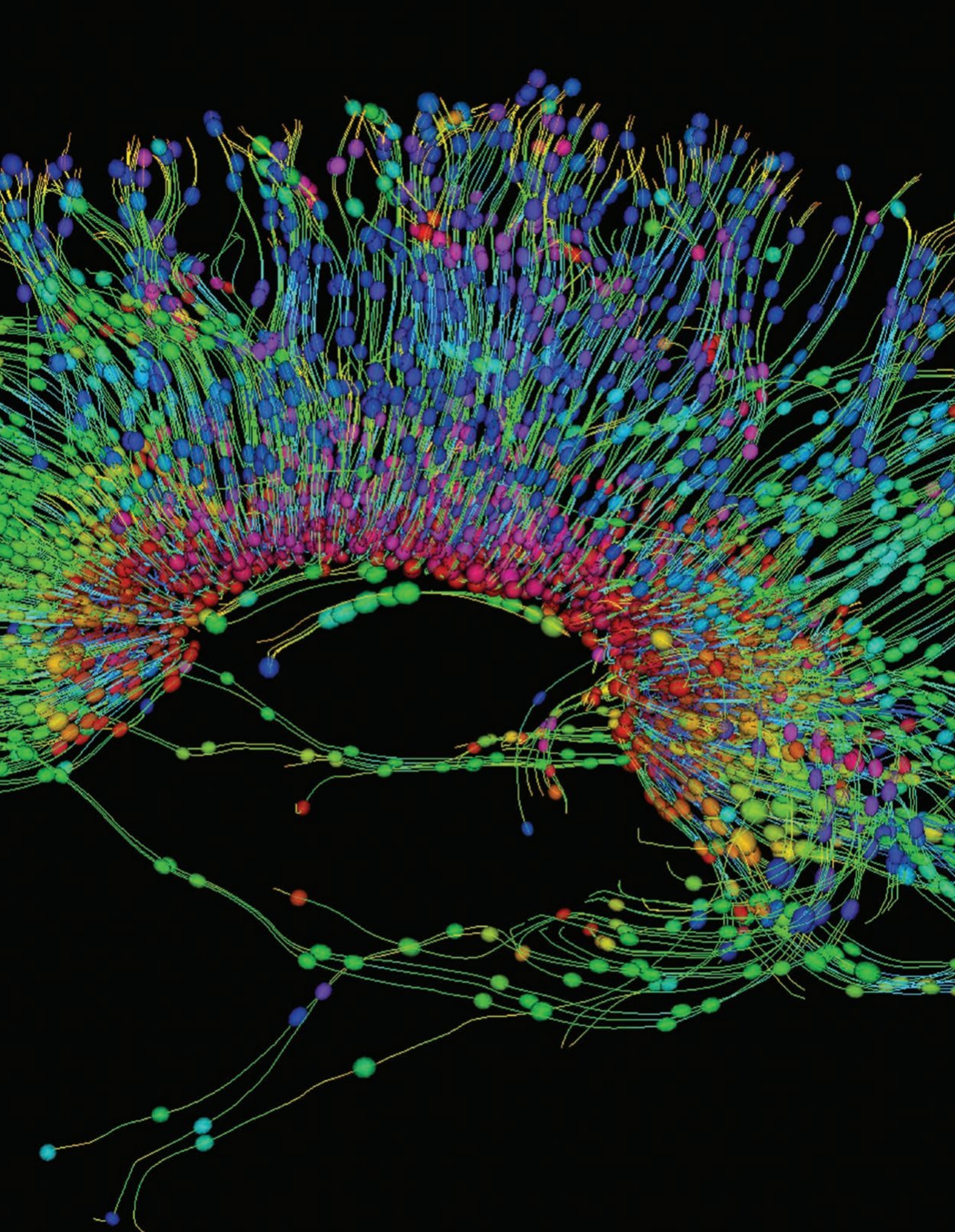
14 Contrast the roles of Broca's and Wernicke's areas in the brain. (2 marks)

15 Explain hemispheric specialisation in terms of function and dominance. Give examples of functions specialised in the left and right cerebral hemispheres. (4 marks)

16 What system in the midbrain helps us to filter out unnecessary information and focus? Describe how this occurs. (4 marks)

17 Outline what the corpus callosum is connected to and the role it plays in the cerebrum. (2 marks)

ISBN 978-1-009-25401-4



ISBN 978-1-009-25401-4
Gallagher et al

UNIT 1

HOW ARE BEHAVIOUR AND MENTAL PROCESSES SHAPED?

CHAPTER 6

BRAIN PLASTICITY AND BRAIN INJURY

Introduction

In the previous chapter, you learned about how the brain enables us to interact with our external world by processing sensory information, initiating voluntary movement, understanding language, making decisions and regulating our emotions. While there is still much about the brain that is not completely understood, it is well documented that the brain is constantly changing and adapting throughout our lives. Scientists call this feature of the brain 'plasticity'. In other words, the brain is highly malleable.

This chapter builds on your understanding of the roles of different brain structures to investigate how the brain changes and adapts as part of its normal functioning, second to second, in day-to-day experiences and also following injury. The processes involved in neuroplasticity are introduced and then related to memory and learning, and finally applied to a variety of acquired brain injuries and neurological disorders. Chronic traumatic encephalopathy, a neurological disorder that has been linked to repeated impacts to the head, is covered in detail as an example of a progressive and fatal disease.

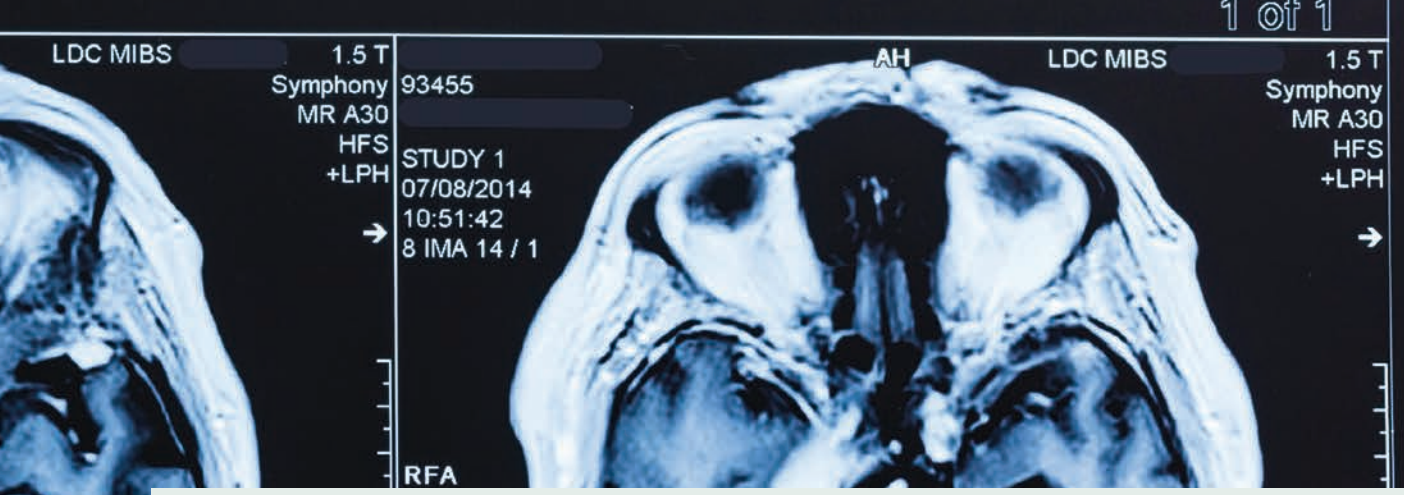
Curriculum

Area of Study 2 Outcome 2

How are mental processes and behaviour influenced by the brain?

Study Design:	Learning intentions – at the end of this chapter I will be able to:	
• The capacity of the brain to change in response to experience and brain trauma, including factors influencing neuroplasticity and ways to maintain and/or maximise brain functioning	**6A**	**Neuroplasticity**
	6A.1	Explain the capacity of the brain to change in response to experience and brain trauma
	6A.2	Identify and explain processes that are involved in neuroplasticity
	6A.3	Identify and explain ways to maintain and maximise brain function
	6A.4	Apply my understanding of neuroplasticity to real-world examples

ISBN 978-1-009-25401-4 Callagher et al



Study Design:	Learning intentions – at the end of this chapter I will be able to:
• The impact of an acquired brain injury (ABI) on a person's biological, psychological and social functioning	**6B Acquired brain injuries** 6B.1 Describe the characteristics of an acquired brain injury 6B.2 Identify examples of acquired brain injuries 6B.3 Explain the impact of an acquired brain injury on biological, psychological and social functioning 6B.4 Apply my understanding of acquired brain injury to real-world examples
• The contribution of contemporary research to the understanding of neurological disorders	**6C Contemporary research into neurological disorders** 6C.1 Describe the characteristics of neurological disorders 6C.2 Identify examples of neurological disorders 6C.3 Describe the contribution of contemporary research to the understanding of neurological disorders
• Chronic traumatic encephalopathy (CTE) as an example of emerging research into progressive and fatal brain disease	6C.4 Describe the features of chronic traumatic encephalopathy 6C.5 Describe the emerging research into chronic traumatic encephalopathy as a progressive and fatal brain disease 6C.6 Apply my understanding of neurological disorders to real-world examples

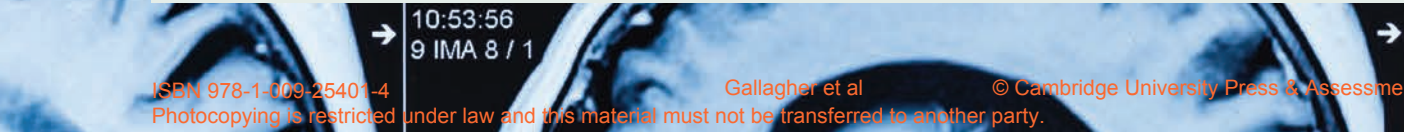
VCE Psychology Study Design extracts © VCAA; reproduced by permission

Key Science Skills

- Systematically generate and record primary data, and collate secondary data, appropriate to the investigation
- Record and summarise both qualitative and quantitative data, including use of a logbook as an authentication of generated or collated data
- Organise and present data in useful and meaningful ways, including tables, bar charts and line graphs

Glossary

Acquired brain injury (ABI)
Aphasia
Broca's aphasia
Chronic traumatic encephalopathy (CTE)
Concussion
Epilepsy
Experience-dependent plasticity
Experience-expectant plasticity
Experience-independent plasticity
Long-term depression
Long-term potentiation
Neurodegenerative disease
Neurological disorders
Neuroplasticity
Rerouting
Seizure
Sprouting
Stroke
Synaptic pruning
Synaptogenesis
Tau protein
Traumatic brain injury (TBI)
Wernicke's aphasia

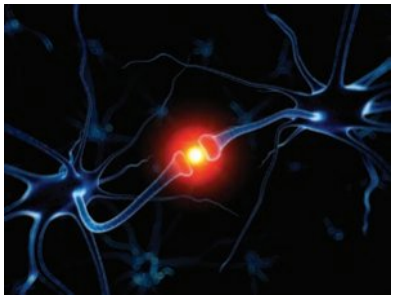


ISBN 978-1-009-25401-4

Concept map

The capacity of the brain to change in response to experience and brain trauma

6A Neuroplasticity



The impact of acquired brain injury on biological, psychological and social functioning

6B Acquired brain injuries

Understanding neurological disorders, including epilepsy, and emerging research into chronic traumatic encephalopathy

6C Contemporary research into neurological disorders

See the Interactive Textbook for an interactive version of this concept map interlinked with all concept maps for the course.

ISBN 978-1-009-25401-4

Neuroplasticity

Study Design:
The capacity of the brain to change in response to experience and brain trauma, including factors influencing neuroplasticity and ways to maintain and/or maximise brain functioning

Glossary:
Experience-dependent plasticity
Experience-expectant plasticity
Experience-independent plasticity
Long-term depression
Long-term potentiation
Neurodegenerative disease
Neuroplasticity
Rerouting
Sprouting
Synaptic pruning
Synaptogenesis

ENGAGE

Phantom limb pain

Phantom limb pain, in which sensations or pain are felt in a limb that is no longer there, is a common and debilitating condition experienced by approximately 70% of people who have had one or more limbs amputated. The neurological basis of phantom limb pain is not completely understood, with several theories attempting to explain its cause and how the central nervous system and/or peripheral nervous system contribute to the condition.

One interesting theory explains phantom pains as resulting from a fault in cortical reorganisation in the parietal lobe's somatosensory cortex following amputation. As discussed in the previous chapter, each body part has a dedicated location on the primary somatosensory cortex to receive and process its sense of touch. For example, specific neurons in the somatosensory cortex are used to receive sensory input from the hand. In the case of hand amputation, when the neurons responsible for sensations from the hand no longer receive input due to the removal of the hand, these neurons begin to instead receive and respond to new inputs coming from the person's face. This is because, on the somatosensory cortex, the neurons responsible for the face are located below the neurons responsible for the hand. This means that sensations to the face are now being received by the neurons responsible for the amputated hand, resulting in feelings of tingling, itching or pain being incorrectly perceived as occurring in the amputated hand.

Phantom limb pain is a chronic condition, with many amputees experiencing phantom sensations for years, with no relief from medications or treatments. A well-known and simple treatment for phantom limb syndrome is mirror therapy. This treatment involves using a mirror to reflect an image of the remaining limb to create an illusion of two intact limbs (Figure 6A–1).

In the case of leg amputation, by moving the remaining leg, the mirror allows a person to visualise the amputated leg moving and imagine motor control over the missing leg. Visual feedback may help to reduce the dysfunctional reorganisation of the somatosensory cortex and return it to its original configuration, thereby overcoming phantom limb pain.

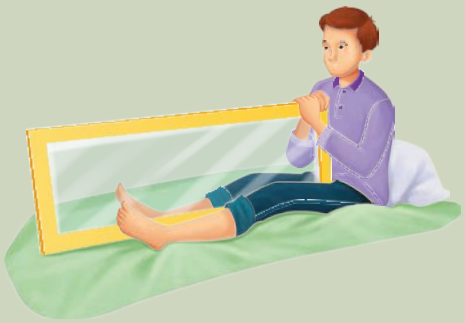


Figure 6A–1 Mirror therapy uses a mirror to create an illusion of two intact limbs.

ISBN 978-1-009-25401-4 Gallagher et al

Recent advancements in technology have allowed for a more sophisticated version of mirror therapy, in which virtual reality (VR) goggles are used to visualise a representation of the missing limb. Figure 6A–2 shows an amputee and what they would see in the goggles. Every year, we see further improvements in the area of virtual reality, complemented by technologies such as augmented reality and brain neuroimaging.

The fact that phantom limb pain occurs and can be treated demonstrates the brain's ability to reorganise following an injury. This is an example of neuroplasticity, which is the focus of this chapter.

Figure 6A–2 Virtual reality extends on mirror therapy to allow people to see a virtual representation of their missing limb.

EXPLAIN

Changes in the brain in response to experience and brain trauma

Neuroplasticity the ability of neural networks in the brain to change as a result of experience

At one point, it was believed that the brain's structure was determined and fixed during a critical period in early childhood and that it remained static and unchangeable throughout life. However, over many years of research, it has come to be widely understood that while genes govern the basic overall brain structure, our experiences and interactions with our environment continue to change our brain over the course of our life span. This capacity of the brain to dynamically modify its neural networks, changing and adapting in both structure and function, is called **neuroplasticity**. It is this quality that allows the brain to remember, learn and respond to our changing needs, such as when a child develops motor control or learns to speak, an adolescent learns to play a new sport or an adult recovers from a brain injury.

Synaptogenesis the process of forming new synapses

Early theories held that a new neuron grew as each new memory was formed. We now know that the process of memory formation is more complex. Newly learned information is encoded into memory when new dendrites sprout from a neuron to create a specific neural connection. In this way, neuroplasticity allows new neural pathways to be produced that represent the experience.

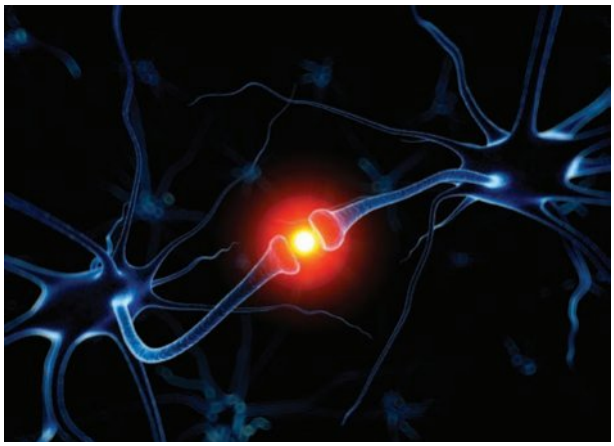


Figure 6A–3 Synaptic connections that are used frequently are strengthened.

Neuroplasticity is most active in childhood, as the first few years of life are a time of rapid brain growth. At birth, each neuron in a newborn baby's brain has around 2500 synaptic connections, and by the time a child is around two years old, each neuron has around 15 000 synaptic connections. This rapid increase in synapses allows a child's brain to grow and constantly develop and change as the child explores their new world and learns new skills. Each new experience for a child prompts a change in brain structure, function or both. As the brain grows, individual neurons first grow more axon terminals and dendrites and then use these to increase the number of synaptic connections or synapses. This process of forming new synapses is called **synaptogenesis**.

ISBN 978-1-009-25401-4 Gallagher et al

As we gain new experience, some synaptic connections that are frequently used are strengthened through the process of **long-term potentiation**. In this process, the synaptic connections that are repeatedly activated become stronger, leading to long-term strengthening in those connections. With repeated activation of a neural pathway, other structural changes occur to allow for more and stronger connections, including the formation of more dendritic branches, axon branches and receptor sites, and an increase in the number of neurotransmitters released into a synapse (as illustrated in Figure 6A–4). Conversely, **long-term depression** occurs in the case of repeated low levels of activation of certain synaptic connections, leading them to become weaker over time and potentially to their eventual elimination through **synaptic pruning**.

By developing new connections and pruning away weak ones, the brain can adapt to the constantly changing environment unique to each person. This is much like how a gardener prunes a growing tree to give it the desired shape. By adulthood, an individual has about half the number of synapses that they had at three years old. Indeed, while the adult brain remains plastic, it has a much lower degree of plasticity than the developing brain. For example, did you ever try to learn an instrument or a second language when you were younger? Consider how easy this process was for you then, compared to learning a new instrument or second language now in your mid to late teens. Consider how easy (or difficult) this process would seem to your parent or grandparent. As a person gets older, they are likely to find learning such new skills more difficult, but still achievable. Therefore, we can say that the degree of neuroplasticity decreases as we get older; however, neuroplasticity is happening all the time and still remains, to some degree, across the whole life span.

VIDEO 6A–1
STRUCTURAL AND FUNCTIONAL CHANGES DUE TO NEUROPLASTICITY

Long-term potentiation the relatively permanent strengthening of synaptic connections as a result of repeated activation

Long-term depression the relatively permanent weakening of synaptic connections as a result of repeated low level activation

Synaptic pruning the elimination of unused synapses

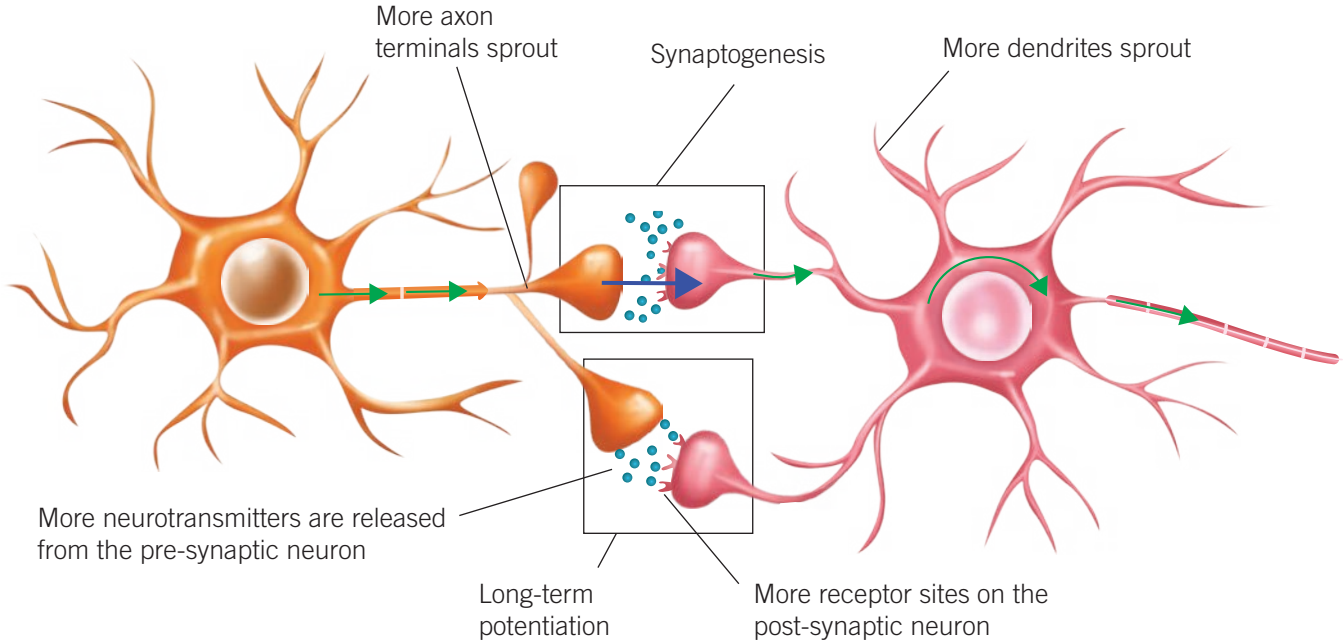


Figure 6A–4 Many structural and functional changes are involved in neuroplasticity when a neural pathway is repeatedly activated.

ISBN 978-1-009-25401-4 Gallagher et al

Figure 6A–5 The brains of younger people are more plastic than those of older people, allowing them to learn new skills more quickly and easily.

At any age, the brain requires experience in order to develop. For example, if you are never exposed to Italian lessons through family, school or travel, you will never learn to speak Italian. This shows that genetics may govern the basic brain structure at birth, but subsequent experiences determine its capacities and deficiencies. Neural circuits are constantly reorganising based on the quantity, quality and timing of our experiences. Whether we are learning to talk, learning to kick a football or learning about a new subject in school, these experiences create pathways in our brain that represent what we know. These pathways are continuously added, removed, changed in strength, linked with other neurons or eliminated, making new learning, unlearning and relearning possible. Each new experience creates a new pathway, while the practice of a certain activity strengthens its neural connections.

The sayings 'neurons that fire together, wire together' and 'neurons not in sync, do not link' highlight that experience determines which neural connections will be strengthened and which will be weakened. The repetition or practice of a task, skill or piece of information activates a neuron in a pathway to send neurotransmitters repeatedly across the synapse to an adjacent neuron. Over time, with repeated activation, the pathways become tough road maps linking parts of the brain. Highly used pathways are easily activated, as they are more efficient and ready to be activated together, with the stimulation of one neuron in a pathway being more likely to trigger the activation of the next neuron. This repetition is required for a neural pathway to be strengthened and long-lasting learning to take place, as the connections that have been activated most frequently are preserved. Rather than 'practice makes perfect', 'practice makes permanent' best describes the processes involved in neuroplasticity. For example, think of any skill you have mastered and compare it to the time when you were first learning this skill. Due to repeated practice, you will now be demonstrating the skill with speed and ease due to the readiness of those strengthened neural pathways to activate and fire together.

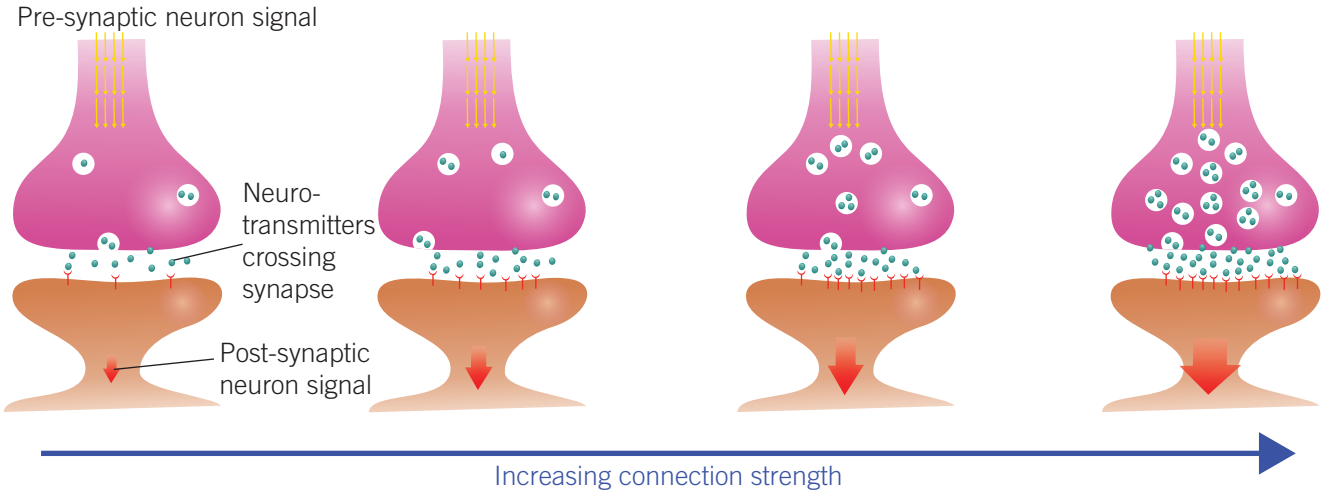
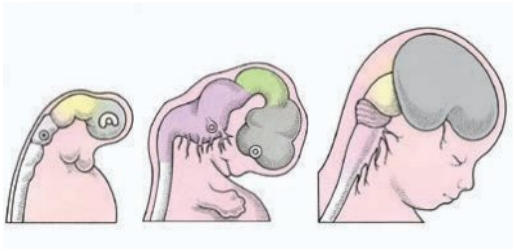


Figure 6A–6 Repeated activation of two neurons together results in a strengthened connection that is more ready to be activated again in the future.

ISBN 978-1-009-25401-4 Gallagher et al

Different types of plasticity occur at different times over the life span. Three important types of plasticity are experience-independent plasticity, experience-expectant plasticity and experience-dependent plasticity. We will now consider these in turn.

Experience-independent plasticity involves brain changes that occur regardless of experience. They unfold over time through a series of events governed by genetics. For example, genetics are responsible for neural development in the prenatal (before birth) developmental phase.



Experience-expectant plasticity involves brain development triggered by specific environmental cues that the brain expects to encounter at certain times. For example, the development of the visual cortex is cued when an infant opens their eyes for the first time.

Experience-dependent plasticity involves the unique and personal brain changes that take place when different situations occur. Examples include learning a new skill during primary school or recovering from brain trauma in adulthood. Table 6A–1 outlines several research-based principles of experience-dependent plasticity that are relevant to helping with a person's rehabilitation after brain damage.

Experience-independent plasticity a type of plasticity that involves brain changes that occur regardless of experience

Experience-expectant plasticity a type of plasticity that involves brain development triggered by specific environmental cues that the brain expects to encounter at certain times

Experience-dependent plasticity a type of plasticity that involves the unique and personal brain changes that take place when different situations occur

Table 6A–1 Principles of experience-dependent plasticity

Principle		Description
1	Use It or Lose It	Failure to drive specific brain functions can lead to functional degradation.
2	Use It and Improve It	Training that drives a specific brain function can lead to an enhancement of that function.
3	Specificity	The nature of the training experience dictates the nature of the plasticity.
4	Repetition Matters	Induction of plasticity requires sufficient repetition.
5	Intensity Matters	Induction of plasticity requires sufficient training intensity.
6	Time Matters	Different forms of plasticity occur at different times during training.
7	Salience Matters	The training experience must be sufficiently salient (relevant and appropriate) to induce plasticity.
8	Age Matters	Training-induced plasticity occurs more readily in younger brains.
9	Transference	Plasticity in response to one training experience can enhance the acquisition of similar behaviours.
10	Interference	Plasticity in response to one experience can interfere with the acquisition of other behaviours.

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 1

1 Identify four changes that occur to neurons and their synapses due to neuroplasticity.
2 Explain the phrase 'neurons that fire together, wire together'.
3 Describe the three different types of plasticity that occur during life.

Changes in the brain due to brain trauma

In instances where the brain experiences trauma, such as through an accident, damage may occur to parts of the brain responsible for certain functions, resulting in a lowered or complete inability to perform those functions. When injury occurs to the brain, there is a loss of tissue at the site of the injury; however, there can also be degeneration in some of the surrounding connected regions.

Most studies suggest that once neurons and other cells in the brain are damaged or die, they typically do not regenerate (although there are some exceptions in specific areas of the brain where new neurons may grow). This means that the remaining healthy neurons are responsible for recovery from damage and injury. In some instances, the processes of neuroplasticity can help the healthy parts of the brain recover, and completely different brain areas may even take over lost functions to restore some ability. For example, if brain trauma from a car accident results in a loss of movement in a person's hands, that ability isn't necessarily lost forever. Through initial compensatory strategies and then therapy and rehabilitation, a person may regain some functioning by repairing neural pathways or forming new ones. Two of the processes that are involved in neuroplasticity following brain trauma are **rerouting** and **sprouting**. Rerouting involves healthy nearby neurons creating alternative neural pathways when existing connections are lost through injury. Sprouting involves existing neurons forming new axon terminals and dendrites to allow new connections to be made.

Rerouting when healthy nearby neurons create alternative neural pathways when existing connections are lost through injury

Sprouting when existing neurons form new axon terminals and dendrites to allow new connections to be made

Unfortunately, these processes do not guarantee complete recovery from brain injury and may work to varying degrees from person to person, as each situation involving brain trauma is unique. The brain is not infinitely malleable and in some cases brain trauma may result in permanent loss of functioning.

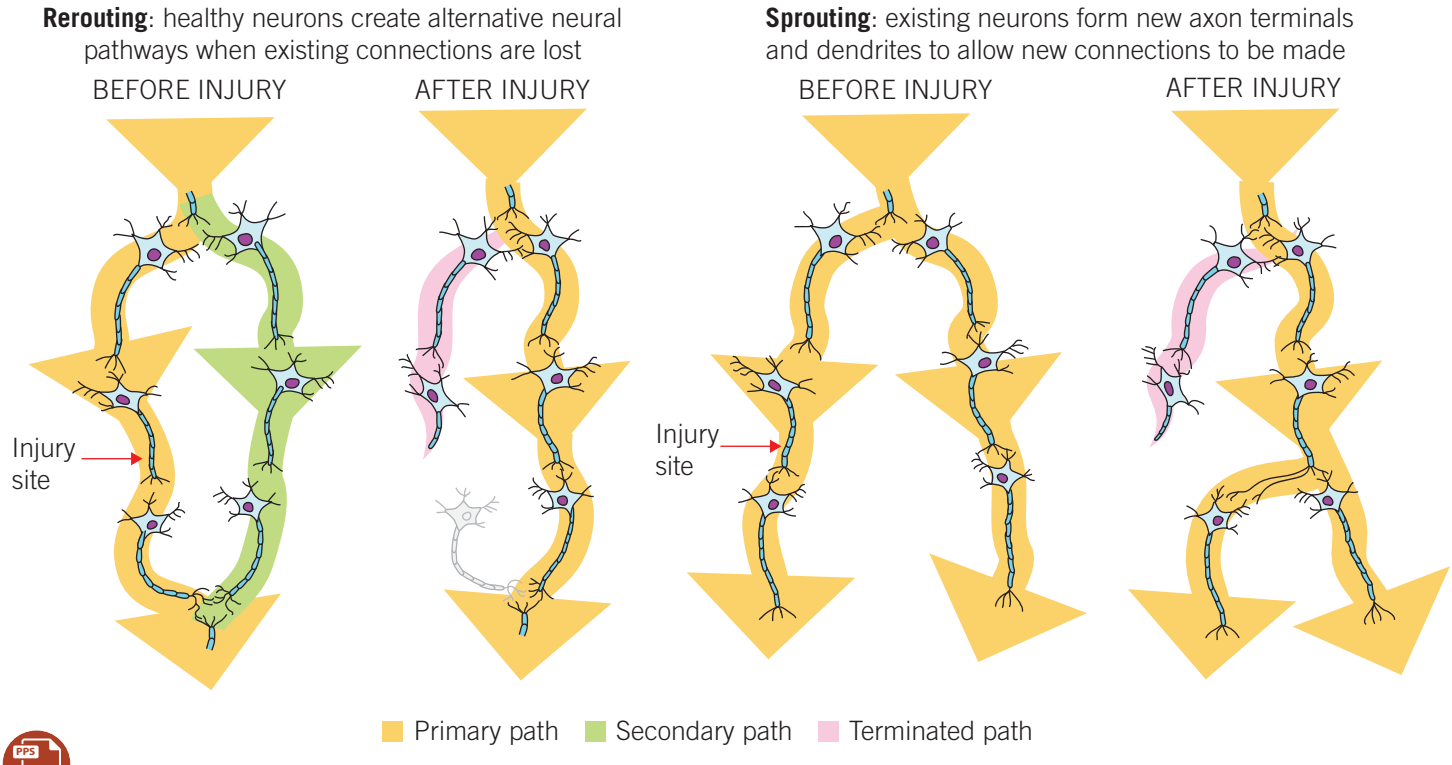


Figure 6A.4 Following a brain injury, the neuroplasticity processes of rerouting and sprouting can assist in recovery.

Over the years, there have been many incredible cases of recovery from significant trauma to the brain. One such study in 2018 followed the recovery of a six-year-old boy who underwent drastic surgery to remove a brain tumour. The surgery required the removal of about one-third of the child's right brain hemisphere, including the entire right occipital lobe and most of the right temporal lobe. As you will recall from Chapter 5, the occipital lobe in each brain hemisphere is responsible for our sense of vision, with the right occipital lobe receiving and processing visual information from the left visual field (the left side of the outside world that is received by each eye). Additionally, one role of the right temporal lobe is the ability to recognise faces, objects and words. Removal of these two parts of the brain could therefore be expected to result in the loss of these abilities.

LINK **5B** THE HINDBRAIN, MIDBRAIN, FOREBRAIN AND CEREBRAL CORTEX

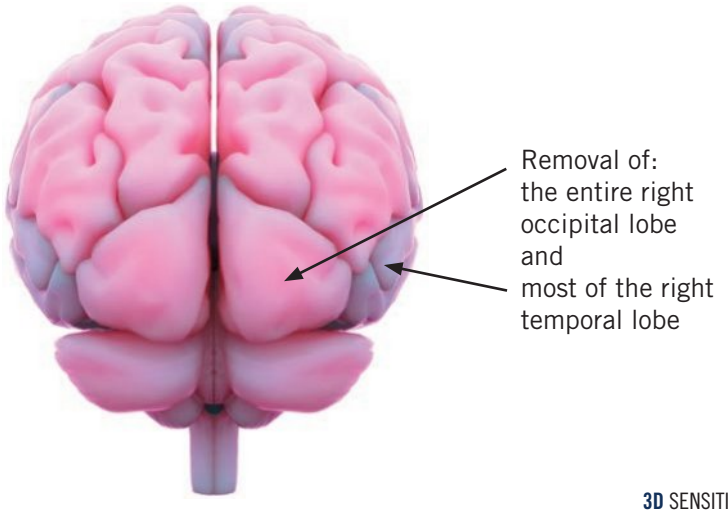


Figure 6A–8 For one six-year-old boy, treatment of a brain tumour required surgical removal of his right occipital lobe and right temporal lobe.

LINK **3D** SENSITIVE AND CRITICAL PERIODS IN PSYCHOLOGICAL DEVELOPMENT

Remarkably, the child, whose recovery was tracked over three years following the surgery, retained his ability to recognise faces, objects and words. This demonstrates that the remaining left hemisphere of his brain compensated for the loss of the right temporal lobe, taking over the function of face, object and word recognition. Unfortunately, the child did not regain sight in his left visual field. The child could still see, because he still had his left occipital lobe – but he could only see what was situated in his right visual field. This may be due to the occipital lobe neural circuits being established and fixed at an earlier age and being less prone to plasticity than other parts of the brain.

Importantly, despite the drastic surgery he underwent, the child retained his pre-surgery cognitive abilities and remained at an above-average IQ. It is not completely clear how the child's recovery occurred, but the researchers believed that it involved rerouting pathways through the thalamus, as well as the brain taking advantage of overall high plasticity due to the child's young age. Recovery was aided by the addition of myelin, dendritic growth, non-neuronal cells and the re-sculpting of synapses.

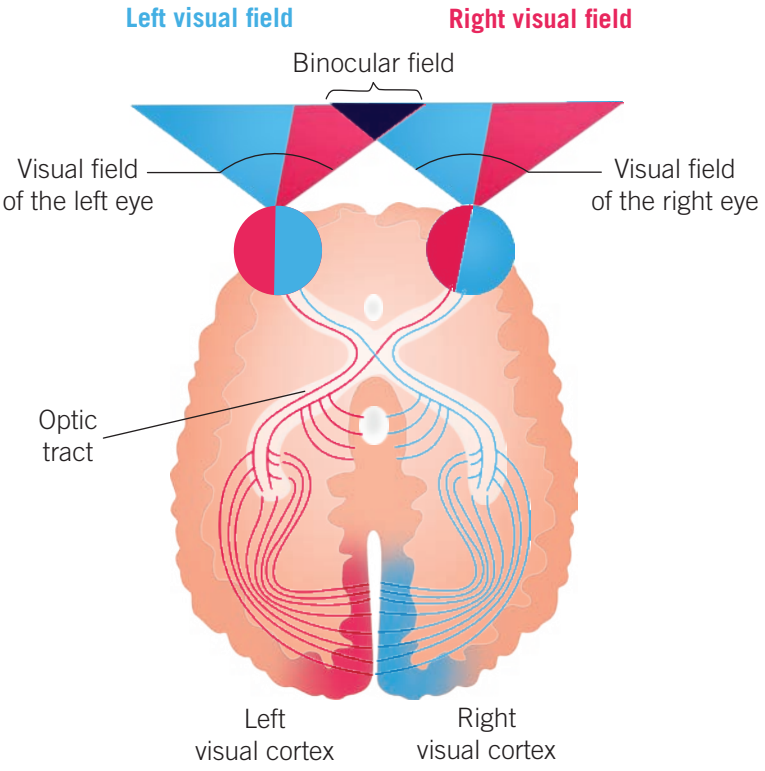


Figure 6A–9 The child's vision remained impaired following the surgical removal of the right occipital lobe, with an inability to see objects in his left visual field.

ISBN 978-1-009-25401-4 Gallagher et al

Figure 6A–10 A rehabilitation centre in France is using a new physical therapy system devoted to improving walking through fun exercises with which the patient interacts in real time. It uses a double walkway complete with instruments, a motion capture system, three cameras and EMG, all synchronised with a virtual reality environment.

The particular therapy a person will complete following brain trauma depends on the specific trauma and functional deficits they are experiencing and may include exercise and physical therapy, as well as cognitive therapy. Therapy aims to teach, guide and promote brain plasticity, helping the brain to rebuild lost connections by strengthening or rerouting the remaining pathways. Interestingly, the time following brain trauma is the best opportunity for taking advantage of the brain's neuroplastic abilities, as this is when the brain is most capable of making significant changes.

Following trauma, there is a sequence of three phases of neuroplasticity. Immediately after the injury, neuron death occurs and inhibitory pathways decrease, which may uncover secondary neural networks that have rarely been used. After around two days, the activity of these pathways changes from inhibitory to excitatory, and synaptogenesis creates new synapses. Neurons and other cells replace damaged cells and promote healing. Lastly, after a few weeks, synaptogenesis continues, sprouting increases and the processes allowing for the remodelling of the brain are at their highest (Su, Veeravagu & Grant, 2016). At this time, rehabilitation and therapy can help promote changes to recover some function. The effectiveness of rehabilitation differs by case, with some people regaining full functioning, others seeing no improvements at all, and those in between who reach a plateau in their recovery and are left with some residual effects of the injury.

Check-in questions – Set 2

1 Name and explain two processes of plasticity that occur following a brain injury.
2 Explain the three phases of neuroplasticity that can allow for recovery following a brain injury.

Maintaining and maximising brain functioning

In addition to those recovering from brain trauma, people who have not experienced any brain damage can also take advantage of the processes involved in neuroplasticity to maintain and maximise their brain functioning. Neuroplasticity continues throughout life, allowing a person to learn, remember and adapt to new challenges and experiences. Certain behaviours allow these processes to work at their best, with the right mental stimulation, diet and physical activity all encouraging optimum brain functioning.

ISBN 978-1-009-25401-4 Gallagher et al

Mental stimulation

Mental stimulation involves any activity that activates or enriches the mind. The types of activities should be age-appropriate and can differ from person to person depending on what they enjoy. In early childhood, enriched sensory environments can stimulate neuroplasticity processes, such as sensory play involving activities that engage the child's senses of touch, hearing, sight, smell and taste. This idea is backed by research, as animal studies have found that raising animals in deprived conditions, such as in darkness, hinders development and can lead to permanent loss of function. Conversely, animals raised in enriched environments develop an increased brain weight and increased motor, sensory and cognitive functioning.

In adolescents and adults, there is benefit in any novel activity that takes a person out of their comfort zone or challenges them to learn something new while engaging in focused attention. This could include learning an instrument, language or new skill, practising a hobby, being creative, playing sport or travelling to a new destination. In older age, activities that help keep the mind active are especially important when physical abilities are decreasing. Puzzles, cooking, reading, music, attending concerts or the theatre, social activities, reasoning games, crafts and other cognitively challenging activities are beneficial. Research-based mobile applications for 'brain games' can be useful; however, some research has found that these games only improve the person's ability to play the specific game, rather than their general cognitive ability. They are also beneficial only if the person is engaged in and enjoying the game.

Figure 6A–11 Neuroplasticity can be encouraged through mental stimulation, which involves any activity that activates or enriches the mind.

In terms of brain plasticity, research has found that mental stimulation can promote the following:

- formation of new dendritic branches and synapses
- increased functioning of the chemicals that aid in the maintenance, growth and synaptic plasticity of neurons
- increased formation and survival of new neurons in certain brain regions
- reduced age-related atrophy in the brain structures involved in memory (Phillips, 2017).

Diet

Another modifiable lifestyle factor to help maintain good brain functioning is diet, including the total intake, frequency and content of food consumed. While the brain comprises only 2% of a person's total body weight, it consumes 20% of the total energy derived from nutrients to support the processes involved in neurotransmission. This demonstrates the importance of good nutrition for brain health.

ISBN 978-1-009-25401-4 Gallagher et al

Figure 6A–12 Neuroplasticity can be encouraged through a healthy diet.

Research has specifically found that diets high in polyphenols, a natural compound found in plant-based foods such as colourful fruits, vegetables, spices and teas, can promote antioxidant and anti-inflammatory activities in the brain. They can support a healthy brain by:

- enhancing synaptic transmission and cognitive function
- preventing age-related decline in central nervous system functioning and **neurodegenerative diseases**, such as dementia
- increasing the formation and survival of new neurons in certain brain regions
- increasing the functioning of the chemicals that aid in the maintenance, growth and synaptic plasticity of neurons
- increasing the volume of the brain structures involved in memory, mood and emotion regulation
- mitigating chronic inflammation, which can dysregulate neurotransmission and supportive brain cells (Phillips, 2017).

Neurodegenerative disease an incurable condition that involves the progressive death of neurons

Table 6A–2 provides a list of the common food sources that contain polyphenols, which are thought to support brain health.

Table 6A–2 Consuming a wide range of foods that contain polyphenols is important for brain health.

Polyphenols	Food sources
Flavonoids	
Catechins	Green and white tea, grapes, cocoa, lentils, berries
Flavanones	Oranges, grapefruit, lemons
Flavanols	Green vegetables, apples, berries, onions
Anthocyanins	Berries, red grapes, wine
Non-flavonoids	
Resveratrol	Grape skin, red wine, nuts
Curcumin	Turmeric, mustard
Coumarin	Liquorice, strawberries, apricots, cherries, cinnamon
Phenolic acids	
Ellagic acid	Walnuts, strawberries, cranberries, blackberries, guava, grapes
Tannic acid	Nettles, tea, berries
Gallic acid	Tea, mango, strawberries, rhubarb, soy
Caffeic acid	Blueberries, kiwis, plums, cherries, apples

Source: Manach, C., Scalbert, A., Morand, C., Rémésy, C., & Jiménez, L. (2004). Polyphenols: Food sources and bioavailability. *The American Journal of Clinical Nutrition*, *79*.

While avoiding unsustainable 'fad' diets is recommended, recent research has found that an intermittent fasting schedule may be beneficial for enhancing brain plasticity. Importantly, for a healthy person, intermittent fasting does not necessarily involve a reduction in overall caloric consumption. Rather, it involves eating all meals for the day within a specific eating window and fasting for the remaining time.

ISBN 978-1-009-25401-4 Gallagher et al

For example, a '16:8' fasting schedule would involve consuming all food within an 8-hour window and fasting for the remaining 16 hours of the day.

Animal studies have shown that an intermittent fasting regimen may enhance learning and memory and prevent age-related diseases by:

- reducing age-related atrophy in the brain structures involved in memory
- increasing synapse formation and neurotransmitter release
- increasing the functioning of the chemicals that aid in the maintenance, growth and synaptic plasticity of neurons.

Intermittent fasting has also been found to have many other health benefits, including improving insulin sensitivity, hypertension, inflammation and sleep. It is important to note that any changes to diet should be discussed with and monitored by a doctor to ensure that they are implemented in a healthy and safe way.

Figure 6A–13 A diet following intermittent fasting guidelines may help to promote neuroplasticity.

Physical activity

Regular physical activity is another modifiable behaviour that has been found to have many benefits for the brain. The type of physical activity should be suited to a person's age and physical ability and can include stretching, walking, gardening, swimming, dancing, strength training or playing sport. It is also likely that exercise increases the health-promoting effects of diet and vice versa, and many studies have focused on researching the combined effects of exercise and diet on neuroplasticity. Like diet, exercise has a broad spectrum of actions on the body and general brain health. It promotes neuroplasticity by altering the synaptic structure and functions in various regions of the brain.

With reference to brain health and plasticity, research has found that physical activity can promote the following:

- increased density of neuron dendrites
- reduced age-related decline in the cortical tissue of the frontal, temporal and parietal lobes
- increased volume of the brain structures involved in memory
- increased functioning of the chemicals that aid in the maintenance, growth and synaptic plasticity of neurons
- increased formation and survival of new neurons in certain brain regions
- protection against cognitive decline and neurodegenerative diseases, such as Alzheimer's disease and Parkinson's disease
- improved neuroplasticity in people with mental disorders, including mood disorders, post-traumatic stress disorder and schizophrenia.

Studies have established a beneficial link between aerobic exercise (or cardiorespiratory exercise) and brain functioning. There may also be a level of intensity of exercise that is 'just right' for cognitive improvements, with moderate-intensity exercise appearing the most effective.

ISBN 978-1-009-25401-4 Gallagher et al

Low-intensity exercise seems to be less effective, while high-intensity exercise may actually induce a stress response, impairing cognitive performance. While the benefits of exercise on health are obvious, it remains unclear what combination of intensity, frequency and duration provides the most benefit for neuroplasticity.

Figure 6A–14 Neuroplasticity can be encouraged through physical activity, particularly aerobic exercise.

WORKSHEET 6A–1 NEUROSCIENCE OF ISOLATION

Check-in questions – Set 3

1 Describe what mental stimulation involves in relation to neuroplasticity.
2 Describe what kind of diet aids neuroplasticity.
3 Describe what type of physical activity aids neuroplasticity.
4 For each of the factors that contribute to improved neuroplasticity – mental stimulation, physical activity and diet – identify two processes they promote.

VIDEO 6A–2 SKILLS: DRAWING NEURON DIAGRAMS

6A SKILLS

Drawing neuron diagrams

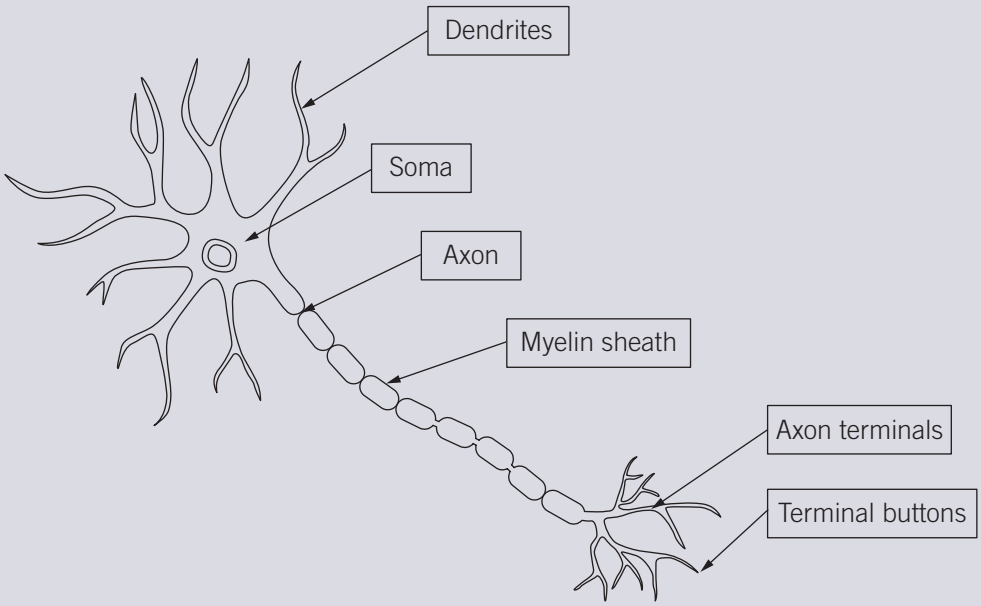
In VCE Psychology, you may be required to draw a simple neuron or synapse diagram. Here, you will learn some useful tips for drawing diagrams in psychology.

Tips regarding the structure of the neuron

- Messages always travel in only one direction through a neuron: from the dendrites, down the axon and out via the axon terminals/terminal buttons.
- Dendrites and axon terminals are at opposite ends of a neuron, and while they may look similar, they do not have the same function.
- When drawing a synapse, the neuron situated before the synaptic gap is the 'pre-synaptic neuron' and the neuron situated after the synaptic gap is the 'post-synaptic neuron'.
- Be aware of similar key terms for different structures: synapse and synaptic gap; axon, axon terminals and terminal buttons.
- Unless specified otherwise, a neuron diagram should show a simple motor neuron, rather than a sensory neuron or interneuron, which have similar structures but a different overall shape and layout.
- Remember, this isn't an art class! Follow the basic rules for drawing scientific diagrams, including:
  - use a sharp grey lead pencil
  - draw simple, clear outlines, with no shading or 3D elements
  - use colour only when required
  - use a ruler to draw the lines for arrows and be clear about which structure the line is pointing to
  - label all major structures.

ISBN 978-1-009-25401-4 Gallagher et al

Example neuron diagram



ACTIVITY 6A–1 NEUROPLASTICITY SUMMARY POSTER

Create a poster summarising the processes involved in neuroplasticity. You can present it in a table format, as in the example provided below.

Neuroplasticity of a mastered skill	Neuroplasticity of a forgotten skill
Picture of skill	Picture of skill
Neuroplasticity processes	Neuroplasticity processes
Synapse diagram	Synapse diagram

Select one skill that you have mastered and complete regularly. It could be a hobby-based skill, such as shooting a basketball, or an everyday skill, such as touch-typing without looking at your laptop keyboard.

Next, select one skill that you have forgotten or lost over time. It could be a hobby-based skill from when you were a child that you no longer do (e.g. doing a handstand or cartwheel) or an everyday skill that you have since changed, such as changing the cursive style of handwriting you learned in primary school to a less formal style.

Select a picture to represent these two skills. Either take a photo of yourself doing them, draw a picture or find a picture online to use.

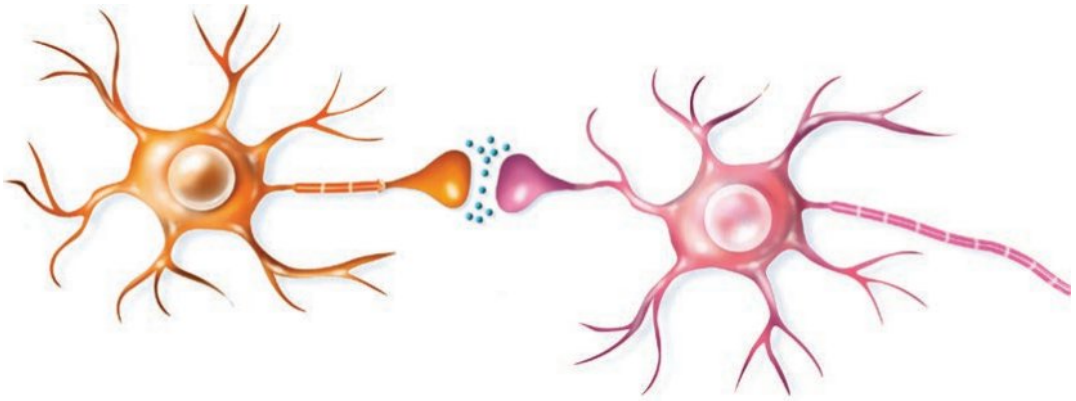
Make some dot points about the neuroplasticity processes that were occurring when you were learning and demonstrating the 'mastered' skill and about the processes that were occurring when you were not practising or demonstrating the 'forgotten' skill.

Lastly, draw two labelled synapse diagrams to show the differences between the neuroplasticity processes occurring for each skill.

ISBN 978-1-009-25401-4

Section 6A questions

1 Annotate the following synapse diagram to describe the changes that take place with regard to dendrites, neurotransmitters and receptor sites when a neural pathway is repeatedly activated.



2 Billie knows how to tie her shoelaces using the 'bunny ears' method, and now wants to learn to use the 'around the tree' method. Her brother is helping to teach her this, and they practise every morning before school.
   - **a** Explain the involvement of long-term potentiation in Billie learning to tie her shoelaces using the new 'around the tree' method.
   - **b** Explain the role of long-term depression in Billie learning to use the new method for tying her shoes.
   - **c** Billie's brother has not used the 'bunny ears' method to tie his shoelaces for many years and can't remember how to do it at all. Name the neuroplasticity process that has resulted in Billie's brother being unable to use the old method.
   - **d** Billie was so proud when she learned the new 'around the tree' method of tying her shoelaces that she wanted to teach her grandmother, who used the 'bunny ears' method and had never learned the 'around the tree' method. Explain why Billie's grandmother may take more attempts to master the new method than Billie did.

3 Yan and Amaya are playing tennis in their Year 7 Physical Education class. Yan is really good at serving, as he played tennis throughout primary school. Amaya, on the other hand, has never played tennis before and she can't seem to serve the ball over the net. Explain how experience-dependent plasticity might explain the difference in tennis skills between Yan and Amaya.

4 Sarina was in a motorbike accident where she hit her head on the road and suffered a brain injury. Immediately following her injury, Sarina was unable to move her left hand. Over the course of several months of physical therapy, Sarina gradually regained most of her hand function. Name and explain the role of two neuroplasticity processes involved in Sarina's rehabilitation following her brain injury.

5 Marek is a healthy 58-year-old with a family history of neurodegenerative disease. Marek's father had developed Alzheimer's disease, a type of dementia in which neurons gradually die, resulting in symptoms such as memory loss. Describe three recommendations a doctor might give to Marek to help him maintain his current good health and delay the development of neurodegenerative disease.

ISBN 978-1-009-25401-4 Gallagher et al

6B Acquired brain injuries

Study Design:
The impact of an acquired brain injury (ABI) on a person's biological, psychological and social functioning

Glossary:
Acquired brain injury (ABI)
Aphasia
Broca's aphasia
Concussion
Stroke
Traumatic brain injury (TBI)
Wernicke's aphasia

ENGAGE

Locked-in syndrome

Imagine being awake, aware and able to hear everything around you, but unable to talk or move any muscle in your body or face, so you cannot communicate in any way. This situation sounds like a nightmare, or something only seen in fictional movies. However, these symptoms are part of a rare but real condition called 'locked-in syndrome', which can be caused by damage to the brainstem. Initially named by Plum and Posner in 1966, locked-in syndrome is characterised by complete paralysis of the muscles, resembling and often misdiagnosed as a coma or vegetative state (awake without awareness).

In some less severe cases, patients maintain the ability to blink and move their eyes vertically up and down. This is often the way that a family member or doctor discovers that the patient's consciousness is still there, despite them appearing completely unresponsive. Recovery from locked-in syndrome is possible, with patients regaining some ability to communicate to varying degrees. Technology is of great assistance to patients, with some able to use an electronic communication device with eye movement sensors, computer voice prosthetics or electric wheelchairs. Other methods of communication include yes/no codes or communication boards with letters or symbols indicated via eye movements.

A link to a personal account of a patient's experience of locked-in syndrome is provided in the Interactive Textbook.

DOCUMENT 6B–1 LOCKED-IN SYNDROME CASE

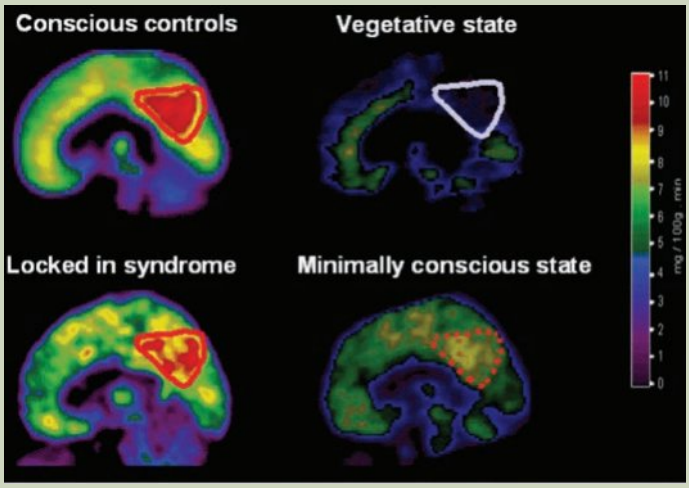


Figure 6B–1 Functional neuroimaging techniques can show the activity of different parts of the brain during different states of consciousness, such as during locked-in syndrome.

ISBN 978-1-009-25401-4

EXPLAIN

The impact of acquired brain injuries on functioning

Acquired brain injury (ABI) an injury resulting from damage to the brain occurring after birth, at any time during life

An **acquired brain injury (ABI)** is the result of damage to the brain that occurs after birth, at any time during life. An ABI may be sudden or insidious (prolonged), and some causes include:

- physical injury or trauma, such as an impact to the head from a fall, a fight or a sporting accident
- disease or infection, such as meningitis, Parkinson's disease or Alzheimer's disease
- oxygen deprivation to the whole body or brain, such as through a near-drowning, heart attack or stroke
- poisoning, or alcohol or drug abuse
- brain tumours.

Acquired brain injury is an umbrella term that encompasses many different types of injuries and conditions, including traumatic brain injury (TBI), aphasia, concussion and stroke. It is difficult to calculate the exact prevalence of ABI, but in 2007, the Australian Institute of Health and Welfare estimated that over 430 000 Australians had a brain injury with daily activity limitations and participation restrictions. Three-quarters of people with a brain injury were male. Three-quarters were under 65 years old, and two-thirds had acquired their brain injury before the age of 25.

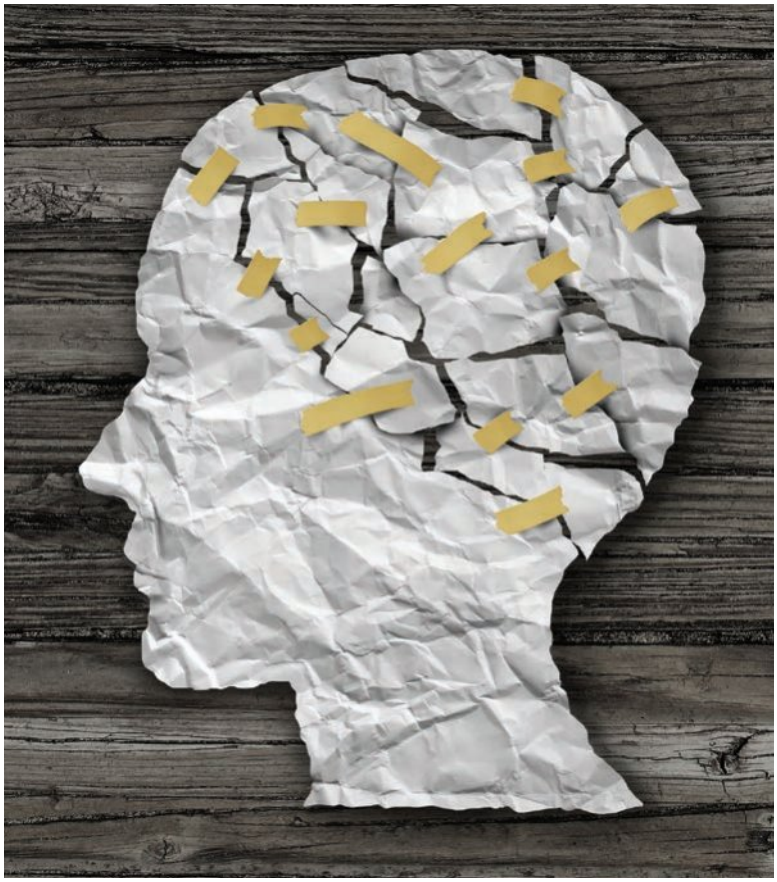


Figure 6B–2 Acquired brain injuries are the result of damage to the brain occurring after birth, such as from physical injury, disease, oxygen deprivation, poisoning or brain tumours.

In general, ABIs result in a change to the brain's structure and therefore the brain's activity, resulting in some effect on a person's biological, psychological or social functioning. The specific symptoms or losses of functioning depend on which areas of the brain are affected and will differ by case. Tests such as brain imaging can help identify the exact area and amount of structural damage, as well as any deficits in functioning. The symptoms resulting from an ABI may be temporary or more permanent and can be classed in a range from 'mild' (where the person requires the use of an aid or piece of equipment to complete a core activity) to 'profound' (where the person always needs assistance from another person to perform core activities and cannot function independently). Sometimes, symptoms are not visibly obvious to others, and in these cases, the ABI can be referred to as a 'hidden disability'.

Some examples of the effects of an ABI are shown in Table 6B–1, categorised as biological, psychological or social.

ISBN 978-1-009-25401-4 Gallagher et al

Table 6B–1 Biological, psychological and social effects of an acquired brain injury

Biological	Psychological	Social
• Impaired sensory functioning, such as loss of vision or hearing disturbances • Muscle weaknesses • Poor balance • Tremors • Arthritis • Headaches • Fatigue • Seizures • Chronic pain • Slurred or slowed speech • Bladder problems • Hormone imbalance • Sleep disturbances	• Memory loss • Slowed thinking • Confusion • Poor attention and concentration • Reduced ability to plan, organise and problem solve • Inflexible thinking • Poor judgement • Lack of initiative or motivation • Anxiety • Depression • Emotional instability • Irritability • Short-temperedness • Personality changes • Impaired self-awareness • Self-centredness • Negative self-talk	• Impaired social skills • Impaired ability to communicate with others such that others can't understand them, or they can't keep up with a conversation • Socially inappropriate behaviour • Difficulty following social rules and conventions, such as yelling, interrupting, asking personal questions or an inability to take turns • Aggressive verbal or physical behaviour • Difficulty relating to others • Loss of confidence and self-esteem • Impulsivity • Losing touch with friends or changed relationships • Isolation • Trouble relating to others or feeling misunderstood • Poor ability to manage conflict

As a result of these effects, a person with an ABI may experience secondary effects, such as:

- grief in coming to terms with their injury
- difficulties managing and maintaining relationships
- difficulties managing the challenges and changes in their everyday life
- changes in their identity
- a need to adapt to new ways of schooling
- loss of employment
- financial difficulties
- difficulty with accessibility within their house and community
- challenges finding appropriate work and recreational opportunities
- increased need for assistance
- a need to move into supported accommodation.

VIDEO 6B–1
ACQUIRED BRAIN INJURIES

Additionally, people with ABIs are at a higher risk of homelessness, in part due to discrimination and a lack of suitable rental options or affordability. This means that they have a higher risk of interacting with the criminal justice system, which may explain why there is a high prevalence of ABIs among people in custody.

Recovery from an ABI depends on the cause, extent and location of the damage, as well as on factors such as the person's age and health. At the time of an injury, the amount of recovery that will be made cannot be predicted. In some cases, the actions taken immediately following the incident can determine the severity of the damage, so timely, appropriate and effective first aid is important until the person can receive formal medical help to prevent further complications.

ISBN 978-1-009-25401-4 Gallagher et al

Figure 6B–3 Treatment following an accident should involve immediate and careful action to help minimise damage. Tests such as brain imaging can help to determine whether an acquired brain injury has occurred.

6A NEURO-PLASTICITY LINK

Rehabilitation involving intensive therapy can gradually help a person regain some of their lost physical functioning. It also gives them access to equipment and mobility aids to help them relearn independent living skills. Adaptations to the home may also be required, such as adding ramps and handrails. As discussed in Section 6A, the biggest improvements typically come in the first few months following the injury, as neuroplasticity is at its peak in many areas of the brain and the processes of rerouting and sprouting are helping to form new connections to reorganise the brain.

Figure 6B–4 Rehabilitation for an acquired brain injury aims to first help a person regain lost functioning and independent living skills.

Recovery from an ABI is often ongoing, and it can continue for years. Along with any specific neurological or physical therapies, the person may need support in returning to work or study, accessing suitable housing, settling into the community and participating in community life. In some cases, the person may not regain full functioning, and they may have to learn to live permanently with the effects of their injury.

In the remainder of this section, we look more closely at four common types of ABI affecting people in Australia: traumatic brain injury (TBI), aphasia, concussion and stroke.

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 1

1 When does damage to the brain need to occur to be considered an acquired brain injury?
2 Identify three ways an acquired brain injury may occur.
3 Identify two biological, two psychological and two social effects of an acquired brain injury.

Traumatic brain injury

Traumatic brain injury (TBI) occurs when there is sudden physical trauma to the brain from an external force. TBI is a leading cause of death and disability in children and young adults across the world, and can occur when a person's head violently comes into contact with an object, such as due to:

- vehicle accidents
- falls
- violence or physical assaults
- work-related accidents
- sporting accidents
- objects, such as a bullet, piercing the skull
- infants being shaken.

Traumatic brain injury (TBI) an injury that occurs when there is a sudden, physical trauma to the brain from an external force

Figure 6B–5 Traumatic brain injuries occur due to sudden physical trauma from an external force to the brain, such as a vehicle accident or fall.

Surrounding and protecting the brain is a clear fluid called cerebrospinal fluid. When a person's head is hit very hard, the cerebrospinal fluid is not enough of a cushion to stop the brain from hitting the thick surrounding membranes or bones of the skull. This causes damage to the delicate brain tissue, resulting in bruising, swelling, bleeding, tearing or increased pressure. The damage varies in extent depending on the severity of the incident. This is often measured by how long a person loses consciousness, ranging from momentary loss to falling into a coma. Most cases of TBI are classified as mild, whereby the person is awake but may have had a short loss of consciousness. A small percentage of cases involve a person arriving at medical care unconscious; these cases are classified as severe.

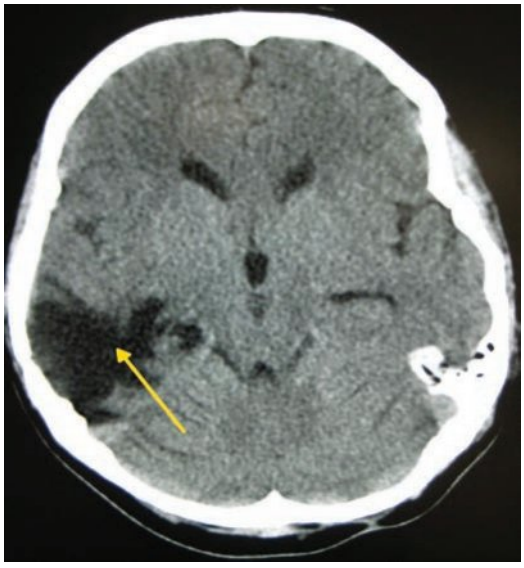


Figure 6B–6 A neuroimaging scan of the head years after a traumatic brain injury. Notice the empty space marked by the large dark patch and arrow where the damage occurred.

ISBN 978-1-009-25401-4 Gallagher et al

Most at risk of TBIs are children under four years, young adults aged 15–24 years and adults aged over 60 years. Males are also more likely to suffer from TBIs than females. A wide range of biological, psychological and social effects are seen following TBI, with recovery sometimes continuing for years. Research has suggested a link between receiving moderate or severe TBI and developing Alzheimer's disease or other types of dementia years later, and there also seems to be a link to a future diagnosis of epilepsy.

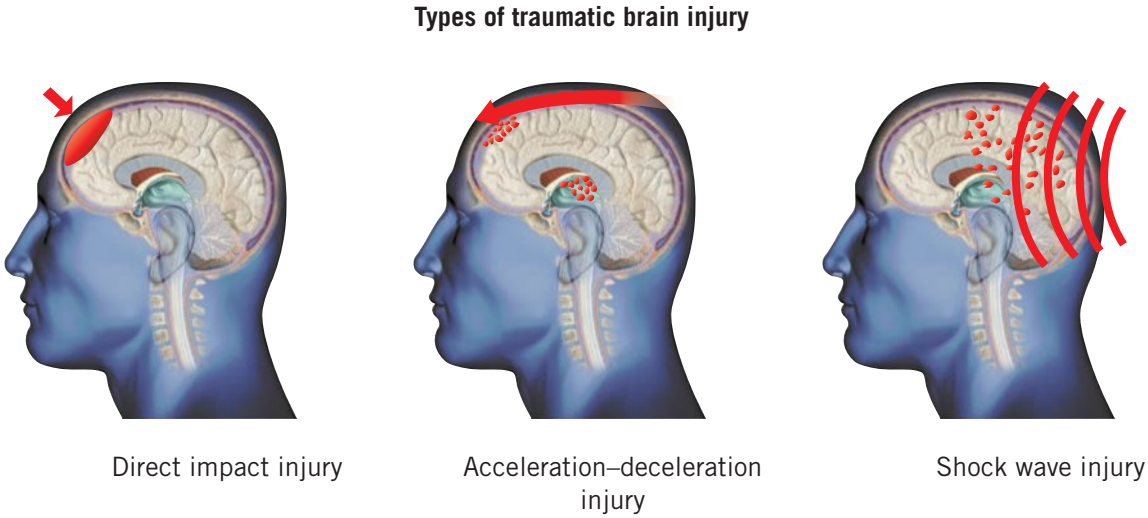


Figure 6B–7 Types of traumatic brain injury include those caused by a direct impact to the head, sudden acceleration or deceleration, or shock waves from an intense blast.

Aphasia

Aphasia
an acquired language disorder resulting from damage to the language-processing centres of the brain

Aphasia is an acquired language disorder that results from damage to the language-processing centres of the brain. Aphasia is characterised by an impaired understanding and/or production of language. These impairments occur while talking, reading, writing or listening to someone speak; however, a person's intelligence is not affected. A person with aphasia may know what they want to say but have trouble expressing their message. For example, a person may have trouble finding the right word to use, using correct grammar to form a sentence, understanding a joke or what someone is asking, participating in a conversation in a noisy environment, understanding long sentences or recognising the difference between similar words.

Aphasia is usually the result of damage to the left hemisphere of the brain, most typically from a stroke, but it can also be due to TBI, tumours or other diseases. There are several types of aphasia, including Wernicke's aphasia and Broca's aphasia, with severity depending on the extent of the damage.

WORKSHEET 6B–1 APHASIA

Figure 6B–8 Aphasia is a language disorder that causes a variety of symptoms related to a person's speech.

ISBN 978-1-009-25401-4 Gallagher et al

Wernicke's aphasia is characterised by trouble comprehending speech and producing meaningful sentences. A person with this kind of aphasia can produce fluent sentences, but the meaning of those sentences is nonsensical or confusing. Wernicke's aphasia results from damage to Wernicke's area in the temporal lobe of the brain, which is responsible for speech comprehension.

Broca's aphasia is characterised by a person being able to understand speech but having trouble producing fluent speech. Their words have meaning, but they are not connected in flowing sentences. Speech is slow and takes a lot of effort. Broca's aphasia results from damage to Broca's area in the frontal lobe of the brain, which is responsible for speech production.

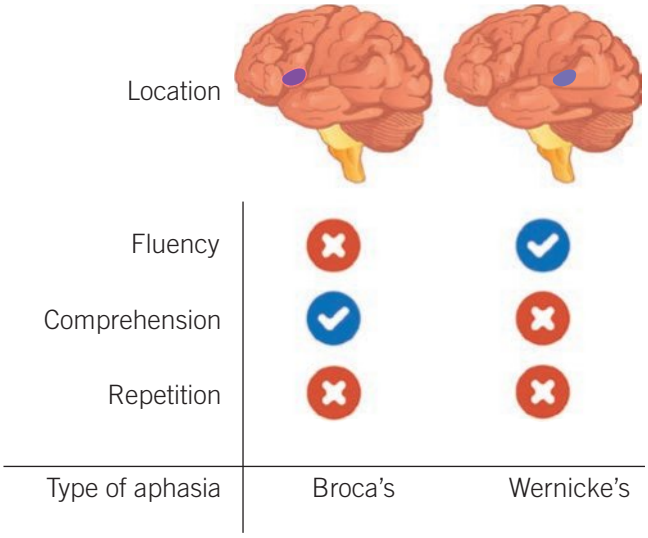


Figure 6B–9 Broca's aphasia and Wernicke's aphasia affect different aspects of language because they are caused by damage to different parts of the brain.

Figure 6B–10 Aphasia can cause difficulties in all aspects of language, including reading and communicating with others.

LINK **5B** THE HINDBRAIN, MIDBRAIN, FOREBRAIN AND CEREBRAL CORTEX

Wernicke's aphasia an acquired language disorder characterised by difficulty comprehending speech and producing meaningful sentences

Broca's aphasia an acquired language disorder characterised by difficulty producing fluent speech

Concussion a mild form of traumatic brain injury, resulting from an external force to the head or body that causes the brain to bounce inside the skull

Concussion

A **concussion** is a mild form of TBI resulting from an external force to the head or body that causes the brain to bounce inside the skull. When understanding concussion, it is first important to realise that the brain has a degree of movement because it is floating in fluid inside the skull. Its main anchorage is the brainstem and spinal cord at the bottom. Second, the laws of motion covering momentum and inertia apply to the brain, so if the head suddenly accelerates to the left and then stops, a force impacts the brain first on the right and then again on the left. Despite the presence of fluid, the surface of the brain (the cerebral cortex) can be injured if the forces acting on it cause it to connect with the inside of the skull. Strong acceleration and deceleration of the head can also cause small bleeds from blood vessels in the brain.

The causes of concussions are similar to those for TBI, with sporting accidents, vehicle accidents and falls being the most common.

Figure 6B–11 Concussions can be caused by a range of accident types.

ISBN 978-1-009-25401-4 Gallagher et al

Concussions are usually not life threatening, but they can cause serious symptoms. The symptoms usually begin immediately, but they can also not develop until hours, days, weeks or even months after the injury. These symptoms vary depending on the severity of the injury, and most people make a fast recovery. Initial symptoms of a concussion may include a temporary loss of normal brain function, with the experience of headache, memory loss, blurry vision and confusion, accompanied by nausea, fatigue and lack of coordination. Most people do not lose consciousness when they experience a concussion and have no obvious signs of damage to the physical structure of the brain. A person with a concussion will usually experience a gradual improvement in their symptoms over a couple of weeks.

Figure 6B–12 Initial symptoms of a concussion can involve headaches and blurry vision.

Following a concussion, a person should rest and recover to allow their brain to heal with time. Experiencing one concussion seems to increase a person's susceptibility to experiencing another concussion in the future. Receiving a second concussion soon after the first is dangerous and can increase the likelihood of severe symptoms, such as brain swelling. It could even be fatal. This demonstrates the importance of an athlete taking enough time to recover before returning to sports. Multiple concussions have recently been linked with the development of other neurological conditions later in life, including Alzheimer's disease and CTE (chronic traumatic encephalopathy), which is covered in Section 6C.

6C CONTEMPORARY RESEARCH INTO NEUROLOGICAL DISORDERS LINK

Stroke

Stroke an acquired brain injury involving an interruption to the blood supply in the brain or bleeding in the brain, resulting in deterioration of brain tissue

A **stroke** involves either an interruption to the blood supply in the brain or bleeding from blood vessels in the brain. Both causes can result in the death of brain tissue. Blood carries oxygen and nutrients to the brain, so when blood cannot get to the brain via the arteries due to stroke, neurons and other cells in the brain die. Strokes can be characterised according to whether:

- blood clots block blood vessels in the brain (Figure 6B–13)
- there is a gradual closure of blood vessels
- there is severe bleeding.

Stroke can affect anyone; however, men are at greater risk than women, and risk increases with age, with the highest rates of stroke occurring after the age of 85. Other risk factors for stroke include hypertension, an unbalanced diet high in 'bad' fats and salt, diabetes, inactivity, heavy alcohol use, tobacco use and excess weight.

ISBN 978-1-009-25401-4 Gallagher et al

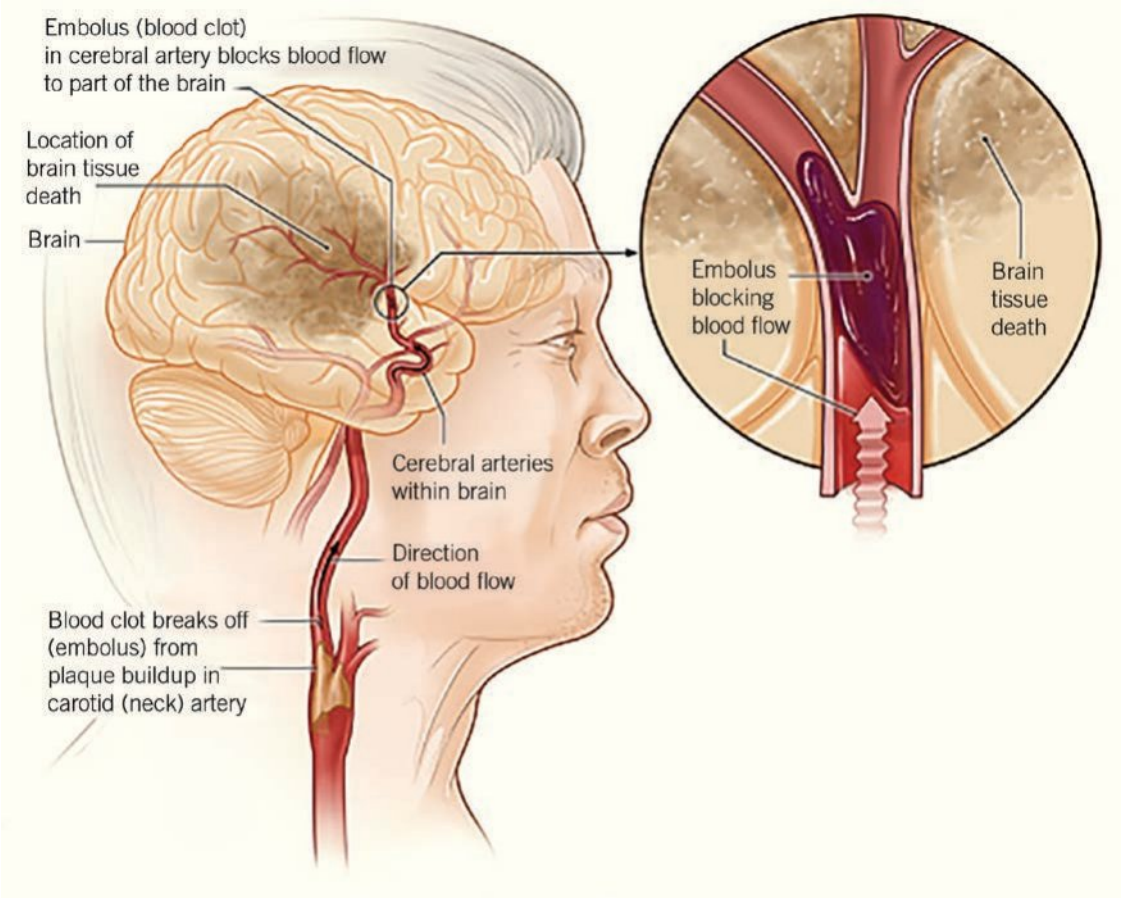


Figure 6B–13 There are several types and causes of stroke. One type involves a blood clot blocking an artery and impairing blood flow to part of the brain.

Following a stroke, a person can experience a range of symptoms of varying severity, depending on which part of the brain has been affected and the extent of the blood shortage. A stroke may result in loss of sensations, communication difficulties such as aphasia, visual problems, loss of consciousness, lack of coordination, cognitive distortions such as confusion or disorientation, and paralysis. Many people who experience stroke are left dependent on others for caregiving, and recurrence of stroke is common, as is the development of dementia following a stroke. A large proportion of those who experience a stroke suffer a long-lasting disability, and stroke is one of the leading causes of death in many countries.

A stroke is a medical emergency, and immediate treatment for a stroke is vital to ensure the minimisation of damage. Interruption of the blood supply to a specific area of the brain due to stroke can, in some cases, take several hours to have its full effect. This creates a small time window during which it is possible for medical treatment to disrupt or even reverse the stroke process. If medical professionals can salvage the at-risk tissue, this can minimise the neurological deficits and disability that would have resulted without any intervention.

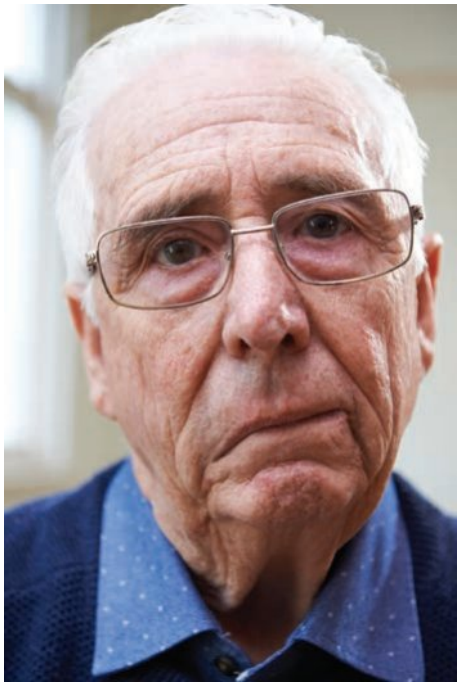


Figure 6B–14 An observable sign of stroke is drooping on one side of the face.

ISBN 978-1-009-25401-4 Gallagher et al

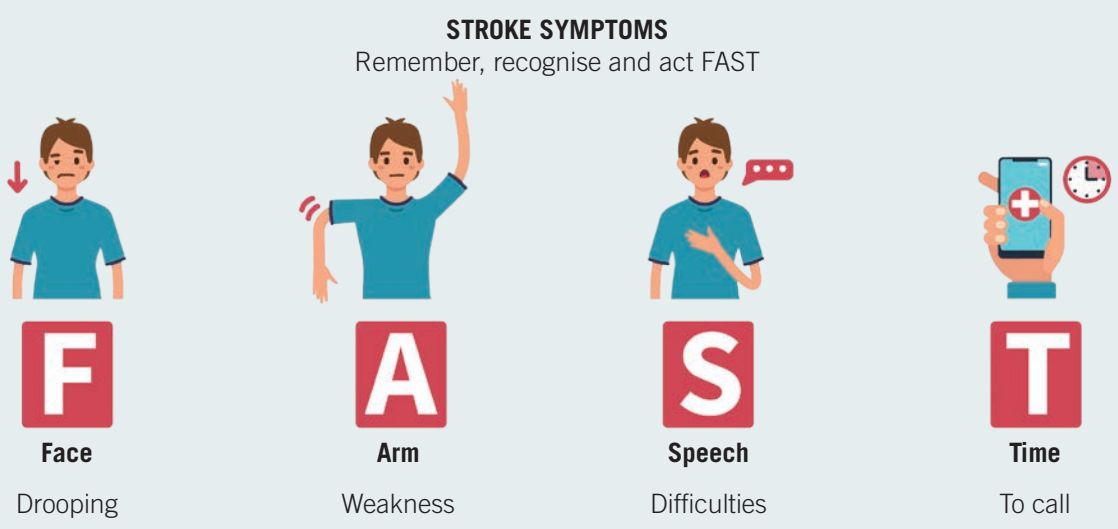


Figure 6B–15 The acronym FAST can be used to identify whether a person has experienced a stroke.

The acronym FAST can help a bystander determine whether they are observing stroke symptoms in a family member or friend:

- Face – Has their face drooped?
- Arms – Can they lift both arms?
- Speech – Is their speech slurred and do they understand you?
- Time – Time is critical. Call an ambulance immediately.

Recovery from stroke is variable and depends on the age of the person, the size of the damaged area and the treatment and rehabilitation offered. Task repetition and task-specific practice can result in significant changes in the brain due to the processes involved in neuroplasticity.

Check-in questions – Set 2

1 Identify two ways that a traumatic brain injury may occur.
2 Describe what happens in the brain when a traumatic brain injury occurs.
3 Describe aphasia.
4 Identify two areas of the brain associated with aphasia.
5 Identify four common initial symptoms of concussion.
6 Describe what happens in the brain when a person experiences a stroke.
7 Identify three effects of a stroke.

6B SKILLS

VIDEO 6B–2 SKILLS: DRAWING NEURON DIAGRAMS

3B THE BIOPSYCHO-SOCIAL APPROACH LINK

UNITS 3&4 LINK

The biopsychosocial approach

In Chapter 3, you were introduced to the biopsychosocial approach, which describes how biological, psychological and social factors combine and interact to influence a person's development, health and wellbeing. The biopsychosocial approach underpins much of what you will learn in Units 1 & 2 as well as Units 3 & 4 Psychology, including concepts in this chapter on neuroplasticity.

The biopsychosocial approach is particularly useful in helping us understand the complex nature of humans, acknowledging that each person is different and has a unique combination of influences. It is important to note that each factor can be considered from both a positive and negative perspective and can therefore be either a risk factor or a protective factor for health and wellbeing. The factors can also interact to influence one another.

ISBN 978-1-009-25401-4 Gallagher et al

It is necessary to understand each component of the biopsychosocial approach and to be able to identify which factors sit within each area.

The following table summarises some of these factors.

Table 6B–2 Factors in the biopsychosocial model

Biological	Psychological	Social
• Genetics and genetic vulnerabilities • Nervous system functioning • Neurochemistry • Hormone functioning • Effects of medication, diet, alcohol or drugs • Disability • Disease or disorder • Physical health and illness • Stress or immune response	• Thoughts • Regulation of emotions • Perceptions • Self-esteem • Personality traits • Coping skills and resilience • Attitudes • Beliefs • Memory and learning abilities • Expectations	• Social support • Interpersonal relationships • Peer influences • Family circumstances • Exposure to stressful or traumatic events • Socio-economic status • Culture • Lifestyle • Environmental surroundings • Access to medical care

When asked to identify a biological, psychological or social factor in a certain situation, consider whether it is affecting the person's:

- physiology or parts of the body (biology)
- thoughts and mind (psychology)
- interactions with others, life events and physical surroundings (social).

ACTIVITY 6B–1 DEBATE: SHOULD ALL CHILDREN WEAR HELMETS IN CONTACT SPORTS?

Conduct a debate on the topic of 'Should all children playing contact sports wear a helmet?'

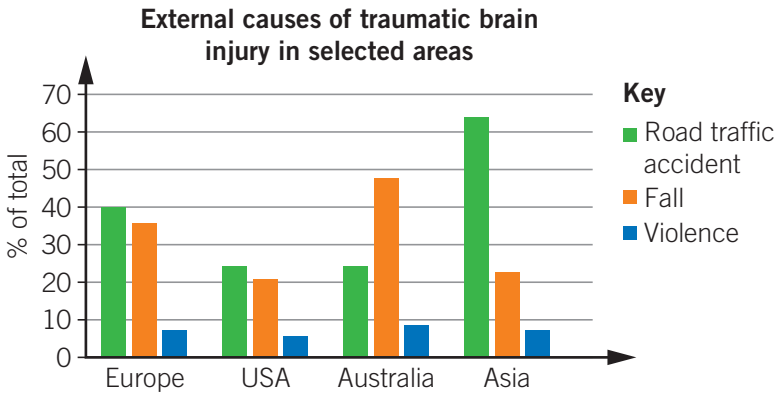
Working with a partner or small group, take either the 'For' or 'Against' side and determine some persuasive arguments addressing the topic.

Alternatively, create a list of 'For' and 'Against' arguments yourself and then compare them with a partner or small group.

Section 6B questions

1 Justify whether a brain tumour would be classified as an acquired brain injury.
2 With reference to the physiology of the brain, explain why a helmet may not completely protect against a person receiving an acquired brain injury.
3 Rayna is an 11-year-old who experienced a brain injury when she nearly drowned at the beach. She now experiences a range of challenges as a result of her injury. Rayna has returned to school but finds she has trouble with her memory – she cannot retain as much information as she used to, even in her favourite subjects. While her friends have been very supportive, Rayna is frustrated that she can't play the same games at lunchtime, and this has resulted in her getting into regular arguments with her friends. She has found that after lunchtime, she feels very fatigued, and she usually needs to go home early from school to rest. Identify one biological, one psychological and one social effect of Rayna's injury.

ISBN 978-1-009-25401-4 Gallagher et al



Source: Adapted from World Health Organization (2006) *Neurological disorders: Public health challenges* (Report). WHO.

4 The graph on the left shows three of the main external causes of traumatic brain injury in several areas of the world.

- **a** Referring to the graph, identify the most common cause of TBI in Australia.
- **b** Identify one common feature of the causes of TBI across the geographical areas.
- **c** Approximately what percentage of TBIs do road traffic accidents account for in Asia?

5 Provide a link between the location of Broca's area in the brain and the symptoms of Broca's aphasia.

6 Explain the danger of experiencing a stroke.

7 The SCAT5 Sport concussion assessment tool is a questionnaire and set of tests used by medical professionals to assess athletes' suspected concussions, scoring severity of symptoms on a seven-point scale. Below is an extract from the tool: the symptom form to be completed by the athlete who has experienced a concussion.
Identify two psychological changes and two biological changes that this symptom form evaluates, and explain what scores an athlete who has received a concussion during sport may write down when completing this form.

SYMPTOMS	SCORE						
	None	Mild		Moderate		Severe	
Headache	0	1	2	3	4	5	6
'Pressure in head'	0	1	2	3	4	5	6
Neck pain	0	1	2	3	4	5	6
Nausea or vomiting	0	1	2	3	4	5	6
Dizziness	0	1	2	3	4	5	6
Blurred vision	0	1	2	3	4	5	6
Balance problems	0	1	2	3	4	5	6
Sensitivity to light	0	1	2	3	4	5	6
Sensitivity to noise	0	1	2	3	4	5	6
Feeling slowed down	0	1	2	3	4	5	6
Feeling like 'in a fog'	0	1	2	3	4	5	6
'Don't feel right'	0	1	2	3	4	5	6
Difficulty concentrating	0	1	2	3	4	5	6
Difficulty remembering	0	1	2	3	4	5	6
Fatigue or low energy	0	1	2	3	4	5	6
Confusion	0	1	2	3	4	5	6
Drowsiness	0	1	2	3	4	5	6
More emotional	0	1	2	3	4	5	6
Irritability	0	1	2	3	4	5	6
Sadness	0	1	2	3	4	5	6
Nervous or anxious	0	1	2	3	4	5	6

ISBN 978-1-009-25401-4 Gallagher et al

Contemporary research into neurological disorders

Study Design:

- The contribution of contemporary research to the understanding of neurological disorders
- Chronic traumatic encephalopathy (CTE) as an example of emerging research into progressive and fatal brain disease

Glossary:

Chronic traumatic encephalopathy (CTE)
Epilepsy
Neurological disorders
Seizure
Tau protein

ENGAGE

Exciting prospects for neural interface technology

Neuralink is a neurotechnology company founded in 2016 that is designing and developing the first widely accessible brain–machine interface system, which can allow a person to control a computer through thought alone. The technology includes a 'Link' neural implant device that is implanted in the skull (Figure 6C–1). The implant has extremely fine connections to multiple tiny electrodes that are inserted into specific areas of the brain that control movement. The electrodes can detect the activity of the neurons and transfer it to the implant, which then sends the information wirelessly to a computer.

Figure 6C–1 Neuralink's 'Link' implant aims to be the first widely accessible brain–machine interface system.

The initial application of this system is as a medical device for people with quadriplegia (paralysis of the arms and legs) due to a severe spinal cord injury. The goal is to allow a person to regain independence through the ability to control computers and mobile devices directly with their brain. This would improve their communications and enable them to easily and independently access the internet and various other everyday technological applications that were previously difficult or impossible to access due to their paralysis. The company hopes that the device will eventually be used to treat a range of neurological disorders, with potential future applications of the device including restoring lost motor functioning, controlling prosthetic limbs and restoring eyesight or hearing.

As of March 2022, Neuralink has already achieved success with animal modelling, and human clinical trials are expected to begin soon.

ISBN 978-1-009-25401-4 Gallagher et al

EXPLAIN

Introducing neurological disorders

Neurological disorder any disorder of the nervous system, including of the brain, spinal cord or nerves

Neurological disorders include any disorder of the nervous system, including those that affect the central nervous system's brain or spinal cord, or the peripheral nervous system. There are more than 600 neurological disorders, some of which may develop due to an ABI (acquired brain injury), while others are congenital conditions that develop while the baby is still in the womb. At any time throughout life, the brain, spinal cord and nerves are vulnerable to damage caused by injury or trauma, nutritional deficiencies, substance use, poisoning and other diseases, viruses and infections.

Neurological disorders are long-lasting and can affect any aspect of a person's functioning, including their language, movement, vision and cognition. They produce a wide range of symptoms which can depend on the disorder, but a common comorbidity is poor mental wellbeing.

Neurological disorders are classified according to the main location in the body being affected, the type of dysfunction being experienced or the main cause. In addition to those ABIs mentioned in the previous section, some other neurological disorders you may have heard of include dementia, cerebral palsy, meningitis, motor neurone disease, migraines, narcolepsy, epilepsy, Tourette syndrome, multiple sclerosis and Parkinson's disease.

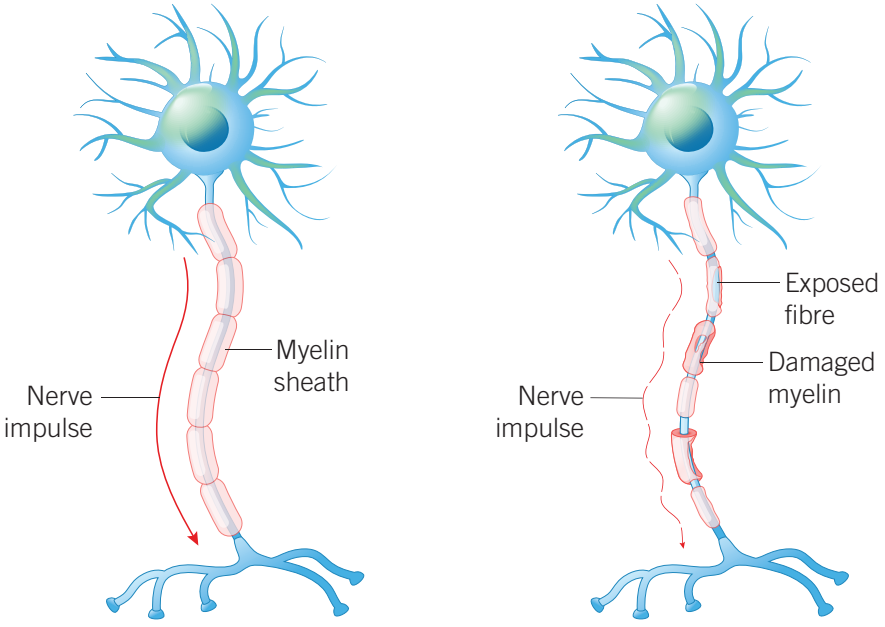


Figure 6C–2 Multiple sclerosis is a neurological disorder affecting the myelin surrounding neurons in the nervous system. Myelin is an insulator, so when lost, electrical nerve impulses leak out and weaken.

Globally, neurological disorders are one of the leading causes of death and disability, and as populations are growing and ageing, this trend is expected to continue. Research into neurological disorders is therefore important to help us develop a common understanding of these disorders, their treatments and even their cures. The remainder of this section details emerging research on two neurological disorders: epilepsy and chronic traumatic encephalopathy.

ISBN 978-1-009-25401-4 Gallagher et al

Epilepsy

Epilepsy is a neurological disorder that causes sudden, intense bursts of brain activity, resulting in **seizures**. Epilepsy involves recurrent and unprovoked seizures that are not due to temporary health problems, such as an interruption to the normal brain signals due to high fever, high or low blood sugar, substance use or withdrawal, or concussion. Normal brain activity involves neurons firing in order as a message passes through the brain. Large numbers of neurons do not usually fire at the same time. When a seizure occurs, there is abnormal brain activity that involves excessive, synchronised activity in groups of neurons.

Epilepsy
a neurological disorder that causes sudden, intense bursts of brain activity, resulting in seizures

Seizure
an uncontrolled rapid movement or shaking of body parts, also called convulsions, usually accompanied by loss of awareness or unconsciousness

Causes

Epilepsy can affect people of all ages, but it is more common in young children and older people. It affects around 1% of the Australian population. Often, there is no known cause of epilepsy; however, it can be caused by brain tumours, improperly formed blood vessels, serious head injuries, stroke, brain infections, Alzheimer's disease, loss of oxygen at birth, hardening of the arteries or genetics. There are mild forms sometimes seen in children that may only involve slight involuntary muscle movements and that go away before adulthood without requiring treatment.

Following a brain injury, a seizure may occur early on, within a few days to weeks, due to brain bleeding, trauma or swelling. These seizures may go away once the person recovers from the initial injury. A seizure that occurs later on after the initial injury has resolved may be due to scarring of the brain, causing the cells to not function as they should and did prior to the injury. In these cases, epilepsy may be diagnosed.

Types and symptoms

A range of epilepsy syndromes exist, and these are characterised by their differing symptoms. Examples include Rett syndrome, Rasmussen's syndrome and juvenile absence epilepsy. Seizures experienced during epilepsy fall into three main types: generalised onset, focal onset and unknown onset (Table 6C–1). The symptoms of each seizure type vary from case to case.

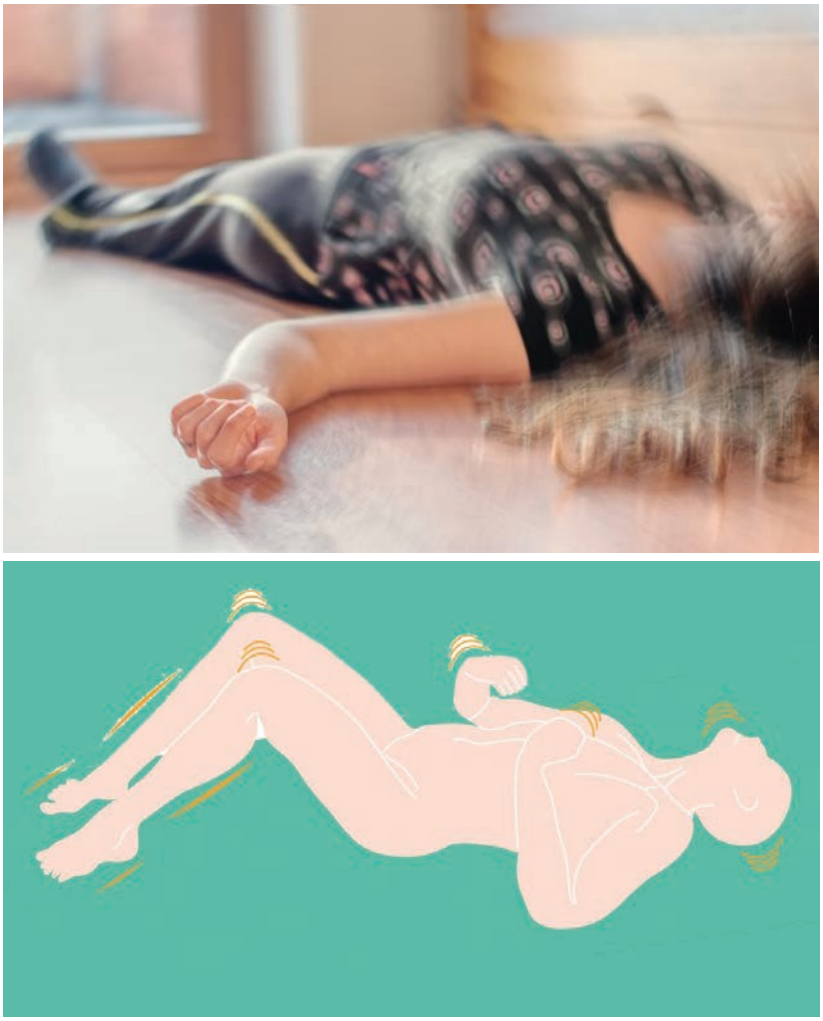


Figure 6C–3 Epilepsy is a neurological disorder characterised by seizures.

ISBN 978-1-009-25401-4 Gallagher et al

Table 6C–1 The main types of epileptic seizures are classified by how much of the brain is affected, or whether this is unknown

Generalised onset seizures	Focal onset seizures	Unknown onset seizures
		
Affects both sides of the brain at the same time. **Symptoms:** • Sustained rhythmic jerking movements • Muscles becoming weak or limp, tense or rigid or twitching • Epileptic spasms, where the body repeatedly flexes and extends • Staring • Making noises • Falling down • Loss of consciousness • Confusion and tiredness upon returning to consciousness • Not breathing • Loss of bladder control • Biting the tongue **Notes:** There are different types of generalised seizures.	Starts in one specific area of the brain on one side. Typically affects a certain part or one side of the body, depending on where the seizure occurred in the brain. For example, a seizure in the occipital lobe causes visual symptoms. **Symptoms:** • Jerky or rhythmic movements • Tense or rigid muscles • Brief muscle twitching • Epileptic spasms • Lack of movement • Repeated automatic movements like clapping, running or chewing • Tingling • Dizziness • Staring • Confusion • Changes in emotions • Altered sensations **Notes:** Sometimes a person will have a feeling that the seizure is coming on, and may experience feelings of *déjà vu*, impending doom, euphoria or visual or hearing changes. This type of seizure can be further divided into whether awareness is lost or retained.	When the beginning of the seizure is not known. Particularly when it has not been observed by another person due to occurring at night or when the person is alone. These may later be re-classified as generalised or focal onset.

Risks

In most cases, a seizure itself does not cause death. Rather, the increased risk of death among those with epilepsy can be attributed to the underlying cause (e.g. trauma or self-harm). However, a long convulsive seizure lasting over five minutes is a medical emergency and can be fatal. Furthermore, seizures can occur at dangerous times, such as when the person is driving a car or swimming, and accidents or falls during seizures can cause serious injuries, such as broken bones or head injuries. In seizures involving falls and loss of consciousness, immediate basic first aid, including putting the person in the recovery position on their side, can help protect the person's airways and their head from impact with the floor or nearby objects.

ISBN 978-1-009-25401-4 Gallagher et al

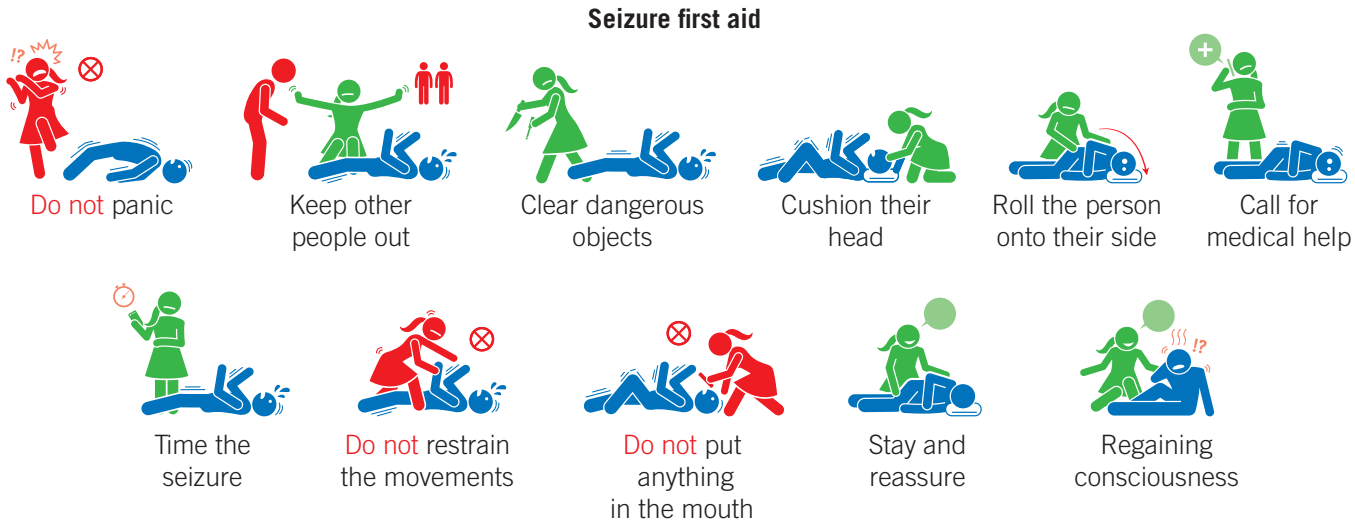


Figure 6C–4 Following correct first aid responses to a person experiencing a seizure can help keep them safe.

From a psychosocial perspective, epilepsy can strain relationships and affect a person's work and recreation. For example, a new diagnosis of epilepsy may mean that a person can no longer go swimming alone for regular exercise. The stigma, discrimination and public perception surrounding epilepsy may often be a bigger concern to the person than their actual seizures.

Diagnosis

Along with neurological examinations and blood tests, the diagnosis of epilepsy involves tests to detect brain abnormalities. An EEG (electroencephalograph) is a device that detects, amplifies and records the electrical activity of the brain. Unusual spikes or waves of brain activity can be detected depending on the type of epilepsy, aiding diagnosis. Brain imaging techniques, including MRI (magnetic resonance imaging) and CT (computerised tomography), can be used to identify the location in the brain being affected, or detect scar tissue, tumours or other structural problems in the brain that might be causing seizures.

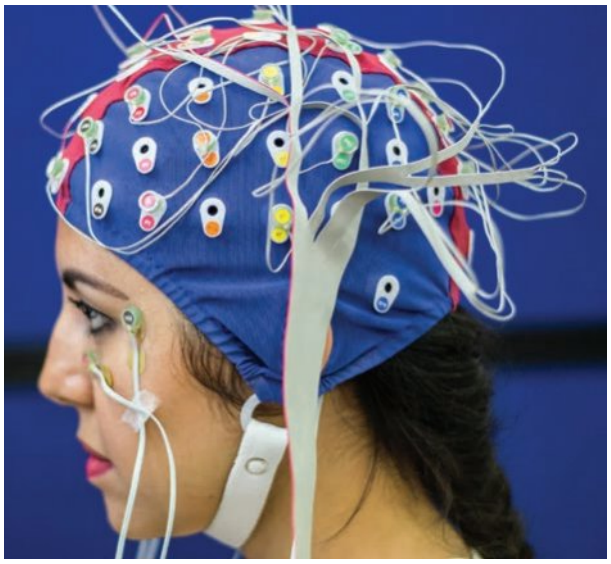


Figure 6C–5 An electroencephalograph (EEG) uses electrodes placed in contact with the scalp to detect the electrical activity of the brain. This is a common tool for diagnosing epilepsy.

Treatment

The treatment for epilepsy is based on the type, frequency and severity of the seizures being experienced, as well as the age, health and other medical history of the person. For most people with epilepsy, anti-seizure medication can reduce the frequency of seizures or prevent them, and some people may never have any more seizures in their lifetime. It may take a person trialling a couple of different medications to find the one that works best to prevent seizures. Additionally, a person can sometimes learn to identify what triggers their seizures and use this information to prevent seizures whenever possible. For a case where medication doesn't work to control the symptoms of epilepsy, surgical options can be considered.

ISBN 978-1-009-25401-4 Gallagher et al

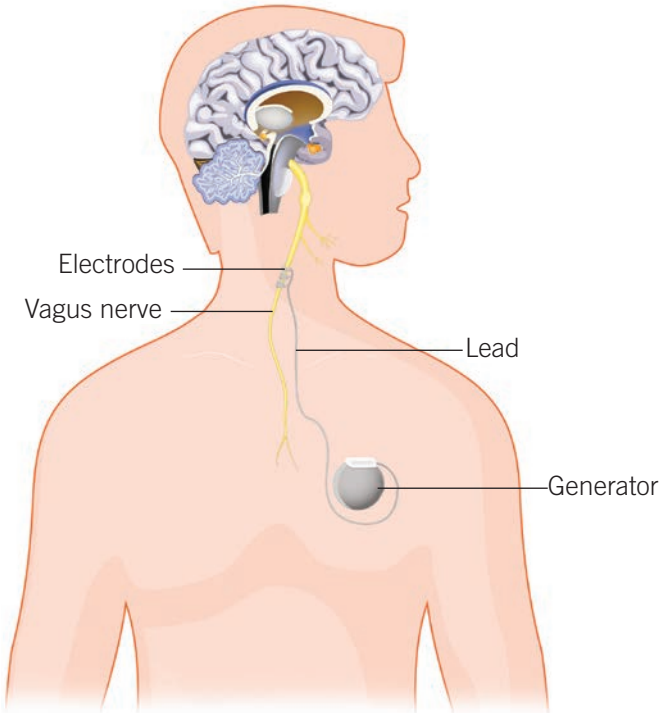


Figure 6C–6 A vagus nerve stimulator is a device implanted under the skin that sends regular, mild electrical impulses via the vagus nerve to the brain to control seizures in epilepsy.

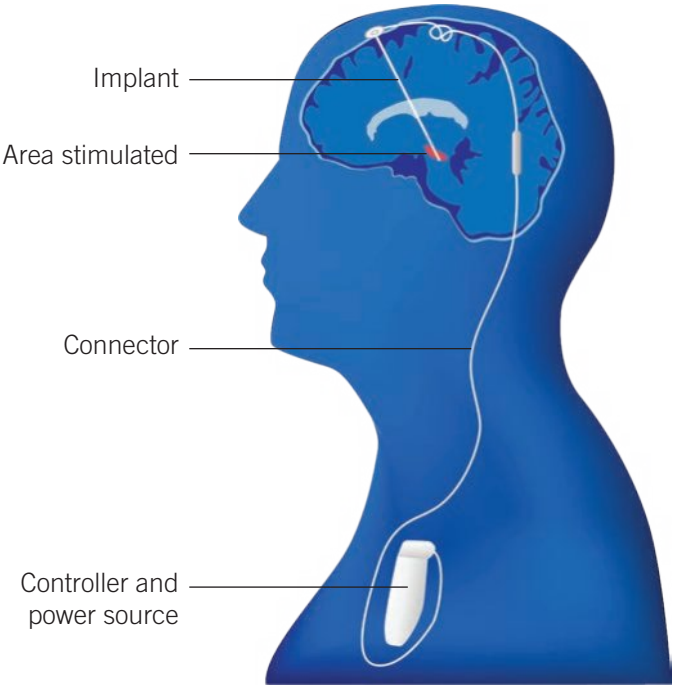


Figure 6C–7 Another surgical implant treatment for epilepsy is deep brain stimulation. The controller unit detects epileptic seizures via the implant inserted deep into the brain and supplies electrical stimulation via the same route to stop them.

A vagus nerve stimulator is a device implanted under the skin that sends regular, mild electrical impulses to the brain to control seizures. A pulse generator is implanted under the skin in the chest, and thin wires connect it to the vagus nerve at the neck (a large nerve that runs on each side of the body from the brainstem, through the neck, to the chest and abdomen). The device is programmed to deliver mild electrical impulses automatically and repeatedly to the vagus nerve at specific intervals, without action by the person. For example, the stimulation may be programmed to turn on for 30 seconds and then off for 3 minutes. The impulses reach the brain and may help to control seizures by changing brain activity, stimulating blood flow and raising important neurotransmitter levels, or modulating the nerve pathways involved in seizures over time. Additionally, if a person feels a seizure coming on, they can use a handheld magnet to initiate extra stimulation to help prevent or stop the seizure.

Other forms of surgical implants used to treat epilepsy include deep brain stimulation (Figure 6C–7) and responsive neurostimulation. These implants work to detect seizure activity in the brain and deliver electrical stimulation to help prevent or stop it.

Other forms of surgery can be used to treat severe cases of epilepsy, particularly if the seizure always occurs in one part of the brain. The specific area of the brain in which the seizure is taking place can be surgically removed to help stop the spread of excessive synchronised brain activity to other areas of the brain. Since this type of surgery involves removing a part of the brain, it can only be used when that part is not involved in critical functions, such as speech, movement, memory or vision. Structural abnormalities causing seizures, such as tumours or abnormal groups of blood vessels, can also be removed surgically. Certain types of epilepsy may be treated with MRI-guided laser ablation or radiation, whereby tissues (e.g. scar tissue) can be removed without even opening the skull. In some extreme cases, a person may undergo removal of their corpus callosum, which connects the two hemispheres of the brain, or even a whole hemisphere of the brain.

ISBN 978-1-009-25401-4 Gallagher et al

If epilepsy is not treated, seizures can become more frequent and severe over time. However, with proper treatment, some people can become seizure-free after a few years and stop taking medication.

Emerging research

Many current and emerging studies aim to improve the lives of people diagnosed with epilepsy. Some exciting developments include new drug formulations; wearable or implantable technology to help detect seizures or falls; advances in vagus nerve stimulation, laser ablation, EEG, MRI and ultrasound; implantable cooling devices; better understanding of ketogenic diets, gene therapy and cannabinoids; and improved diagnostic tests, fall safety equipment and seizure prediction algorithms.

Check-in questions – Set 1

1 What are neurological disorders?
2 Name four different neurological disorders.
3 Describe what occurs in the brain during epilepsy.
4 Name the three types of seizures experienced during epilepsy.
5 Name the device that is often used to diagnose epilepsy.
6 Identify three different treatments for epilepsy.

ACTIVITY 6C–1 EPILEPSY SURGICAL TREATMENTS

Research how surgical implants, including deep brain stimulation and responsive neurostimulation, work to treat epilepsy.
Create a poster showing:

- diagrams of where the implants go in the body
- summaries of how the treatments work
- descriptions of who can have the treatment done
- descriptions of any relevant risks
- identification of interesting statistics and other information.

Chronic traumatic encephalopathy

Chronic traumatic encephalopathy (CTE) is a neurodegenerative disease linked to repeated impacts to the head. It is most commonly seen in athletes in high-contact sports who have experienced multiple head impacts (either with or without concussion). These sports include football (American and Australian), ice hockey, boxing and other combat sports, rugby, soccer, wrestling, basketball and baseball. CTE is also seen in military personnel who have experienced blast impacts, survivors of domestic violence and people with self-injury from head-banging behaviours.

Chronic traumatic encephalopathy (CTE) a neuro degenerative disease linked to repeated impacts to the head

Figure 6C–8 Chronic traumatic encephalopathy is most commonly seen in athletes in high-contact sports and military personnel who have experienced blast impacts.

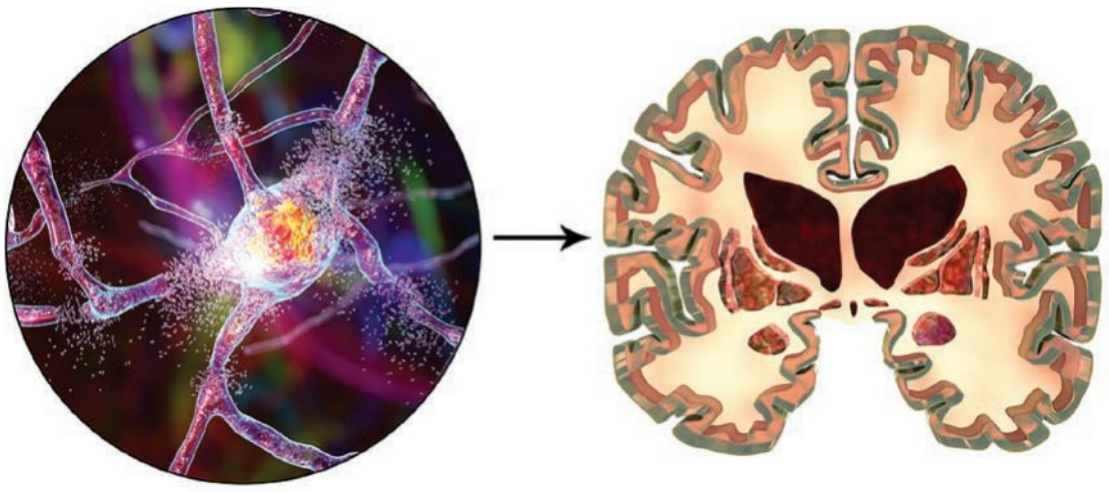
ISBN 978-1-009-25401-4 Gallagher et al

CTE was first identified by Dr Harrison Martland in 1928 as 'punch drunk syndrome'. Using a small case study of boxers, Dr Martland found that the athletes were experiencing a range of cognitive impairments and went on to develop a severe and progressive syndrome, which included Parkinson's disease and dementia. As more cases arose, the condition became known by a range of names, including 'traumatic progressive encephalopathy' and 'dementia pugilistica'. From the 1940s, however, the term 'chronic traumatic encephalopathy' became accepted. This shift in terminology acknowledges that the condition arises not only from boxing, but also from a variety of sources involving brain trauma.

Tau protein
a protein required by cells for stability that can malfunction and build up within neurons disrupting important processes and disrupting communication with adjacent neurons

Physiological basis of CTE

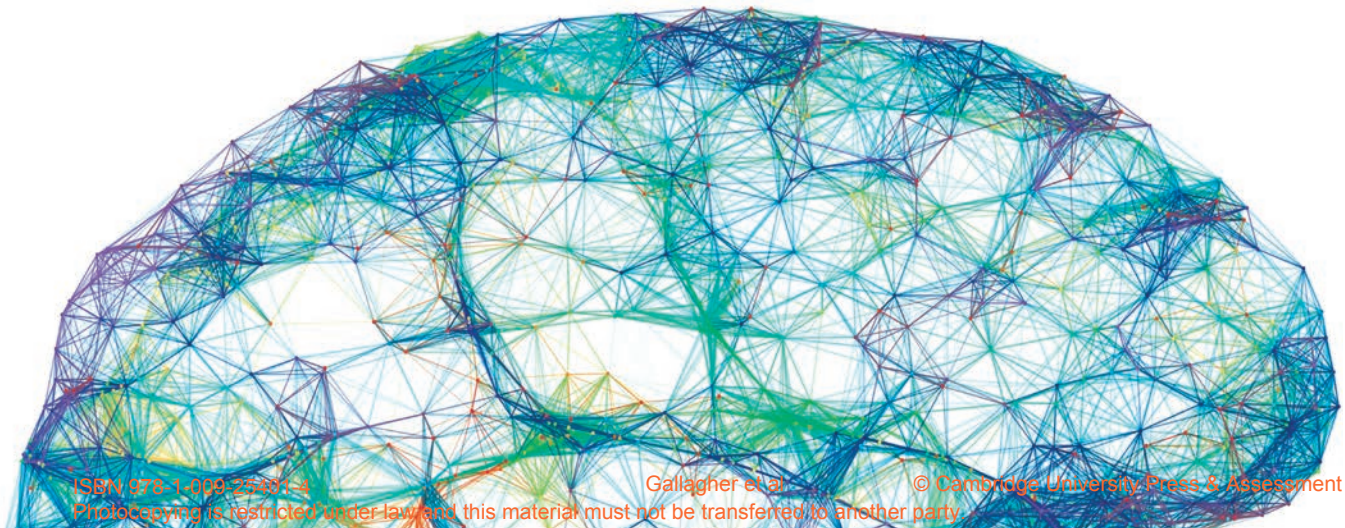
As a neurodegenerative disease, CTE results in gradual, progressive and widespread damage to the brain. In CTE, **tau protein** builds up within neurons and other cells in the brain, disrupting important processes that keep cells alive and healthy, as well as disrupting communication with adjacent neurons. In a healthy brain, excess tau is broken down and removed as part of the brain's usual functioning. Exactly why this process begins to malfunction is not well understood; however, in CTE, repetitive head injuries appear to precede tau aggregation, which then accumulates and spreads with age.



Neuron degeneration

Atrophy of cerebrum and enlargement of ventricles (fluid-filled spaces, showing as dark areas)

Figure 6C–9 In chronic traumatic encephalopathy, neurons in the brain gradually degenerate as the accumulated tau protein kills cells. As the disease progresses, the brain begins to atrophy due to significant neuron and cell loss.



The accumulation of tau compromises the integrity of the brain tissue and begins to kill neurons and other cells, resulting in widespread atrophy of many parts of the brain and a reduction in brain volume (Figure 6C–10). CTE is often mistaken for Alzheimer's disease because the same protein accumulation is evident in patients with Alzheimer's.

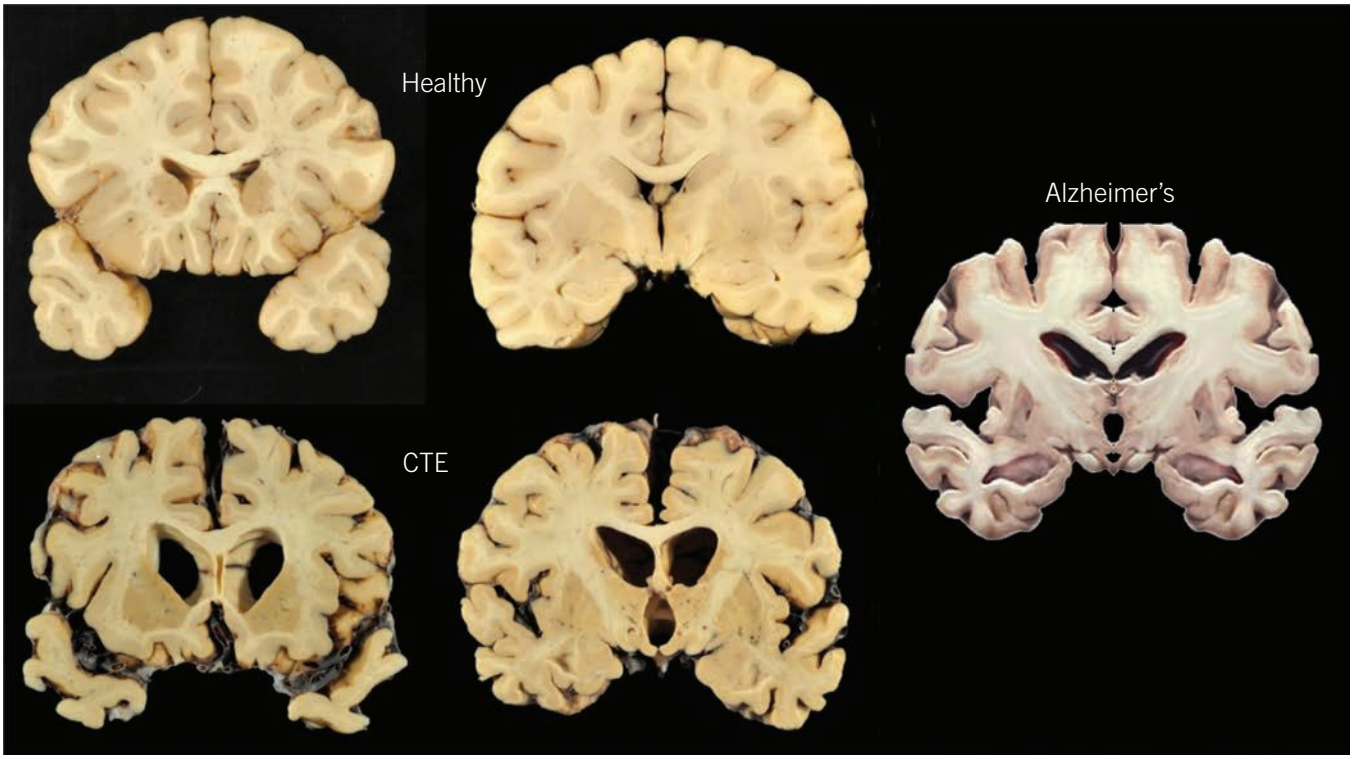


Figure 6C–10 Sections from a healthy brain (top two images) and from the brain of former University of Texas football player Greg Ploetz, diagnosed with stage 4 chronic traumatic encephalopathy (bottom two CTE images). Compare these images to the brain of an Alzheimer's patient (right), which shows similarities to the CTE brain.

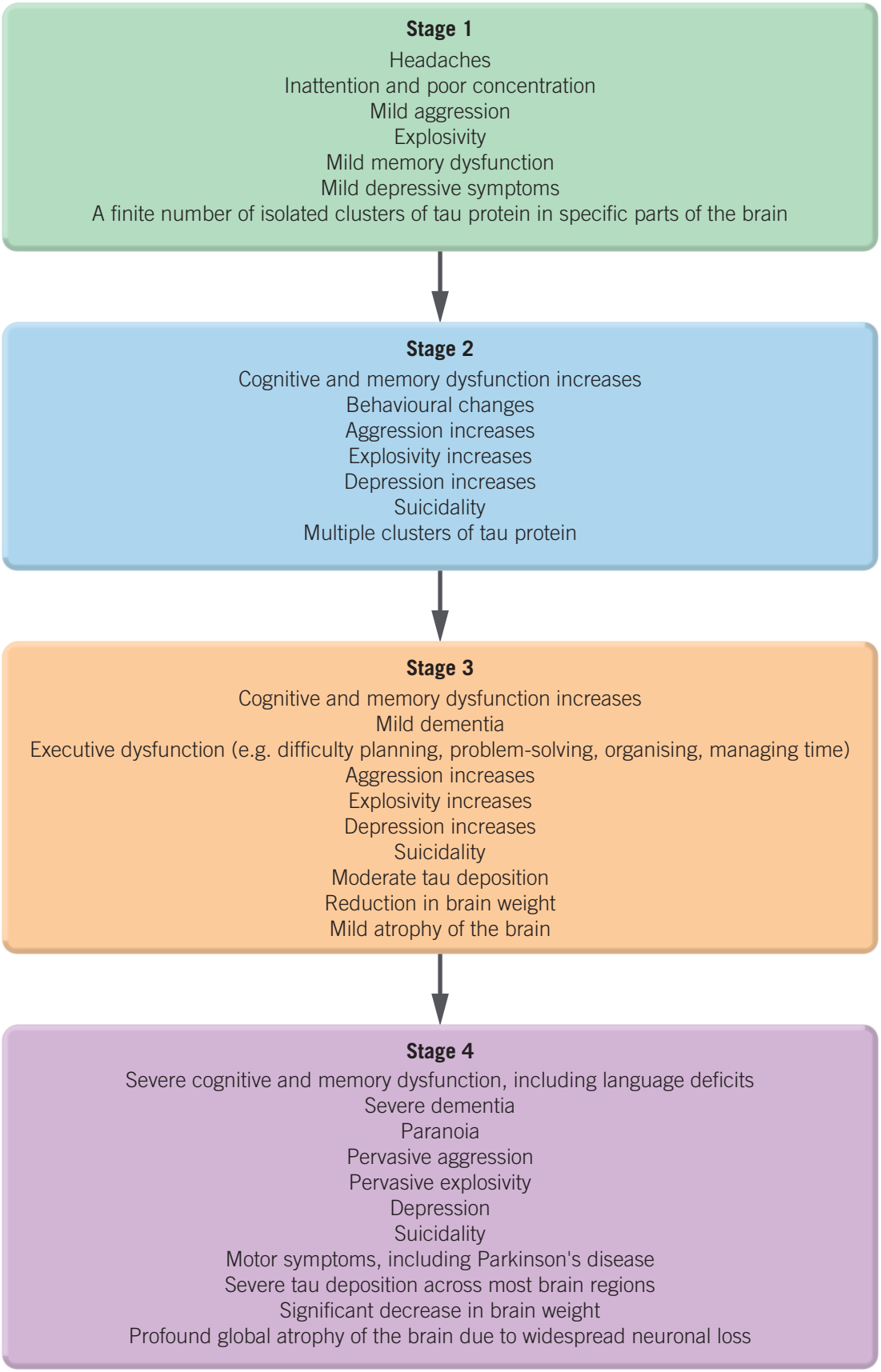
Causes

While not every case of a concussion or TBI leads to CTE, these kinds of head injuries appear to be a necessary trigger to develop CTE. The amount of trauma needed to develop CTE is not known; however, those who experience an increased incidence of head impacts are deemed most at risk. It is likely that all blows to the head, whether a concussion is experienced or not, contribute to the development of the disease. Besides the number of impacts, other possible risk factors to developing CTE may include the timing, location and severity of the injuries, genetics and lifestyle factors.

Symptoms

Neurodegenerative diseases, such as CTE, worsen progressively over the course of many years. Research has determined four main stages of CTE, demonstrating a decline in functioning as the disease progresses. As time passes, symptoms that begin in stage 1 become more severe, and new symptoms also occur. These stages are associated with increasing tau protein pathology in the brain and subsequent degeneration of the brain tissue.

ISBN 978-1-009-25401-4 Gallagher et al



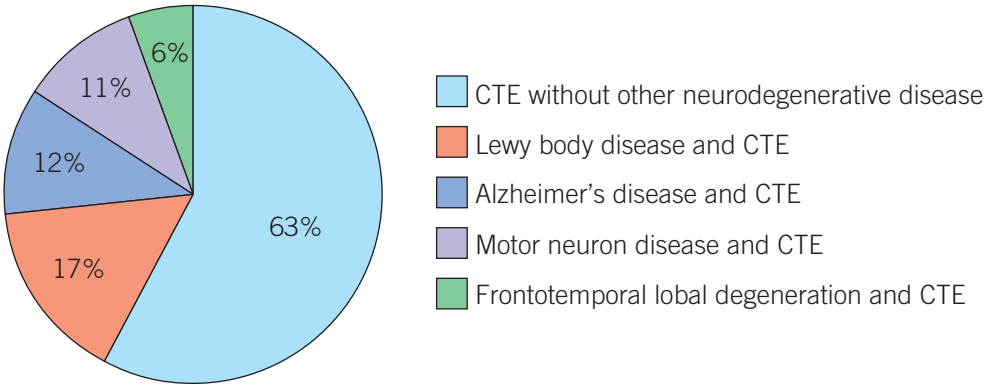
Source: Adapted from Maher, I., Alosco, M. L., & McKee, A. C. (2017). Psychiatric phenotypes in chronic traumatic encephalopathy. *Neuroscience & Biobehavioral Reviews*, *83*; Stein, T. D., Alvarez, V. E., & McKee, A. C. (2014). Chronic traumatic encephalopathy: A spectrum of neuropathological changes following repetitive brain trauma in athletes and military personnel. *Alzheimer's Research & Therapy*, *6*(1).

Figure 6C–11 Common symptoms and physiological changes during each of the four stages of CTE

ISBN 978-1-009-25401-4 Gallagher et al

Diagnosis

Currently, there are no conclusive tests to diagnose CTE while the person is alive, due to a lack of distinct biomarkers or measurable indicators. A clear diagnosis is only possible after death during an autopsy. Adding to this difficulty, many symptoms of CTE are similar to those of other neurological disorders, such as Alzheimer's disease. Indeed, CTE and Alzheimer's disease change the brain in physically similar ways (Figure 6C–10). It is therefore quite common for other neurodegenerative diseases to be diagnosed alongside suspected CTE (Figure 6C–12). It is possible that the repetitive trauma or accumulation of tau protein seen in CTE provokes further abnormal protein development, triggering other neurodegenerative diseases.



Source: Adapted from Stein, T. D., Alvarez, V. E., & McKee, A. C. (2014). Chronic traumatic encephalopathy: A spectrum of neuropathological changes following repetitive brain trauma in athletes and military personnel. *Alzheimer's Research & Therapy*, *6*(1).

Figure 6C–12 Percentage of cases of CTE occurring with other neurodegenerative diseases

Treatment

CTE is currently incurable and irreversible. As for other neurodegenerative diseases, patients are treated based on their symptoms with medications and other therapies that attempt to improve their impaired behavioural and cognitive functioning, such as memory, mood and alertness. Lifestyle habits that promote health and wellbeing are also encouraged, and the combination of good nutrition, physical activity and mental and social engagement may be beneficial. Like the time-sensitive windows in the treatment of a stroke, timely treatment of TBI could reduce the risk of developing CTE.

Prevention

Prevention is the most effective method for combating CTE. Shifts in the way that contact sports are played, including rule changes for safe tackles or penalties for reckless play, have helped prevent head injuries. In the case of injury, there needs to be encouragement and an atmosphere of safety for players to honestly report their symptoms to their coaches, and there must be clear processes to track injuries and symptoms over time, including safe return-to-sport guidelines. Noticing when further assessment is required may help identify the beginnings of CTE and prevent further accumulation of trauma.

In 2020, the Australian Football League (AFL) introduced stricter policies regarding concussion management, mandating medical clearance at least five days prior to the team's next scheduled competition match. Prior to the 2020 season, players could receive medical clearance from the team doctor at any time prior to the next match, meaning that a player could be cleared the day before, or even on the day of, the next match.

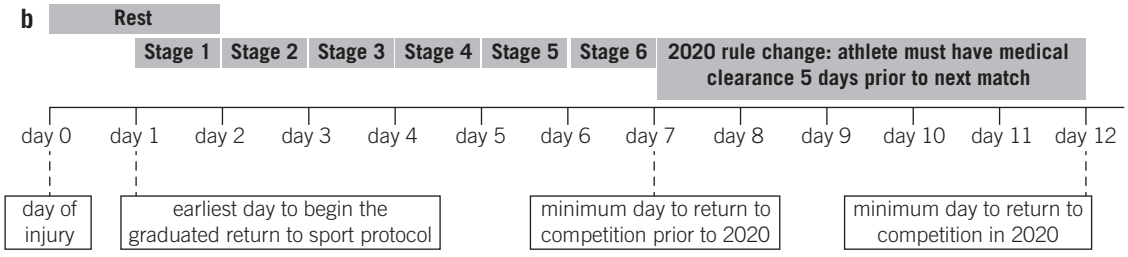
ISBN 978-1-009-25401-4 Gallagher et al

The new rules effectively result in at least 12 days between a player experiencing a concussion and playing their next match (Figure 6C–13). These rule changes will help ensure players have enough time to recover from concussions so that they can return to competition and play safely.

a

Stage	Aim	Activity	Goal of step
Rest	Physical and cognitive rest	nil	Complete rest in acute phase.
1	Symptom-limited activity	Daily activities that do not provoke symptoms	Gradual reintroduction of work/school activities.
2	Light aerobic exercise	Walking or stationary cycling at a slow to medium pace. No resistance training.	Increase heart rate.
3	Sport-specific exercise	Running drills. No head impact activities.	Add movement.
4	Non-contact training drills	Harder training dills. May start progressive resistance training.	Exercise, coordination, increased thinking.
5	Full contact practice	Following medical clearance, participate in normal training activities.	Restore confidence and assess functional skills.
6	Return to sport	Normal game play.	

b



Source: Pearce, A. J., King, D. A., White, A. J., & Suter, C. M. (2021). Effects of stricter management guidelines on return-to-competition timeframes following concussion in professional Australian Rules Football: An exploratory analysis. *Sports Medicine*, *51*(12).

Figure 6C–13 a A summary of the AFL's return-to-sport strategy and **b** the new return-to-competition time frames with the addition of the five-day medical clearance

Figure 6C–14 Preventing head injuries will help to reduce CTE, but American football helmets, while protecting against skull fractures, may not help against concussions and CTE.

Protective gear

American football is one of the best-known contact sports that requires a helmet, and the conventional view is that wearing one prevents head injury. While the helmets shown in Figure 6C–14 do protect against skull fracture or similar injury, whether they protect against concussion and CTE is more controversial. As you saw in Section 6B, TBI may be caused by the violent acceleration and deceleration of the brain inside the skull, and helmets can do nothing to protect against this. Indeed, they may make things worse, according to an unconfirmed theory known as risk compensation. This theory states that protective gear leads to a false sense of security, causing wearers to take more risks under the assumption that they are well protected. Consider, for example, how American football players lead with their heads in contact with the opponent, whereas AFL and rugby players, who don't wear helmets, try harder to keep their heads out of contact. While better protective gear may be a part of the solution for concussions and CTE, this is a complex area that needs to be approached carefully.

6B ACQUIRED BRAIN INJURIES LINK

ISBN 978-1-009-25401-4 Gallagher et al

Emerging research

WORKSHEET 6C–1 NEUROSCIENCE BY THE PRIZES

In recent years, awareness of the long-term consequences of head injuries has increased, particularly with regard to repeated concussions during contact sports. While the tau protein is the marker scientists can currently find for CTE, they know that there is more going on in CTE brains than just the accumulation of tau, as there is also damage to white matter and blood vessels.

In 2020, 29-year-old AFL Women's player Jacinta Barclay passed away following a short but intense period of mental illness. A post-mortem analysis of her brain uncovered neurological damage that may be indicative of CTE. Barclay's brain was found to have degradation of the cerebral white matter, unusual in someone so young and in peak physical health, and more like what would be seen in an elderly person. This has highlighted the need for further research into gender equity in sports concussion research, as well as research into younger athletes. It also sheds more light on the detrimental effects of CTE on mental wellbeing.

Figure 6C–15 Brain banks around the world dissect donor brains to research the brain pathology of disorders such as CTE, and store the preserved slices for future examination.

Given the importance of physical exercise and the popularity of participating in contact sports, ongoing research into CTE is important. Indeed, much remains to be learned about the disease. In addition to the areas of interest identified above, recent and emerging research on CTE is investigating such topics as how to reduce the accumulation of tau, how to detect the build-up of tau and how to diagnose CTE in living patients. Let's now look at some of this research.

Researchers are experimenting with a drug to stop the development of dementia caused by repeated head injuries sustained while playing sport. The new drug may be able to block a certain neurotransmitter that can cause abnormal amounts of tau protein to accumulate following a head injury. There has been success in animal models, so human clinical trials are the next step in this research.

WORKSHEET 6C–2 BRAIN STRUCTURES AFFECTED IN CTE

Other studies have investigated the early detection and quantification of CTE in living patients using neuroimaging techniques. Advances in MRI technology are enabling the measurement of brain volume and the detection of abnormalities in the brain's white matter, which are associated with CTE. Meanwhile, PET (positron emission tomography) neuroimaging techniques may be able to use a tracer to bind to and track the tau protein. These neuroimaging techniques, alongside other measures, such as genetic testing, may enable early detection of CTE.

Other studies are trying to develop agreed-upon criteria to diagnose CTE during life. Consensus is needed regarding the features necessary for a CTE diagnosis. These criteria are intended for use by researchers to diagnose the participants in their investigations with a 'provisional level of certainty' as having CTE brain pathology. As part of the criteria, it is proposed that a person must have both substantial exposure to repeated head impacts and core clinical features that are not fully accounted for by other conditions, given the similarities to

ISBN 978-1-009-25401-4 Gallagher et al

other neurological disorders. If these criteria are met, the individual's level of functioning will then be graded. Reaching consensus in diagnostic features will help research continue with more confidence that the findings are valid and reliable, thereby advancing knowledge of CTE.

Still other studies are investigating biological markers for diagnostic blood tests; the role of genetics; the influence of age, playing position and length of sporting career; and the contribution of environmental risk factors such as stress, alcohol and substance abuse.

Check-in questions – Set 2

1 Explain the main cause of chronic traumatic encephalopathy.
2 Describe what is occurring in the brain of a person with chronic traumatic encephalopathy.
3 Describe the overall trend in symptoms over the four stages of chronic traumatic encephalopathy.
4 Describe what emerging CTE research is investigating.

6C KEY SCIENCE SKILLS

VIDEO 6C–1 KEY SCIENCE SKILLS: PRESENTING DATA IN TABLES, CHARTS AND GRAPHS

Presenting data in tables, charts and graphs

Once data is collected in a research investigation, it is important to present it in an appropriate way so that others can understand the findings. The presentation format you choose will depend on the type of data to be represented, as what works best for one type of data may not work for other types. In VCE Psychology, you only need to use tables, bar charts and line graphs. The table below provides guidelines for when each should be used and with what kind of data.

Table 6C–2 Data presentation guidelines

Table	Bar chart	Line graph
• Use when the data cannot be presented in one to two sentences in writing. • Highlights important data for the reader to find quickly. • Use instead of graphs when showing precise values is more important than showing trends and patterns.	• Use instead of tables when it is more important to show the trends, patterns, relationships and overall pictures in the data, rather than exact data values. • Use when the data has discrete (separate) categories. • May include grouped or stacked data to represent the subsections of a large category. • Useful to visually compare several categories quickly. • Most useful for presenting data that has large differences between categories.	• Use instead of tables when it is more important to show the trends, patterns, relationships and overall pictures in the data, rather than exact data values. • Use when data is numerical and continuous. The straight line shows how one data point continues to the next, and it can be used to estimate the values between the points. • Useful for tracking small changes over time. • Multiple sets of data may be compared using multiple lines on the one graph.

2A PROCESSING AND ANALYSING DATA LINK

Once you have determined which presentation format to use, you need to make sure it is correctly drawn, following established conventions. Refer to Section 2A for examples of how to present tables, bar charts and line graphs.

Let's now consider a question in which you need to justify the best way to represent a given set of data.

ISBN 978-1-009-25401-4 Gallagher et al

Question

A researcher collected data on 336 brain donors exposed to repetitive head impacts from different sports. They determined how many patients had evidence of CTE based on brain pathology. The table below details the percentage of all the patients who played each sport who had evidence of CTE.

Sport	% patients with CTE pathology present
Football	78
Boxing	79
Ice hockey	74
Rugby	75
Soccer	61

Source: Mez et al. (2021). Validity of the 2014 traumatic encephalopathy syndrome criteria for CTE pathology. *Alzheimer's & Dementia*, *17*(10).

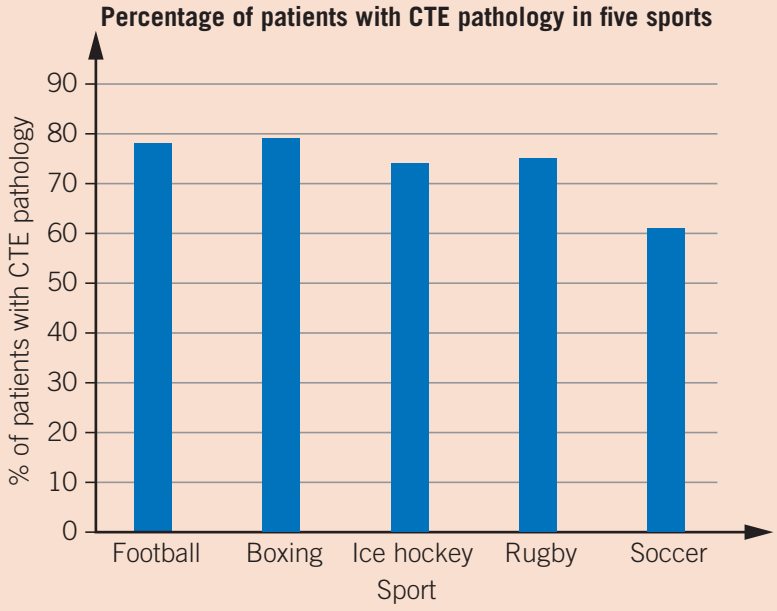
a The researchers are going to publish their findings in a journal article. Explain why they might choose to display this data in a results table rather than a graph or chart.

b If the researchers were to choose a graphical presentation, determine whether a line graph or bar chart would be more appropriate, and draw one following correct graphing conventions.

Suggested answer for full marks

a The data shown is most suitable for a table as the values are quite close together without much difference. It would be difficult to see the small difference between the results for each sport when using a bar chart.

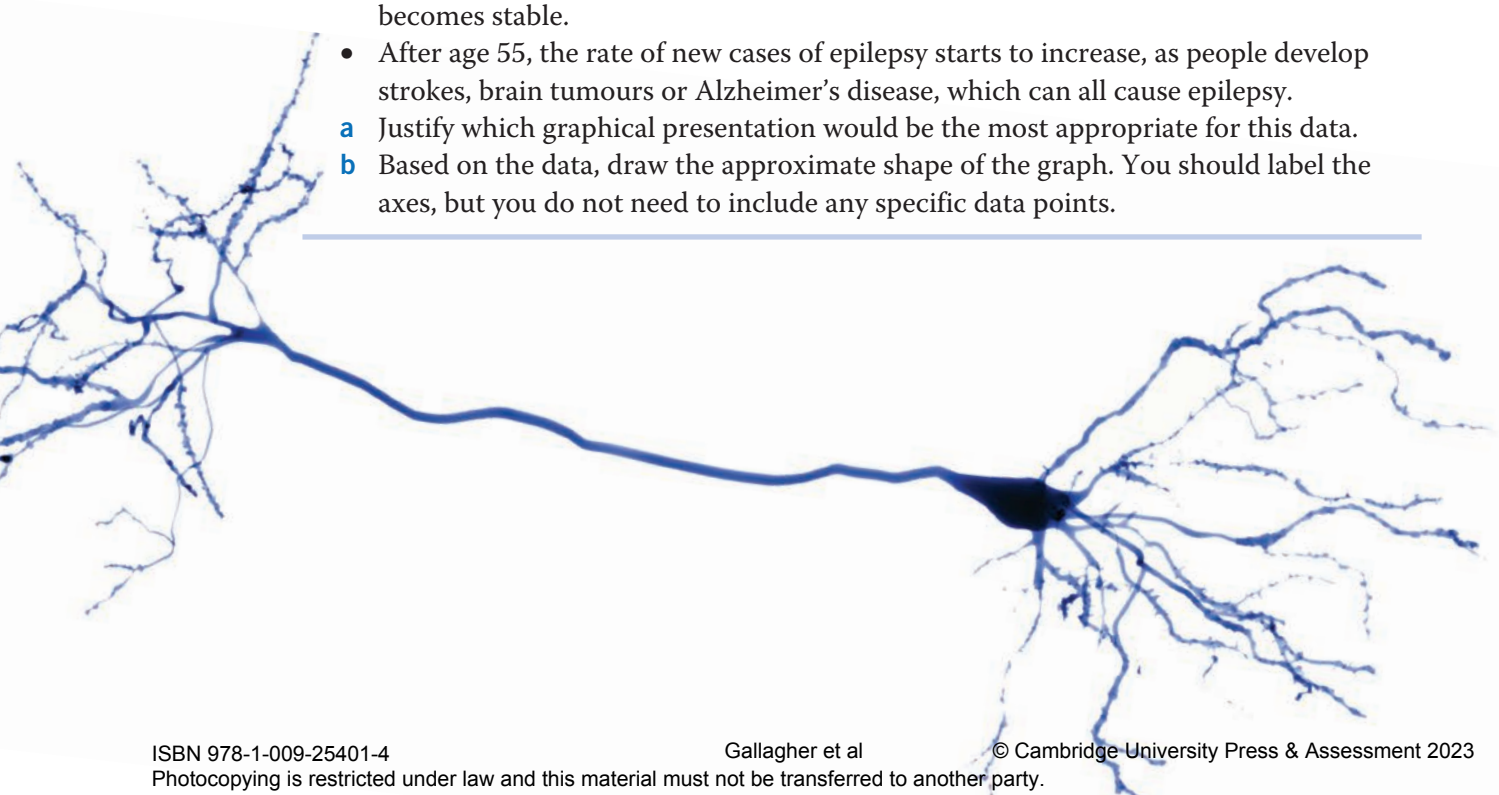
b A bar chart would be more appropriate than a line graph as the data is categorical, with each sport representing a separate category. The percentage CTE pathology values are not continuous or tracked over time, as would be required for a line graph.



ISBN 978-1-009-25401-4 Gallagher et al

Section 6C questions

1 Explain the difference between normal brain activity and the brain activity involved in an epileptic seizure.
2 Explain why epilepsy is classified as a neurological disorder.
3 Zuri recently experienced her first seizure, and she is now completing some tests at the hospital, including getting an MRI. The doctor has told Zuri that she experienced a generalised onset seizure, and now the doctor is trying to determine whether Zuri should be diagnosed with epilepsy.
   a Explain why the doctor has organised an MRI scan for Zuri.
   b Identify two observable symptoms that Zuri may have experienced during her seizure.
   c If Zuri is diagnosed with epilepsy, explain why medication might be the first treatment option discussed with the doctor.
4 Luca is an experienced mixed martial arts fighter, which is a sport incorporating techniques from various combat sports including boxing, kickboxing and martial arts. Over the years, Luca has experienced several knockouts from hits to the head, resulting in concussions and sometimes brief periods of unconsciousness. Luca decided to retire from the sport after he started experiencing some strange symptoms, including frequent headaches and trouble with his memory, such as often forgetting where he put things. His partner says that Luca has also been losing his temper more easily than he used to. Luca has been seeing a specialist doctor to help determine an appropriate diagnosis.
   a Identify the neurological disorder that Luca may be experiencing, providing evidence to support your response.
   b Explain why the doctor may not be able to formally diagnose Luca with this disorder.
5 Explain how advancements in neuroimaging techniques may be useful in the diagnosis and treatment of CTE.
6 A researcher collected data on new cases of epilepsy in a population. Below are their main findings:
   - New cases of epilepsy are most common among children, especially during the first year of life.
   - The rate of new cases of epilepsy gradually decreases until about age 10 and then becomes stable.
   - After age 55, the rate of new cases of epilepsy starts to increase, as people develop strokes, brain tumours or Alzheimer's disease, which can all cause epilepsy.
   a Justify which graphical presentation would be the most appropriate for this data.
   b Based on the data, draw the approximate shape of the graph. You should label the axes, but you do not need to include any specific data points.



ISBN 978-1-009-25401-4

Chapter 6 review

Summary

Create your own set of summary notes for this chapter on paper or in a digital document. A model summary is provided in the Teacher Resources, which can be used to compare with yours.

Checklist

In the Interactive Textbook, the success criteria are linked from the review questions and will be automatically ticked when answers are correct. Alternatively, print or photocopy this page and tick the boxes when you have answered the corresponding questions correctly.

Success criteria – I am now able to:		Linked questions
6A.1	Explain the capacity of the brain to change in response to experience and brain trauma	12☐
6A.2	Identify and explain processes that are involved in neuroplasticity	9☐, 10☐, 11☐
6A.3	Identify and explain ways to maintain and maximise brain function	13b☐
6A.4	Apply my understanding of neuroplasticity to real-world examples	13a☐
6B.1	Describe the characteristics of an acquired brain injury	5☐, 6☐, 14☐
6B.2	Identify examples of acquired brain injuries	1☐, 3☐
6B.3	Explain the impact of an acquired brain injury on biological, psychological and social functioning	2☐, 8☐, 15☐
6B.4	Apply my understanding of acquired brain injury to real-world examples	1☐
6C.1	Describe the characteristics of neurological disorders	16☐
6C.2	Identify examples of neurological disorders	4☐
6C.3	Describe the contribution of contemporary research to the understanding of neurological disorders	18d☐
6C.4	Describe the features of chronic traumatic encephalopathy	7☐, 20☐
6C.5	Describe the emerging research into chronic traumatic encephalopathy as a progressive and fatal brain disease	19☐
6C.6	Apply my understanding of neurological disorders to real-world examples	17☐

Key Science Skills

Skills	Questions and Skills boxes
Systematically generate and record primary data, and collate secondary data, appropriate to the investigation	6C Key Science Skills Chapter review – 18a
Record and summarise both qualitative and quantitative data, including use of a logbook as an authentication of generated or collated data	6C Key Science Skills Section 6C question – 6b Chapter review – 18c
Organise and present data in useful and meaningful ways, including tables, bar charts and line graphs	6C Key Science Skills Section 6C questions – 6a, b Chapter review – 18b

ISBN 978-1-009-25401-4

Multiple-choice questions

1 Priyanka was involved in an accidental collision while playing soccer. She was taken off the pitch complaining of a headache, blurry vision and nausea. Which type of brain trauma did Priyanka likely experience?

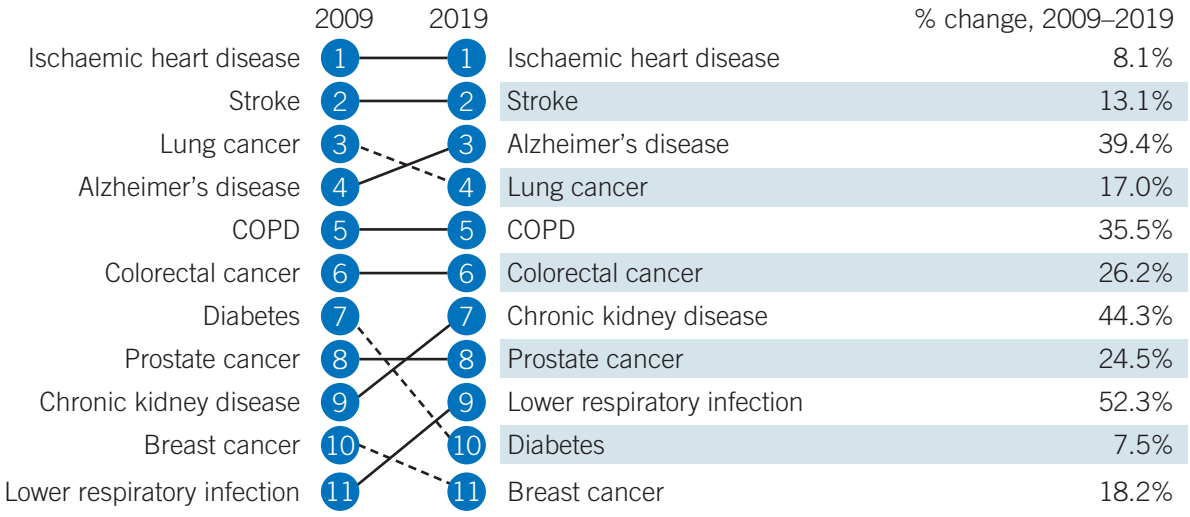
A concussion
B stroke
C epilepsy
D CTE

2 Because aphasia is an acquired language disorder, which hemisphere of the brain is more likely to have been affected?

A The left hemisphere would be affected, as it is more specialised for language.
B The right hemisphere would be affected, as it is more specialised for language.
C The left and right hemispheres would be equally affected.
D In some people, the left hemisphere would be damaged, and in others, the right hemisphere would be damaged.

Use the following information to answer Questions 3–4.

The image below displays the top 11 causes of death in 2019 and the percentage change of incidence from 2009 to 2019.



	% change, 2009–2019
Ischaemic heart disease	8.1%
Stroke	13.1%
Alzheimer's disease	39.4%
Lung cancer	17.0%
COPD	35.5%
Colorectal cancer	26.2%
Chronic kidney disease	44.3%
Prostate cancer	24.5%
Lower respiratory infection	52.3%
Diabetes	7.5%
Breast cancer	18.2%

Source: Institute for Health Metrics and Evaluation (2020).

3 Which cause of death in the figure above is an acquired brain injury?

A diabetes
B lower respiratory infection
C chronic kidney disease
D stroke

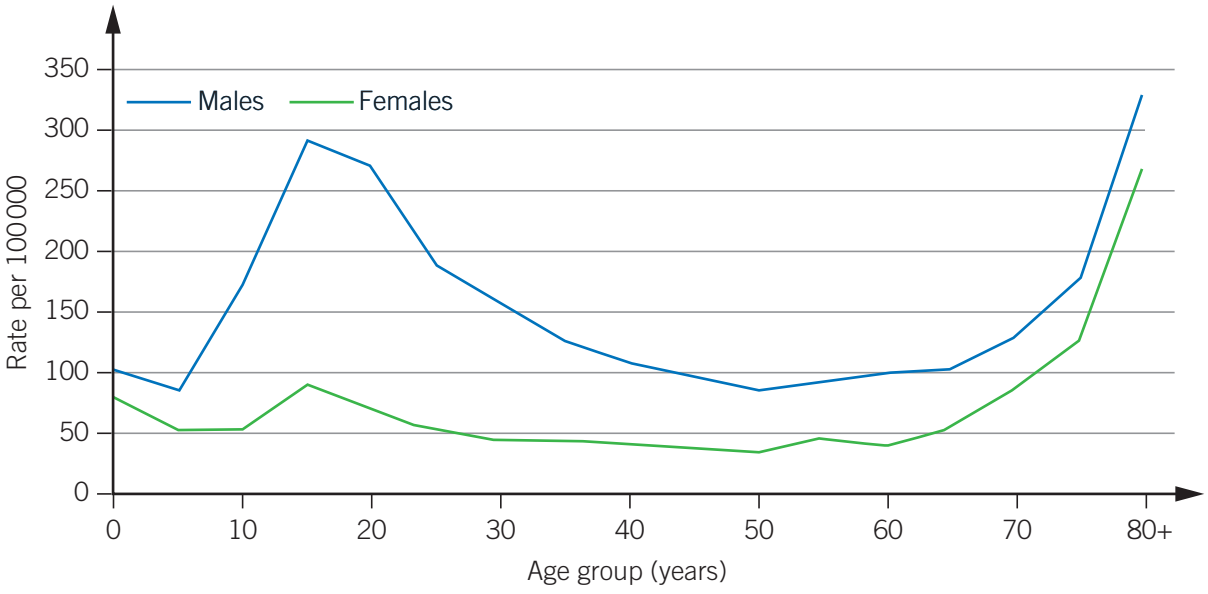
4 Which neurological disorder resulted in the largest increase in deaths from 2009 to 2019?

A lower respiratory infection
B Alzheimer's disease
C stroke
D ischaemic heart disease

ISBN 978-1-009-25401-4 Gallagher et al

Use the following information to answer Questions 5–6.

The figure below displays the rate of TBI-related hospital stays according to age and sex in 2004–2005.



Source: Australian Institute of Health and Welfare. (2007). *Disability in Australia: Acquired brain injury* (Cat no. AUS 96). Canberra: AIHW.

5 According to the graph, which two approximate ages experienced the highest rates of TBI?

A 4 years and 80+ years

B 20 years and 30 years

C 15 years and 80+ years

D 25 years and 80+ years

6 What is the relationship between birth sex and rate of TBI?

A In only the first half of the lifespan, males experience higher rates of TBI than females.

B Across the whole life span, males experience higher rates of TBI than females.

C Males experience higher rates of TBI than females from ages 10 to 40, then females experience higher rates of TBI.

D Across the whole life span, females experience higher rates of TBI than males.

7 A common symptom in someone experiencing stage 1 CTE is

A paranoia.

B Alzheimer's disease.

C Parkinson's disease.

D explosivity.

8 Which of the following is a psychological effect of an acquired brain injury?

A Poor attention while watching television

B Impaired ability to communicate with a friend

C Hearing disturbances while at work

D Headaches while at school

ISBN 978-1-009-25401-4

Short-answer questions

9 Explain how changes to the dendrites and receptor sites on a neuron contribute to the process of synaptogenesis. (3 marks)

10 Explain how the process of long-term depression might occur after initially learning how to do long division in Year 6 Mathematics. (3 marks)

11 Use an example to explain the link between repetition and long-term potentiation. (3 marks)

12 Compare the processes of experience-independent plasticity and experience-dependent plasticity. (2 marks)

13 Juan experienced a brain trauma from a rock-climbing accident. This has resulted in him having difficulty walking.

a With reference to the processes of neuroplasticity, explain why Juan's doctors would encourage him to undertake physical therapy in which he practises walking with an aid. (2 marks)

b Why might Juan's doctors also encourage Juan to eat a healthy diet during his recovery? (2 marks)

14 Describe the difference between an acquired brain injury and a traumatic brain injury. (2 marks)

15 The following picture displays a person with aphasia. The thought bubble on the left shows what the person is thinking. The speech bubble on the right shows what the person is saying out loud.

Identify which type of aphasia this person is experiencing. Justify your answer. (2 marks)

16 Explain how a stroke may result in a person experiencing a type of aphasia. (3 marks)

17 Tonya came home to find her elderly mother slumped over in a chair, unable to use her left arm to pull herself back up. Her mouth was drooping on one side, and she was having trouble speaking. With reference to acquired brain injuries, explain why Tonya would have immediately called an ambulance for her mother. (2 marks)

ISBN 978-1-009-25401-4 Gallagher et al

18 As part of a study, a researcher collected data on the number of stroke events among females aged 55–74 and 75+ years, every three years from 2005 to 2017. Beginning in 2005, 3591 strokes were recorded in the 55–74 age bracket, and 11 136 strokes were recorded in the 75+ age bracket. The number of strokes in the 75+ age bracket remained around three times higher than for the 55–74 age bracket throughout the study. In 2008, the 75+ age bracket recorded its highest number of strokes, at 11 735 events. The highest number of strokes recorded for the 55–74 age bracket was in 2017, with 4676 stroke events.

a The table below displays the data the researcher collected; however, several entries are missing. Copy and complete the table with the missing data values based on the information provided in the scenario. (3 marks)

Year	55–74 years	75+ years
2005		
2008	3686	
	3854	11 625
2014	4096	11 441
		11 539

Source: Australian Institute of Health and Welfare. (2020). *Australia's health 2020: Stroke.*

b Plot the data from the completed table into an appropriate graph. (4 marks)

c Using evidence from the data, describe the relationship between risk of stroke and age. (2 marks)

d Compare the trend in stroke events over time for both age groups represented in the data. (2 marks)

19 Explain why sporting associations should enforce an appropriate minimum amount of time off from sport following a concussion. (3 marks)

20 Explain the link between tau protein and the symptoms of memory loss in CTE patients. (4 marks)

ISBN 978-1-009-25401-4 Gallagher et al

Unit 1 Revision exercise

Multiple-choice questions

1 Which of the following is an example of an environmental factor that can influence development?
- **A** the education level of parents
- **B** nutrients provided from diet
- **C** hormones
- **D** genes

2 Which of the following is an example of cognitive development?
- **A** learning how to share toys and take turns when playing games with others
- **B** understanding others
- **C** learning how to read, write and calculate mathematical problems
- **D** learning how to label and describe different emotions

3 In Piaget's theory of cognitive development, animism is characterised by _____ and occurs in the _____ stage.
- **A** being unable to see things from another person's perspective; pre-operational
- **B** believing that inanimate objects have feelings; pre-operational
- **C** being unable to see things from another person's perspective; sensorimotor
- **D** believing that inanimate objects have feelings; sensorimotor.

4 One similarity between critical and sensitive periods in development is that
- **A** both have well-defined time frames.
- **B** both only apply to cognitive development.
- **C** if learning does not occur during both a sensitive and a critical period, it will never happen.
- **D** the brain is primed and ready to learn during both a sensitive and a critical period.

5 Simon is over 2 metres tall. According to which criterion would this be an atypical characteristic?
- **A** statistical rarity
- **B** maladaptive behaviour
- **C** social norms
- **D** personal distress

6 Which of the following is a feature of behaviours that are considered atypical?
- **A** They are patterns of behaviour that are expected for an individual.
- **B** They conform to standards of proper and acceptable ways of behaving in each situation.
- **C** They include skills or abilities that fall within the normal or expected range of development.
- **D** They occur at a different pace to those of similar-aged peers.

7 Which of the following cognitive variations is associated with autism?
- **A** dysfunctional executive functioning
- **B** weak theory of mind
- **C** limited time management
- **D** dysfunctional working memory

ISBN 978-1-009-25401-4 Gallagher et al

8 Which of the following best describes the role of a psychologist in supporting those with mental illness?

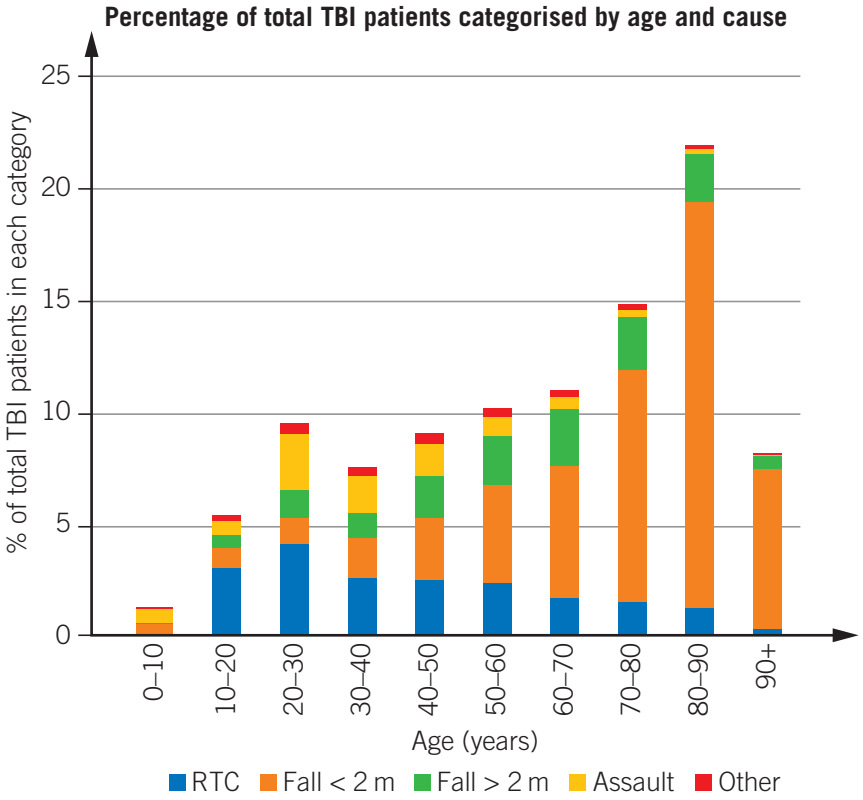
A diagnosing a mental illness and using ongoing counselling to manage symptoms
B diagnosing a mental illness and prescribing medication as ongoing treatment
C providing day-to-day support to help clients meet their individual goals and navigate health services
D admitting individuals to hospital if and when required

9 Experience-independent plasticity refers to

A brain development triggered by specific environmental cues that the brain expects to encounter at certain times.
B the unique and personal brain changes that occur when different situations occur.
C brain changes that occur regardless of experience.
D the idea that neurons that fire together, wire together.

Use the following information to answer Questions 10–12.

The graph on the right displays data collected in a certain region and period on the percentage of all traumatic brain injuries (TBI) patients categorised into 10-year age ranges, and further categorised by cause of the TBI: by age and cause, including assault, falls from greater than 2 metres high, falls from less than 2 metres high, road traffic collisions (RTC) and 'other'.



10 Which age group contains the greatest percentage of total traumatic brain injury patients caused by falls from heights of less than 2 metres?

A 50–60 years
B 60–70 years
C 70–80 years
D 80–90 years

11 Falls from less than 2 metres high account for approximately what percentage of all TBI patients in the 90+ years age group?

A 7%
B 90%
C 2%
D 20%

12 Which of the following might explain the 20–30 years age group having the highest proportion of total TBI patients due to road traffic collisions?

A There is a higher prevalence of risk-taking behaviour in this age group.
B This age group may spend more time socialising late at night.
C This group includes more inexperienced drivers than older age groups.
D All of the above

ISBN 978-1-009-25401-4 Gallagher et al

13 Greek physician Galen (129–216 CE) observed that injury to the head and brain affected behaviour, while gladiators who had injuries to their hearts were still able to think and reason. What conclusion is justified by this evidence?

- **A** There is a two-way connection between the heart and the brain.
- **B** Perceptions are not formed in the blood.
- **C** The ability to think and reason is not located in the heart; it is more likely to be located in the brain.
- **D** The mind is part of the body.

14 Why do brain function researchers perform functional MRI or PET scans of the brain while the subject performs a task? Choose the most relevant option.

- **A** Functional MRI or PET scans improve performance of the task.
- **B** Functional MRI or PET scans reveal the areas of the brain that are active while the task is being performed.
- **C** Functional MRI or PET scans reveal brain injuries that hinder performance of the task.
- **D** Functional MRI or PET scans reveal the areas of the brain that are not active while the task is being performed.

Short-answer questions

15 Harry Harlow conducted controlled experiments on attachment with infant rhesus monkeys taken from their biological mothers at birth and raised with 'surrogate' mothers.

- **a** State the independent and dependent variables in Harlow's experiment. (2 marks)
- **b** Identify the type of data collected by Harlow in this experiment to measure whether the independent variable had an effect, and state an advantage of collecting this type of data. (2 marks)
- **c** Explain what Harlow's study demonstrated about the formation of attachment in infants. (1 mark)
- **d** Outline one limitation of Harlow's study. (1 mark)

16 Georgina has been finding it difficult to concentrate and focus her attention at school. She is often fidgety and gets up out of her chair and moves around the room. This has negatively affected her results at school. Her mother took Georgina to a psychiatrist for an assessment, resulting in a diagnosis of ADHD.

- **a** Besides conducting the assessment and giving the diagnosis of ADHD, provide one other way the psychiatrist may help Georgina. (1 mark)
- **b** Using the maladaptive behaviour criterion, determine why Georgina's behaviour at school would be considered atypical. (2 marks)
- **c** Provide a limitation of using maladaptive behaviour as a criterion to determine whether Georgina's behaviour is atypical. (2 marks)

17 Simu was competing in a 'boot-camp' style obstacle course with a group of friends. He was climbing over a tall wooden wall and had just reached the top when he slipped and fell to the ground, hitting his head. Simu momentarily lost consciousness. His friends quickly called the course medical team to help. After being checked for spinal cord damage, Simu was taken to the medical area for assessment. It was determined that Simu had experienced a concussion and that he should not continue the course.

- **a** What type of injury is a concussion? (1 mark)
- **b** Explain when Simu might be at risk of chronic traumatic encephalopathy. (2 marks)
- **c** Identify a biological, a psychological and a social effect on his functioning that Simu might experience following his concussion. (3 marks)

ISBN 978-1-009-25401-4 Gallagher et al

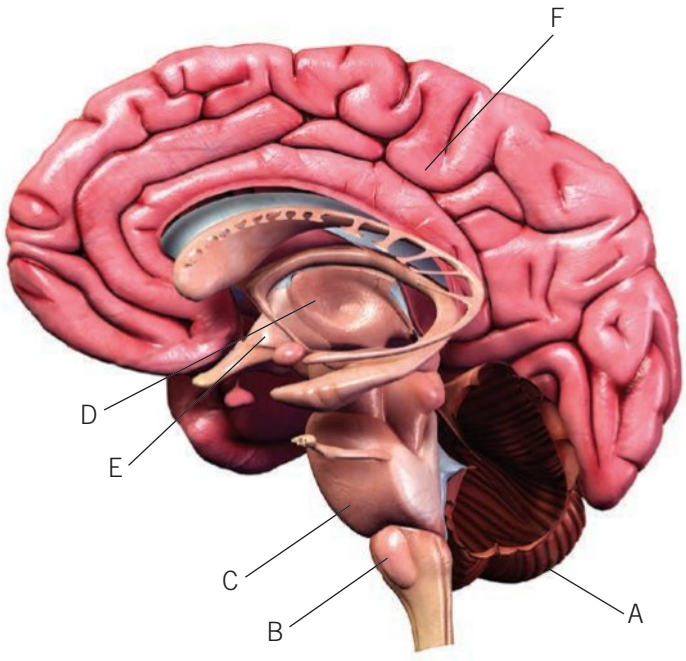
18 Patricia experienced a stroke and is recovering in a rehabilitation hospital. Her therapists are helping her with some skills that she has struggled with since the stroke, including handwriting.

- **a** Explain why Patricia attempting to write and repeatedly practising is important for her in recovering this skill. (2 marks)
- **b** Draw a basic neuron connecting with another neuron. Annotate your diagram to explain what the process of sprouting involves for Patricia. Label the main structures of the neuron that are involved. (5 marks)
- **c** Explain why the rehabilitation hospital would encourage Patricia to eat a well-balanced diet. (2 marks)

19 Rene Descartes made a significant contribution to the study of mind–body interactions.

- **a** Outline Rene Descartes' theory of dualism. (2 marks)
- **b** What was Descartes wrong about in terms of which region of the brain facilitated mind–body interactions? (1 mark)
- **c** One of the questions posed by research on brain activity is 'Can we be consciously aware without experiencing brain activity?' Write down what you think the answer is, giving at least one reason for your view. (2 marks)

20 Name the brain structures labelled **A** to **F** in the diagram. (6 marks)



21 State one brain structure associated with each of the following functions.

- **a** Coordinating muscle movements and learning skilled movements (1 mark)
- **b** Waking up and alertness (1 mark)
- **c** Sleep (1 mark)
- **d** Focusing attention (1 mark)
- **e** Maintaining homeostasis (1 mark)

22 Explain what structure in the brain could be damaged in subjects experiencing the following symptoms.

- **a** Lack of control of breathing, and lack of sneeze reflex (1 mark)
- **b** Movement tremors in Parkinson's disease (1 mark)
- **c** Loss of balance while standing and walking (1 mark)

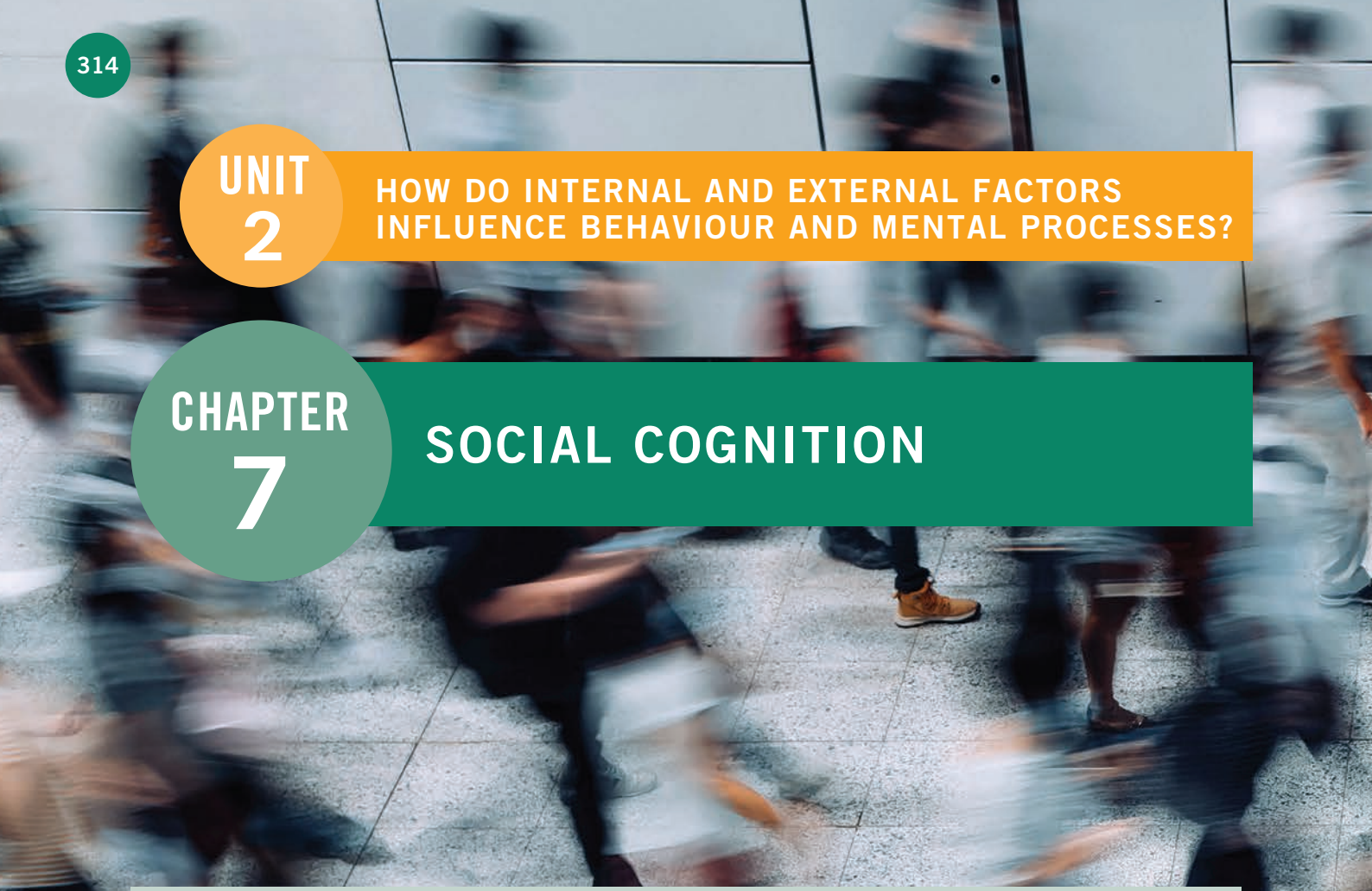
ISBN 978-1-009-25401-4 Gallagher et al

UNIT 2

HOW DO INTERNAL AND EXTERNAL FACTORS INFLUENCE BEHAVIOUR AND MENTAL PROCESSES?

CHAPTER 7

SOCIAL COGNITION



Aboriginal and Torres Strait Islander readers should be aware that this chapter contains images of people who have, or may have, passed away.

Readers should be aware this chapter discusses potentially sensitive topics such as racism, homophobia and sexism.

Introduction

Social cognition is a part of social psychology – the branch of psychology relating to interactions between people. Specifically, social cognition is the study of the mental processes involved in perceiving and thinking about people. In this chapter, we will analyse how social cognition influences the way individuals behave and evaluate how other people can influence the behaviour of an individual.

Why is it that we like some people and not others, even though we have just met them? What forms our attitudes towards people? How do stereotypes, prejudices and discrimination arise? These are some of the big questions asked in social psychology. Their answers greatly affect individual health and wellbeing, from helping us understand how we make decisions to helping us analyse how people protect themselves from psychological discomfort.

This chapter describes how our perceptions of people construct our view of our social world and how this influences our decision-making and interpersonal interactions. It then explores cognitive dissonance – inconsistencies and disagreements in knowledge and thinking – and how this is avoided through bias. The chapter also shows how heuristics, or shortcuts in thinking, are used in decision-making and problem-solving, as well as their advantages and disadvantages. Finally, it discusses how prejudice and discrimination arise and how they can be reduced, both in individuals and more widely in society.

ISBN 978-1-009-25401-4 Gallagher et al

Curriculum

Area of Study 1 Outcome 1
How are people influenced to behave in specific ways?

Study Design:	Learning intentions – at the end of this chapter I will be able to:
• The role of person perception, attributions, attitudes and stereotypes in interpreting, analysing, remembering and using information about the social world, including decision-making and interpersonal interactions	**7A The role of person perception** **7A.1** Explain what is meant by person perception, with reference to forming impressions of other people from physical cues, saliency detection and social categorisation, including relevant examples **7A.2** Explain what is meant by an attribution when explaining behaviour, with reference to internal and external attributions, including relevant examples **7A.3** Explain what is meant by an attitude when interpreting, analysing, remembering and using information about the social world, including the tri-component model of attitudes and its limitations **7A.4** Apply my understanding of how the tri-component model allows us to interpret, analyse, remember and use information about the social world **7A.5** Explain what is meant by a stereotype, including its role in using information about the social world, decision-making and interpersonal interactions
• The avoidance of cognitive dissonance using cognitive biases	**7B Avoiding cognitive dissonance using cognitive biases** **7B.1** Explain what is meant by cognitive dissonance **7B.2** Explain how cognitive dissonance is avoided through cognitive biases, including actor–observer bias, anchoring bias, attentional bias, confirmation bias, false-consensus bias, functional fixedness, the halo effect, the misinformation effect, optimism bias, self-serving bias and the Dunning–Kruger effect, with reference to relevant examples **7B.3** Apply my understanding of the cognitive biases used to avoid cognitive dissonance in real-world scenarios
• The positive and negative influences of heuristics as mechanisms for decision-making and problem-solving	**7C The positive and negative influences of heuristics** **7C.1** Explain what is meant by heuristics as a mechanism for decision-making and problem-solving, including relevant heuristic examples such as availability, representativeness and affect **7C.2** Outline the positive and negative effects of using heuristics in decision-making and problem-solving **7C.3** Apply my understanding of how heuristics are used in decision-making and problem-solving in real-world scenarios

ISBN 978-1-009-25401-4

Study Design:	Learning intentions – at the end of this chapter I will be able to:
• The influence of prejudice, discrimination and stigma within society on a person's and/or group's mental wellbeing and ways to reduce it	**7D The influence of prejudice, discrimination and stigma** **7D.1** Explain what is meant by prejudice, discrimination and stigma with reference to relevant examples such as sexism, racism, ageism, disability and homophobia **7D.2** Explain how the interaction between stereotypes (including stigma), prejudice and discrimination can influence a person's mental wellbeing **7D.3** Explain how prejudice, discrimination and stigma can be reduced, with reference to changing social norms, extended contact and inter-group contact (including sustained contact, mutual interdependence, superordinate goals and equality of status) **7D.4** Apply my understanding of how prejudice, discrimination and stigma in society influence a person's and/or group's mental wellbeing and the ways to reduce prejudice and discrimination in real-world scenarios

Key Science Skills

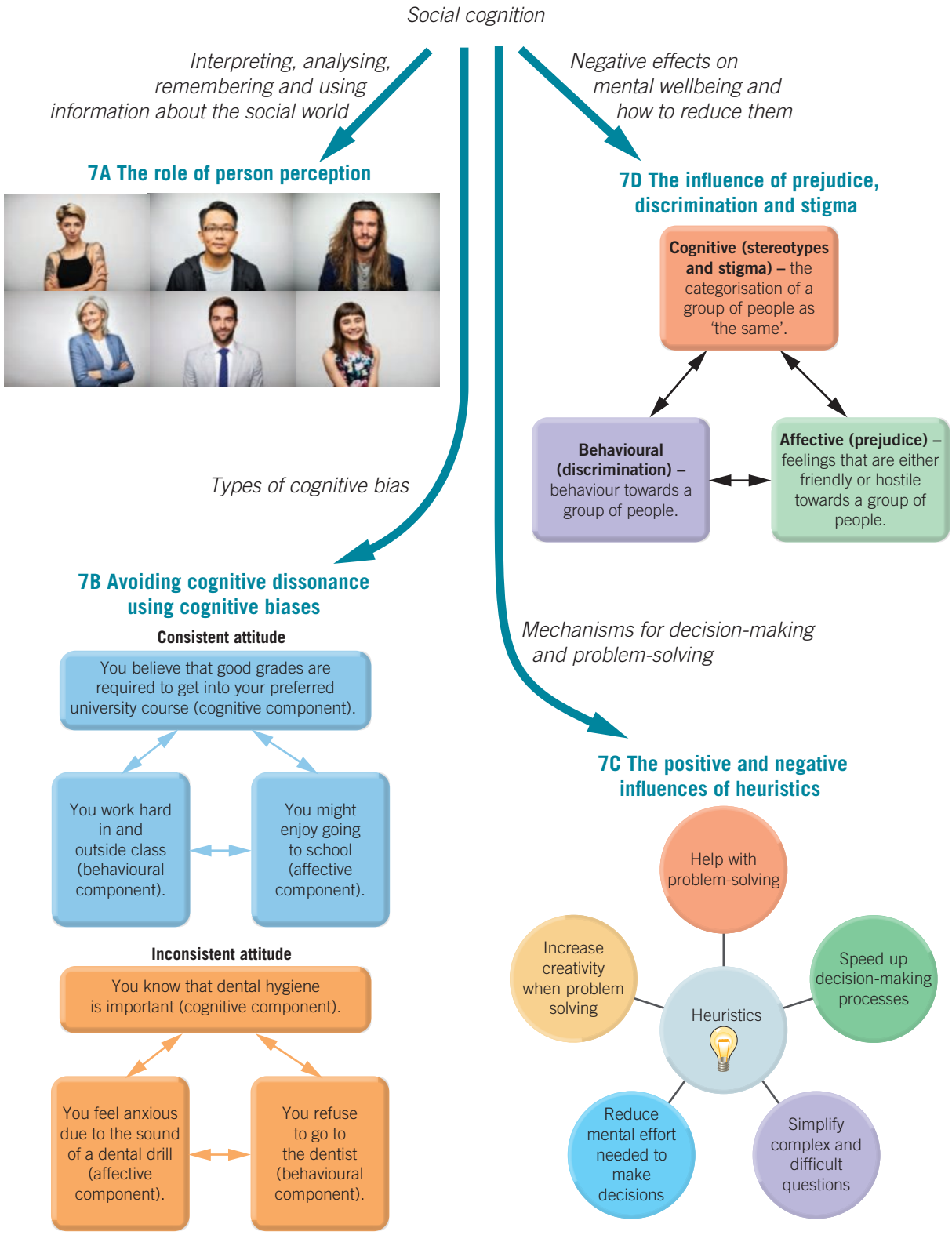
- Process quantitative data using appropriate mathematical relationships and units, including calculations of percentages, percentage change and measures of central tendency (mean, median, mode), and demonstrate an understanding of standard deviation as a measure of variability
- Identify and analyse experimental data qualitatively, applying where appropriate concepts of: accuracy, precision, repeatability, reproducibility and validity; errors; and certainty in data, including effects of sample size on the quality of data obtained

Glossary

Actor–observer bias
Affect
Affect heuristic
Affective component
Ageism
Anchoring bias
Attentional bias
Attitude
Attributions
Availability heuristic
Behavioural component
Bias
Body language
Cognitive bias
Cognitive component
Cognitive dissonance
Cognitive load
Confirmation bias
Contact hypothesis
Direct discrimination
Discrimination
Dunning–Kruger effect
Equality
Extended-contact hypothesis
False-consensus bias
Functional fixedness
Fundamental attribution error
Halo effect
Heuristics
Homophobia
Indirect discrimination
Ingroup
Inter-group contact
Intersectional discrimination
Just-world hypothesis
Misinformation effect
Modern prejudice
Mutual interdependence
Old-fashioned prejudice
Optimism bias
Outgroup
Person perception
Personal attributions
Physical cues
Prejudice
Prototype
Racism
Representativeness heuristic
Salient
Schema
Self-serving bias
Sexism
Situational attributions
Social categorisation
Social cognition
Social norms
Stereotype
Stereotyping
Stigma
Superordinate goals
Sustained contact
Tri-component model of attitudes

ISBN 978-1-009-25401-4

Concept map



See the Interactive Textbook for an interactive version of this concept map interlinked with all concept maps for the course.

ISBN 978-1-009-25401-4 Gallagher et al

The role of person perception

Study Design:
The role of person perception, attributions, attitudes and stereotypes in interpreting, analysing, remembering and using information about the social world, including decision-making and interpersonal interactions

Glossary:
Actor–observer bias
Affective component
Attitude
Attributions
Behavioural component
Bias
Body language
Cognitive bias
Cognitive component
Fundamental attribution error
Halo effect
Ingroup
Just-world hypothesis
Outgroup
Person perception
Personal attributions
Physical cues
Salient
Schema
Self-serving bias
Situational attributions
Social categorisation
Social cognition
Stereotype
Stereotyping
Stigma
Tri-component model of attitudes

ENGAGE

The case of Jeremy Meeks

Does society treat individuals differently based on their looks? There are studies that indicate this. In some cases, physical attractiveness may determine who our friends are and how others treat us. However, can physical attractiveness go so far as to determine how we view someone who has committed a crime against society?

Take the example of Jeremy Meeks. The Stockton Police Department in California said he was 'one of the most violent criminals in the Stockton area', and they even posted his mugshot on Facebook. It went viral, inspiring nicknames such as 'Mugshot McDreamy' and the hashtag #FelonCrushFriday. He was ultimately sentenced to more than two years in prison for offences such as firearms possession.

Figure 7A–1 Jeremy Meeks, a violent criminal, became famous because of his good looks and now has a successful modelling career.

Although other former criminals have great difficulty finding work and respect after they are released, Jeremy Meeks was given modelling work based on his good looks and internet fame due to his viral mugshot. He walked down the catwalk of a fashion show during New York Fashion Week.

ISBN 978-1-009-25401-4 Gallagher et al

EXPLAIN

Humans as social creatures

By nature, we are social creatures. From an evolutionary perspective, humans have preferred to live, hunt and gather in packs because predators were unlikely to attack large groups of people. As tribes became societies, the roles of different individuals and the rules, customs and norms of societies have become more extensive and complex. Modern society today is vastly different from the small groups of ancient humans who once roamed the planet. However, one consistent aspect of any group interaction has been the importance of each group member trying to understand the thoughts, feelings and motives underlying why other group members behave in certain ways. Because of this, humans throughout history have drawn conclusions about the behaviours of others, which has in turn informed our decisions – such as whether we like or trust someone, whether we think someone has behaved well or badly in certain situations and whether we want to associate with certain people or not.

Figure 7A–2 Social interaction is a cornerstone of human society.

The mental processes involved in these social decisions are a part of **social cognition**, which involves the following:

- how we perceive other people
- how we interpret, analyse, remember and use information to judge people in social situations
- how we explain (attribute) the behaviours of other people
- how we form attitudes towards people, including stereotypes that might lead to prejudice and discrimination
- how we mentally construct our social world.

Such mental processes involve a lot of complex information – such as how someone looks, sounds, smells and acts – and our brains have evolved shortcuts that speed up these processes. One shortcut is to simplify the information coming in, but this can lead to a type of systematic error in thinking known as **cognitive bias**. An example is paying attention only to facts and events that confirm your own opinion. There are many types of **bias**, some of which will be discussed in this chapter. Since they cause us to make mistakes in judgement, the word *error* is often used interchangeably with *bias*.

Social cognition how we judge others in social situations by interpreting and analysing information

Cognitive bias a systematic error in thinking generally due to oversimplifying the information available

Bias a disproportionate weight in favour of or against an idea or thing, usually in a way that is closed-minded, prejudicial or unfair often leading to error

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 7A–1 FORMING IMPRESSIONS OF OTHERS

In small groups or as a whole class, consider the images of the people below. Based on your first impressions of them, answer the questions and discuss why you came to the conclusions that you did.

Questions

1. Who do you think parents would prefer to babysit their young children? Why?
2. Who do you think is the most intelligent? Why?
3. Who do you think could be a criminal? Why?
4. Who would you prefer to work with in a group assignment? Why?
5. Who do think is most likely to be a lawyer or teacher? Why?
6. Who would you rather sit next to on a train? Why?

Responses could include judgements such as 'I think this person looks friendly', 'I don't trust this person' or 'I think I could be great friends with this person'. These kinds of judgements determine the relationships we develop with others. For example, thinking that someone is helpful will encourage us to ask them for help. Thinking that someone is less than honest might make us sceptical about what they say.

Figure 7A–3 We might make a judgement that someone who is dressed in a suit is intelligent and successful, while someone who dresses casually and slouches when they walk or sit is lazy.

ISBN 978-1-009-25401-4 Gallagher et al

Person perception

Person perception refers to the mental processes we use to form our impressions and opinions of other people. It includes how these impressions are formed and how different conclusions can be made based on them.

LINK 2A PROCESSING AND ANALYSING DATA

Person perception the mental processes we use to form our impressions of other people

Schema our pre-existing mental ideas relating to a given concept that help us organise and interpret new information

Schemas

Person perception involves combining pieces of information that we have gathered about a person so that we can form an idea of that person's characteristics. We then form an opinion and make judgements about the person based on the **schema** that we have assigned them. A schema is our pre-existing mental ideas relating to a concept that helps us organise and interpret information. Our schemas include both abstract knowledge and specific examples about a person, group or situation. Imagine that your mind is like a series of pigeonholes, and every time you encounter a new person, object or event, the encounter will either be placed in an existing pigeonhole or a new one will be created. In this way, schemas involve collecting and categorising everything we have experienced in our lives. Schemas represent past experiences, which are useful for predictions about or expectations for future events. For example, if you have visited or watched documentaries about Japan, you would have noticed that Japanese people have different ways of greeting each other, and this will be built into your group schema about Japanese people. Therefore, when you meet a Japanese person, you might expect them to use that style of greeting.

Figure 7A–4 Schemas can be thought of as pigeonholes in that they are distinct containers that hold different types of information.

Schemas guide what we attend to, perceive, remember and infer depending on our existing attitudes and expectations. Each person we meet is placed into a certain schema when we form an impression of them. Sometimes, there is little or no information available, so we rely on our past experiences and personal biases to fill in the gaps. When new information is presented to us, we tend to selectively recall facts that fit the schema that we already hold. For example, if we see a photograph of a person, we base our perception of that person primarily on what they look like, and we may make assumptions and fill in the gaps with regard to other aspects of that person, such as how we imagine that person would behave and what they would be like if we were to speak to them.

Person perception allows us to take shortcuts when interpreting social information, as well as make judgements and decisions quickly; however, it can also lead to a biased perception of other people. This is because we subconsciously tend to rely on our own prejudices, which distorts the accuracy of the impression we have formed. In the following sections, we will learn about the factors that influence person perception.

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 7A–2 DEMONSTRATING SCHEMAS

Individually or in pairs, pick a well-known person (e.g. a sports star or a celebrity) and make a mind map of everything you know about them. Try to do this without using the internet or anyone else's help. In the mind map, you might include facts about the person's life, personality traits, how they look, and so on. The resulting mind map is a representation of the schema you have for that person.

Check-in questions – Set 1

1 What is the difference between social cognition and person perception?
2 Explain why person perception is an important part of our social world.
3 What is a schema?
4 Explain how schemas allow us to form impressions of others with minimal information.
5 How can schemas lead to an incorrect judgement of another person?

Physical cues

Physical cues the physical characteristics and behaviours of people that influence our impressions of them

When you meet someone for the first time, you first notice what that person looks like, what they are wearing and their body language. These pieces of information are called **physical cues**. From these cues, we infer certain qualities about people. For example, imagine that you are in a coffee shop. As you are waiting for your coffee, you see someone who's dressed nicely, and you find them physically attractive. You might assume that they are smart and funny and that they have a good work ethic. While at the same coffee shop, you might also see another person dressed in workout gear. Although they aren't necessarily as carefully groomed as the first person you saw, you might still assume positive traits about this stranger. You might think that they are hardworking, fit and happy. The third person you come across in the coffee shop might have just woken up; their clothing is dishevelled, and their hair is pulled back messily. They could be more hardworking than the first person, and they may be fitter and happier than the second; however, you might perceive them as lazy, unorganised and apathetic due to their physical appearance.

Figure 7A–5 The physical appearance of these two men might affect how you form a judgement about who would be the best person to sit next to on a crowded train.

ISBN 978-1-009-25401-4 Gallagher et al

Physical appearance, especially attractiveness, has been shown to be an important factor in person perception. Several studies have found that people who are considered physically attractive are also generally regarded as warmer, happier and more intelligent, interesting, independent and socially successful than people who are considered unattractive. People regarded as attractive also tend to be rated higher on other positive traits. Imagine that your boss asks for your opinion about whether your co-worker, Dave, would be a good team leader for an upcoming project. You don't know Dave well, but you think he's a tall and attractive person, so you automatically say yes. This is because your positive thoughts about Dave's appearance influence how you consider his other characteristics, including his leadership skills and intelligence. You subconsciously form these opinions despite not really knowing whether Dave would make a good team leader at all. Your assumption about Dave's leadership skills has been influenced by the **halo effect** – a cognitive bias in which one quality of a person might make us think that other aspects of them are also good, while one negative impression might make us think other aspects of them are bad. This effect can also include other characteristics besides physical appearance. For example, people who are perceived as kind may also be considered intelligent, while people who are perceived as antisocial or rude might also be considered mean or unintelligent.

LINK **7B** AVOIDING COGNITIVE DISSONANCE USING COGNITIVE BIASES

Halo effect
a cognitive bias in which one impression of a person influences our belief about their other qualities

Figure 7A–6 What characteristics would you attribute to each of these women based on their personal appearance? According to the halo effect, you would likely assume that the younger woman is more cheerful and sweet tempered than the older woman.

The role of attractiveness in producing the halo effect has been illustrated in many different settings – such as in academia, the workplace and even within the justice system. One study found that students who were considered more attractive and harder working subsequently received better grades than students who were perceived to be less attractive. Another study, conducted in the United States, discovered that more attractive servers earned an average of US$1261 more annually in tips than their less attractive counterparts. Another study even found that attractive felons tend to receive less jail time.

ISBN 978-1-009-25401-4 Gallagher et al

WORKSHEET 7A–1 BODY LANGUAGE

Body language

Our impressions of people are also influenced by the information that people convey through body language. **Body language** is non-verbal communication in which physical posture, movement and behaviour rather than words are used to express a certain message. Body language incudes gestures, eye movement, facial expressions, body posture and other movements. In prehistoric times, it was how a stranger could be evaluated quickly, which could have meant the difference between offering them friendship or preparing for a fight.

Body language non-verbal communication in which physical behaviour and movement rather than words are used to express or deliver a certain message

A person's body language enables quick and often accurate judgements to be made about them. For example, in Western cultures like Australia or the United States, slouching may indicate lack of interest, crossing your arms may indicate that you feel defensive, and nodding your head may indicate that you are interested in a conversation or that you agree with another person.

Figure 7A–7 a Winking and pointing your finger at someone suggests a greeting or gesture of agreement to a friend. **b** Placing one hand on your head and the other palm up with fingers splayed indicates frustration or confusion.

In Western cultures, eye movements are also an important aspect of body language. Making eye contact is considered a sign of attention and interest, while breaking eye contact and looking around means the opposite – that you are not interested in what is being said. Avoiding eye contact tends to be judged as a sign that a person is unfriendly, shy, embarrassed, ashamed or dishonest. Similarly, a person who leans towards us or who orients their body to us and nods while we speak influences us to create a positive impression of them. We tend to judge them as likeable and believe that they like us.

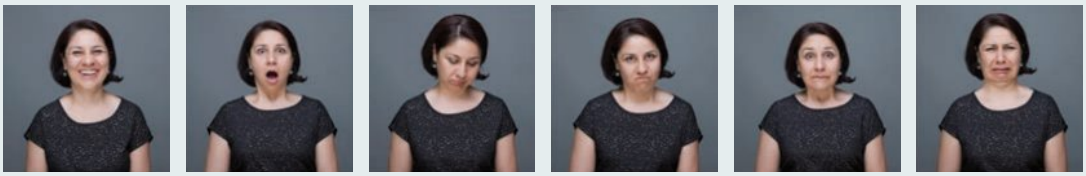
There are many body language differences between cultures that can cause misunderstandings. The 'thumbs up' gesture can mean 'all right' in one culture but be an insult in another; and in some Asian cultures, direct eye contact could be interpreted as rude and aggressive.

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 7A–3 INTERPRETING FACIAL EXPRESSIONS

Facial expressions are one of the key factors that help us interpret body language. Individually or in pairs, match the emotions listed below to the appropriate facial expression.

1 Surprise
2 Fear
3 Anger
4 Happiness
5 Disgust
6 Sadness



A B C D E F

After you have matched an emotion to each facial expression, compare your results with the person or pair next to you or as a whole class. Discuss what kinds of body language would likely match each facial expression. To further explore the link between interpreting facial expressions and body language, break into groups and pick one emotion to demonstrate. Perform the body language you might expect to see with the emotion you have picked, but make sure that your face is 'neutral'. See if your peers can match the body language to your chosen emotion without the help of the facial expression.

Saliency detection

Our brains can select only a portion of the huge amount of incoming sensory information for interpretation. Therefore, we are likely to initially judge people based on **salient** characteristics. This refers to anything that is noticeable compared to its surroundings or background (e.g. appearance, behaviour or traits). Things that are bright, moving, new, threatening or important to us are more salient than other things without these characteristics, and they are more likely to attract our attention. For example, if you see a man wearing a business suit but with a bright red mohawk hairstyle, then you'll likely pay more attention to his hair than his suit. Or, if you are interviewing for a new job, information that is important to you, such as the salary, would be more salient compared to other details like small talk.

Salient
a descriptor for anything that is prominent, conspicuous or otherwise noticeable when compared to its surroundings

Figure 7A–8 When we meet someone new, we pay attention to the details about them that stand out the most in relation to the specific environment that we are in.

ISBN 978-1-009-25401-4 Gallagher et al

Figure 7A–9 Age, gender and race tend to be the most salient factors that contribute to first impressions. Knowing this helps us understand how we can interact with anyone we have just met.

Salience usually depends on the context of the social situation. A child seen in a kindergarten wouldn't be salient, but one seen at a nursing home would be. The act of crying wouldn't be salient at a funeral, but it would be in a job interview.

When meeting someone for the first time, we are more likely to initially judge them based on their physical appearance, sex, race and age rather than their religion, career or political beliefs because these latter features are not salient. Further, when people explain what causes certain behaviours or situations, they tend to mention the most noticeable or salient information. In general, observers will more likely assume that a person's behaviour was caused by personal traits, since these are the factors that are more salient. For example, if a work colleague is consistently late or absent, then you will most likely assume that they are lazy. On the other hand, your work colleague is more aware of the outside factors that cause them to be late, such as having an unreliable car; therefore, these outside factors are more salient to them.

Unfortunately, the most salient information isn't always the most accurate or important. Focusing primarily on salient features can cause people to miss potentially more important information. For example, salient media coverage might cause people to overestimate the frequency of relatively unusual dangers, such as being attacked by people with mental illnesses, and underestimate much more common threats that do not receive salient coverage, such as being assaulted by someone you know.

ACTIVITY 7A–4 DEMONSTRATING SALIENCE

Although saliency detection helps us focus on a person's most obvious features, it doesn't necessarily help us focus on the most important information that we can use to make judgements. While keeping this in mind, consider the three images below and try to identify what's not right about each image. It might not be what you expect!

After you have identified the inconsistencies in each image, discuss with a partner why you might not have initially noticed each error.

ISBN 978-1-009-25401-4 Gallagher et al

Social categorisation

Social categorisation is a mental shortcut used in person perception to categorise people into groups based on their shared social characteristics. It happens when we think of someone as male or female, or old or young – or when we mentally place people in certain social groups. After doing this, we might consider those people more as members of a social group, and use our existing information about that group in our schema rather than think of them as individuals. For example, if you meet someone with black hair who dresses all in black and wears white makeup, then you might make a judgement about the type of music they listen to or their views about art, because this is the information in your schema for 'goth'. Social categorisation can sometimes be a conscious process, but for the most part, it seems to happen subconsciously.

Social categorisation a mental shortcut used in person perception to categorise people into groups based on their shared social characteristics

Figure 7A–10 When we meet someone new, we automatically categorise them into a social group based on characteristics such as age, gender or race.

Social categorisation has both advantages and disadvantages. There isn't enough time to get to know everyone you meet, so social categorisation enables you to make assessments swiftly and then reach decisions quickly. In a stressful situation, this can be vital, such as when people are deciding who is a potential ally or foe. It also helps you multitask. For example, when you are assigned to a group for a school project, you can quickly assess what each student is good at while simultaneously thinking about what role each should have.

LINK **7D** THE INFLUENCE OF PREJUDICE, DISCRIMINATION AND STIGMA

The disadvantage of social categorisation is that it can lead to errors of judgement, stereotyping and discrimination against the people you meet. As an example, imagine that a family with young children has just arrived at a campsite and they are given the choice of setting up next to a bunch of surfers or next to a group of older women. Tired and wanting a quiet night, the family thinks that the surfers will likely stay up late being rowdy but that the women will go to bed early, so they pick the site next to the women. It turns out that the surfers have a competition very early the next day, so they go to sleep early to be fresh and ready, while the women are celebrating a birthday and stay up late laughing and singing loudly.

Although this might be a trivial example, a social categorisation misjudgement could have far more serious consequences, such as when it leads to prejudice and discrimination.

Figure 7A–11 Social categorisation can lead to mistakes in person perception. For example, you might decide to partner with the new girl in your class for a big assignment. You do this because you might have judged that she is intelligent due to her appearance and quiet nature. However, after partnering with her for a while, you come to realise that she is lazy and insists that you complete the bulk of the assignment.

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 2

1 Explain how the following factors influence person perception, with an example for each answer.
   a Physical cues
   b Saliency detection
   c Social categorisation
2 How might the halo effect influence our impression of someone that we would consider unattractive?
3 Give examples that have not been used in the text of three common body language expressions (e.g. postures or gestures) and describe the first impression that each might give.
4 What is the purpose of saliency detection?
5 What is a disadvantage of saliency detection?
6 Identify a strength and limitation of social categorisation.

Attributions

After taking a practice exam, Laura and Sophie get their results back. Laura failed the test, and Sophie got a perfect score. When discussing her results with her friends, Laura tells them she's sure that the test contained 'trick' questions and that the teacher didn't properly teach the content, which resulted in Laura's failing mark. Laura also suggests that the teacher likes Sophie better, so she marked her test more favourably, resulting in Sophie's perfect score. Why did Laura explain her and Sophie's test results this way?

Figure 7A–12 A person who receives a bad test result might look for reasons why and make an attribution about the marker's behaviour.

As we construct our perceptions of the social world, we try to understand why people behave in certain ways. As Laura searched for reasons to understand the event of her failing mark and Sophie's perfect score, as well as to understand her teacher's behaviour in marking Laura's test so harshly, Laura made a few attributions. **Attributions** are inferences that we make about the causes of events and the causes of behaviours (both our own and those of others). As we observe others (and think about our own behaviour), we tend to make inferences based on their behaviour. For example, Mei invites Zareen (a co-worker) and Anna (a long-time friend) to dinner at a popular restaurant, but Anna arrives 30 minutes late. Zareen thinks Anna was delayed due to bad traffic or because there was no parking in the area. However, Mei knows that Anna is rarely on time, and she thinks her friend is disorganised. Both these responses are examples of attributions – but notice that each is completely different.

Attributions inferences that we make about the causes of events and behaviours (both our own and those of others)

ISBN 978-1-009-25401-4 Gallagher et al

Attributions were first described in 1958 by a researcher named Fritz Heider. He theorised that people tend to see the cause of a behaviour as being influenced by factors that are either internal or external to a person. Factors that are internal to a person are known as **personal attributions** (or dispositional attributions), and they involve explanations of a person's behaviour based on their characteristics, such as their ability, personality or energy. Factors that are external to a person are known as **situational attributions**, and they involve explanations of a person's behaviour based on factors outside the person involved, such as luck or something in the environment, in the task or in the actions of another person. Although our attributions are often reasonable and valid, they are also susceptible to bias. In the example of Mei and her friends, Zareen made a situational attribution when she attributed Anna's lateness to external factors (bad traffic), while Mei made a personal attribution when she attributed Anna's behaviour to internal factors (Anna's disorganisation).

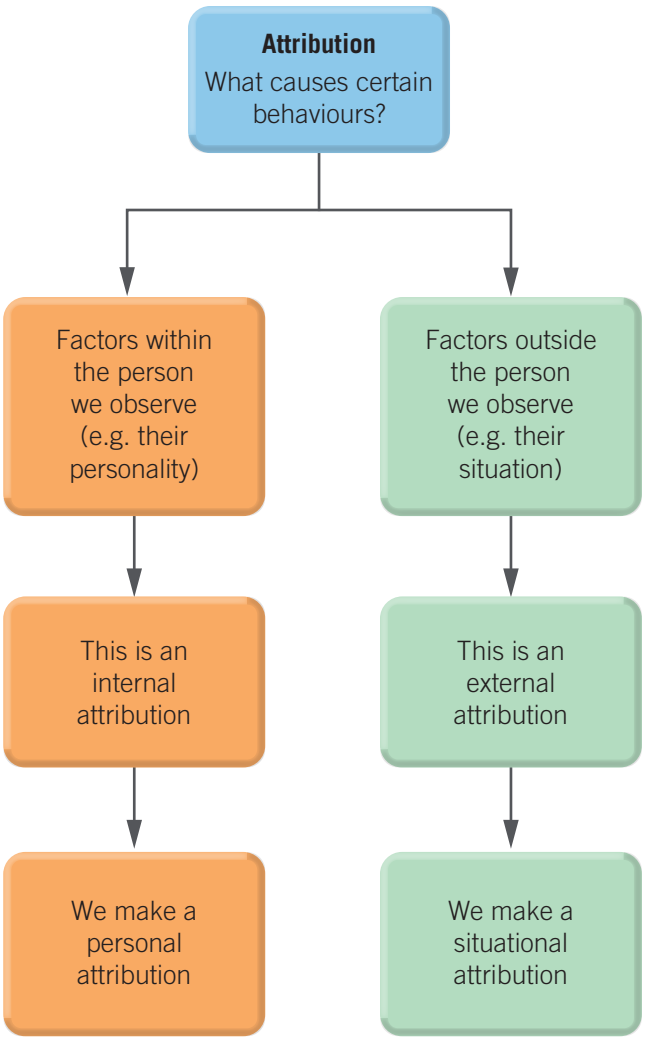


Figure 7A–13 We can make personal attributions or situational attributions to explain our own behaviour or the behaviours of others.

VIDEO 7A–1 INTERNAL AND EXTERNAL ATTRIBUTIONS

Personal attributions explanations of a person's behaviour based on their characteristics, such as their ability, personality or energy

Situational attributions explanations of a person's behaviour based on factors outside the person involved, such as luck or something in the environment, in the task or in the actions of another person

ACTIVITY 7A–5 USING ATTRIBUTIONS TO EXPLAIN BEHAVIOUR

We make attributions to explain behaviour every day – for both our own behaviour and the behaviour of others. Attributions help us make sense of certain behaviours that we don't have enough information to explain properly. In pairs or small groups, consider the images below and discuss the types of attributions that you would make to explain the behaviour shown in each image. In your discussions, consider what types of attributions you are making. Do they tend to be personal attributions or situational attributions?



ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 3

1 What is an attribution?
2 Why do we use attributions to explain our behaviour and that of others?
3 Provide two reasons why an attribution is a form of social cognition.
4 Describe one similarity and one difference between personal and situational attribution.

Fundamental attribution error

Fundamental attribution error the tendency to overemphasise personal characteristics and ignore situational factors when judging the behaviour of other people

The **fundamental attribution error** or bias is our tendency to overemphasise personal factors and ignore situational ones when judging the behaviour of other people – that is, we tend to attribute someone's behaviour to their internal factors instead of their external ones. As a result, we tend to think that someone behaves well or badly because they are a good or bad person. We specifically tend to believe that people do bad things because they are bad people, and we are inclined to ignore any situational factors that could have played a role. For example, if someone overtakes us sharply while we are driving, our first thought might be 'what a jerk!' instead of considering the possibility that the driver is rushing due to an emergency.

Just-world hypothesis a cognitive bias in which people believe that the world is fair or just, and that everyone gets what they deserve

The fundamental attribution error might occur because observers are generally unaware of the situational factors at play. Further, this attribution error might be influenced by the **just-world hypothesis**, in which people believe that the world is fair or just and that everyone gets what they deserve. This cognitive bias makes us think that other people's misfortune is deserved due to bad behaviour rather than being due to situational factors. For example, many people might believe that those who caught COVID-19 didn't take care of their health, that victims of family violence provoked their attackers, that victims of crime weren't careful enough, that people on the dole are lazy, and so on. These kinds of negative perceptions can lead to serious errors in judgement.

Figure 7A–14 If someone you don't like loses their job, you might think it was because they were lazy or incompetent rather than because the business that employed them was closing down.

ISBN 978-1-009-25401-4 Gallagher et al

Actor–observer bias

When explaining our own behaviour, we tend to have an opposite bias to the fundamental attribution error. We are more likely to blame external factors than our personal characteristics when something bad happens to us. This is known as the **actor–observer bias**: the tendency to attribute our own behaviour to situational (external) causes, but to attribute the behaviour of others to their internal factors. For example, if we see a young man trip and fall on the pavement, we might think he is clumsy. However, if we trip and fall on the pavement, then we might blame the slippery or uneven pavement.

Figure 7A–15 If someone cuts in front of us in traffic, then we are likely to believe that they are a rude person. However, if we cut in front of someone else, we might believe it was acceptable because we were late for an important appointment.

Actor–observer bias the tendency to attribute our own behaviour to situational (external) causes, but to attribute the behaviour of others to their internal factors

One possible reason why the actor–observer bias occurs is because we have more information about our own external factors and situation than we do about the situation and factors that others might be experiencing.

When we try to explain another person's behaviour, we are at a disadvantage because we only know what we can readily observe about their behaviour. Unsurprisingly, if we know other people well, we are less prone to actor–observer bias. We are more likely to be aware of and understand if any situational factors explain their behaviours.

LINK **7B** AVOIDING COGNITIVE DISSONANCE USING COGNITIVE BIASES

Self-serving bias

The **self-serving bias** is the tendency to attribute our successes to internal factors and our failures to external factors. For example, if you win a game, then you might attribute your success to skill; however, if you lose, then you might blame the rules. This bias seems to arise because we have a need to 'save face' – to maintain our self-esteem and the good impression that others have of us. Any endeavour that results in success or failure may be subject to the same bias – such as a job application, being considered for an award or even trying to establish a relationship with someone new.

Self-serving bias the tendency to attribute our successes to internal factors, and our failures to external factors

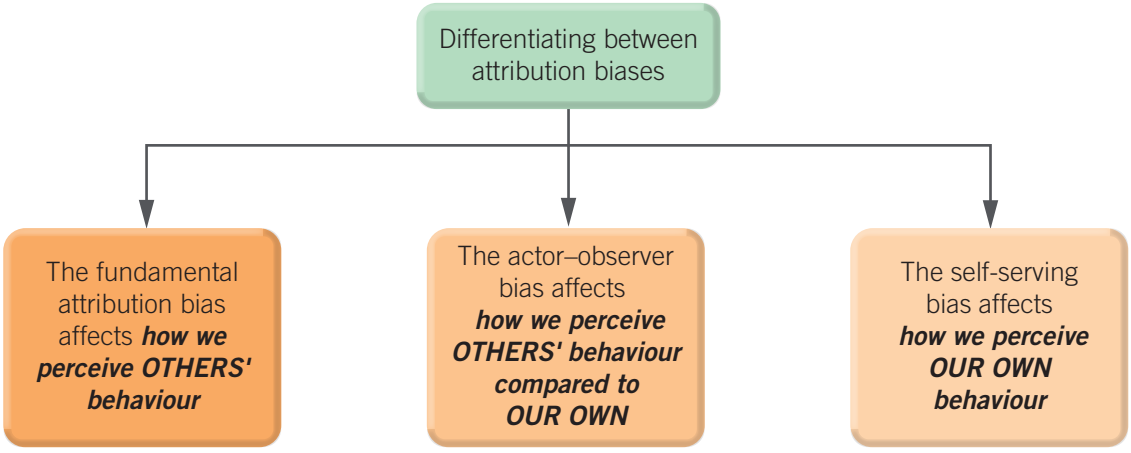


Figure 7A–16 Differentiating between the three attribution biases can help you understand how we perceive behaviour.

ISBN 978-1-009-25401-4 Gallagher et al

Figure 7A–17 While the winner of an award credits their work ethic or skill for their win, the losers may blame the judges or other external, situational forces that held them back.

Check-in questions – Set 4

1 Name and describe three types of attribution bias.
2 Give an example of each type of attribution bias that has not been used in the text.
3 Identify the type of attribution bias that explains the behaviours in the following examples.
   - **a** At a party, Olena is introduced to Aaron, who doesn't make much eye contact, slouches and barely makes any responses. Olena decides that Aaron is rude, abrupt and generally unpleasant to be around.
   - **b** A basketball player scores in the final seconds of the first half of a game, which places his team in the lead. He attributes this to his skills. When he misses his next three shots in the second half of the game, he blames his teammates for not passing the ball fast enough for him to make the shots.
   - **c** At a check-up, Mina's doctor tells her that her cholesterol levels are elevated. Mina assumes that her high cholesterol is due to genetic factors. The following week, Mina's husband also finds out that he has high cholesterol levels. Mina believes that her husband's high cholesterol levels are due to poor diet habits and a lack of exercise.
   - **d** Aisha gets a good mark on a mathematics test and tells her parents that she studied hard and knows the topic well. The next week, Aisha gets a bad mark for an English test, but she tells her parents that the questions didn't relate to what her teacher had taught the class.
   - **e** Susan has a job interview. She takes the train but trips when she gets off and grazes her knee, requiring her to stop at a pharmacy to buy antiseptic and plasters. Despite her best efforts, she arrives 10 minutes late and explains what happened to the receptionist. However, the receptionist doesn't tell the interviewers. After the interview, the interviewers conclude that Susan isn't punctual and believe that she can't be trusted to get to work on time if she was hired. Despite having a good interview, Susan doesn't get the job.
   - **f** Karen has been receiving job seeker payments for over a year. When her family asks how the job hunting is going, she blames the lack of available jobs in her field for her lack of progress. However, when her cousin Sam becomes unemployed and struggles to find a new job, Karen tells her family that Sam is just lazy and can't be bothered to find a new job.

ISBN 978-1-009-25401-4 Gallagher et al

Attitudes

Should secondary school students have to wear a uniform? At what age is it acceptable to get married? Should there be mandatory vaccination against COVID-19? Are women just as capable as men of serving in combat? Do peas taste good? Should there be a test for prospective parents? Should the legal drinking age be lowered?

Figure 7A–18 We have attitudes about every object, person and event that we encounter in our lives.

People tend to have the strongest opinions about topics like sports and politics. You might find that these topics can divide people when they engage with them. To understand why, consider the questions asked above and think about why you have chosen the answers you did. Is it because of your likes and dislikes towards each topic? Or is it because of your past experiences with these topics, people and events? In many situations, your likes, dislikes and past experiences contribute to the creation of something you possess that is completely unique to you – your attitude.

An **attitude** in psychology is a person's evaluation of other people, objects, issues or anything else. The significant word in this definition is 'evaluation', as it refers to a judgement being made about a specific aspect of our lives (whether a positive, negative or neutral judgement). Other examples of what we form attitudes about include food items and types of smartphones (objects), ourselves and celebrities (people), our friends and family (groups), Christmas and elections (events), and the COVID-19 vaccination and climate change (issues). Although some of our attitudes might be stronger than others, whatever judgement we have must be consistent and long lasting for it to be considered an attitude.

Attitude
an evaluation that a person makes about other people, objects, issues or any other thing

ISBN 978-1-009-25401-4 Gallagher et al

Because attitudes are learned rather than innate, the effects of experiences, external influences and exposure to media must be considered when determining the reason an attitude is formed.

The media greatly influences our attitudes – sometimes without us even noticing. In Australia, many newspapers, magazines and television channels show a specific perspective on an idea, and they often leave out details of any opposing opinions. This means that the media can portray an issue in a specific way, show an unbalanced or unfair view on the issue and possibly alter your opinion of it. The media also uses your attitude to help sell you products via advertising.

Attitudes can also sometimes emerge from direct contact or personal experience with the objects of the attitude. For example, you might have the attitude that smoking is bad and that it causes cancer because someone close to you passed away from lung cancer, or that dogs are excellent companions because you have had many dogs over the course of your life.

Attitudes can also be formed through interactions with others who hold specific attitudes, such as parents, teachers and friends. Parents' values, beliefs, practices and, of course, attitudes can be transferred to their children. For example, if both of your parents share the belief that asylum seekers should be allowed entry into Australia, it is likely that you will also share this belief.

Figure 7A–19 We learn countless attitudes through being exposed to media or our family and friends. For example, we might develop positive attitudes about recycling through these contacts.

ACTIVITY 7A–6 HOW DO WE FORM ATTITUDES?

Using your knowledge of how attitudes are formed, design a flow chart that shows how attitudes might be formed for each of the situations below, in which people:

- take a holiday at one destination over another
- see an advertisement for clothing that they buy after seeing it multiple times
- buy one type of car because it is superior to others
- think that animals are dirty and carry diseases.

Tri-component model of attitudes a model proposing that attitudes must have three related components – affective, behavioural and cognitive

The tri-component model of attitudes

There are several models that describe the structure of attitudes, the most common of which is the tri-component model of attitudes (Rosenberg & Hovland, 1960). The **tri-component model of attitudes** proposes that attitudes have three related components – affective, behavioural and cognitive (or the 'ABCs of attitudes'; Figure 7A–20). This model suggests that all three components must be present for an attitude to be considered an attitude. See Table 7A–1 for a detailed description of each component.

ISBN 978-1-009-25401-4 Gallagher et al

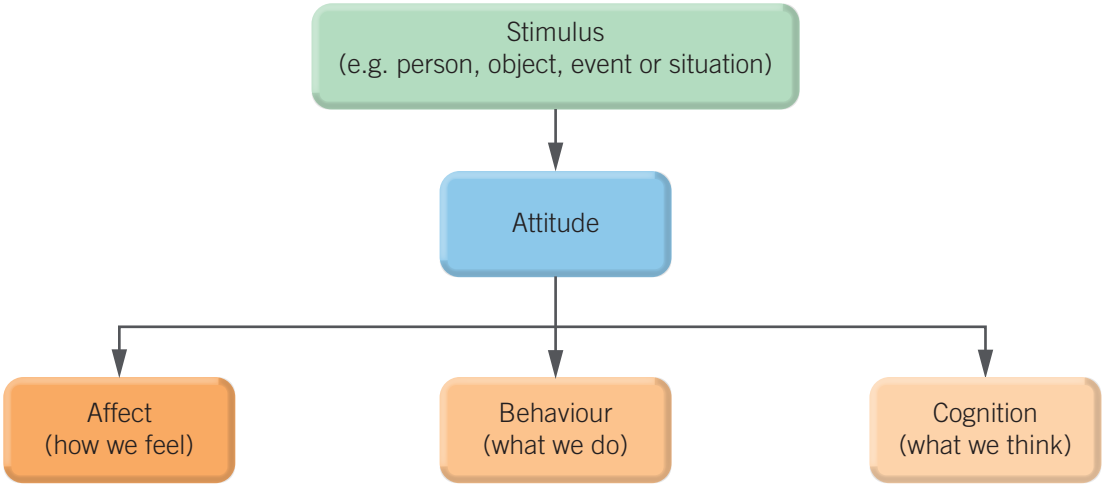


Figure 7A–20 The tri-component model of attitudes proposes that our attitudes are made up of affective, behavioural and cognitive components.

WORKSHEET 7A–2 TRI-COMPONENT MODEL TRUE OR FALSE

Table 7A–1 The tri-component mode of attitudes

Component	Description	Example
Affective component	This is the emotional component of attitudes – it involves how you feel about people, objects, places, events or ideas. These feelings can be good, bad or neutral.	'I feel good when I'm with my friends.' 'I feel fit when I play basketball.'
Behavioural component	This is the action component of attitudes – it involves what you do (or do not do) as an expression of your attitude. It also refers to how you might behave if a certain situation occurs.	'I hang out with my friends whenever I can.' 'I play basketball every night.'
Cognitive component	This is the mental component of attitudes – it involves the beliefs or thoughts that you have about people, objects, places, events or ideas. Our beliefs are linked to what we know about the world, and they develop from life-long experiences. These thoughts can be good, bad or neutral.	'I think my friends are nice, funny and cool.' 'I think basketball is the best sport to play.'

Affective component the emotional component of attitudes, involving how you feel about people, objects, places, events or ideas

Behavioural component the action component of attitudes, involving what you do (or do not do) as an expression of your attitude

Cognitive component the mental component of attitudes, involving the beliefs or thoughts that you have about people, objects, places, events or ideas

ACTIVITY 7A–7 DEMONSTRATING THE TRI-COMPONENT MODEL OF ATTITUDES

We have attitudes about countless objects, people and events, and we demonstrate these attitudes in various ways. Consider some of your attitudes and how they can be applied to the tri-component model. In a copy of the table below, write an attitude that you hold about the environment, school and social media and break it down into each of its components.

Attitude	Affective component	Behavioural component	Cognitive component

ISBN 978-1-009-25401-4 Gallagher et al

In many cases, the affective, cognitive and behavioural components are all consistent with each other. For example, you might fear snakes (affective) because you believe that they are dangerous (cognitive), so you avoid areas where snakes have been spotted (behavioural). Similarly, you might believe that eating broccoli is good for your health (cognitive) and you like the taste of broccoli (affective), so you often serve broccoli at dinner (behavioural).

However, there are times when a person's behaviour does not reflect their attitude. The behavioural component is often inconsistent with the affective and cognitive components. For example, a person might like watching movies with their friends (affective component) because they believe it's a great way to experience a shared interest (cognitive component), but they might choose not to go to a movie because they have too much homework to complete that night (behavioural component). There are also times when the affective or cognitive components are consistent with the behavioural component, but not with each other. These inconsistencies often result from one component being considerably stronger or weaker than the other two.

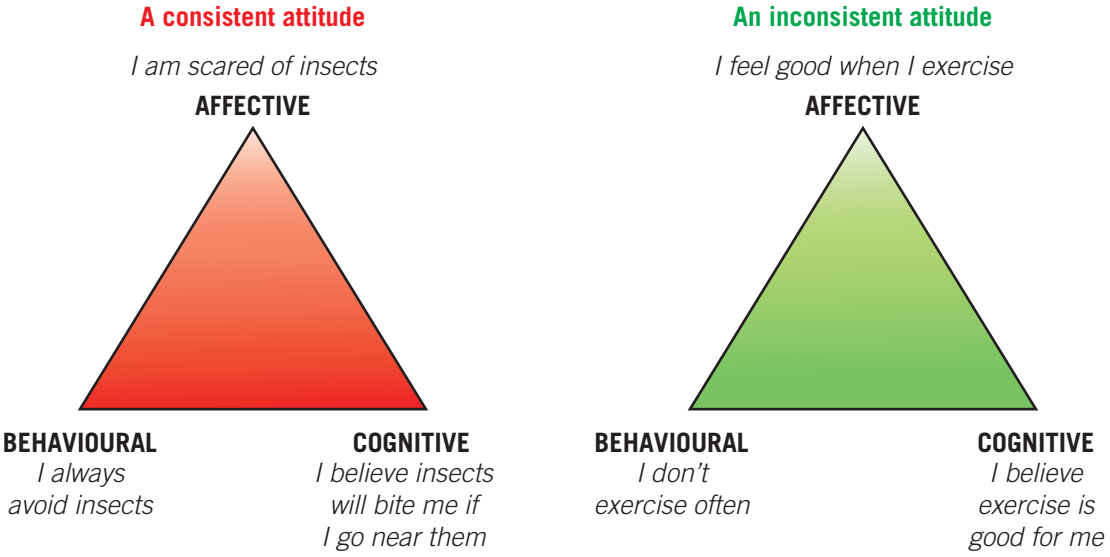


Figure 7A–21 Attitudes can be consistent or inconsistent.

Check-in questions – Set 5

1. Rewrite the definition of an attitude in your own words.
2. Describe two ways that attitudes can be formed.
3. Describe the three components of the tri-component model of attitudes and give examples that haven't been used in the text.
4. Identify the affective, cognitive and behavioural components for each of the attitude statements below.
   - **a** Smoking should be made illegal because of how passive smoking negatively affects other people. I would never choose to smoke.
   - **b** High school students shouldn't be required to wear uniforms. I love to express myself through my clothing, and I always make small changes to my uniform to show my style. Having to wear a uniform stifles productivity and creativity.
   - **c** All my friends are getting their noses pierced, but my parents won't let me because they think my nose will get infected easily. I think nose piercings look great, and I still want to get one.

ISBN 978-1-009-25401-4 Gallagher et al

d I would rather watch a movie on Netflix than go to the cinema. I hate the crowds, and there's always someone who makes too much noise. When my friends ask me to go to the movies, I always say no.

e Deep-sea diving is the most fun in the world. I think that everyone should try it because it makes you feel terrific. I'm going to save up my money to go again.

Limitations of the tri-component model of attitudes

Psychological attitudes play a significant role in influencing our behaviour – they might even direct it sometimes. Once you know someone's attitude, it might seem easy to predict their behaviours towards objects, people or ideas. However, this isn't always the case. For example, you might dislike eating meat (affective) because you believe that it's bad for the environment (cognitive), but when you go to your friend's house for dinner, you eat the steak that they serve (behavioural). Why is there a mismatch between the cognitive, affective and behavioural components of this attitude? One reason might be that attitudes tend to be general, while behaviour is highly specific. Although the cognitive and affective components of your attitude might imply that you'll behave in a certain way, they are not a guarantee that you will. Additionally, situational factors also influence how different people behave in certain situations. For example, in the scenario given above, your decision to eat the steak at your friend's house might have been because you were incredibly hungry. Other factors can also be considered: Was the meal a culturally significant one? Would your friend's parents have been offended if you rejected the meal they made for you?

Figure 7A–22 Our attitudes cannot reliably predict our behaviours. For example, although you might dislike eating a certain food, you might consume it at a friend's house for certain reasons.

The assumption that attitudes govern our behaviour has also been challenged by research findings. Sociologist Richard LaPiere (1934) studied the consistency between a person's attitude towards people of a different race and their behaviour towards them (e.g. whether the person discriminated against the others and treated them differently). He concluded that attitudes do not reliably predict behaviour. This has led some psychologists to propose that there is no behavioural component in attitudes – that attitudes only have affective and cognitive components. However, there is still support among psychologists for the tri-component model of attitudes, with the acceptance that attitudes can't always be consistent with behaviour since the latter is usually the product of many different influences besides our attitudes. In short, although the tri-component model demonstrates certain components that compose an attitude, it does not reliably predict whether these attitudes are consistent or inconsistent.

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 6

1 Can attitudes reliably predict behaviour? Explain your answer.
2 Briefly describe two factors that may influence whether attitude and behaviour are consistent.
3 In the scenarios below, identify the attitude component that doesn't match the others.
   a Mel loves her sociology course and has found all the textbooks interesting to read. She always contributes to class discussions about the content and thinks that her lecturer is intelligent and experienced. However, Mel often gets poor grades because she hates completing assignments and always submits them late.
   b Sree loves Facebook and thinks it's great to keep in touch with her overseas family and friends. However, Sree's school friends think Facebook is uncool. Whenever Sree is at school, she only uses Snapchat and tells her friends that she doesn't have a Facebook account.
   c Kylie believes that Queensland shouldn't open its borders to any more immigrants. She tells her family that she dislikes how 'multicultural' Queensland has become and how concerned she is that immigrants are taking valuable jobs away from 'real Aussies'. Every Saturday, Kylie takes her family to a local Indian restaurant because she loves their butter chicken.
   d Margaret is trying to save money to go overseas. She's excited to spend some time in Japan and explore the area where her husband, Haru, grew up, and she believes that this trip will be a wonderful opportunity to bond. However, Margaret is addicted to internet shopping and keeps spending the money she has saved for the trip.

Stereotypes

When we meet people for the first time, we tend to judge them based on what we think will be their likely characteristics. For example, if you met a famous footballer, you might expect them to be fit, aggressive or not intellectual. Why is this the case? When we assess or evaluate people, we tend to place them into categories based on our existing knowledge of the world. A person might be judged based on their gender, age, race, sexuality – even on what they are wearing. For example, if we see a woman formally dressed in a corporate suit, we might assume that she is unemotional, ambitious and a businesswoman, or if we see a man wearing dirty clothes and a beanie, we might assume that he is homeless or a drug user. We have placed each of these people into a category known as a **stereotype** – a collection of fixed ideas that we have about members of a certain group in which we ignore the individual differences of people. This process of creating stereotypes and assigning people to them is called **stereotyping**.

Figure 7A–23 Some individuals, such as those above, do not fit the common stereotypes for their gender.

Stereotype a collection of fixed ideas about members of a certain group in which their individual differences are ignored

Stereotyping the process of creating stereotypes and matching people to them

ISBN 978-1-009-25401-4 Gallagher et al

Stereotypes ignore individual characteristics and regard every member of a certain group as possessing the same set of characteristics. Stereotypes about certain groups can be positive, negative or neutral. Stereotypes occur quite frequently in the media because they are an easy tool that writers and directors can use to portray characters simply and in a way that allows the audience to quickly understand their actions.

ACTIVITY 7A–8 DESCRIBE A SCIENTIST

Imagine a scientist. What do they look like? What are their characteristics?

Describe your interpretation and compare it with the descriptions of your classmates. What were the common features of a scientist in your class? Were they male with grey hair, dressed in a white lab coat and wearing glasses? Discuss how this image of a scientist is quite stereotypical.

ACTIVITY 7A–9 IDENTIFYING STEREOTYPES

Consider the photos below and describe the common stereotypes that might be attributed to the people in each photo.




Compare your written descriptions with those written by the person next to you and the rest of the class. Discuss how people might think, feel and behave towards others whom they believe fit these stereotypes and record your findings in a report for this activity.

Check-in questions – Set 7

1 What is a stereotype?
2 Give three examples of common stereotypes that haven't been used in the text.
3 Can you think of a situation in which you have stereotyped someone, only to find the person to be nothing like what you initially thought? Describe this situation.

ISBN 978-1-009-25401-4 Gallagher et al

How stereotypes can be helpful or harmful

Although we might immediately think that stereotyping people is harmful, stereotypes are useful in helping us understand the world around us. A stereotype is like a blueprint for a type of person or personality that can guide our interactions with them. We meet too many people to have enough time to know everyone in detail, so stereotypes save us time in terms of determining how we should behave towards new people. Stereotyping lets us use less information about someone to determine what we think about them, and thus makes using certain thinking and decision-making skills a lot faster. For example, imagine that you have just moved into a new house and you discover that your neighbour is a police officer. This might change your behaviour when you are in your yard because you have a stereotypical view of your neighbour 'always being on the job'. Stereotyping might also keep us from getting hurt. For example, if you saw someone in dirty and smelly clothes, muttering to themselves and moving towards you with a knife, you might quickly assume that they want to hurt you, allowing you to move to safety.

Figure 7A–24 Stereotypes can help us interact with people we don't know very well because we can access information about them from the category in which we have placed them.

Stereotypes are also useful because accessing ready information about people helps us interact with them more effectively and quickly after we meet them. For example, we assume that younger children have lower levels of logic and intelligence than adults. This knowledge helps us interact with younger children more easily.

Although stereotypes can help us organise our knowledge of people quickly, they are often harmful to the people that we are stereotyping. Unfortunately, stereotypes tend to be overgeneralisations about group members, as well as based on incorrect or inadequate information. Individuals are unlikely to have all the characteristics that the stereotype assumes, and individual differences are ignored. We tend to disregard information about individuals that doesn't fit the stereotype we have of them, which sometimes leads to mistakes in our interactions. For example, when meeting a new student in your mathematics class, you might assume that, because they are Asian, they are studious and good at mathematics, so you decide to pair with them for a group project. However, you might be surprised to learn that your new classmate is a gifted and talented artist rather than a fan of mathematics – meaning that they can't do as much for the group project as you expected them to. This is one example of how you can wrongly presume information about your classmates because of how they have been stereotyped.

ACTIVITY 7A–10 EXAMINING THE VALIDITY OF STEREOTYPES IN MEDIA

As a whole class, gather a range of media (e.g. news reports, magazines, newspapers or episodes of an animated series) and record all the examples of stereotypes that are implied or that you observe (you can record the examples individually or in small groups). Once you have analysed each piece of media, share your examples of stereotypes with your classmates. Together, identify how these observed stereotypes are similar or different compared to how people are in everyday life. Record your results in a table, with columns for type of media, stereotypes observed and how these stereotypes are similar/different from the reality.

ISBN 978-1-009-25401-4 Gallagher et al

Stigma

Stereotyping can also lead to **stigma** – negative attitudes against someone based on a distinguishing characteristic, such as mental illness, disability, gender, sexuality, race, religion or culture. In short, stigma is a negative label put on anyone who is part of a social group associated with disapproval or rejection. When stigma is attached to any individual simply because they are a member of a stigmatised group, they may feel devalued, ignored and rejected by others. For example, after the events of September 11, some people developed a negative stereotype that people of Middle Eastern appearance were dangerous and a threat to national security. This resulted in people from the Middle East (and even those who appeared to come from the Middle East) being unfairly stigmatised.

Stigma
negative attitudes about someone based on a distinguishing characteristic (e.g. mental illness, disability, gender, sexuality, race, religion or culture)

Figure 7A–25 Many social or cultural groups are stigmatised by others based on race, ethnicity or religion, such as Australian Muslims, Aboriginal and Torres Strait Islander peoples, and African and Asian Australians. This can cause anger and a sense of being persecuted, which might lead members to stick to their own groups.

Ingroups and outgroups

Finally, stereotyping can lead to prejudice. This arises when stereotypes create a feeling of 'us against them'. People tend to classify different social groups as either **ingroups** or **outgroups**. An ingroup is any group that you belong to or identify with, while an outgroup is any group that you don't belong to or identify with. Examples of ingroups might include your family, friends, school or any sporting teams you belong to. Similarly, a school or sporting team that you don't belong to would be considered an outgroup.

Ingroup
any group that a person belongs to or identifies with

Outgroup
any group that a person does not belong to or identify with

Figure 7A–26 Members of the same netball team or school belong to the same ingroup.

ISBN 978-1-009-25401-4 Gallagher et al

Figure 7A–27 Your close friends would be considered an ingroup you are a part of

Categorising ourselves and others in this way can influence attitudes about the members of both ingroups and outgroups. Individuals tend to believe that ingroup members are more like each other, while outgroup people are dissimilar and like each other. Consequently, ingroup members tend to view each other more positively and they more easily develop loyalty to each other due to their common membership of the same group. Meanwhile, ingroup members might view people from any outgroup more negatively, which can lead to prejudice towards those outgroup members.

Table 7A–2 Summary of how stereotypes are helpful or harmful

How stereotypes are helpful	How stereotypes are harmful
• Stereotypes offer us information that helps us interact with people we don't know well. • Stereotypes allow us to make decisions about others more quickly.	• Stereotypes often include incorrect information that leads to overgeneralisations about members of a social group. • Stereotypes can lead to stigma. • Stereotypes can lead to prejudice.

Check-in questions – Set 8

1 Explain how stereotypes can help individuals navigate their social world.
2 Identify and describe three ways that stereotypes can be harmful.
3 Distinguish between an ingroup and an outgroup.
4 Give three examples of ingroups that you belong to and identify some of your outgroups.

7A SKILLS

VIDEO 7A–2 SKILLS: HOW TO CREATE CONCEPT MAPS

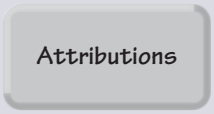
How to create concept maps in psychology

Concept maps are a great study technique. They require you to organise concepts and then create links between them, which reduces large amounts of information to a few key concepts. By mapping and labelling the links between concepts, you can deepen your understanding of the relationships between them. If you can understand the links between particular concepts, then you can predict examination questions based on the links. Being able to predict and write your own questions based on your concept map is a great way to study for an outcome or examination!

ISBN 978-1-009-25401-4 Gallagher et al

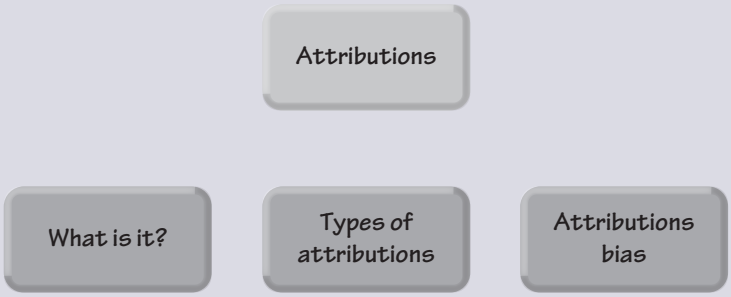
1 When making a concept map, you must first identify the key concepts that you have studied in a section or area of study. For example, if you choose 'Attributions' as the area of study, then you would use the following key terms:
   - attributions
   - personal attribution
   - situational attribution
   - the fundamental attribution or error
   - the just-world hypothesis
   - actor–observer bias
   - self-serving bias.

2 After identifying the key terms, decide which is the broadest concept and place it at the top of a piece of paper. This is your concept map topic. In this example, the broadest concept would be 'Attributions'.

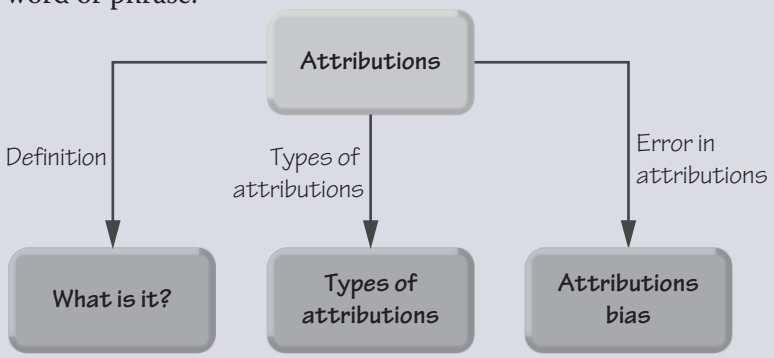


3 Organise the rest of your key terms into small groups by collecting the terms that have something in common. For example, 'personal attribution' and 'situational attribution' are types of attributions, so they can be grouped together into one key concept.

4 Above every small group you have created for your chosen topic, write a general phrase that describes the group. These phrases are your concept group headings.



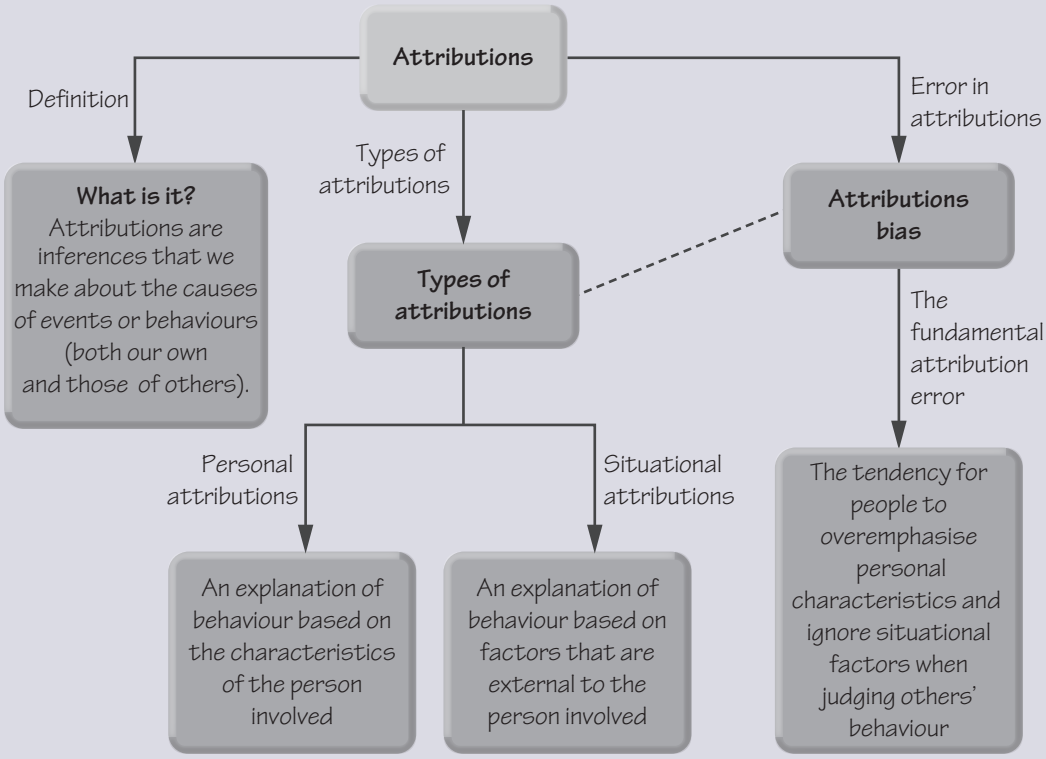
5 Draw lines that link your concept map topic to each of the small concept groups. Write a connecting word or phrase along each linking line that indicates the nature of the relationship between the concept map topic and each small concept group. If other concepts are nested within a small group, draw other lines that connect these nested concepts to the small group concept and label each line with a connecting or descriptive word or phrase.



6 Place the relevant content for each of your concept groups under or near the relevant heading on your map.

ISBN 978-1-009-25401-4 Gallagher et al

7 Examine the links between your concepts and indicate further connections between concepts with a dotted line. Label these dotted cross-links and add specific examples where appropriate.

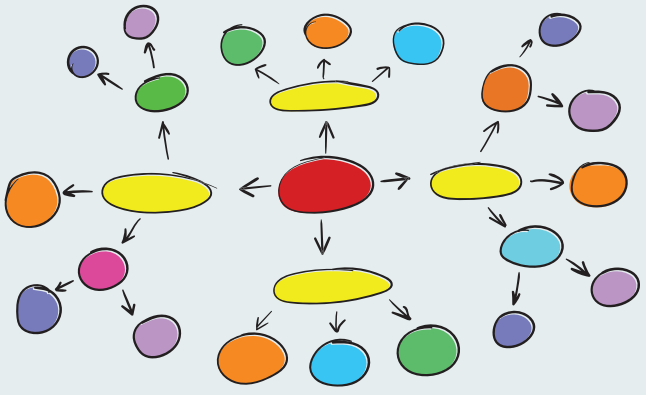


8 Revisit your concept map regularly and add new information when needed. If you feel that your concept map is complete, design a set of questions based on the information within the mind map. You could answer these questions yourself or swap with a friend.

ACTIVITY 7A–11 CONCEPT MAPPING SOCIAL COGNITION

In the 7A Skills box, you learned how to create a concept map. Individually or in groups, create a concept map for the topic of social cognition. Use the glossary terms at the start of the chapter to guide you, ensuring that you focus on:

- key definitions
- key examples
- key facts or characteristics
- key possible connections between concepts.



ISBN 978-1-009-25401-4 Gallagher et al

Section 7A questions

1 Using the table below, match the term to the definition.

Term	Definition
1 Social cognition	A The physical characteristics and behaviours of people that influence our impressions of them
2 Person perception	B A descriptor for anything that is prominent, conspicuous or otherwise noticeable when compared to its surroundings
3 Schema	C Inferences that we make about the causes of events and behaviours (both our own and those of others)
4 Physical cues	D The mental component of attitudes involving the beliefs or thoughts that you have about people, objects, places, events or ideas
5 Halo effect	E An evaluation that a person makes about other people, objects, issues or any other thing
6 Body language	F Mental processes that we use to form impressions of other people
7 Salient	G The tendency to attribute our own behaviour to situational (external) causes, but to attribute the behaviour of others to their internal factors
8 Social categorisation	H Any group that a person does not belong to or identify with
9 Attributions	I Non-verbal communication in which physical behaviour and movement rather than words are used to express or deliver a certain message
10 Personal attribution	J Explanations of a person's behaviour based on factors outside the person involved, such as luck or something in the environment, in the task or in the actions of another person
11 Situational attribution	K A mental shortcut used in person perception to categorise people into groups based on their shared characteristics
12 Fundamental attribution error	L A model proposing that attitudes have three related components – affective, behavioural and cognitive
13 Actor–observer bias	M The action component of attitudes involving what you do (or do not do) as an expression of your attitude
14 Self-serving bias	N A cognitive bias in which one impression of a person influences our belief about their other qualities
15 Attitude	O A collection of fixed ideas about members of a certain group in which their individual differences are ignored
16 Tri-component model of attitudes	P The tendency to overemphasise personal characteristics and ignore situational factors when judging the behaviour of other people
17 Affective component	Q Any group that a person belongs to or identifies with
18 Behavioural component	R How we judge others in social situations by interpreting and analysing information
19 Cognitive component	S Explanations of a person's behaviour based on their characteristics, such as their ability, personality or energy
20 Stereotype	T The tendency to attribute our successes to our internal factors and our failures to our external factors
21 Ingroup	U The emotional component of attitudes involving how you feel about people, objects, places, events or ideas
22 Outgroup	V A concept or idea that helps us organise and interpret information, including both abstract knowledge and specific examples about a person, group or situation

ISBN 978-1-009-25401-4 Gallagher et al

2 Using your understanding of person perception, physical cues and the halo effect, explain what assumptions would be made about the personalities of the people in the advertisement below.

3 Using your knowledge of body language, explain how you could increase the likelihood of creating a positive first impression in a job interview.

4 Viduni and Tiyahsa are catching up over coffee. Viduni is criticising her other friend, Victoria, for being mean to her boyfriend and describes Victoria as being bad tempered. When Tiyahsa mentions that Viduni herself was also mean to her boyfriend, Viduni claims the situation was different because her boyfriend didn't respect her. Using examples from the scenario, describe the difference between personal and situational attribution and explain how they were expressed in the given scenario.

5 In the final seconds of a football match, Sam misses a kickable goal that would have won the match. He blames this on an uneven field. Identify and explain the type of bias that Sam is demonstrating in this scenario.

6 Identify the three components of the tri-component model of attitudes in the following scenario:
I am writing to my local member of parliament to let him know that I think the legal drinking age in Australia should be lifted to 21 years of age. Eighteen-year-old adolescents are far too immature to drink alcohol. I hate seeing young people out in the city behaving recklessly while under the influence of alcohol.

7 How do saliency detection and social categorisation contribute to the development of stereotypes?

8 You are going to lunch for the first time with someone you have met on a dating app. In your conversations with your date, you have learned that they are wealthy, that they live in a penthouse in the CBD and that they went to a private school.
   a What stereotypes would you have developed about your online date?
   b Explain why these stereotypes might be inaccurate.

9 Outline the relationship between ingroups/outgroups and stereotypes.

ISBN 978-1-009-25401-4 Gallagher et al

Avoiding cognitive dissonance using cognitive biases

Study Design:
The avoidance of cognitive dissonance using cognitive biases

Glossary:
Anchoring bias
Attentional bias
Cognitive dissonance
Confirmation bias
Dunning–Kruger effect
False-consensus bias
Functional fixedness
Misinformation effect
Optimism bias

ENGAGE

When prophecy fails

When a cult believes that the world will end on a specific date, do you ever wonder how cult members cope when the world doesn't end?

Social psychologist Leon Festinger wondered this in the 1950s, and he and his colleagues published a book in 1956 on the topic: *When Prophecy Fails: A Social and Psychological Study of a Modern Group That Predicted the Destruction of the World*. The book is based on the true story of a small UFO cult in the United States called the Seekers. The leader of the Seekers convinced her followers that she had received a message from a planet called Clarion that a flood would destroy large areas of Earth on 21 December 1954, but that the cult members would be rescued before the event by a flying saucer. The followers made preparations for the event, including selling their possessions and giving up their vocations, activities and social relationships with non-believers.

Festinger studied the cognitive dissonance between the members' belief and the non-event, as well as how they coped with it. Some of the cult members found excuses (e.g. the date was wrong), and they 'doubled down on' and became firmer in their belief, while others became disillusioned and left the cult. Festinger's next book introduced the theory of cognitive dissonance.

ISBN 978-1-009-25401-4 Gallagher et al

EXPLAIN

How cognitive dissonance arises

The following example illustrates how cognitive dissonance can arise, and how cognitive bias can reduce it:

> John is an avid environmentalist. He is president of the environmental club at school, goes to climate change marches, and John's family owns an electric car. One day, he decides to attend a lecture on the negative environmental effects of certain animal products which apparently contribute significantly to climate change. To his dismay, John realises that he uses many of those products on a regular basis. His stomach drops. That means that he is part of the problem he is trying to resolve. This cannot be! John is a champion of the environment. But John doesn't think he is willing to stop eating meat and he knows his family won't be. To get rid of the awful feeling in his stomach and resolve the identity crisis he is having, John quickly concludes that the speaker must not know what they are talking about. Also, he thinks, even if animal products aren't great for the environment, he has done so many other things that are good for the environment that it must even out. John's mind is put at ease.
>
> **Source:** The Decision Lab. (2021). *Why is it so hard to change someone's beliefs?*

What is cognitive dissonance?

7A THE ROLE OF PERSON PERCEPTION LINK

In Section 7A, you read about the influence of attitudes on people's perception, as well as the different components that make up people's attitudes. You also learned that the affective, behavioural and cognitive components of the tri-component model of attitudes can present either consistently or inconsistently. Inconsistency usually occurs between an attitude and a behaviour. For example, if you believe that snakes are dangerous and you feel that they are scary and gross, but you still go to the zoo with a friend to look at snakes, then this is an inconsistent attitude.

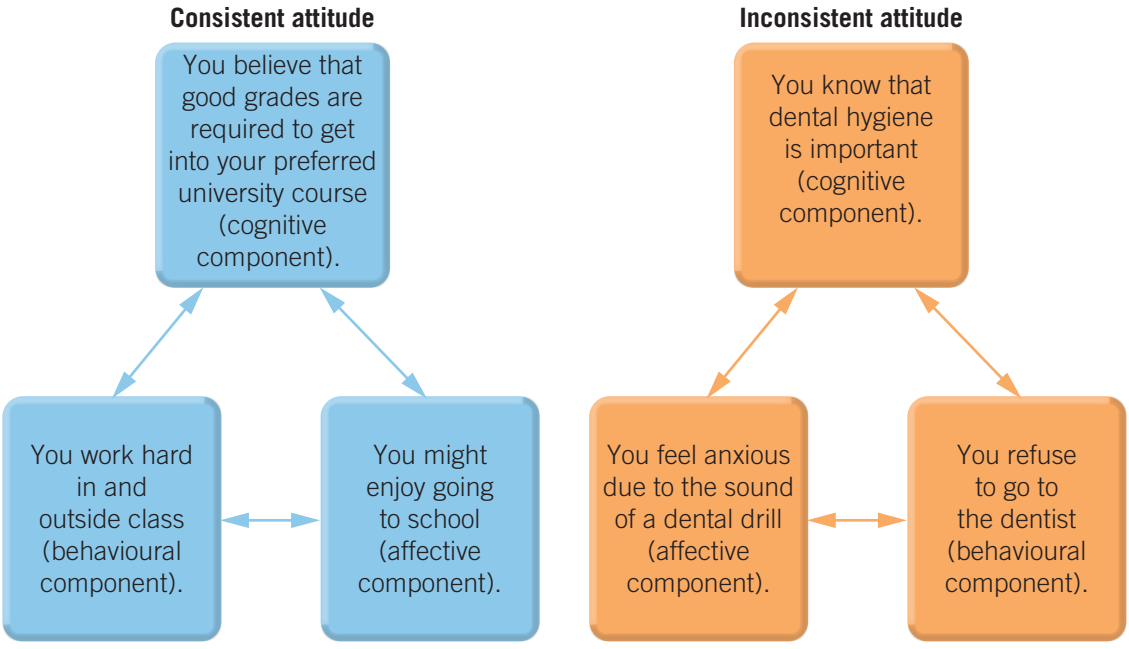


Figure 7B–1 A consistent attitude occurs when all three components match, while an inconsistent attitude occurs when at least one component doesn't match the others.

ISBN 978-1-009-25401-4 Gallagher et al

In the example on the previous page, John's attitude and behaviour were inconsistent, which made him feel uncomfortable. In his attempt to resolve the inconsistency revealed by the new information regarding certain animal products, John rejected the speech and rationalised his behaviour so that his identity as an environmentalist wasn't painfully compromised.

Cognitive dissonance the discomfort that people experience when they have conflicting beliefs or when their behaviours contradict their beliefs

Like John, you also might have experienced inconsistencies between your attitudes and behaviour that have made you feel somewhat awkward or uncomfortable. In this section, we explore this inconsistency between attitudes and behaviour, as well as the psychological discomfort it causes and what people do to reduce it.

In 1957, Leon Festinger published a book titled *A Theory of Cognitive Dissonance*. It established cognitive dissonance as one of the most influential theories in social psychology. Festinger proposed that **cognitive dissonance** occurs when people experience discomfort because they have conflicting beliefs, or because their behaviours contradict their beliefs. For example, if you dislike dishonesty and believe that liars are bad people, but you find yourself in a situation in which you must tell a small lie to a friend, then you will likely feel tense about your behaviour. Or imagine a personal trainer who promotes Pilates or high-impact training to their clients, but who doesn't practise these exercises themselves; they might also be experiencing cognitive dissonance.

Figure 7B–2 People might experience cognitive dissonance if they regularly eat meat but object to animal farming.

The experience of dissonance is psychologically unpleasant. Not only are people who experience cognitive dissonance motivated to avoid it, they also might work hard to reduce or eliminate it. The stronger the discrepancy between their thoughts, the greater people's motivation to reduce or avoid the dissonance, and they will generally choose the easiest course of action for this. Interestingly, this can involve acting without being completely aware of it.

Cognitive dissonance can be reduced by adjusting our attitudes or behaviours to remove the conflict. In John's case, he could have reduced his usage of animal products or changed his pro-environmental attitude. However, such changes are difficult to make.

ISBN 978-1-009-25401-4 Gallagher et al

Figure 7B–3 Ignoring situations or information that might cause cognitive dissonance could be detrimental to a person's health, such as not considering the dangers of smoking.

Not everyone experiences cognitive dissonance to the same degree. Some people are less concerned about inconsistency, and they experience less cognitive dissonance than people who think consistency is important. Other factors that affect the degree of cognitive dissonance include:

- **type of belief** – more personal beliefs lead to greater dissonance
- **value of beliefs** – beliefs that people value more cause greater dissonance
- **level of conflict** – a greater conflict between beliefs causes greater dissonance

Our responses to cognitive dissonance can also harm our personal and working lives. Further, attempting to avoid dissonance might stop us from accepting new information and ideas, and thereby prevent us from changing our harmful actions.

ACTIVITY 7B–1 INDUCING COGNITIVE DISSONANCE

Indicate the extent to which you agree or disagree with each statement below.

1 World hunger is a serious problem that needs to be solved.

Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
1	2	3	4	5

2 We must address the growing number of homeless people in the community.

Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
1	2	3	4	5

3 Our government should spend less on defence and more on improving peoples' wellbeing.

Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
1	2	3	4	5

For the following questions, respond with 'yes' or 'no' according to whether you do these things regularly.

4 Do you personally do anything to reduce world hunger (e.g. make donations or write to your member of parliament)?

5 Do you personally do anything to help the homeless in your community (e.g. volunteer at a shelter or make donations)?

6 Do you personally convey your feelings to relevant people in the government (e.g. write to politicians or attend protests/marches)?

Consider and analyse your answers to both sets of questions above. Did you select 4 or 5 on the scale for statements 1–3? Was this consistent with your responses to questions 4–6? Did you select 1 or 2 on the scale, but answer 'no' to questions 4–6? Try to identify whether you have any consistencies or inconsistencies in this activity.

If you have noticed any inconsistency between what you believe about something and your behaviour towards it, then how did it make you feel? Describe how you could reduce the cognitive dissonance that you might have experienced.

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 1

1 What is cognitive dissonance?
2 Give two examples of cognitive dissonance that you have experienced in your own life.
3 Outline three factors that influence the level of dissonance that a person might experience at any given time.

How cognitive bias reduces cognitive dissonance

Cognitive dissonance can't be completely avoided. As beliefs continuously form and evolve, there will always be inconsistencies. However, cognitive dissonance is often reduced through cognitive bias, which you learned about in the previous section. Cognitive bias includes errors in thinking that lead us to misinterpret the information we perceive around us and that affect the rationality and accuracy of our decisions and judgements.

Cognitive biases tend to be subconscious and automatic; they are mental processes that we use for quicker and more efficient decision-making. They use heuristics (mental shortcuts, which will be discussed later in the chapter), and they emerge mostly from social pressures and emotions. The cognitive biases below are examples of how cognitive dissonance can be reduced.

Actor–observer bias

Introduced in Section 7A, this bias involves us blaming external factors for our bad behaviour or a negative event happening to us, but then blaming a person's internal factors for their bad behaviour or a negative event happening to them. Using the example of John again, the actor–observer bias might lead John to think that he has no choice but to use animal products due to his circumstances (he can't obtain alternatives); however, when considering the same action performed by someone else, this bias might lead John to believe that person made that choice because they aren't a true environmental supporter.

LINK 7A THE ROLE OF PERSON PERCEPTION

Anchoring bias the tendency to rely too heavily on the first piece of information that we learn when we make decisions

Anchoring bias

When people try to make a decision, they often use their starting point as their main guide. For example, if you wanted to buy a certain computer, you might see it advertised online as costing $2000. When you shop at the local computer store, the shop assistant discounts the computer to $1750. You quickly accept the discount because you are saving $250. However, the next day, you go to a computer store across town and see the computer on sale for $700 less than the price you found online and $500 less than what you paid for it. Later, you might be angry with yourself for making a quick decision rather than shopping around more. So why did you accept the first discounted price?

Figure 7B–4 According to the anchoring bias, if a parent watched lots of TV when they were younger, then they might consider it more acceptable for their children to watch TV for long periods. On the other hand, parents who didn't have social media when they were younger may limit their children's use of social media.

The tendency to rely strongly on an initial piece of information is known as the **anchoring bias**. Psychologists have found that people tend to rely too heavily on the first piece of information that they learn (the anchor), which results in them making insufficient adjustments in decisions. You thought that $2000 was the standard price for the computer, so the first discount seemed like a great deal.

ISBN 978-1-009-25401-4 Gallagher et al

You didn't seek further information, such as the possibility that other dealers might discount the price further, because you didn't know that it could be valued at a different price than the one you already learned.

In the example of the pro-environmentalist John, the anchor of his bias was the scope of the environmental issues that he knew about first. He ultimately placed less value on the animal product issues that he heard about later in the lecture.

Attentional bias

Attentional bias our tendency to pay attention to some things and ignore others, thereby limiting our options

Attentional bias involves our tendency to pay attention to some things and ignore others, thereby limiting our options. External factors (e.g. the people around us) can bias our attention, as can our internal state (e.g. our emotional state or tiredness). Attentional bias affects what we perceive and the decisions that we make based on our perceptions. We might think that we have considered all options, but the reality is that we often overlook some options and focus on only a few.

Figure 7B–5 If we have a strong attitude and believe that campervans are a cheaper option for a holiday, then we might only pay attention to evidence that supports this viewpoint.

Turning again to the example of John, he experiences dissonance when he learns that his behaviour (using animal products) is inconsistent with his opinion (pro-environment). To reduce or avoid this dissonance, he might only pay attention to news reports that discuss other aspects of environmental sustainability and ignore those that identify animal products as a major cause of negative environmental effects.

In another example, a person might feel tension if they know that binge drinking has several health risks, but they drink heavily on the weekend anyway. In this case, attentional bias would reduce their experience of dissonance by causing them to focus on evidence that suggests that binge drinking is not as unhealthy as first suggested. Attentional bias would also allow them to ignore any evidence of binge drinking's risks.

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 7B–2 THE STROOP EFFECT

The Stroop effect is a test for attentional bias. Individually or in pairs, say the colour of each word in each column of the chart out loud. Time yourself to determine how long you took to complete each column and work out the difference in times for each.

Control	Compatible	Incompatible
dog	red	yellow
chair	yellow	green
boat	green	blue
tray	blue	red
bottle	green	blue
fence	yellow	green
wheel	blue	red
block	red	yellow

The Stroop effect test measures how long it takes you to name the colours of words when they are compatible (i.e. the colours match the words) and incompatible (i.e. the colours do not match the words). It probably took you longer to name the incompatible colours, as you had to pay more attention to the meaning of the words. It takes less time to name the colours of compatible words because less attention to the words' meaning is required.

LINK 9A UNDERSTANDING THE ROLE OF ATTENTION IN PERCEPTION

Confirmation bias

If a person smokes and knows it causes lung cancer, then it may cause them to feel cognitive dissonance. However, seeing certain affirming information, such as the claim that 'the mechanism of how smoking causes lung cancer has not been definitely proved', might reduce their cognitive dissonance. This particular method of minimising cognitive dissonance is known as **confirmation bias** – the tendency to seek, favour or remember information that supports an existing belief rather than other contrary information. When people with this bias look for new information, they might choose to research from only one source that they know supports their view rather than from a range of sources, or they might choose to recall a piece of information that upholds their view rather than other more relevant information that might not support their view. For example, an individual who runs a website claiming that September 11 was a hoax might experience dissonance if they encounter evidence that causes them to doubt their belief. To reduce their cognitive dissonance, they might look for additional information from other conspiracy theory websites rather than from a range of sources with different opinions.

Confirmation bias the tendency to seek, favour or remember information that supports an existing belief rather than contrary information

Figure 7B–6 People who believe that vaccines are unsafe or ineffective often use confirmation bias to reinforce their views and minimise their experience of cognitive dissonance.

ISBN 978-1-009-25401-4 Gallagher et al

False-consensus bias

False-consensus bias the tendency to overestimate how much others share our opinions or beliefs

Suppose you think that a movie is terrible because you didn't like what happened to certain characters, and you assume that everyone else shares the same opinion. This is an example of the **false-consensus bias** – the tendency to overestimate how much others share our opinions or beliefs. This kind of cognitive bias leads us to believe that our opinions are common and the norm, as we tend to estimate that our beliefs are more prevalent than alternative beliefs.

The false-consensus bias makes us feel positively about ourselves, as if we are part of a popular group. In the example of John, he might think that most people believe in environmental sustainability and use the same animal products as him, so it's all right for him to do so. He can reduce the discomfort of cognitive dissonance by assuring himself that most people hold the same position as he does and that his attitudes and behaviours are correct.

People tend to be more susceptible to the false-consensus bias regarding issues that are important to them (e.g. political beliefs) rather than those that are less important (e.g. food preferences).

Figure 7B–7 We would see the false-consensus bias in action if we went to a concert and expected everyone who attended to have enjoyed themselves because we did.

Functional fixedness

Functional fixedness a cognitive bias involving the tendency to regard objects as only having one function or as working in a specific way

Functional fixedness is a type of cognitive bias involving the tendency to regard tools, objects, processes or technology as only having one function or as working in a specific way. For example, imagine that you need to hammer some nails into a wooden shelf, but you can't find a hammer. A friend suggests using a heavy metal wrench to hit the nail instead. You are surprised by your friend's 'out of the box' thinking and wish that you'd considered this yourself.

ACTIVITY 7B–3 FUNCTIONAL FIXEDNESS IN ACTION

In small groups, read the following information and try to solve the problem:

You are given two candles, some thumbtacks, two boxes of matches and a pinboard hung on a wall. The task is to attach the candles securely to the pinboard on the wall using only these items. Write down how you would do it.

ISBN 978-1-009-25401-4 Gallagher et al

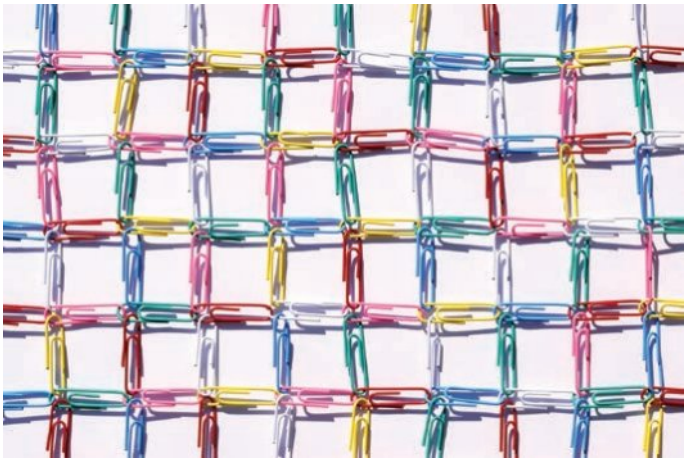



Figure 7B–8 Functional fixedness might prevent a person from realising that paperclips and empty bottles can be used for other purposes.

Functional fixedness occurs due to preconceived notions about the functions of objects. It prevents us from improvising solutions to problems and limits creativity and new ideas in problem-solving.

How could the cognitive bias of functional fixedness influence the example of John? If John is fixedly thinking that the function of meat at a barbecue is to be the main tasty component, and that the only function of vegetables is for them to be a healthy salad, then he might miss the idea of serving barbecued sweet corn, capsicum, eggplant or pumpkin (and limiting his use of meat in the process).

Misinformation effect

Researchers have shown that certain information that people receive after an event can interfere with their original memory of the event; new information can even be remembered as having happened at that event. This is a cognitive bias known as the **misinformation effect**. In the context of John's example, suppose that after the lecture, he read countless articles stating that animal products didn't have much of an environmental effect; the misinformation effect might make him think that the lecture concluded with this information instead, thereby reducing his cognitive dissonance.

Misinformation effect a cognitive bias in which information that is received after an event interferes with a person's original memory of the event

Optimism bias

Humans tend to be optimistic. Mostly, we underestimate the chances of negative events happening, and we overestimate the chances of positive events happening. This is known as the **optimism bias**. Research has found that most of us (approximately 80%) exhibit this bias about most topics – which is why we indulge in risky behaviour like smoking and don't do what is beneficial for us, like exercise, save money and put on sunscreen when we go outdoors.

The optimism bias does have some benefits; research has found that people who believe that they are unlikely to fail and more likely to succeed have better self-esteem, lower stress levels and better overall wellbeing. However, the optimism bias reduces cognitive dissonance when it overcomes the conflict or tension caused by the thought that doing something will turn out badly. In John's case, the optimism bias might make him think that new technology will be developed that makes animal production more sustainable and less impactful on the environment.

Optimism bias our tendency to underestimate the chances of negative events happening and overestimate the chances of positive events happening

ISBN 978-1-009-25401-4 Gallagher et al

Figure 7B–9 The optimism bias might cause a person to be late for work because they were too optimistic about how long it would take them to get ready in the morning after a long night out.

Consider another scenario: Mike has recently been to the doctor, who told him that he needs to change his high-sugar and high-fat diet or he will suffer a heart attack. Mike resolves to eat more fruits and vegetables and fewer sweets. For the first week of his resolution, Mike is doing well – he even exercises every day. During the second week, Mike has a terrible day at work, which prompts him to cave in and buy a cheeseburger meal with chips and ice-cream. Mike begins to feel guilty, but then he reminds himself that he won't suffer a heart attack from one slip-up; the optimism bias even starts to make him think that he will likely be fine, even if he has more slip-ups in his diet.

Self-serving bias

7A THE ROLE OF PERSON PERCEPTION LINK

Dunning–Kruger effect
a cognitive bias in which people with low skills or ability in a specific area overestimate their abilities and performance, while people with high skills or ability underestimate their abilities and performance

The self-serving bias, as introduced in Section 7A, highlights our tendency to blame external factors when negative events happen to us and to give our own personality or skills credit when positive events happen to us. This is similar to the actor–observer bias, but it focuses more on what is happening to you; the actor–observer bias considers what happens both to you and to other people.

In the case of John, the self-serving bias might lead him to believe that he supports environmental causes because he is a good person; conversely, if he is not doing enough for these causes, then the self-serving bias might lead him to believe that external factors are preventing him from doing so.

In another example, someone might pride themselves on being an excellent driver, but having an accident might cause cognitive dissonance. By attributing the cause of the accident to the other driver, the person can reduce their cognitive dissonance.

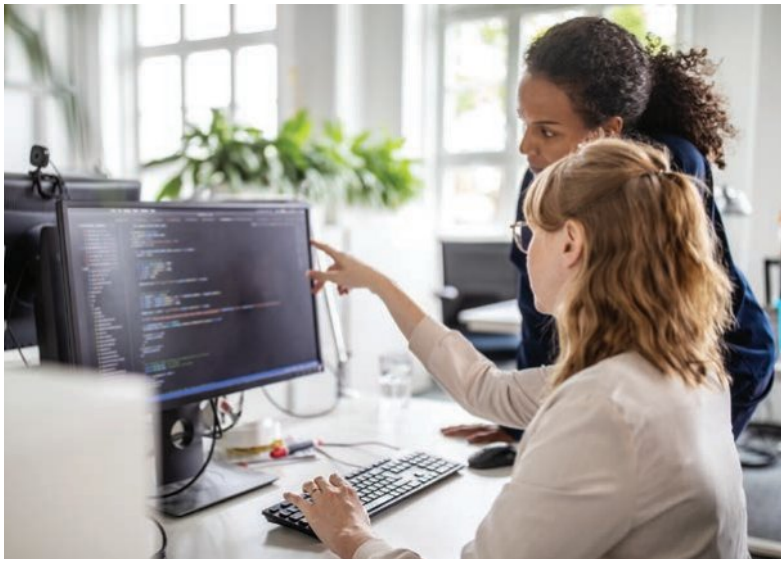


Figure 7B–10 At one software engineering company, 42% of employees predicted that they would be ranked in the top 5%. This is an example of the Dunning–Kruger effect.

The Dunning–Kruger effect

Approximately 80% of people think that their driving skills are above average, which is a mathematically impossible statistic. This overconfidence can be attributed to a cognitive bias called the **Dunning–Kruger effect**, in which people with low skills or ability in a specific area overestimate their ability. The definition of this bias can sometimes include the opposite effect as well – the tendency of high performers to underestimate their skills. The Dunning–Kruger effect is usually measured by comparing an objective test of performance with self-assessment.

ISBN 978-1-009-25401-4 Gallagher et al

One contributing cause of the Dunning–Kruger effect is that people who aren't aware that they don't know much about an area or topic (or people who aren't skilful at something) simply don't have much experience. Therefore, they don't know the range of high performance and their place relative to it. Other cognitive biases, such as the self-serving effect or optimism bias, might also play a role.

In the example of John, the Dunning–Kruger effect may help reduce his cognitive dissonance by allowing him to overestimate his understanding of environmental science and thus dismiss the lecture suggesting that there was more he didn't know.

The opposite end of the Dunning–Kruger effect – high performers who genuinely don't realise their abilities – might occur because skills and abilities come easily to these people, or because they don't realise how difficult a task or skill is for others.

WORKSHEET 7B–1 COGNITIVE DISSONANCE

Check-in questions – Set 2

1 Using the table below, match each term to its definition.

Term		Description	
1	Anchoring bias	A	The tendency to seek, favour or remember information that supports an existing belief rather than contrary information
2	Attentional bias	B	A cognitive bias involving the tendency to regard objects as only having one function or as working in a specific way
3	Confirmation bias	C	The tendency to rely too heavily on the first piece of information that we learn when we make decisions
4	False-consensus bias	D	A cognitive bias in which people with low skills or ability in a specific area overestimate their abilities and performance, while people with high skills or ability underestimate their abilities and performance
5	Functional fixedness	E	Our tendency to underestimate the chances of negative events happening and overestimate the chances of positive events happening
6	Misinformation effect	F	Our tendency to pay attention to some things and ignore others, thereby limiting our options
7	Optimism bias	G	The tendency to overestimate how much others share our opinions or beliefs
8	Dunning–Kruger effect	H	A cognitive bias in which information that is received after an event interferes with a person's original memory of the event

2 For each of the scenarios below, identify the cognitive bias.

a A married couple are arguing about what kind of cake they had at their wedding. One person is adamant that they had a chocolate cake, while the other person is certain that they had a lemon cake.

b A sharply dressed co-worker is judged as being more competent than one wearing a T-shirt.

c An inexperienced chess player believes that he is skilled enough to win against his more experienced opponent, but he ends up overestimating himself.

d You believe that all your schoolmates like hip-hop music because you do.

ISBN 978-1-009-25401-4 Gallagher et al

e A job applicant believes that he's been hired because of his achievements, qualifications and excellent interview. When asked about the previous job that rejected his application, he says that the interviewer didn't like him.
f Sally opposes restrictions to movement and transport during pandemics, and she searches for news stories and opinion pieces about such issues. Even though she finds a series of stories outlining the effects and spread of viruses, she interprets the findings in a way that supports her existing beliefs.
g On his way home from school, Vin becomes hungry. He suddenly notices what appears to be a larger number of food advertisements than normal.
h Carmen is out shopping for work clothes. In the first store she visits, she sees a shirt that costs $120. In another store, she sees a shirt that costs $100 and purchases it because she believes this second shirt is a good deal.
i Tina hasn't been to the dentist for years because she believes that her teeth are strong and healthy, and that she won't have any cavities.
j At school, Sophie's hair tie breaks. Unfortunately, it's part of the school rules that girls must have their hair tied back, and Sophie doesn't have a spare hair tie. She begins to panic when one of her friends suggests that she use a pencil to hold her hair in a bun. Sophie is surprised to find that this idea works well.
k When someone pays little attention to your attempts to converse with them and they don't even look at you, you conclude that they are rude. It doesn't occur to you that the person behaved as they did because they were tired, unwell or otherwise having a bad day.

3 When cognitive dissonance is experienced, does it always need to be reduced? Justify your response.

VIDEO 7B–1 SKILLS: RESPONSES APPROPRIATE FOR COMMAND TERM

7B SKILLS

Ensuring your responses are appropriate for the command term

In VCE Psychology, it is important that your responses are to the point and appropriately detailed. One way to know whether your responses should be concise or detailed is to know what each command term means. Below are 14 common command terms that you will likely encounter in your studies:

- **Analyse** – to separate and select the main points from the information provided.
- **Apply** – to use, implement or put into practice the key concepts/knowledge learned.
- **Compare** – to assess, measure or highlight the similarities and differences between two concepts or aspects of key knowledge.
- **Contrast** – to assess, measure or highlight the differences between two concepts or aspects of key knowledge.
- **Define** – to provide a clear, concise and accurate meaning of a term.
- **Demonstrate** – to show, explain or describe the relevant concept.
- **Describe** – to provide a detailed account, informative summary or outline of the key knowledge learned.
- **Discuss** – to argue the advantages and disadvantages of a subject or theoretical issue.
- **Distinguish** – to name and characterise key pieces of knowledge so that it is clear how they are different from each other.
- **Evaluate** – to judge, assess or weigh the merits of the concept or procedure under study.
- **Explain** – to provide or clarify the meaning of a concept or the reason for its occurrence.

ISBN 978-1-009-25401-4 Gallagher et al

- **Identify** – to recognise, detect or highlight key concepts in a given scenario or in the information learned.
- **Justify** – to demonstrate adequate reasons for the conclusions that were reached.
- **Outline** – to provide the main points and facts while leaving out minor details.

Let's examine how responses might change depending on the command term used. Consider the three questions below.

Question 1: Identify two cognitive biases that can be used to reduce cognitive dissonance. (2 marks)

Question 2: Explain how two cognitive biases can be used to reduce cognitive dissonance. (2 marks)

Question 3: Distinguish between two cognitive biases that can be used to reduce cognitive dissonance. (2 marks)

These questions are nearly identical, apart from the command terms used. How does the command term change each response? As a rule of thumb, the command term and the mark allocation indicate the amount of information required for each response. Consider the suggested responses and explanations for each response below.

Question 1

Identify two cognitive biases that can be used to reduce cognitive dissonance. (2 marks)

Suggested answer

- Self-serving bias (1 mark)
- Confirmation bias (1 mark)

Explanation

Question 1 asks you to identify or name two cognitive biases for one point each. In an 'identify' question, you don't need to provide any information other than names for the terms/concepts being requested (in fact, providing more information runs the risk of wasting time).

Question 2

Explain how two cognitive biases can be used to reduce cognitive dissonance. (2 marks)

Suggested answer

- The self-serving bias can be used to reduce cognitive dissonance because it allows people to attribute their negative personal behaviours to external events rather than to their personal failings. (1 mark)
- The confirmation bias can be used to reduce cognitive dissonance because it allows people to affirm their beliefs through researching information from only sources that they know support their view (rather than from a range of sources). (1 mark)

Explanation

This question asks for more details than Question 1. In an 'explain' question, you must give a detailed account of the key concepts being requested. For each cognitive bias response, you must detail the process that each bias uses to reduce cognitive dissonance.

Note: If this question was based on a given scenario, then your response must apply or use examples directly from the scenario.

ISBN 978-1-009-25401-4 Gallagher et al

Question 3

Distinguish between two cognitive biases that can be used to reduce cognitive dissonance. (2 marks)

Suggested answer

- The self-serving bias relates to an individual's own behaviour, while the confirmation bias relates to information that is external to the individual's behaviour. (1 mark)
- The self-serving bias relates to the behavioural component of the tri-component model of attitudes, while the confirmation bias relates to the cognitive component. (1 mark)

Explanation

Like Question 2, Question 3 also asks for more details compared to Question 1; however, the type of information requested is different from that of Question 2. When distinguishing between concepts, your response must include the specific differences between concepts. As such, simply using the definition of a term isn't the most appropriate way to respond to a question like Question 3.

VIDEO 7B–2 KEY SCIENCE SKILLS: PROCESSING QUANTITATIVE DATA AND ANALYSING THE QUALITY OF DATA

2A PROCESSING AND ANALYSING DATA

7B KEY SCIENCE SKILLS

Processing quantitative data and analysing the quality of data

In VCE Psychology, you are often required to interpret statistics in class and during outcomes. You might also need to calculate statistics from raw data during outcomes (e.g. the scientific poster). Calculating statistics such as percentages, percentage change, measures of central tendency and measures of variability gives raw data meaning so that an investigation's conclusions can be accurately determined.

In Chapter 2, the following statistics were described:

- Measures of central tendency – the central location of a set of data, including mean (the average value of a set of data), median (the middle value in an ordered data set) and mode (the most frequently occurring value in a data set).
- Measures of variability – the distribution of data, including the standard deviation (the spread of data around the mean).

Further, data collected from an investigation must be analysed in terms of its quality before any decisions can be made based on the data and the investigation concluded. Data can be analysed in terms of its accuracy, precision, repeatability, reproducibility, true value, validity, errors, certainty, outliers and contradictory or incomplete data.

Question

A researcher is investigating whether the halo effect has a stronger impact on individuals who are considered highly attractive. A group of 25 university students who study psychology were shown two photos: photo A showed a conventionally attractive woman, while photo B showed a conventionally plain-looking woman. The participants were then given a survey with 20 positive characteristics and asked to circle which positive characteristics they associated with each photo.

ISBN 978-1-009-25401-4 Gallagher et al

The table of results is below:

	Photo A	Photo B
Mean number of positive characteristics associated with appearance	15	8
Standard deviation of positive characteristics associated with appearance	1	3.5

1 Referring to the data in the table, comment on whether the halo effect has had an impact for each photo.
2 Describe what the standard deviations in the data table can tell us about the association of positive characteristics for each photo.
3 Comment on the internal validity of the experiment.

Suggested answers

1 Photo A (with a conventionally attractive woman) received an average of 15 positive characteristics associated with the image, while photo B (with a conventionally plain-looking woman) received an average of eight positive characteristics. This indicates that the halo effect had a larger impact if the individual in the photo was considered highly attractive.
2 The standard deviation for photo A was smaller (one characteristic) than for photo B (3.5 characteristics), which indicates that positive characteristics associated with the appearance of photo B varied further from the mean. The positive characteristics associated with the appearance of photo A were closer to the mean.
3 This experiment likely has low internal validity, which means that a conclusion cannot be drawn. This is because the sampling method was not representative, since university students are not representative of all people. Further, because the participants were psychology students, their responses may have been affected by their knowledge of the halo effect.

Section 7B questions

1 Copy and complete the table below.

Term	Description	Example
Cognitive dissonance		
Actor–observer bias		
Anchoring bias		
Attentional bias		
Confirmation bias		
False-consensus bias		
Functional fixedness		
Halo effect		
Misinformation effect		
Optimism bias		
Self-serving bias		
Dunning-Kruger effect		

ISBN 978-1-009-25401-4 Gallagher et al

2 Provide an example of a consistent attitude and an inconsistent attitude.

3 Eli has recently been to the doctor, who informed him that he is overweight and that he needs to change his lifestyle immediately. Although Eli believes that he must start eating healthily and exercising to lose weight, he dislikes getting sweaty and completes very little exercise.
   - **a** Outline the reason why Eli might have cognitive dissonance.
   - **b** Outline how optimism bias, attentional bias and false-consensus bias might reduce psychological tension that Eli is feeling.
   - **c** Describe the relationship between cognitive dissonance and confirmation bias.

4 Compare the following terms:
   - **a** self-serving bias and actor–observer bias
   - **b** attentional bias and the misinformation effect

5 A researcher wants to know whether confirmation bias impacts the level of cognitive dissonance that individuals might have in relation to attitudes against climate change scepticism. The researcher placed an advertisement in the newspaper and drew a sample based on the 22 participants who responded. The experimenter divided the participants into two groups and presented each group with some facts about climate change. Participants in Group A were presented with facts that aligned with or confirmed their climate change scepticism, while participants in Group B were presented with facts that challenged their climate change scepticism. The researcher then measured their level of discomfort on a Likert scale, in which '5' indicated extreme discomfort and '1' indicated minimal discomfort. The raw data is presented in the table below.

Group A	1	3	2	2	1	1	5	3	2	1	2
Group B	2	1	4	4	4	5	3	4	5	5	4

   - **a** Define the term 'central tendency'.
   - **b** What do you think is the best measure of central tendency for organising this experiment's data? Justify your response.

6 The researchers repeated the study from Question 5 several times and found that the results were similar across a similar time, experimenter and conditions. Discuss the experiment in terms of:
   - **a** Repeatability
   - **b** External validity.

ISBN 978-1-009-25401-4 Gallagher et al

The positive and negative influences of heuristics

Study Design:
The positive and negative influences of heuristics as mechanisms for decision-making and problem-solving

Glossary:
Affect
Affect heuristic
Availability heuristic
Cognitive load
Heuristics
Prototype
Representativeness heuristic

ENGAGE

Manipulating voting

Employing subtle tactics to influence voting has always been a part of politics. In addition to manipulating political stories in the media, efforts have frequently been dedicated to convincing the crowd to make certain decisions.

One way of manipulating voting decisions lies in the design of the ballots – the papers on which voters record their vote. The Nazi Party in Germany in the 20th century focused on this as part of their propaganda strategy. For the vote regarding the union of Austria and Germany in 1938, the Nazi Party designed a ballot paper that had the circle for *Ja* ('yes') considerably bigger than the one for *Nein* ('no'). Consider Figure 7C–1 and notice how the name 'Adolf Hitler' is in the largest font and how it is placed directly above the 'yes' circle.

Figure 7C–1 The Nazi Party used a mental shortcut to help sway the decision-making process of people who voted for the Austrian union with Germany in 1938. The large circle is labelled 'yes' and the smaller one 'no'.

Due to the size of the circles, voters subconsciously attributed more importance to the bigger circle and were more drawn to it. This resulted in a great majority of Austrians voting for unification with Germany and for Adolf Hitler as the leader.

After unification, the Nazis encouraged a wave of violence against Jews in the Austrian capital of Vienna, ultimately building up to the 'Crystal Night' riots against Jews and Jewish property in November 1938.

ISBN 978-1-009-25401-4 Gallagher et al

EXPLAIN

What are heuristics and why are they helpful?

How do we make up our minds to do something? How much cognitive activity is involved in the decision-making process? As humans moving through our daily lives, we process large amounts of sensory information and make many decisions in a limited amount of time. When information is insufficient but an immediate decision is needed, we use shortcuts – or 'rules of thumb' – to determine the best (and least effortful) course of action. These shortcuts are known as heuristics. In this section, we explore the positive and negative influences of heuristics as mechanisms for decision-making and problem-solving.

Heuristics mental shortcuts that allow us to make quick decisions on limited information

The word 'heuristics' originates from a Greek word that means 'to find'. **Heuristics** are mental shortcuts that allow us to make quick decisions on limited information. You might use heuristics to decide whether to go to the movies with a friend, or when you consider which public transport to use when you organise an outing. When a person notices someone they don't know staring at them with a frown and decides to walk away, their brain has probably used a heuristic to assess the situation. They have not taken the time to fully deliberate the advantages and disadvantages of their actions.

Figure 7C–2 You might use heuristics when you are deciding what kind of fruit to have for lunch or when you take an alternative route home to avoid obstacles.

Cognitive load the amount of information that our working memory can hold at any given time

More simply, a heuristic is a problem-solving strategy that uses generalisations, or broadly accurate frameworks, based on previous experiences with similar problems to reduce our **cognitive load** – the amount of information that our working memory can hold at any given time. Working memory is our immediately accessible memory, which allows us to perceive the world and act in the moment. When we use heuristics to decide what to do, we use readily accessible information and simple rules (which we have collected from similar experiences) rather than a complex analysis.

Heuristics are used because they are a quick and efficient way to make decisions when we don't have all the relevant information. They are automatic, and they allow us to make decisions in situations when speed matters more than accuracy. In the example above, of the person walking away from a stranger, their brain relied on a negative fear response to judge that there might be a threat. Without analysing and rationalising, the person just walks away, and they might later describe their actions as using their 'instincts'.

Heuristics are also useful when you need to make a decision while experiencing a high cognitive load. Our working memory has a finite amount of space to analyse what is happening in our consciousness when we are active.

ISBN 978-1-009-25401-4 Gallagher et al

Imagine that the person in the example on the previous page, who noticed the stranger staring at them, was simultaneously giving relationship advice to a friend on the phone and waiting to cross a busy street. They would have used heuristics almost subconsciously to deal with the decision to walk away, without walking in front of a car, while their working memory and consciousness remained focused on the complex conversation that they were having with their friend (which requires a more extensive thought process).

Figure 7C–3 Heuristics have many uses in our decision-making processes.

ACTIVITY 7C–1 AN EXERCISE IN SOCIAL JUDGEMENT

Write down your answers to the questions below and keep them for a later activity that will reveal the purpose of asking these specific questions.

1 Dr Swinkels' cousin, Rudy, is somewhat atypical. He has unusual tastes in movies and art, he is married to a performer, and he has tattoos on various parts of his body. In his spare time, Rudy takes yoga classes and collects 78 RPM records. As an outgoing and rather boisterous person, he has been known to act on a dare on more than one occasion. What do you think Rudy's occupation is most likely to be?
   - **A** Farmer
   - **B** Librarian
   - **C** Trapeze artist
   - **D** Surgeon
   - **E** Lawyer

2 In one chapter of a best-selling novel, would you expect to find more words that end in '*-ing*' or that have 'n' as the second-last letter ('_____n_')?

3 Jenny has a free afternoon and is deciding what she would like to do. She considers going shopping but recalls that last time she went shopping, she felt guilty about how much money she spent. During lunch, Jenny flicks through a magazine and sees a humorous re-enactment of a famous scene from the 1997 movie 'Titanic' (Figure 7C–4). She finds the image amusing and chuckles to herself. What activity is she more likely to choose?
   - **A** Going to see a movie
   - **B** Going shopping

Figure 7C–4 The image Jenny found amusing

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 1

1 What are heuristics?
2 How are heuristics helpful in our daily lives?
3 Identify three times you have used heuristics in the last week.

Types of heuristics

VIDEO 7C–1 HEURISTICS

The study of heuristics in human decision-making was first developed in the 1970s and 1980s by psychologists Amos Tversky and Daniel Kahneman. Although there are many kinds of heuristics, Kahneman and Tversky identified three common heuristics in their paper, 'Judgement under Uncertainty: Heuristics and Biases' (1974) – availability, representativeness and affect.

Availability heuristic

Availability heuristic a mental shortcut that uses the first thoughts that come to a person's mind when they are evaluating an issue or deciding what to do

The **availability heuristic** is a mental shortcut that uses the first thoughts that come to a person's mind when they are evaluating an issue or deciding what to do. It is based on the principle that whatever is recalled first must be the most important thought. This means that our decisions or ideas use the most recent information, experience or news. For example, you want to go to a party, and a certain friend offers to give you a lift; however, you immediately recall that this friend tends to speed and that they recently had an accident, so you decide to take the bus instead.

Figure 7C–5 The availability heuristic might be used when considering the likelihood of being attacked by a shark while swimming at the beach. If you can easily recall an instance of a shark attack, you might decide not to swim at the beach at all because you think that a shark attack is likely.

Although the availability heuristic is advantageous in helping us make decisions quickly without recalling and analysing all of our information from the past, it might also lead to errors. For example, after seeing a news report about business failures, a small business owner might decide not to invest in new equipment in case their business fails as well. However, if they analysed the situation further and thought back to older news reports, they might have realised that their growing business sector generally has a bright future.

We tend to overestimate the probability of death and injury from events such as shark attacks, crashes and murders because examples of such events are easily recalled, especially if they happened recently.

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 7C–2 USING THE AVAILABILITY HEURISTIC

Without looking at the table below, order the following events according to the likelihood that they will occur.

a Being killed by a bee sting
b Being killed by flesh-eating bacteria
c Being killed by a shark attack
d Being killed by the flu
e Being killed in an earthquake
f Being killed by drowning in your bathtub
g Being killed by an asteroid
h Being killed by a tornado
i Being killed in a car accident
j Being killed due to sun or heat exposure

Now, examine the statistics below indicating the chances of the above events occurring. Are you surprised by the likelihood of some of the events? Explain why you might be surprised, with reference to the availability heuristic.

Being killed by the flu	1 in 70
Being killed in a car accident	1 in 111
Being killed due to sun or heat exposure	1 in 13 729
Being killed by a tornado	1 in 60 000
Being killed by a bee sting	1 in 79 842
Being killed in an earthquake	1 in 110 000
Being killed by drowning in your bathtub	1 in 840 000
Being killed by flesh-eating bacteria	1 in 1 million
Being killed by an asteroid	1 in 1.9 million
Being killed by a shark attack	1 in 1.9 million

Representativeness heuristic

The **representativeness heuristic** judges the probability of an event occurring by comparing it to a prototype that we already know. A **prototype** in this context is what we think is the most relevant or typical example of a specific event or object. That is, a prototype of an object possesses the largest number of representative characteristics for that object. For example, the prototypical chair is big enough for an average person, and it has four legs, a seat and a back. If you see another object with those characteristics, the representativeness heuristic leads you to the conclusion that this object is similar enough to the prototypical chair that it could also be a chair. More generally, the representativeness heuristic allows us to quickly determine what something is, based on its similarity to a prototype.

Representativeness heuristic a mental shortcut that estimates the probability of an event occurring by comparing its similarity to a prototype that we know

Prototype what we think is the most relevant or typical example of a specific event or object

Figure 7C–6 Through experience we develop prototypes for many objects, people and events – e.g. dogs, dancers, Christmas.

ISBN 978-1-009-25401-4

Something that has no similarity to a prototype might be judged as being in a different category. For example, when Joanne meets Cameron at her friend's party, she notices that he is tall, lean and athletic. Afterwards, Joanne asks her friend about him, who asks if Joanne is referring to a Cameron who plays sports or a different Cameron who studies chemistry. Joanne mentally matches Cameron to the 'sportsperson' category because he fits her mental prototype of an athlete, and she affirms that she met 'the Cameron who plays sports'.

Sometime later, Joanne meets another Cameron, who is shorter and stockier. Because he doesn't match her prototype of 'sportsperson', she thinks that he is the Cameron from her friend's chemistry class and ignores any evidence that indicates he plays sports – even though he is wearing a rugby jersey. Has Joanne in fact mixed these two people up?

This illustrates a flaw of the representativeness heuristic – people overestimate its accuracy in predicting what category something fits into or the probability of an event. The heuristic simply assesses the similarity of things, and if we rely on it to make judgements, then we could make many errors because something being similar does not necessarily mean it is more likely to be that thing. In the example above, Joanne thinks that it unlikely that stocky Cameron plays sports, because she thinks leanness is more representative of being sporty; but of course, stockiness can be a representative characteristic of a sportsperson in rugby, wrestling, weightlifting and other strength sports.

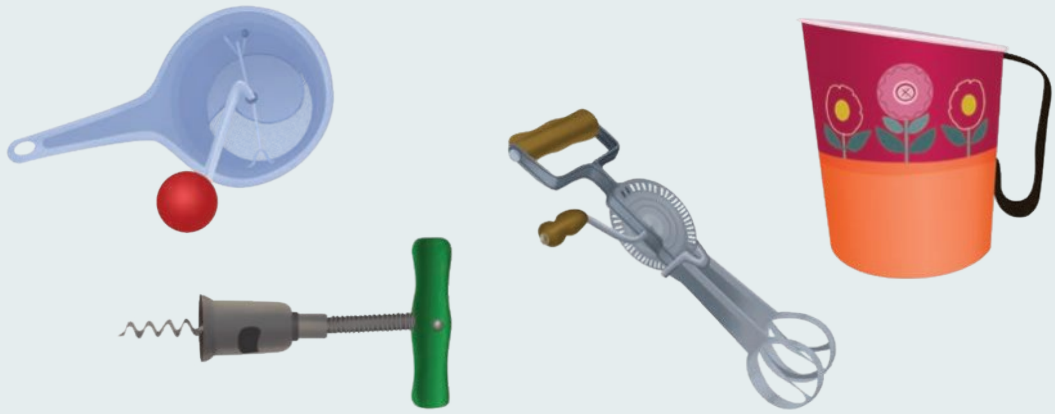
As another example, it is often reported that the police are more likely to suspect darker-skinned people of having committed an offence (sometimes referred to as 'racial profiling') if they use a representativeness heuristic. In such an important and sensitive area, such a heuristic should not be used.

Figure 7C–7 A Black Lives Matter protest on July 17 2016 in Melbourne includes banners against Aboriginal deaths in custody and police harassment that may arise when the representativeness heuristic leads authorities to use racial profiling.

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 7C–3 TESTING PROTOTYPICAL OBJECTS

Keep in mind that a prototype is what we think is the most relevant or typical example of a specific event or object. We compare any unfamiliar object, person or situation that we encounter to the existing prototypes of that object, person or situation. Once we have categorised the object, person or situation, we know how to interact with it. Try identifying the objects below using the representativeness heuristic.



Which objects could your class easily identify? Which were more difficult to identify? Why do you think this was the case?

Affect heuristic

The **affect heuristic** is a mental shortcut based on a person's current emotional state. Essentially, your **affect** (emotional response) plays a role in your decisions and behaviour. For example, a friend may criticise you for something, making you feel defensive and a bit angry, so the next time there's an opportunity to hang out with them, you decide to pass due to your emotions. Another example is a smoker being constantly exposed to disturbing information and images about the consequences of smoking; this might provoke negative emotions, which in turn result in the person's decision to give up smoking. In both examples, emotions dictated how a person or situation were thought about, indicating the influence of the affect heuristic.

Affect heuristic a mental shortcut based on a person's current emotional state

Affect an emotional response (in the field of psychology)

Figure 7C–8 We use the affect heuristic every day – when we decide to catch up with one friend over another because we felt happy the last time we caught up with them; when we decide not to watch a movie sequel because we found the previous one frightening; or when we decide to take a subject at university because we enjoyed studying it in high school.

ISBN 978-1-009-25401-4 Gallagher et al

Our perception of the risks and benefits involved in a decision or behaviour contributes to the affect heuristic – and our emotional state or mood influences our risk assessment, as shown in Figure 7C–9. The size of the benefit (potential payoff) in relation to the size of the risk (potential harm) also influences the outcome in terms of decisions and behaviour.

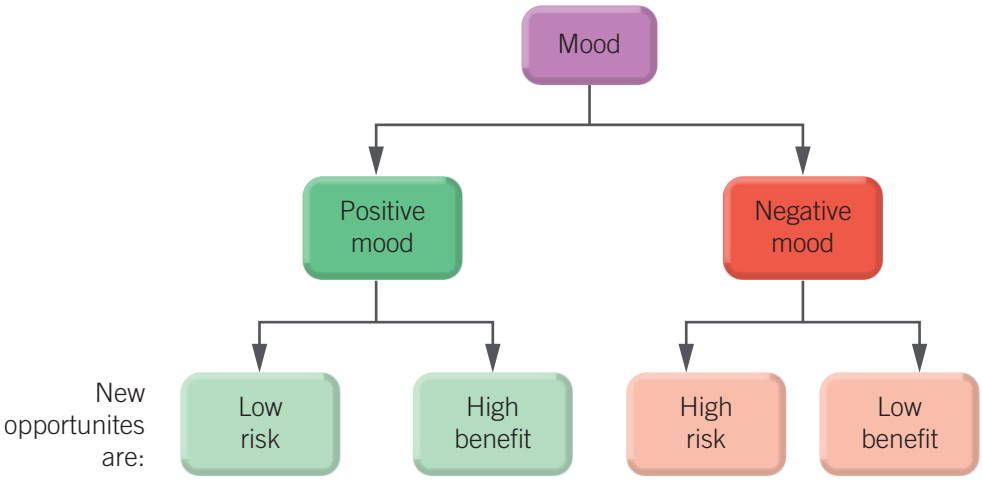


Figure 7C–9 When a person is in a positive mood, new opportunities are perceived as being low risk with high benefits. When a person is in a negative mood, new opportunities are perceived in the reverse way.

One example would be two friends who go out for a ride on their mountain bikes. One friend has recently mastered a specific jump on the track and is in a good mood, while the other has had an accident on the same track and still feels upset about it. The friend in a good mood will view the jump as being low risk (in terms of injury) with high benefits (an adrenaline rush). The upset friend will most likely view the jump as high risk (in terms of another injury) and low benefits (they don't know how big the adrenaline rush might be). Ultimately, mood might determine that the happy friend attempts the jump and the upset friend doesn't.

Figure 7C–10 Some advertising involves manipulating the affect heuristic by equating risky behaviour (e.g. gambling or eating unhealthy foods) with positive emotions, as displayed here. Always showing consumers positive emotions linked to risky behaviour can lead them to make poor decisions with serious, long-term consequences.

WORKSHEET 7C–1 HEURISTICS ROLE PLAYS

If we are under pressure to make a decision, then we are more likely to use the affect heuristic. This might lead us to make poor choices. For example, if you were forced to choose between two jobs in a relatively short timeframe, then you would be more likely take the job for which you felt most comfortable and positive during the interview. If our mood is a bit low and we lack confidence, then the affect heuristic tends to keep us there because we won't risk doing new things, thereby limiting our ability to learn from new and challenging situations.

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 7C–4 AN EXERCISE IN SOCIAL JUDGEMENT REVISITED

In Activity 7C–1, you were asked to answer three questions and keep your answers for this later activity. Each question relates to one of the heuristics that you have just learned about here. In a copy of the table below, provide an explanation for how the availability, representativeness and affect heuristics can be applied to the relevant question from Activity 7C–1.

Heuristic	Question	How the question demonstrates the heuristic
Availability heuristic		
Representativeness heuristic		
Affect heuristic		

Check-in questions – Set 2

1 Define the following terms and provide an example that hasn't been used in the text.
   a The availability heuristic
   b The representativeness heuristic
   c The affect heuristic
2 What is the underlying assumption of the availability heuristic?
3 What is a limitation of using the availability heuristic?
4 Explain what a prototype is and give three examples that haven't been used in the text.
5 When are we most likely to use the affect heuristic?
6 Why does the affect heuristic occur? Answer with reference to the concepts of risk and benefit.

Positive and negative influences of heuristics

We have already established the many positive benefits of using heuristics; however, they can also contribute to negative outcomes such as stereotypes and prejudice. People typically use heuristics to avoid exerting too much mental energy, especially in cases when they are not sufficiently motivated to dedicate significant mental resources to the task at hand. Therefore, when they are not motivated to make judgements or decisions effortfully, they might rely instead on automatic heuristic responses and, in doing so, risk propagating stereotypes. These broad generalisations do not always apply, and their continued use can have serious consequences. Kahneman and Tversky illustrated how the representativeness heuristic might result in the propagation of stereotypes when they presented participants with a personality sketch of a fictional man named Steve and a list of possible occupations. Participants were asked to order the occupations in terms of their likelihood of being Steve's job. Since the personality sketch described Steve as shy, helpful, introverted and organised, the participants tended to indicate that he was most likely a librarian.

Figure 7C–11 Heuristics may result in stereotyping – for example, people might be led to think that the woman above is a full-time homemaker rather than a businessperson.

ISBN 978-1-009-25401-4 Gallagher et al

The stereotype of a librarian used here is, of course, less harmful than many other stereotypes, but it illustrates the link between heuristics and stereotypes. Table 7C–1 provides a summary of the positive and negative influences of three types of heuristics.

Table 7C–1 The positive and negative influences of the availability, representativeness and affect heuristics

Heuristic	Positive influence	Negative influence
Availability heuristic	It saves time and effort in terms of recalling similar situations and analysing them.	It tends to overestimate the likelihood of recent events reoccurring.
Representativeness heuristic	It allows us to understand a new object or event by comparing its characteristics to those we have already established for other objects and events.	We often overestimate the similarity between the two things we are comparing, leading to mistakes in our decision-making.
Affect heuristic	It might encourage us to take bigger risks than we usually would if we are in a positive mood.	If we are in a negative mood, then the heuristic tends to keep us there because we won't risk doing new things, which limits our ability to learn from new and challenging situations.

Check-in questions – Set 3

1 Outline how heuristics can lead to poor decision-making.
2 Using your own example, explain how heuristics can result in stereotypes.

VIDEO 7C–2 SKILLS: PRACTICAL STRATEGIES FOR MULTIPLE-CHOICE QUESTIONS

7C SKILLS

Practical strategies for multiple-choice questions

In VCE Psychology, many of your assessments will contain both short-answer and multiple-choice questions. Although multiple-choice questions may appear to be easier than short-answer questions, students often choose the wrong answer because they haven't read the question properly (or because they have poor strategy) rather than because they have poor content knowledge.

Consider the following question:

Which of the following statements about heuristics is the most accurate?
A Heuristics allow individuals to make decisions quickly.
B There are three types of heuristics.
C Heuristics help make our decision-making process more accurate.
D The representativeness heuristic always results in stereotyping.

Although many students might pick B, the answer is actually A.

So, what is the best strategy to correctly answer a multiple-choice question like this one?

ISBN 978-1-009-25401-4 Gallagher et al

When you first consider a multiple-choice question, highlight the important words in the question. In the example above, we would highlight the words 'most accurate'. Doing this will help you better understand the intent of the question.

When considering each available answer, many students pick the seemingly correct answer without reading the rest of the alternatives. This can lead to mistakes. Instead, use the strategy of eliminating incorrect answers to help you identify the correct answer. In the question above, we can eliminate D because students should be wary of alternatives that use 'always', 'never' or 'only', as they are usually incorrect. We can also eliminate alternatives B and C after considering the information. (B is incorrect because there are more than three types of heuristics, and C is incorrect because heuristics can lead to cognitive bias rather than more accurate decision-making.) This leaves us with A as the correct answer.

Section 7C questions

1 Give two advantages and three limitations of heuristics.

2 Copy and complete the table to compare and contrast the availability, representativeness and affect heuristics.

	Differences	Similarities
The availability and affect heuristics		
The availability and representativeness heuristics		
The representativeness and affect heuristics		

3 For each of the scenarios below, identify and explain which heuristic is being used.

a Sandy has just started his science degree at Melbourne University. He has moved to Melbourne from regional Victoria, and attends a party with his roommate, Kane, to make some friends. Sandy is especially looking forward to meeting Kane's friend, Niall, whom Kane describes as orderly, detail oriented, competent, self-centred and having strong morals. Later in the night, Sandy finally meets Niall and has a long discussion with him about his fine arts course. Sandy expresses his surprise to Kane later and confesses that he thought Niall would be completing a science or engineering degree based on Kane's description of him.

b Alan gives his friend Hakim a list of two professions and asks him which is the most dangerous: a police officer or a logger. Hakim immediately answers that a police officer's job is much riskier because he always hears about police shootings on the news. Hakim is surprised when Alan tells him that loggers are more likely to die on the job, with a fatality rate 28 times higher than that for all other types of workers.

c Lorena was shopping for a dress and couldn't decide what to buy. Her favourite song then started playing in the store. Lorena suddenly felt that the dress in her hand was definitely the best, so she decided to buy it.

ISBN 978-1-009-25401-4 Gallagher et al

The influence of prejudice, discrimination and stigma

Study Design:
The influence of prejudice, discrimination and stigma within society on a person's and/or group's mental wellbeing and ways to reduce it

Glossary:
Ageism
Contact hypothesis
Direct discrimination
Discrimination
Equality
Extended-contact hypothesis
Homophobia
Indirect discrimination
Inter-group contact
Intersectional discrimination
Modern prejudice
Mutual interdependence
Old-fashioned prejudice
Prejudice
Racism
Sexism
Social norms
Superordinate goals
Sustained contact

ENGAGE

Rottnest Island as a prison

In the north-eastern corner of Rottnest Island is a place where hundreds of families have pitched their tents, camping chairs and barbeques during their idyllic summer getaways.

But for decades, these families have remained unaware that beneath that well-trodden patch of earth lies one of Australia's largest mass burial sites.

The remains of at least 373 people lie buried at the site in unmarked graves, the first of which was unearthed in 1971. All remains are those of Aboriginal men.

This place, once known as 'Tent Land', is a vital reminder of the dark history of this island paradise.

A century before it was a holiday destination, Rottnest Island – or Wadjemup, to the Noongar people – served another purpose: it was a prison for the thousands of Aboriginal people who were being gathered by authorities throughout mainland Western Australia.

As a Noongar woman and former member of the Rottnest Island Board, Karen Jacobs told the ABC that after the colonisation of the Swan River area in 1829, her people were suddenly forced off their Country to make room for pasture.

'[The settlers] cleared the land and blocked all the freshwater springs that ran through the city. This meant all the medicinal plants, all of the traditional vegetation and animals were all gone. Our whole hunting ground was gone within three years of settlement', she said.

Settlement came with a strange new legal system that clashed with her people's ancient methods of governance and customary law. Land suddenly belonged to an individual, as did the animals that walked upon it, meaning that traditional hunting and gathering could now be considered trespassing or theft.

Many of those who fell afoul of the new laws were chained together, marched hundreds of kilometres and then shipped to Rottnest Island.

ISBN 978-1-009-25401-4 Gallagher et al

Conditions were horrid, and disease was rife. By the 1880s, up to 10 men lived in each 1.7 m x 3 m cell. Most were later found buried at 'Tent Land', having perished from measles, influenza and malnutrition.

On top of it all, the prison's long-reigning superintendent, Henry Vincent, is believed to have subjected inmates to horrific torture and abuse.

Figure 7D–1 Aboriginal prisoners in chains at Wyndham, Western Australia

However, as of 31 May 2018, things have changed. After three decades of campaigning led by the Aboriginal community, the building ceased operating as an accommodation, and it was returned to the management of the Rottnest Island Authority. Plans for the site have yet to be finalised, but they will ensure that the 'Aboriginal history of Rottnest Island is appropriately interpreted for today's visitors, and the state's Aboriginal community'.

As Iva Hayward-Jackson, chair of the Rottnest Island Deaths Group Aboriginal Corporation, notes:

'All Australians, but especially people who visit Wadjemup, need to wake up to what happened there. That's the only way they can have a genuine experience of the place. It doesn't mean you can't go and have a nice holiday. It means you can have an authentic physical, mental and spiritual encounter with history.'

'That's what reconciliation is; that's what we want', she adds.

EXPLAIN

Stigma

In Section 7A, we briefly discussed stigma as an effect of stereotyping. Stigma is a negative attitude against someone based on a distinguishing characteristic, such as mental illness, disability, gender, sexuality, race, religion or culture. For example, some people have developed a negative stereotype that all long-term unemployed people are alcoholics and drug users. This has resulted in people being unfairly stigmatised.

Figure 7D–2 Stigma can result in individuals feeling rejected and isolated and can result in low self-esteem.

LINK 7A THE ROLE OF PERSON PERCEPTION

Stigma is often perpetuated in media, such as TV shows, movies, advertisements and social media. Additionally, an individual can be stigmatised by strangers, members of the individual's family, friends, colleagues and even the individual themselves.

When an entire social or cultural group is stigmatised, individuals in the group feel rejected based on assumptions about that group, and they feel that their individuality is being ignored. This leads to feelings of anger and of being persecuted and insulted. This can lower their trust and confidence in other groups, as well as their own self-esteem.

ISBN 978-1-009-25401-4 Gallagher et al

When the members of a group are stigmatised and disadvantaged in some way (e.g. economically or in terms of ability or health), they can develop feelings of shame and isolation. These feelings, in turn, can cause changes in the individual's behaviour. In fact, their behaviour can shift to become more like the expectations of people who have stigmatised them expect.

Prejudice

Prejudice the negative attitude people possess towards individuals based only on their membership of a group

Discrimination a negative behaviour directed towards a specific group or individual of the group based only on their membership of the group

Not all attitudes towards people are positive. Some are negative and form the basis of prejudice and discrimination. **Prejudice** involves having a negative attitude towards people based solely on their membership of a certain group. **Discrimination** concerns the negative behaviour directed towards people or groups due to that prejudice. In short, discrimination occurs when prejudice leads to negative behaviour (especially illegal actions) directed towards the targets of prejudice.

Unfortunately, prejudice and discrimination are not new concepts. There are numerous examples in world history that demonstrate how prejudice and discrimination have occurred and caused untold harm to various social and cultural groups, with both immediate and long-term effects. In this section, we will examine the relationship between prejudice and discrimination and explore how these concepts can affect people's mental wellbeing.

When a person or group is stereotyped negatively, it can lead to prejudice. For example, believing that all older workers are weaker or not as healthy as younger workers might lead to negative emotions about older people in the workplace (e.g. 'I dislike hiring old people instead of younger people'). Prejudice is typically directed against groups based on characteristics such as their ethnicity, gender, sexual orientation, appearance, occupation, or mental health or disability status.

Figure 7D–3 There are many characteristics that can be form the basis for prejudice (e.g. disability, race or sexual orientation).

When someone is prejudiced against another person, they overlook the person's individual characteristics or behaviour and assign their negative thoughts about the group to the person. Someone who is prejudiced might even ignore evidence suggesting that their information about the group is wrong or incomplete. A high level of counterevidence is required to overcome prejudice.

Prejudice is often directed towards a minority group by a majority group. Members of a majority group tend to regard themselves as belonging to the 'ingroup', while the minority group belongs to the 'outgroup'. According to American psychologist Herbert Blumer, many people in the majority tend to believe that they are superior, more powerful and more important than those in the minority group to whom the prejudice is directed. This occurs because they believe that the minority group is different in ways that make them 'not belong'. At the same time, a majority group that displays prejudice might also be insecure and feel that the minority group will take over and become the majority.

7A THE ROLE OF PERSON PERCEPTION LINK

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 7D–1 MAJORITY AND MINORITY GROUPS

Can you think of some situations involving a majority and minority group? For example, most students in your class might celebrate Christmas, while the minority group does not. In small groups or as a whole class, brainstorm as many examples as possible of situations that involve majority and minority groups. Examine the common behaviours that are exhibited between the majority and minority groups. Do you think that being in a majority or minority group leads to certain behaviours?

Categories of prejudice

Psychologists believe that the theories of prejudice now fit into two categories: 'old-fashioned' and 'modern' prejudice. **Old-fashioned prejudice** is deliberate and overt prejudice originating from a time in history when the belief in superior and inferior races or nations was widespread and a part of government policy, law, education, religion and other facets of life. This led to the belief that races should be segregated in employment, schooling, housing, resources and other areas.

Old-fashioned prejudice deliberate and overt prejudice

Conversely, **modern prejudice** is more subtle; it displays as the acceptance of minority groups on the surface, but in practice a hidden prejudice lies underneath. For example, an employer could interview a white man and a dark-skinned man for a job, but then hire the white man regardless of who was the most talented. In most Western societies, including Australia, old-fashioned prejudice is becoming less common, mainly because the associated acts of this prejudice (e.g. violence, name calling and discrimination) are usually punishable by law and not socially acceptable. However, modern prejudice is still widespread, and it is more difficult to observe than old-fashioned prejudice.

Modern prejudice a more subtle form of prejudice that insinuates rejection while displaying acceptance

Figure 7D–4 Signs of racial segregation, such as the segregated drinking fountains (left image) that used to be used in some countries and regions, have disappeared. However, signs of modern prejudice, such as displays of anti-Black flags, may still be seen today (right image).

ACTIVITY 7D–2 RESEARCHING OLD-FASHIONED PREJUDICE

Conduct some research into historical examples of old-fashioned prejudice, such as the Stolen Generations, apartheid or segregation in the southern states of the United States. Choose two or three examples and answer the following questions:

- When and where did this example of prejudice occur?
- What events led up to the example of old-fashioned prejudice?
- What happened?
- What short- and long-term impacts affected the minority group in your example?
- What similarities and differences do you notice between these events?

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 1

1 What social groups are commonly stigmatised against?
2 Identify three impacts of stigma.
3 What is prejudice?
4 List three examples of prejudice that have not been used in the text.
5 With reference to Howard Blumer's ideas, analyse a prejudice that you believe is held by a majority social group in Australian society towards a minority group.
6 Outline the difference between old-fashioned and modern prejudice using appropriate examples.

Discrimination

Unfortunately, prejudice doesn't only involve beliefs and emotions; when it is directed towards a group and it involves action, it is known as discrimination. As you learned earlier in this section, discrimination is a negative behaviour directed towards a specific group or towards an individual who belongs to a specific group. Consider an employer who refuses to hire a suitably qualified person because they are Black, and they instead hire a less-qualified person with a different ethnic background. Another example is a woman who, while walking home from her job, is harassed and 'wolf whistled' at by a man in a car. Consider an elderly man who cannot secure a credit card or travel insurance because of his age. All these different situations show discrimination. Discriminatory behaviour can also include actions like strategic ignoring, put-downs, name calling or exclusion, as well as violence or even genocide.

Note that in the context of this chapter, although the word 'discriminate' can mean to distinguish between things neither positively nor negatively, discrimination is not generally used to mean positively favouring something. However, the term 'positive discrimination' is in limited use to mean the action of giving preferential treatment to a member of a group that is commonly discriminated negatively against, such as giving scholarships to Aboriginal and Torres Strait Islander peoples who might otherwise have difficulty accessing education. In Australia, there are both federal and state anti-discrimination laws that ban discrimination based on a person's age, gender, race, colour, religion, political opinion, medical or criminal record, disability or sexual orientation.

Figure 7D–5 Discrimination takes many forms, such as the many deaths of African Americans and First Nations Australians in police custody or the expectation that a woman will be open to flirtation in the workplace.

ISBN 978-1-009-25401-4 Gallagher et al

The Australian Human Rights Commission describes three types of discrimination: direct, indirect and intersectional. **Direct discrimination** occurs when somebody is treated unfavourably due to a personal characteristic protected by law (e.g. age, sex, marital status or sexual orientation). For example, this would occur if a family were refused service at a cafe due to their race, or if an older applicant were not considered for a job due to an assumption that they aren't as familiar or comfortable with new technology as a younger person. With **indirect discrimination**, although everyone is treated the same way, someone is disadvantaged due to a personal characteristic. Indirect discrimination would occur if the only way to enter a public building was by using a set of stairs, which would prevent people with disabilities who use wheelchairs from entering the building. Another example is a policy stating that managers must work full-time, as this might disadvantage people who can only work part-time due to family responsibilities.

Finally, **intersectional discrimination** occurs when a particular group is at an even greater disadvantage because they are affected by more than one form of discrimination. For example, women from a minority ethnic group might face discrimination due to both gender and ethnicity if they are paid less than white women and less than men of their own ethnicity.

Direct discrimination the unfavourable treatment of a person due to a personal characteristic protected by law (e.g. age, sex, marital status or sexual orientation)

Indirect discrimination when the same treatment is applied to everyone, but it disadvantages someone due to a personal characteristic

Intersectional discrimination when several forms of discrimination combine to leave a certain group or groups at an even greater disadvantage

Figure 7D–6 A young woman who is blind and unable to navigate a train journey due to a lack of verbal or physical cues experiences indirect discrimination.

ACTIVITY 7D–3 EXAMPLES OF DIRECT, INDIRECT AND INTERSECTIONAL DISCRIMINATION

In small groups or as a whole class, draw a table and brainstorm as many examples of direct, indirect and intersectional discrimination as possible. While brainstorming, don't forget to list specific examples of discrimination experienced due to age, gender, race, disability or sexual orientation.

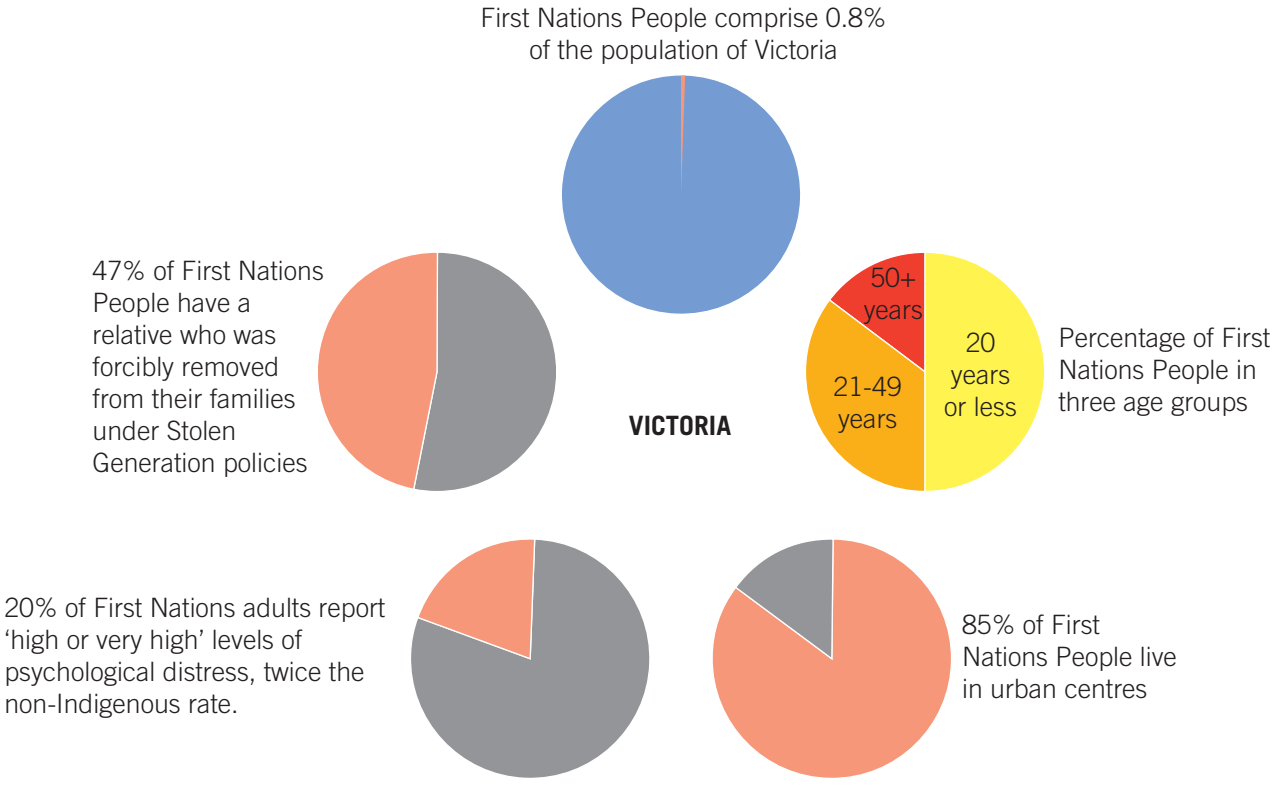
ISBN 978-1-009-25401-4 Gallagher et al

Effects of discrimination

Victims of discrimination may suffer a range of effects that include physical, psychological and social disadvantage. Racism, or discrimination based on race or ethnicity, appears to be a key contributing factor in the onset of disease, both mental and, to a lesser degree, physical. Studies in both the United States and Australia have found that such disadvantages can have long-lasting physical effects, such as:

- elevated blood pressure
- a weakened immune system
- long-term health conditions resulting from a weakened immune system
- higher rates of smoking
- alcohol use
- drug use
- unhealthy eating habits
- psychological distress
- mental health problems, such as depression, anxiety, post-traumatic stress disorder and suicidal thoughts.

Indeed, according to the Australian Bureau of Statistics, almost one-quarter (23%) of Aboriginal and Torres Strait Islander peoples reported having both a mental health condition and one or more other long-term health conditions. Figure 7D–7 gives some additional statistics concerning the wellbeing of First Nations People living in Victoria.



Source: Figures from Department of Health. (2014). Aboriginal health population infographic tool: Koolin balit. Aboriginal health. Victoria State Government.

Figure 7D–7 Additional statistics relevant to the wellbeing of First Nations Australians in Victoria

ISBN 978-1-009-25401-4 Gallagher et al

The relationship between stereotypes and stigma, prejudice and discrimination

LINK 7A THE ROLE OF PERSON PERCEPTION

You have already learned about the tri-component model of attitudes in Section 7A. Like this model, stereotypes (stigma), prejudice and discrimination can be considered parts of a whole. Stereotyping and stigma can lead to prejudice, which in turn can result in discrimination.

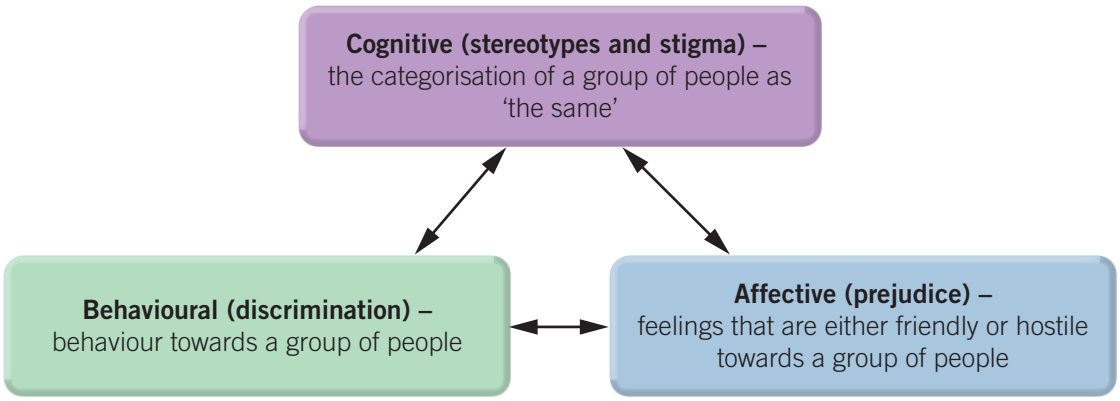


Figure 7D–8 The interaction between stereotyping, prejudice and discrimination

For example, imagine a young woman who is prejudiced against elderly people. She has negative beliefs about elderly people (cognitive component) and a strong feeling of dislike towards the elderly (affective component), so she engages in negative acts against them, such as not giving her seat to an elderly person when she is on a crowded bus (behavioural component).

ACTIVITY 7D–4 COMPARING PREJUDICE AND DISCRIMINATION

By yourself or in pairs, create a list of the similarities and differences between prejudice and discrimination. As a whole class, compare your lists and consider whether your understanding of each term has changed.

Examples of prejudice and discrimination

In the previous section, you learned that discrimination is behaviour directed towards a particular group or towards an individual who belongs to a specific group. Many different groups experience discrimination, with the most obvious examples being groups that can be discriminated against based on gender, race, age and sexual orientation.

Sexism

Sexism involves prejudice or discrimination that is based on an individual's sex or gender. It primarily affects women and girls, but it can generally affect anyone. Amnesty International reported that discriminatory laws in many countries limit women's rights to divorce, own property, have control over their own bodies and be protected from harassment. Amnesty International also reports the following:

Sexism a type of prejudice or discrimination based on a person's sex or gender

- Globally, 40% of women of childbearing age live in countries where abortion remains highly restricted or inaccessible in practice, even when allowed by law.
- Some 225 million women do not have access to modern contraception.
- The gender pay gap currently stands at 23% globally. Women worldwide are not only paid less on average than men, but they are more likely to do unpaid work and to work in informal, insecure and unskilled jobs. Much of this is due to social norms that consider women and their work to be of a lower status than men and the work that men do.
- Gender-based violence, such as sexual harassment and rape, disproportionately affects women.

ISBN 978-1-009-25401-4 Gallagher et al

Figure 7D–9 Sexism can occur in many forms. It can be subtle, such as women doing most of the work involved in raising children and completing housework, or blatant, such as women experiencing violence. Sexism can also affect men, an example being the attitude that men must be strong and tough.

ACTIVITY 7D–5 SEXISM IN ADVERTISING

You might have heard people state that, although sexist attitudes are still present in society today, they aren't as bad as they once were. But how true is this claim – especially in the area of advertising?

By yourself or in pairs, search for advertisements from the 1950s and 2000s. How many advertisements do you see that are sexist in nature? Choose three sexist advertisements and analyse them by answering the following questions:

- What product is being advertised?
- Who is the advertisement being sexist against?
- What is the advertisement suggesting about the gender?
- Do you think that this advertisement is offensive in any way? Why or why not?

Racism

Racism
a type of prejudice or discrimination based on a person's race or ethnicity

Racism involves prejudice or discrimination that is based on a person's race or ethnicity. Racism affects virtually every country in the world, and it results in those who are considered inferior being treated less favourably in multiple ways. Examples of racist behaviour can include subtle behaviours (e.g. not sitting next to someone who is of a certain race, telling racist jokes or using racist nicknames) and more overt forms (e.g. violence or withholding education, healthcare, jobs or housing). History has provided many horrific examples of racism, such as the enslavement of African peoples by Europeans and Americans in the Caribbean and North and South America, or the genocide of Jewish people and other minorities during the Holocaust.

Figure 7D–10 The Stolen Generations are only one example of the racism perpetrated against Aboriginal and Torres Strait Islander peoples. Pictured here is Aboriginal Elder Nancy Hill-Wood, a member of the Stolen Generations.

Racism has also been consistently perpetrated against Aboriginal and Torres Strait Islander peoples since Australia's English invasion and colonisation. Aboriginal and Torres Strait Islander peoples were considered less than human, and they were mistreated accordingly. They were killed en masse or forcibly removed to reserves, their sacred spaces were desecrated, and their children were removed from their families and placed in missionary schools. This abhorrent treatment nearly led to cultural genocide. Today, Aboriginal and Torres Strait Islander peoples still face shocking levels of racism throughout Australia. Reconciliation Australia (2021) reported that, in 2020, 52% of Indigenous Australians had experienced an incident of racial prejudice in the previous six months. This figure is almost 10% higher than it was in 2018.

ISBN 978-1-009-25401-4 Gallagher et al

Ageism

Ageism is a type of prejudice or discrimination based on a person's age. Although it often affects older people, ageist attitudes can also affect younger people. Ageist attitudes are perpetuated in many ways in society, such as through birthday cards that make fun of old age, the rarely positive images of older individuals on TV and the many colloquialisms used to describe older people. Further, older people might experience losing a job; being refused interest-free credit, a new credit card, car insurance or travel insurance; receiving a lower quality of service in a shop or restaurant; or being refused a referral from a doctor to a consultant due to certain ageist attitudes. Ageism against younger people manifests in many areas, such as in employment, health, housing and politics, in which younger people's voices are often denied or dismissed.

Ageism
a type of prejudice or discrimination based on a person's age

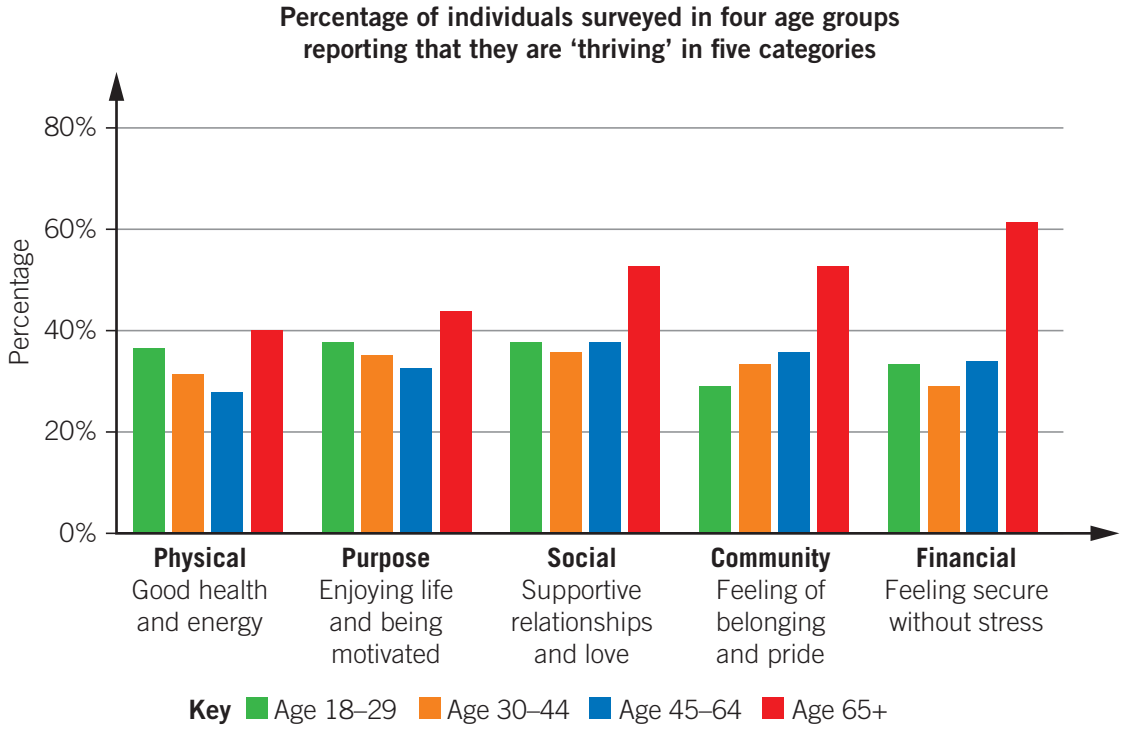


Figure 7D–11 The results of this 2014 survey in the United States suggest that older people had a better quality of life than younger people. The same might be true in Australia. There is a pervasive myth that, as we get older, our quality of living decreases.

ACTIVITY 7D–6 MYTHS ABOUT AGEING

In small groups, brainstorm a list of common myths that exist about older people (e.g. that older people can't drive well). Once you have a list, conduct some research and see how true these myths really are.

Homophobia

Homophobia is a type of prejudice or discrimination based on a person's sexual orientation. Amnesty International reported that 'it exists everywhere in the world. Everywhere in the world, people face discrimination because of who they love, who they are attracted to and who they are. Currently, over 70 countries have laws against same-sex relationships. Even in countries that don't have such laws, negative social attitudes against LGBTQIA people are widespread.

Homophobia
a type of prejudice or discrimination based on a person's sexual orientation

ISBN 978-1-009-25401-4 Gallagher et al

As Amnesty phrased it, LGBTQIA people 'risk being unfairly treated in all areas of their lives, whether it's in education, employment, housing or access to health care, and they may face harassment and violence'.

Figure 7D–12 Homophobia and other types of discrimination can also be expressed through the vandalising of property and vulgar graffiti.

In Australia, same-sex unions are allowed, and there are laws against discrimination on the grounds of sexual orientation. However, this doesn't mean that homophobia doesn't exist in Australia. In early 2022, a polarising political debate occurred on the topic of laws allowing religious organisations to be exempted from anti-homophobia laws. Social isolation and stress from rejection by family and community groups are some of the significant negative consequences that young people experience due to homophobia.

Check-in questions – Set 2

1 Describe three examples of discrimination.
2 Describe a situation in which you believe that you have experienced discrimination.
3 Explain the difference between direct discrimination and indirect discrimination, with reference to an example that hasn't been used in the text.
4 Discuss how discrimination can affect the wellbeing of those who experience it.
5 Using an example, outline the interaction between stigma, prejudice and discrimination.
6 Compare and contrast sexism and homophobia, with reference to examples.
7 Identify an example of ageism that you might have experienced in your own life.

Reducing stigma, prejudice and discrimination

In Australia, much has been done to prevent stigma, prejudice and discrimination. However, prejudice is challenging to reduce because it can be difficult to detect, prevent and eradicate. A lot of prejudice is subtly embedded in our everyday language, culture and social dialogue. Although research has offered numerous methods to reduce prejudice and discrimination, there is no single solution. Instead, a combination of different methods appears to work best. In the following section, we will explore different methods for reducing prejudice, including inter-group contact, changing social norms and extended contact.

Inter-group contact
a concept proposing that for prejudice between groups to be reduced, there must be more direct contact between the groups' members (i.e. the groups must spend more time together)

Inter-group contact

Inter-group contact is a concept proposing that for prejudice between groups to be reduced, there must be more direct contact between the groups' members – that is, the groups must spend more time together. Psychologists have long believed that an effective way to reduce prejudice among groups is to have them in contact with each other. However, 'contact' is not just about sitting people next to each other or making them work in the same room. The contact must be well planned and meaningful to both parties, and it must include the following conditions: sustained contact, mutual interdependence, equality and superordinate goals, which will be discussed next.

ISBN 978-1-009-25401-4 Gallagher et al

Sustained contact

The idea of **sustained contact** is quite simple: the more time you spend with someone, the less likely you are to hold a prejudiced view of them. Therefore, sustained contact involves prolonged and cooperative interaction between two groups that are prejudiced against each other. For example, imagine that there's a new girl in your psychology class. She wears dark makeup, has black fingernails and wears piercings all over her face. She always sits by herself, which is fine with you and your friends. She looks scary, and you don't want to end up next to her. One day in class, your friends all sit down and leave a spare seat for you – next to the new girl. You sit down and don't say anything to her. At the end of the lesson, you notice that she has a sticker of a band you like on her diary. You comment on it, and she shyly agrees that she likes the band too. You start chatting with her and get to know her a little: her name is Jayne, she has just moved to your city and she likes many of the same things you do. In fact, she isn't all that different from you and your friends. In the next psychology class, Jayne sits next to you. When your friends ask why she sat next to you, you explain that she's quite nice and not what you had expected. As the year continues, you spend most of your classes sitting next to Jayne and you become good friends.

Sustained contact prolonged and cooperative interaction between two groups who are prejudiced against each other

Figure 7D–13 Interacting regularly with your neighbours is an example of sustained contact.

In this scenario, the prejudice you originally felt against Jayne was reduced because you had meaningful contact with her over a long period of time. In this way, sustained contact has been used to break down a stereotype that was mostly based on minimal information (e.g. Jayne's appearance). If this contact had never occurred, then maybe you would have spent all year not knowing what a nice person Jayne was.

Contact hypothesis

Sustained contact alone is not always enough to reduce prejudice. For example, Aboriginal and Torres Strait Islander peoples have been living, working and voting with non-Indigenous Australians for many years, yet prejudice remains. Major cities in Australia are also populated by large groups of people from other countries, many of whom are second- or third-generation immigrants. Even though many were born here, they may look or behave differently, which makes them more likely to attract prejudice from Anglo-Saxon Australians. This prejudice exists even though a high level of contact has existed between these two groups in society over a long period of time.

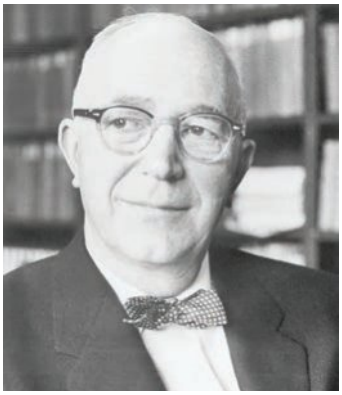


Figure 7D–14 Gordon Allport

In the 1950s, psychologist Gordon Allport helped to develop the **contact hypothesis**, which claims that social contact between social groups is sufficient to reduce inter-group prejudice. Allport based his hypothesis on the idea that

Contact hypothesis a hypothesis stating that social contact between social groups is enough to reduce inter-group prejudice

ISBN 978-1-009-25401-4 Gallagher et al

prejudice is a negative prejudgement about a person, and that frequent contact may provide knowledge or information about the person, which can change that prejudgement. Allport suggested that contact between groups would reduce prejudice if four conditions were met: mutual interdependence, equality between groups, a common goal, and the support of authorities, laws or norms.

Figure 7D–15 People who play team sports (e.g. football, basketball or volleyball) need to rely on each other to complete the mutual goal of winning the game.

Mutual interdependence

For contact to involve **mutual interdependence**, the two groups must depend somehow on one another to meet a goal. This might mean that the groups need something from each other, such as a skill or piece of knowledge. The two groups must work together cooperatively on a meaningful and well-planned task for it to be successfully completed. This cooperative contact helps to reduce their prejudice towards one another. Think of mutual interdependence as when two groups each have half of the pieces of a jigsaw puzzle. They will receive a collective prize if they complete the puzzle, but they must rely on each other if they want to win. To receive the prize, they must work together and pool their knowledge of the puzzle, skills at completing puzzles and, of course, the actual jigsaw pieces.

Mutual interdependence when two groups must depend somehow on one another to meet a goal

Equality the state of being on the same level as one another, with neither group having more or less status or power than the other

Equality

To reduce prejudice between two groups, they must have equality of status. **Equality** refers to being on the same level as one another, with neither group having more or less status or power than the other. Status refers to the level of influence, prestige or power that is assigned to a group in society. A group's status can be real or based on how members view the group. For a group to have a perceived status, most members must agree on the status of the specific group. Different groups are clearly considered to have different levels of status in society. Groups that are perceived as having a high status hold positions of power or earn large amounts of money; those that are perceived as having a low status have less influence and power, and they hold positions that are less prestigious. Generally, groups with a high status have power and influence over other groups with a lower status. Despite this, equal status is a critical aspect of the prejudice-reduction process. When groups work together, both parties must regard each other as fair and equal. Reducing prejudice when one group believes that they have more power over another group is difficult, and sometimes ineffective. Equality must be for everyone before prejudice can begin to be reduced.

Superordinate goals the top-level, ultimate goals shared between groups or individuals that cannot be achieved alone or without the other person or group

Superordinate goals

Superordinate goals are the top-level, ultimate goals that individuals or groups have. In the context of reducing prejudice and discrimination, superordinate goals are applied to groups or individuals who demonstrate prejudice against one another. These goals require cooperation between groups that would otherwise oppose each other. They supersede or override other lesser goals. Having shared goals and cooperating to achieve

ISBN 978-1-009-25401-4 Gallagher et al

them reduces conflict, because people perceive themselves as members of the same larger group. The superordinate goal rests on the concept of the whole being greater than the sum of its parts – meaning that group cooperation achieves more than all the components working alone. It isn't the goal itself that psychologists find important; it is what working towards the goal does to help reduce prejudice among groups of people. An example of this can be found in major wars. For example, consider the United States and Russia; although ideologically and politically opposed to each other, these two countries fought on the same side in the Second World War. Both nations decided that the conflicts between them were less important than the superordinate goal of defeating their shared enemy, Nazi Germany.

Figure 7D–16 Moving a couch is an example of a superordinate goal.

Sherif's Robber's Cave experiment

Muzafer Sherif is one of the major founders of social psychology, and his 1954 Robber's Cave experiment (named after where it took place, at Robber's Cave in Oklahoma in the United States) remains a classic study in this field. The study was conducted in three stages.

Stage one: formation of the ingroup

In stage one, 24 white Protestant boys aged 11–12 were chosen to participate in the study. Sherif obtained consent for the boys' participation and ensured that none displayed any obvious psychological issues. The boys' teachers also confirmed that they had no problems with the boys' behaviour at school. They were randomly assigned to one of two groups and were placed on separate buses and transported to a campsite. Sherif ensured that the boys didn't get to see each other at the camp; he kept them at opposite ends of the grounds. Sherif spent a week turning the individuals into two coherent and dynamic teams of young boys. Each group stayed in their own large cabin and was encouraged to choose a name for themselves. One group was called the 'Rattlers' and the other the 'Eagles'. Each team created its own flag and engaged in team-building exercises to encourage group cohesion. By the end of the week, Sherif had, as planned, two distinct and dynamic teams.

Stage two: development of negative attitudes towards the outgroup

In stage two, Sherif tested his hypothesis, that 'when two groups have conflicting aims, their members will become hostile to each other even though the groups are composed of normal, well-adjusted individuals'.

To achieve this, the boys were slowly made aware of the other group's presence in the camp (e.g. hearing them or seeing items they had discarded). Then, the camp supervisors made sure that the groups saw the other group using the swimming hole or on the baseball field to cause tension between the groups. The boys reacted territorially, with a clear distinction between 'us' and 'them'. For example, they made comments like, 'they'd better not be in our swimming hole'.

ISBN 978-1-009-25401-4 Gallagher et al

Next, Sherif arranged competitions for the boys and manipulated their scores to remain even so that he could pit the groups against one another. A trophy and 12 medals were on display in the dining hall where the groups had started eating together. When the Rattlers won the first baseball game, the Eagles burned their flag. Following this, when the Eagles won the tug-of-war competition, the Rattlers raided and trashed the Eagles' cabin. Sherif's hypothesis was supported.

Stage three: reduction of prejudice

In this stage, Sherif attempted to reduce the prejudice between the groups. Activities such as watching movies together initially failed to achieve this, as the prejudice between the two groups was too great to be undone by contact alone. To overcome their prejudice, it was necessary for the boys to engage in mutually interdependent activities and complete superordinate goals. One day, the camp staff told the boys that the camp's water supply was 'broken' and that fixing it required all boys to work together and unclog the blocked valve. On a separate occasion, the truck delivering food broke down, and the boys had to work together to push it up the hill to the camp. The boys also had to pool their money to hire a movie for everyone to watch.

Undertaking these mutually interdependent activities helped the boys develop better attitudes towards one another. Hostility disappeared, and the boys began to view each other as belonging to one larger group rather than as 'us versus them'. The experiment remains a classic social psychology study – and even today, it is still referred to due to its simplicity and the clarity of its conclusions.

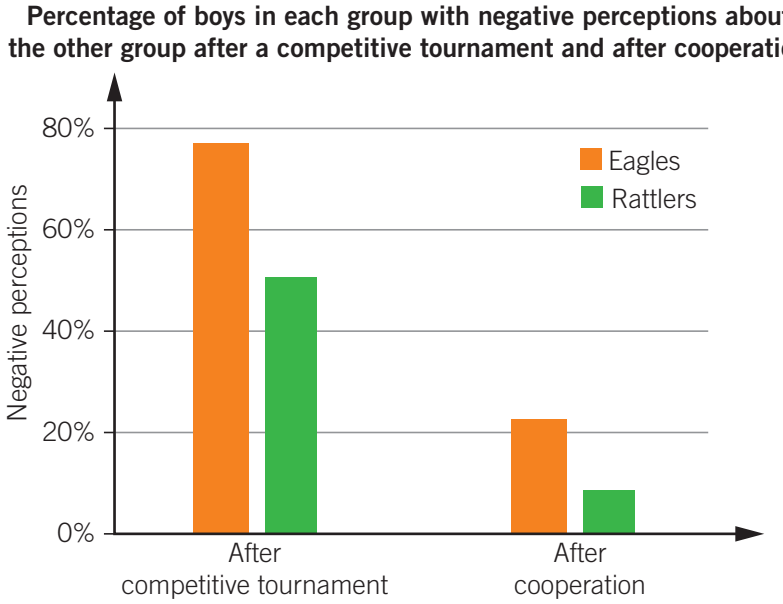


Figure 7D–17 The results of Sherif's Robber's Cave experiment

ACTIVITY 7D–7 ANALYSING THE ROBBER'S CAVE EXPERIMENT

Copy and complete the table below by finding examples of strategies that reduce prejudice from Sherif's experiment, as well as from other real-world examples.

Strategy to reduce prejudice	Example from Robber's Cave	Other example
Sustained contact		
Mutual interdependence		
Equality		
Superordinate goal		

ISBN 978-1-009-25401-4 Gallagher et al

Changing social norms

Social norms shared standards or social beliefs about what is normal, acceptable or typical behaviour

Social norms are views that the majority in a society share regarding what is and isn't acceptable to say and do in social interactions. Some common social norms include not picking your nose in public, going to the back of a queue instead of cutting in line, or dressing appropriately for your environment. The purpose of social norms is to provide order and predictability in society. They are not defined by what people think is important to them personally, but rather by what people believe are the social expectations of others whose opinions matter to them. Overall, people want approval and to belong, and those who don't follow the norms will suffer disapproval or be outcast from the group. As such, norms exert a powerful influence on how people behave in public and in social situations – with people's behaviour sometimes being quite different from what they might truly think or feel.

Prejudice and discrimination flourish when they are perceived as a social norm or shared value, but they die out when other social norms oppose them. Social norms play a key role in prejudice and discrimination because they establish how people behave towards any outgroup. These norms are typically well ingrained, but they can change over time.

In Australia, much has been done through education and legislation to try to change the social norms relating to prejudice and discrimination. The support of authorities for these measures tends to lead to more positive inter-group interactions because authorities can establish norms of acceptance and guidelines for how group members should interact with each other. For example, anti-discrimination legislation has reduced open expressions of prejudice in Australia. An education campaign focusing on the social problems associated with prejudice and discrimination (in addition to relevant legislation) has led to increased opportunities for women and members of minority groups in our society. The importance of education has been demonstrated by research showing that people who are more educated express fewer stereotypes and prejudices in general.

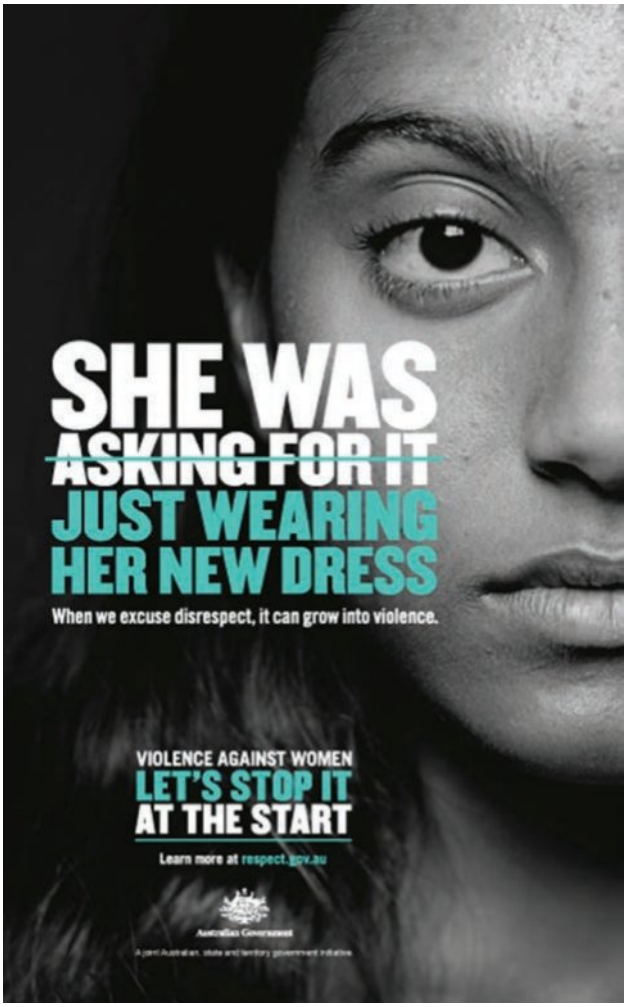


Figure 7D–18 Media campaigns are one tool that the government uses to reduce prejudice and discrimination.

The media also fights against prejudice by reporting on certain problems and issues that groups and individuals face as targets of prejudice and discrimination. This fosters a public debate that increases understanding and politically pressures governments and agencies to act. However, there is still much work to do.

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 7D–8 RESEARCHING ANTI-DISCRIMINATION LAWS

Australia has four core anti-discrimination laws — the *Age Discrimination Act 2004*, *Disability Discrimination Act 1992*, *Racial Discrimination Act 1975*, and *Sex Discrimination Act 1984* (information current in 2022). As a whole class, divide into four groups and decide the allocation of one law to each group. Each group will oversee researching their allocated anti-discrimination law, and they will report back to the class with their information. While researching your selected law, consider the following questions:

- Who is this law directed at?
- What are the requirements of the law?
- What are some examples of the behaviours this law might change or reduce?

WORKSHEET 7D–1 PREJUDICE AND DISCRIMINATION EXTENDED RESPONSE

Extended-contact hypothesis

The contact hypothesis, introduced on page 385, claims that direct social contact between people from different groups will produce more positive attitudes between the two groups. An extension of this is the idea that when members of an ingroup see that one of their own has a close relationship with an outgroup member, it can lead to more positive attitudes towards that outgroup. This hypothesis is known as the **extended-contact hypothesis**. Imagine the following scenario: Nadia plays netball every Tuesday night. One Tuesday night, her netball team is pitted against a team with members from a rival school. Nadia doesn't like the members on this team because she believes that they 'play dirty' and that they are from 'the wrong side of the tracks'. After the game, Nadia is surprised to see her teammate, Alice, laughing and joking with a rival team member named Sharon. This behaviour between Alice and Sharon continues every Tuesday night. Nadia eventually learns that Alice used to live across the road from Sharon, so they are good friends. Nadia begins to think that if Alice is such good friends with Sharon, then Sharon and the other team members probably aren't as bad as Nadia first thought.

Extended-contact hypothesis the idea that when members of an ingroup see that one of their own has a close relationship with an outgroup member, it can lead to more positive attitudes towards that outgroup

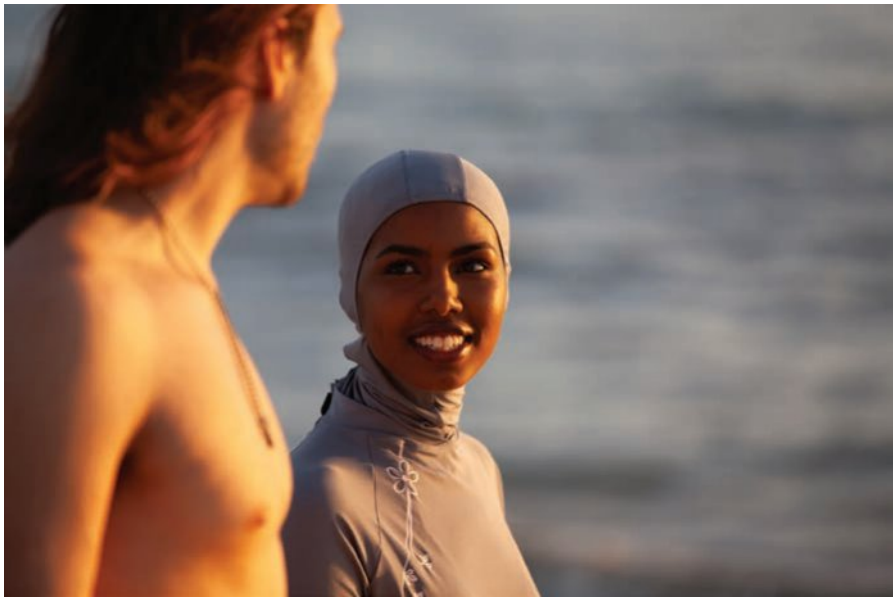


Figure 7D–19 The extended-contact hypothesis has proven successful at reducing prejudice in circumstances involving a high level of segregation between groups.

Research in the United Kingdom indicates that extended contact is most effective when direct contact is limited. Specifically, prejudice tends to be reduced when various types of media show ingroup and outgroup members interacting positively. When direct contact isn't practical or possible, then extended contact allows individuals to benefit from the positive outcomes that they observe in their group interactions.

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 3

1 Explain how each of the following factors can reduce prejudice, with reference to a relevant example for each factor.
   - **a** Inter-group contact
   - **b** Sustained contact
   - **c** Social norms
   - **d** Extended contact

2 Gordon Allport suggested that inter-group contact helps reduce prejudice, but only under certain contact conditions. Identify and describe each of these contact conditions.

3 What is a superordinate goal? Propose an example of how a superordinate goal could be used to reduce prejudice and discrimination between two opposing groups in a large school. Explain how the measures you propose might achieve this.

4 Which form of prejudice does legislation affect? Explain your answer.

5 Provide an example of a time when you might have experienced the extended-contact hypothesis.

7D SKILLS

VIDEO 7D–1 SKILLS: SIGNPOSTING THE MAIN POINTS IN ANSWERS

Signposting the main points in answers

In VCE Psychology, it is important for your responses to be concise and detailed. One way to ensure this is to use signposting when responding to short-answer questions. Signposting is a way to show the examiner where your points are. You can signpost by using dot points, subtitles or even tables to organise the information in your response. See the question and suggested answer below to help your understanding.

Question

Julia is a teacher at Belmont College. Recently, the college has received a large influx of international students, primarily from Vietnam. Julia has found that in her English classes, the Australian students are very prejudiced against the Vietnamese students. Describe two ways that Julia could effectively reduce prejudice in her English class.

Attempted answer

Julia could use sustained contact and superordinate goals. She could use sustained contact by ensuring that the Australian and Vietnamese students spend long amounts of time with each other, perhaps by playing in the classroom or outside during lunchtime. Julia could also use superordinate goals by ensuring that the two groups shared goals that they couldn't achieve alone or without the assistance of the other group (e.g. giving the students a big puzzle to solve together).

Explanation

The attempted answer above has all the correct information, but it's difficult to identify each point at a glance. Instead, subheadings should be used to organise the response. You could also use dot points or a table to show the examiner where your points are.

Suggested answer

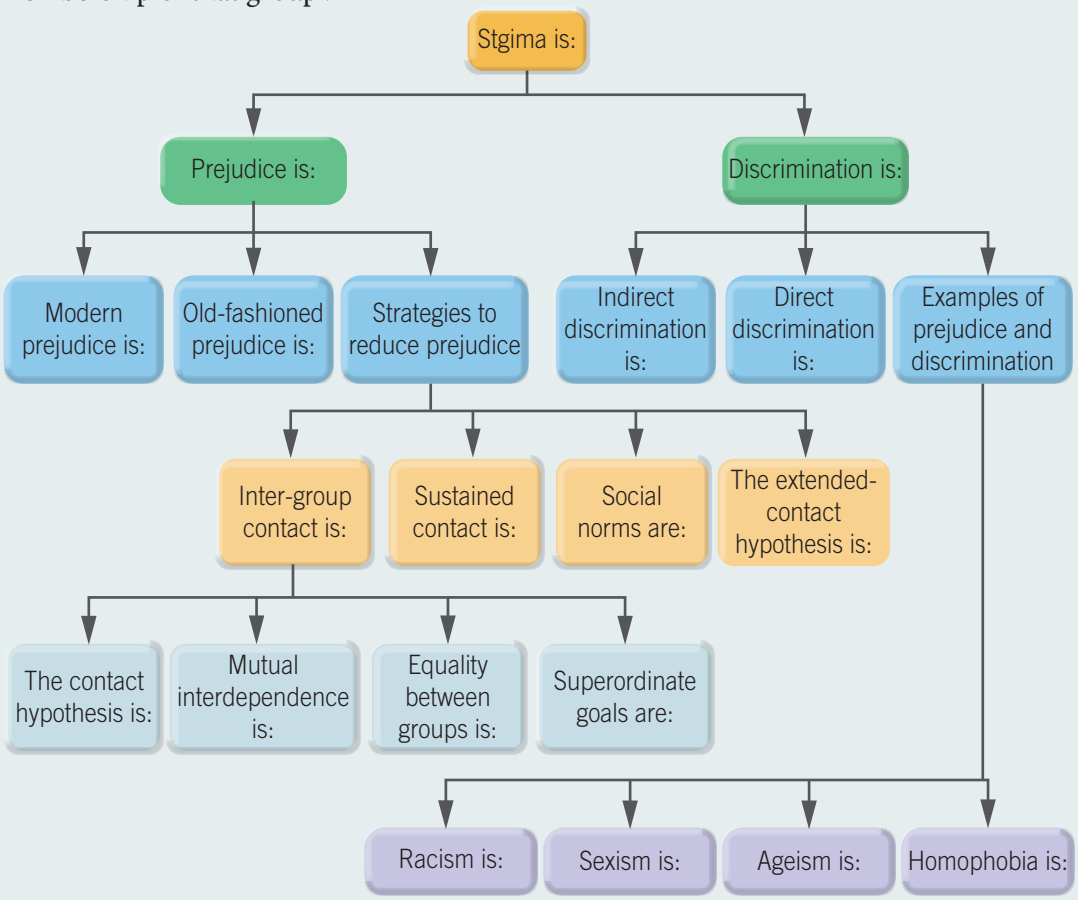
- Sustained contact: Julia could ensure that the Australian and Vietnamese students spend large amounts of time with each other, such as by playing in the classroom or outside during lunchtime.
- Superordinate goals: Julia could ensure that the two groups share goals that they can't achieve alone or without the assistance of the other group, such as by giving the students a big puzzle to solve together.

ISBN 978-1-009-25401-4 Gallagher et al

DOCUMENT 7D–1 PREJUDICE AND DISCRIMINATION FLOW CHART

ACTIVITY 7D–9 PREJUDICE AND DISCRIMINATION FLOW CHART

Print the copy of this prejudice and discrimination flow chart, which has space to add examples. After each 'is:' or 'are:' write a short definition or explanation of what each term means. For example, the text that could be added to 'Prejudice is:' could be 'possessing a negative attitude towards the members of a group based only on their membership of that group'.



Section 7D questions

1 Consider how old-fashioned and modern prejudice relate to direct and indirect discrimination.
2 Stephanie is a healthy 85-year-old woman. Although she hasn't been employed for several years, she used to be a teacher and decides to apply for a volunteer role at the Education Centre at the Queen's Gardens, a large, historic botanic gardens in the centre of the city. When she arrives for the interview, the interviewer simply laughs and tells her that she would be inappropriate for the role and that she'd be better off relaxing at a nursing home. Name and define the type of discrimination that the interviewer displayed towards Stephanie.
3 Explain one difference and one similarity between prejudice and discrimination.
4 Compare and contrast mutual interdependence and superordinate goals.
5 Using examples for each term, describe the interactions between stigma, prejudice and discrimination.
6 Ally is the boss of a small company that has staff from several different countries. She is aware that her staff don't get along well and believes this is due to the prejudicial attitudes that they hold towards each other. Identify and explain how Ally could use two strategies to reduce prejudice in her workplace.

ISBN 978-1-009-25401-4 Gallagher et al

Chapter 7 review

Summary

Create your own set of summary notes for this chapter on paper or in a digital document. A model summary is provided in the Teacher Resources, which you can use to compare with yours.

Checklist

In the Interactive Textbook, the success criteria are linked from the review questions and will be automatically ticked when your answers are correct. Alternatively, print or photocopy this page and tick the boxes when you have answered the corresponding questions correctly.

Success criteria – I am now able to:		Linked questions
7A.1	Explain what is meant by person perception, with reference to forming impressions of other people from physical cues, saliency detection and social categorisation, including relevant examples	1☐, 4☐, 17☐
7A.2	Explain what is meant by an attribution when explaining behaviour, with reference to internal and external attributions, including relevant examples	2☐, 16☐
7A.3	Explain what is meant by an attitude when interpreting, analysing, remembering and using information about the social world, including the tri-component model of attitudes and its limitations	3☐, 19a☐
7A.4	Apply my understanding of how the tri-component model allows us to interpret, analyse, remember and use information about the social world	18☐
7A.5	Explain what is meant by a stereotype, including its role in using information about the social world, decision-making and interpersonal interactions	5☐, 21a☐
7B.1	Explain what is meant by cognitive dissonance	6☐
7B.2	Explain how cognitive dissonance is avoided through cognitive biases, including actor–observer bias, anchoring bias, attentional bias, confirmation bias, false-consensus bias, functional fixedness, the halo effect, the misinformation effect, optimism bias, self-serving bias and the Dunning–Kruger effect, with reference to relevant examples	19b☐
7B.3	Apply my understanding of the cognitive biases used to avoid cognitive dissonance in real-world scenarios	7☐, 8☐
7C.1	Explain what is meant by heuristics as a mechanism for decision-making and problem-solving, including relevant heuristic examples such as availability, representativeness and affect	9☐
7C.2	Outline the positive and negative effect of using heuristics in decision-making and problem-solving	10☐
7C.3	Apply my understanding of how heuristics are used in decision-making and problem-solving in real-world scenarios	11☐, 20☐
7D.1	Explain what is meant by stigma, prejudice and discrimination, with reference to relevant examples such as sexism, racism, ageism, disability and homophobia	12☐, 21b☐, c☐

ISBN 978-1-009-25401-4

Success criteria – I am now able to:		Linked questions
7D.2	Explain how the interaction between stigma, prejudice and discrimination can influence a person's mental wellbeing	13☐, 21a☐, e☐
7D.3	Explain how stigma, prejudice and discrimination can be reduced, with reference to changing social norms, extended contact and inter-group contact (including sustained contact, mutual interdependence, superordinate goals and equality of status)	15☐
7D.4	Apply my understanding of how stigma, prejudice and discrimination in society influence a person's and/or group's mental wellbeing and ways to reduce prejudice and discrimination in real-world scenarios	14☐, 21d☐

Key Science Skills

Skills	Questions and Skills boxes
Process quantitative data using appropriate mathematical relationships and units, including calculations of percentages, percentage change and measures of central tendency (mean, median, mode), and demonstrate an understanding of standard deviation as a measure of variability	7B Key Science Skills Section 7B question – 5a Chapter review – 22a
Identify and analyse experimental data qualitatively, applying where appropriate concepts of: accuracy, precision, repeatability, reproducibility and validity; errors; and certainty in data, including effects of sample size on the quality of data obtained	7B Key Science Skills Section 7B questions – 6a, b Chapter review – 22b, c

Multiple-choice questions

1 Person perception is the process of
- **A** responding to how people behave.
- **B** classifying people into groups.
- **C** forming impressions of other people.
- **D** assuming that all members of a group are the same.

2 Inferences that we make about the causes of events, the behaviour of others, or our own behaviour, are known as
- **A** situational attribution.
- **B** attribution.
- **C** self-serving bias.
- **D** actor–observer bias.

3 According to the tri-component model of attitudes, the three components of an attitude are
- **A** thoughts, feelings and affects.
- **B** feelings, affectations and actions.
- **C** cognitive, attributive and behavioural.
- **D** cognitive, affective and behavioural.

4 Social categorisation involves
- **A** people's tendency to discriminate against others.
- **B** placing people into groups based on their characteristics.
- **C** a group being prejudiced against individuals in other groups.
- **D** making slurs against people due to their differences.

ISBN 978-1-009-25401-4 Gallagher et al

5 A positive influence of stereotyping is that it
- **A** quickly conveys information about a group, which allows the likely characteristics and behaviours of individual members of that group to be rapidly assessed.
- **B** reduces prejudice and discrimination by helping people understand the characteristics of others.
- **C** enables the quick identification of undesirable characteristics.
- **D** involves individuals not being labelled with the negative characteristics of their group.

6 Cognitive dissonance refers to
- **A** consistency between what you do and what your friends do.
- **B** a mismatch between what you do and what your friends do.
- **C** consistency between how you behave and how you believe you should behave.
- **D** a mismatch between how you behave and how you believe you should behave.

7 Matthew meets David for the first time, and really likes him. This is because David is friendly, well dressed and has a soothing voice. Therefore, Matthew has interpreted that David is likeable. Matthew's analysis relates to the psychological event known as
- **A** the halo effect.
- **B** attribution.
- **C** social cognition.
- **D** self-serving bias.

8 Which of the following examples shows the false-consensus effect?
- **A** Believing that your friend is vegan because she volunteers for PETA's animal rights campaigns
- **B** Believing that everyone must believe in a god because you believe in one
- **C** Believing that a classmate has a crush on you because your best friend told you so
- **D** None of the options above

9 There have been several news reports of violent crime in various cities. Olga is invited to an event in the city but turns it down because all she can think about is the danger of being attacked. This is an example of what type of heuristic?
- **A** Representativeness
- **B** Availability
- **C** Base rate
- **D** Accessibility

10 A strength of using the _____ heuristic is that it might encourage us to take bigger risks than we usually would if we are in a positive mood.
- **A** availability
- **B** affect
- **C** accessibility
- **D** representativeness

11 Identify the true statement about heuristics.
- **A** They help us decide something quickly, which can lead to an error in judgement.
- **B** They help us analyse something and make the right decision about it.
- **C** They help us evaluate whether a decision that we made was the best one, while showing us that sometimes we can be wrong.
- **D** They help us decide something quickly and show us that we are usually correct.

ISBN 978-1-009-25401-4 Gallagher et al

12 An example of discrimination is _____, while an example of prejudice is _____.
- **A** being fired due to poor performance; when an individual conforms to a group's stereotype
- **B** believing that all doctors are rich; avoiding a specific ethnic group
- **C** being hired for a job due to being related to the boss; being scared of people from an ethnic group
- **D** not hiring a female; buying coffee from a cafe because they offer loyalty points

13 The relationship between prejudice and discrimination is that
- **A** discrimination is a bias, and prejudice is a behaviour.
- **B** prejudice is an attitude, and discrimination is the behaviour that results from it.
- **C** prejudice is a stereotype, and discrimination is the bias against that stereotype.
- **D** prejudice and discrimination are both attitudes, but discrimination is more strongly held.

14 Mr Lardner wants to reduce racial prejudice at school. Which of the following would be the most effective method to do so?
- **A** Place the lower-status students in higher-status positions, such as prefects.
- **B** Have students engage in competitive tasks on an informal basis.
- **C** Educate the students and their parents about how dangerous prejudice can be.
- **D** Have students engage in cooperative tasks that are achievable.

15 In terms of inter-group contact, equality of status means
- **A** that the relationship between the two groups remains equal.
- **B** that the status, referring to power and influence between groups, must be equal.
- **C** that the status, referring to how persuasive each group is, must be equal.
- **D** the equity among the group members' combined ages.

Short-answer questions

16 Cara's car breaks down on her way to work. She believes that the breakdown happened because she was lazy and didn't service the car. Her partner, Christian, believes that the car broke down because it was old. Cara is making an _____ attribution, while Christian is making an _____ attribution. (2 marks)

17 Zahra met a boy at a party who wore board shorts, had blonde hair and was drunk and obnoxious. Zahra told her friend that he must be a surfer and that she couldn't stand surfers because they always drank too much. With reference to person perception, saliency and social categorisation, explain how Zahra arrived at her conclusions about the boy at the party. (4 marks)

18 Cardi hates cigarettes. Unfortunately, her new boyfriend smokes them. One day, Cardi and her boyfriend have an argument about smoking. Cardi tells her boyfriend that she would never smoke cigarettes because they make people smell bad and they are bad for people's health. Give examples of the three components of Cardi's attitude, using the tri-component model. (3 marks)

19 Nick is currently completing VCE and wants to study medicine at university when he leaves school. He recently went to see a careers counsellor and was informed that he needs to work much harder at school and at home if he wants to achieve a high enough ATAR score to study medicine. Although Nick believes that he needs to work harder to do well, he dislikes studying and finds himself spending most nights playing games on the internet instead of doing his homework.
- **a** Outline one way that Nick may have formed this attitude towards studying. (1 mark)
- **b** Explain how Nick could reduce the cognitive dissonance he is experiencing, with reference to two cognitive biases. (2 marks)

20 You have been watching TV and you see multiple commercials for a certain fast food chain. Every time you see the commercial, you laugh and smile. One night you go out to eat, and you decide to select that fast food chain. Identify the heuristic in this scenario and explain how it has influenced your behaviour. (3 marks)

ISBN 978-1-009-25401-4 Gallagher et al

21 After seeing a news report on the death of Martin Luther King Jr in 1968, Jane Elliot was interested in how normal Americans would act if they were placed in a 'superior' group, and how this might influence discriminatory behaviour towards an 'inferior' group. The following day, Elliot announced to her third-grade students in a small, all-white rural community that they all had to participate in an experiment. In this experiment, Elliott designated the blue-eyed children as the superior group and the brown-eyed students as the inferior group. To make it more realistic, the blue-eyed children were given extra privileges, and they were constantly given compliments. The brown-eyed children weren't given any privileges, and they were repeatedly insulted. Elliott measured the success of her experiment by counting the number of discriminatory acts against the inferior group. Elliott observed that the students' reactions to the discrimination exercise showed immediate changes in their personalities; the blue-eyed children became arrogant and bossy, and the brown-eyed children became increasingly timid. The blue-eyed children also became nasty and refused to play with their brown-eyed classmates. The academic results of the blue-eyed children also improved, with some doing much better than ever before. It was clear that the children in the 'inferior' group were being negatively affected by the prejudice that they were experiencing, and that the 'superior' group was thriving. One day, Elliott reversed the exercise. Although the brown-eyed children started to behave as the blue-eyed children had the previous day, their behaviour was not as intense (undoubtedly because they knew what being in that position was like). Later that day, Elliot ended the activity by discussing the experiment with her class regarding how they felt when they were in the 'inferior' group and experienced discrimination. Together with her class, Elliott had found that when individuals are placed in a 'superior' group, they will likely exhibit discriminatory behaviour towards the members of an 'inferior' group.

a Provide an example of a stereotype from Jane Elliott's experiment and outline how this might have led to the children's acts of discrimination. (2 marks)

b Identify and define the form of discrimination that was being tested in Jane Elliott's experiment. (2 marks)

c Identify and explain the main factor that would have contributed to the formation of prejudice in Jane Elliot's experiment. (2 marks)

d Identify three characteristics that can effectively reduce prejudice. (3 marks)

e List two ways that discrimination affected the behaviour of those in the brown-eyed group. (2 marks)

22 Mr Ford was interested in reducing the prejudicial attitudes he observed between the students in his school. To do this, he tested which strategy to reduce prejudice was the most effective. Mr Ford used his biology and physical education classes as participants for the study. Both classes were given a prejudice scale before and after using a strategy to reduce prejudice. Consider the results below.

	Mean prejudice rating before using strategy (out of 10)	Mean prejudice rating after using strategy (out of 10)
Sustained contact	8.9	6.8
Extended contact	9.5	6.6

a Explain the results shown in the table. (1 mark)

b When one participant recorded their results, they incorrectly interpreted the scale as 1 being the highest prejudice rating and 10 being the lowest prejudice rating. Identify this type of error and describe what should be done to fix it. (2 marks)

c If the researcher wanted to obtain extra data for this study using the same participants, would they use the process of repeatability or reproducibility? (2 marks)

ISBN 978-1-009-25401-4 Gallagher et al

UNIT 2

HOW DO INTERNAL AND EXTERNAL FACTORS INFLUENCE BEHAVIOUR AND MENTAL PROCESSES?

CHAPTER 8

INDIVIDUAL AND GROUP BEHAVIOUR

Introduction

You probably already realise that other people can noticeably influence the way you act and the choices you make. Consider how you might behave in a situation if you were by yourself, compared to when there are other people in the room. The choices you make and the behaviours you display might depend on how many people are present – and on who they are. In this chapter, we will investigate the different ways in which others influence us, especially in terms of obedience and conformity, and how groups affect the power and status of individuals.

Curriculum

Area of Study 1 Outcome 1
Factors that influence individual and group behaviour

Study Design:	Learning intentions – at the end of this chapter I will be able to:
• The influence of social groups and culture on individual behaviour	**8A The influence of social groups and culture on individual behaviour** **8A.1** Explain what is meant by a group and a collective, with reference to their key characteristics and appropriate examples **8A.2** Explain what is meant by status and power (including the types of power), with reference to Zimbardo's Stanford Prison Experiment **8A.3** Explain what is meant by groupthink, group shift and deindividuation, with reference to the reasons why these processes occur and appropriate examples **8A.4** Explain what is meant by individualist and collectivist cultures and outline how this influences individual behaviour, with reference to self-image, relationships, use of social support and decision-making processes **8A.5** Apply my understanding of the concepts of social groups and culture, as well as my understanding of their relative influence on individual behaviour, with reference to appropriate examples

ISBN 978-1-009-25401-4 Gallagher et al

Study Design:	Learning intentions – at the end of this chapter I will be able to:
• The concepts of obedience and conformity, and their relative influence on individual behaviour	**8B The relative influence of obedience and conformity on individual behaviour** **8B.1** Explain what is meant by obedience, with reference to Milgram's 1963 experiment on obedience, the influences on obedience (i.e. social proximity, group pressure and legitimacy of the authority figure) and the ethics of Milgram's study **8B.2** Explain what is meant by conformity, with reference to Asch's 1951 experiment on conformity, the influences on conformity (i.e. normative influence, informational influence, group size, culture, unanimity, social loafing and deindividuation) and the ethics of Asch's experiment **8B.3** Apply my understanding of the concepts of obedience and conformity and my understanding of their relative influence on individual behaviour, with reference to appropriate examples
• Positive and negative influences of different media sources on individual and group behaviour, such as the changing nature of social connections, social comparison, addictive behaviours and information access	**8C Positive and negative influences of media on individual and group behaviour** **8C.1** Explain what is meant by different media sources, such as advertising, TV, video games, news sources and social media **8C.2** Outline how different media sources (e.g. advertising, TV, video games, news sources and social media) can positively and negatively influence individual and group behaviour, with reference to the changing nature of social connections, social comparison, addictive behaviours and information access **8C.3** Apply my understanding of how different media sources positively and negatively influence individual and group behaviour to real-world scenarios and examples
• The development of independence and anti-conformity to empower individual decision-making when in groups	**8D The development of independence and anti-conformity** **8D.1** Explain what is meant by independence and anti-conformity in relation to decision-making, with reference to the differences between conformity, anti-conformity and independence and to the factors that affect anti-conformity and independence (i.e. majority versus minority, personality, culture and ambiguity of the task) **8D.2** Outline how independence and anti-conformity develop, with reference to psychological reactance, the need for uniqueness and the social impact theory **8D.3** Apply my understanding of the development of independence and anti-conformity to empower individual decision-making to real-world scenarios and examples

ISBN 978-1-009-25401-4

Key Science Skills

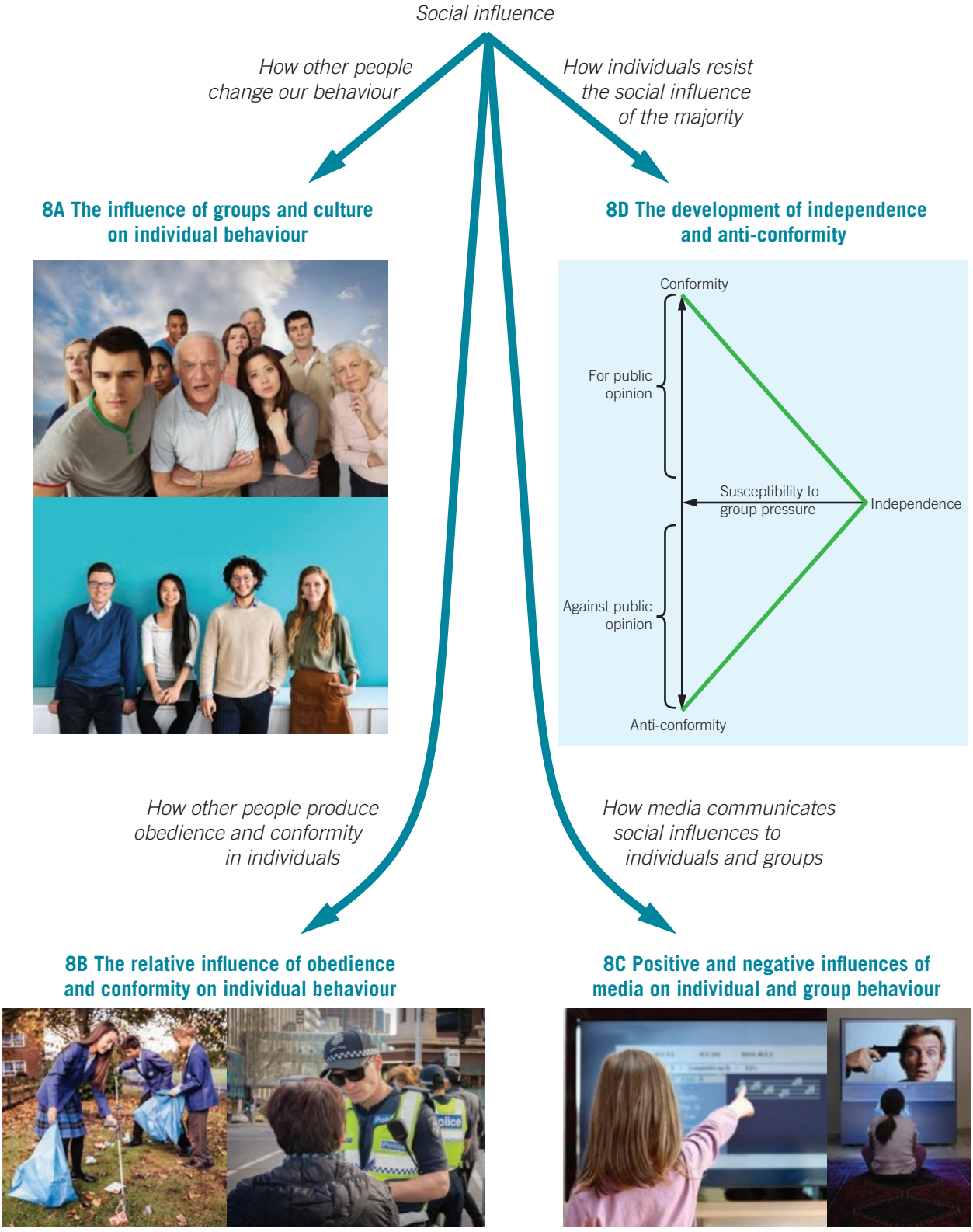
- Evaluate investigation methods and possible sources of error or uncertainty, and suggest improvements to increase validity and reduce uncertainty
- Distinguish between opinion, anecdote and evidence, as well as scientific and non-scientific ideas

Glossary

Addiction
Advertising
Anti-conformity
Collective
Collectivist cultures
Confederate
Conformity
Culture
Deindividuation
Deviate
Dopamine
Downward social comparison
Fear of missing out
Group
Group pressure
Group shift
Group size
Groupthink
Immediacy
Independence
Individualist cultures
Information access
Informational influence
Legitimacy of the authority figure
Media
Modal
News
Non-conformity
Normative influence
Obedience
Power
Psychological reactance
Role
Situational strength
Slider
Social comparison
Social connections
Social impact theory
Social influence
Social loafing
Social media
Social proximity
Status
Television (TV)
The need for uniqueness
Trans-situational strength
Unanimity
Uniqueness
Upward social comparison
Video game

ISBN 978-1-009-25401-4

Concept map



See the Interactive Textbook for an interactive version of this concept map interlinked with all concept maps for the course.

ISBN 978-1-009-25401-4 Gallagher et al

8A The influence of social groups and culture on individual behaviour

Study Design:
The influence of social groups and culture on individual behaviour

Glossary:
Collective
Collectivist cultures
Culture
Deindividuation
Group
Group shift
Groupthink
Individualist cultures
Power
Role
Social influence
Status

ENGAGE

The 2011 London Riots

On 6 August 2011, a week of violence began with a peaceful protest outside Tottenham Police Station (London, UK). The crowd gathered to protest Mark Duggan, a 29-year-old Black British man, being shot dead by armed officers who suspected that he had a gun. The crowd quickly turned violent and sparked a series of sporadic rioting, looting and arson attacks that erupted across London and other parts of the country.

Lance Francis, who was jailed for 14 years for rioting and arson after firebombing a police station in Nottingham, said that 'something came over people' during the week of riots. 'There was a mist in the air; that's the only way to describe it', he said. 'Something came across people. I didn't even know if something was going to happen to me; you could see different gangs walking around with bricks, knives'. Francis claimed that gangs had even called a truce with each other so they could join in the mayhem, turning their attention away from each other and towards the police. 'People started texting each other and saying, "Let's stop the violence against each other and go and cause mayhem"'. Francis continued: 'We were like a rabid pack of dogs. It was freedom, and I think it released tension inside. People were slashing tyres, breaking fences, slashing car windows. The further we went, the more rabid we became; random citizens got attacked. Everyone's heart went black that day'.

Francis was jailed in 2012 for attacking the Canning Circus police station on 9 August 2011; he stated that he was swept away by mob mentality at the time, and he only realised how serious the riots were later. 'At the time, it was like, are people doing this?' he said. 'Even in my heart, I thought, "This is a bit too mad, this". When I got home, and I saw the news, this has gone over the top, and this was like "Woah"'.

Meanwhile, Katie Lovett, who was convicted of looting a stationery shop in Croydon, admitted that she was swept

Figure 8A–1 During the 2011 London riots, people ran wild, looted property and firebombed vehicles and buildings.

ISBN 978-1-009-25401-4 Gallagher et al

up in the 'free for all of the riots'. 'I came out of my door and could see people running in and out of the shop; as I was on my way down, I thought "I'm having some of that" … I didn't have any time to think, "hold on a minute, there are consequences, it was just like a free for all"'.

Source: Adapted from Greep, M. (2021, 10 August) We were like a rabid pack of dogs, *Daily Mail*

EXPLAIN

Social influence

Social influence how people change their behaviour or attitudes due to the direct or indirect influence of others

The behaviour described in the introduction to this chapter – regarding your choices and behaviours depending on who is present – is attributed to **social influence**. This concept refers to how people change their behaviour or attitudes due to the direct or indirect influence that they encounter. Social psychology is a branch of psychology that investigates how people think about, interact with, influence and are influenced by other people's thoughts, feelings and behaviours. Social psychologists aim to understand how people influence others and are influenced by them in return. The term 'social influence' may seem to have negative connotations, as we like to think that we are individuals who are capable of independent thoughts, feelings and emotions. However, we are social creatures – so it stands to reason that we are influenced by the people we spend most of our time with. There are probably times when you might have done something you didn't want to, because you were influenced by someone else. This could be something as simple as tidying your room because you had a friend coming over that you wanted to impress, or something more complex, such as engaging in bullying behaviour because you wanted to fit in with a certain group of people. In this sense, social influence can be positive or negative, and weak or strong.

Figure 8A–2 Your choices and behaviours can depend on who is watching you – this is social influence at its simplest and most direct. How would you feel if you were performing a task while being watched by these two groups?

Consider the different groups you belong to. These might include your family group, friendship group, any sports team you joined and even each of your classes at school. In each group, you might find that your thoughts, feelings and behaviour change depending on who else is in the group with you. For example, you might be more outgoing at school when you are with your friends but quieter and more reserved when you are by yourself at home. Or you may tend to adhere more closely to the norms of the sporting team to which you belong, but be more likely to speak your mind when you are in your English class. The influence of groups on individual behaviour can be apparent, like doing what a teacher tells you to do, or more subtle, like developing opinions that are similar to those of your school friends. In this section, we explore the characteristics of a group and how they can influence individual behaviour in various ways.

ISBN 978-1-009-25401-4 Gallagher et al

VIDEO 8A–1
INFLUENCE OF GROUPS

What is a group?

Three people are studying together for a test. Two other people are taking a walk together. Twenty people are working together to build a house. What do each of these scenarios have in common? They are each an example of a group. In social psychology, a **group** can be defined as two or more people who interact with and influence one another and work towards a common goal.

Moreover, to be a valid group, people must feel that they are part of that group. According to this definition, 20 people watching the same movie in a cinema aren't considered a group because they likely won't interact with other people in the cinema or influence them at that time.

If the characteristics mentioned above aren't present, then this collection of people is called a **collective** – which in psychology is used to mean a collection of people who exert minimal influence on each other and don't interact with every other person. Although they gathered together at the same time and for the same reasons, and may even be influenced by external factors in similar ways, they cannot be considered a group (as defined above) unless they exert influence on each other. Therefore, the previous example of people watching the same movie in a cinema is an example of a collective.

Group
two or more people who interact with and influence one another and work towards a common goal

Collective
a collection of people who exert minimal influence on each other and don't interact with every other person in the collection

Figure 8A–3 A rowing team has all the required characteristics to be considered a group, but an audience at a concert does not.

ACTIVITY 8A–1 GROUP OR COLLECTIVE?

Decide whether the following are examples of groups or collectives. Organise the examples in a simple two-column table.

a People waiting to board a plane
b People shopping in the same store
c People sitting in the same psychology class
d People playing on a soccer team
e People cheering for the soccer team
f People in the same family
g People running the Melbourne marathon
h Penguins huddled together in the Antarctic winter
i People watching the AFL Grand Final on TV
j Your friends who sit with you at lunchtime

ISBN 978-1-009-25401-4 Gallagher et al

Status and power within groups

Within a group, each group member has a discernible status. **Status** refers to the level of importance (whether real or imagined) that group members perceive regarding another group member's position in that group. Consider your family group or your English class. Who has the highest status? In your family, it might be your mother or father, while in your classroom, it would probably be your teacher. Who has the lowest status? In your family, it might be your pet dog, and in the classroom, it might be you! Does each person have a similar level of influence or control over others in the group? Can we describe your teacher and you as having equal power in class? The answer to both of these questions is probably no.

Status
the level of importance (real or imagined) that group members perceive regarding another group member's position in that group

Figure 8A–4 Armed forces such as the Royal Australian Navy have a distinct hierarchy in which a commanding officer has a higher status than a sailor.

Status also affects the amount of power that someone has in a group. **Power** is an individual's ability to control or strongly influence the thoughts, feelings and behaviour of another person or group. Power isn't necessarily a bad thing – indeed, it's part of our everyday interactions with others. Most human relationships typically involve power to some degree, even if one or both parties are unaware of how their power affects others. There are many situations in which one individual will consciously and deliberately try to use their power to sway the opinions or behaviour of others. For example, your parents have the power to give you money if you clean your room and a teacher has the power to give you detention if you don't submit your homework. As another example, a fire truck has the power to stop traffic so that the firefighters can get to the emergency as quickly as possible.

Power
an individual's ability to control or strongly influence the thoughts, feelings and behaviour of another person or group

Individuals generally use different types of power in different situations, and they often use more than one type of power at the same time to influence another person or group. Various kinds of power are summarised in Table 8A–1 on the next page.

ISBN 978-1-009-25401-4 Gallagher et al

Table 8A–1 Types of power

Type of power	Definition	Example	
Coercive power	A person or agency has the ability to punish.		The police have coercive power.
Expert power	A person or agency has specialist knowledge and skills.		An IT consultant or technician has expert power.
Informational power	A person or agency has useful information that isn't readily available elsewhere.		A librarian has informational power.
Legitimate power	A person or agency with a formally recognised position in an organisation to exert rights over others and prescribe behaviour in others.		Members of parliament have legitimate power.
Referent power	A person or agency has the quality of being idolised or adored as a role model.		The Pope has referent power (in addition to several other types).
Reward power	A person or agency has the ability to reward behaviour positively or by removing negative effects.		Parents have reward power (and possibly other types).

ISBN 978-1-009-25401-4 Gallagher et al

Status and power in a group are linked to the roles that everyone has in the group. A **role** is a behaviour adopted by an individual or allocated to them that influences how they function or act in different situations. Each person has many roles in everyday life. For example, one person can have the roles of mother, daughter, friend and IT consultant all at once. Roles can also be temporary (e.g. being a student) or permanent (e.g. being a parent or sibling). They are essential to group dynamics because they carry expectations of how everyone should behave in different situations.

Role
the behaviour adopted by an individual or assigned to them that influences how they function or act in different situations

Once a role is taken on, the members of a group usually expect the individual to behave in a way that is consistent with the role. For example, in a school setting, a student will expect a teacher to teach them content, give them homework and promptly mark their assessments. Role expectancies strongly influence how an individual behaves in a group, especially when their role provides a considerable amount of status and power.

ACTIVITY 8A–2 TYPES OF POWER

With a partner, discuss the type of power the following people would most likely have. (Hint: Each person may have more than one type of power.)

a Year 12 student
b Judge
c Paediatrician
d Psychologist
e Army captain
f Famous actor
g Coroner
h Radio host

Check-in questions – Set 1

1 Describe how group influence can be positive or negative.
2 Describe the features of a group, with reference to an example not used in the text.
3 Explain how a collective is different from a group. Give an example of a collective.
4 Define the following terms and provide an example.
   a Status
   b Power
   c Role
5 Outline the difference between the following types of power.
   a Reward and coercive power
   b Expert and informational power
   c Referent and legitimate power
6 Can you think of an example in your life when someone used their power over you? Describe the situation and type of power that was used.

ISBN 978-1-009-25401-4

Zimbardo's Stanford Prison Experiment

In 1971, Dr Philip Zimbardo investigated the power of assigned roles and how the associated levels of status and power affected behaviour. He wanted to find out whether the reported brutality of guards in United States prisons was due to their personalities or the prison environment.

In what is famously known as the Stanford Prison Experiment, Zimbardo converted a basement in Stanford University's psychology building into a mock prison. Zimbardo then placed an advertisement in the local paper that asked young males to participate in a study that explored prison life. The study was planned to run for two weeks, and participants would be paid US$15 per day for their participation (a considerable amount of money at the time). Seventy-five male university students applied for the study and underwent a range of psychological interviews and tests. Of the 75 who applied, 24 were deemed psychologically fit to participate in the experiment.

Figure 8A–5 The prisoners and guards both wore uniforms that denoted their status.

The selected males were randomly allocated the role of 'prisoner' or 'guard'. Of the 24 selected participants, only 18 were needed – nine 'guards' and nine 'prisoners' – so the rest of the participants acted as replacements if required.

For the prisoner role, the males wore only a smock with their number written on it, with no underclothes. They also wore a tight nylon cap to cover their hair and a locked chain around one ankle. Each prisoner was called only by his assigned number, and the prisoners themselves could only refer to themselves and other prisoners by their number.

All guards dressed in identical uniforms of khaki, wore whistles around their necks and carried clubs borrowed from the police. The guards also wore mirrored sunglasses so that making eye contact with prisoners was impossible. Three guards worked in eight-hour shifts at a time, while the other guards remained on call. Zimbardo instructed the guards to do whatever they thought was necessary to dominate the prisoners, maintain law and order in the prison and command the prisoners' respect – though no physical violence was permitted. Zimbardo not only observed the behaviour of the prisoners and guards but also acted as a prison warden.

ISBN 978-1-009-25401-4 Gallagher et al

THE STANFORD PRISON EXPERIMENT

Day 1

Prisoners were mock-arrested at their homes by real police to make the experiment as authentic as possible. They were searched, had their fingerprints taken and then charged with committing a crime. They were then blindfolded, driven to the mock prison, stripped of their clothes and possessions, deloused and given prison clothes and bedding. At 2:30 am, the prisoners were woken up by loud whistles for the first of many 'counts', which were designed to familiarise the prisoners with their numbers. Some guards took the opportunity to control the prisoners. They taunted the prisoners with insults and petty orders, giving them pointless tasks, such as push-ups.

Day 2

A rebellion broke out on the morning of the second day. The prisoners removed their nylon caps, ripped off their numbers and barricaded themselves inside the cells by positioning their beds against the door. To reassert control, the guards sprayed fire extinguishers at the prisoners. The three backup guards were called in to help regain control of the prison. To subdue the prisoners, the guards removed the prisoners' clothes and mattresses. The ringleaders of the prisoner rebellion were placed into solitary confinement, while those who didn't participate were given better food and placed into more comfortable cells as a reward.

Day 3

Prisoners rewarded for not rebelling were returned to their previous cells.

The guards became more aggressive – they made the prisoners perform humiliating acts like walking like a monster and telling other inmates that they 'loved' them. They restricted access to bathrooms and forced prisoners to relieve themselves in buckets. The prisoners felt severely traumatised and dehumanised, and they became increasingly passive.

One prisoner had an apparent mental breakdown and yelled that he couldn't take it anymore. Although Zimbardo tried to convince the prisoner to stay, he was ultimately released.

Day 4

The inmates started distancing themselves from one another. The rioters believed that the other prisoners were snitches, while the other prisoners believed that the rioters were a threat to their comfort.

Over the next two days, two more prisoners were released due to stress. Prisoner 819 began crying in his cell, so a priest was brought in to speak with him; however, Prisoner 819 refused to talk and instead asked for a medical doctor. After hearing him cry, Zimbardo reassured Prisoner 819 of his actual identity and escorted him out of the prison. As they left, the guards encouraged the remaining inmates to loudly and repeatedly chant that '819 is a bad prisoner'.

Day 5

Friends and relatives of the prisoners were allowed to visit. The cells were cleaned and polished, and the prisoners were showered, shaved and fed to create a good impression. Some of the participants' parents complained, but none insisted that their sons be released.

On the fifth day, a rumour about an attempt to escape had spread. Although this rumour was completely false, it angered the guards so much that they increased their abuse even further.

Day 6

Although Zimbardo (shown here in the role of prison warden) had intended for the experiment to run for two weeks, he terminated it on the sixth day due to the emotional breakdowns of prisoners and the excessive aggression of the guards.

Figure 8A–6 A summary of the events of the Stanford Prison Experiment

ISBN 978-1-009-25401-4 Gallagher et al

Figure 8A–7 Debriefing with participants after the early end of the experiment.

Christina Maslach, who had just completed her PhD at Stanford University, stopped by to observe the experiment and strongly objected when she saw the guards abusing the prisoners. Filled with outrage, she said, 'It's terrible what you are doing to these boys!' Out of the over 50 outsiders who had seen the prison, she was the only one who ever questioned its morality. She ultimately contributed to Zimbardo's decision to terminate the experiment (and she later became his wife).

After the experiment, Zimbardo noted, 'It wasn't until much later that I realised how far into my prison role I was at that point – that I was thinking like a prison superintendent rather than a research psychologist'. He agreed that it was a big mistake for him to have taken those two roles.

Given the results of his experiment, Zimbardo suggested that people will readily conform to the social roles they are expected to play. The behaviour of normal, well-educated men can be significantly affected when they are given a role that involves considerable power and status. In this case, the role of prison guard carried significant power and status, which resulted in the guards quickly adapting to their new, unfamiliar roles and becoming dominating, powerful and coercive. In contrast, the role of prisoner carried minimal status and little power; these participants couldn't avoid or resist the guards' misuse and abuse of power, which increased their feeling of being dehumanised and traumatised and their timid and passive behaviour. Overall, the Stanford Prison Experiment demonstrated the extreme effects of status and power on behaviour.

WORKSHEET 8A–1 STANFORD PRISON EXPERIMENT

ACTIVITY 8A–3 DESIGN AN EXPERIMENT

In small groups, design another experiment or simulation to test how roles affect status and power. Make sure that you include the experiment's aim, hypothesis and method (i.e. selection of participants, materials and procedure). As a whole class, discuss the advantages and disadvantages of the experiment that you designed.

ISBN 978-1-009-25401-4 Gallagher et al

Limitations and criticisms of Zimbardo's experiment

Zimbardo's experiment has provided valuable insights into how status, roles and power influence human behaviour. However, although Zimbardo's experiment was passed by an ethics committee at the university, his experiment has understandably been criticised. Table 8A–2 outlines the various methodological and ethical criticisms of Zimbardo's study.

Table 8A–2 Methodological and ethical issues in the Stanford Prison Experiment

Methodological issues	
Biased sample	Zimbardo used a non-random sample, as the participants were recruited through a newspaper advertisement. Further, his participants included only white males. Therefore, he could not generalise his results to females or non-white individuals.
Not replicated	Zimbardo's experiment was only conducted once. Because it wasn't replicated, the experiment has low reliability.
Ethical issues	
No harm principle	The participants who played the role of prisoner were not protected from psychological harm, and they experienced many incidents of humiliation and distress (e.g. one prisoner was released after 36 hours due to uncontrollable bursts of screaming, crying and anger). However, Zimbardo held extensive group and individual debriefing sessions, and all participants returned post-experimental questionnaires (several weeks after the experiment, then several months after and then at yearly intervals). Zimbardo concluded that there were no lasting adverse effects due to his experiment.
Withdrawal rights	Participants had the right to leave at any time, but Zimbardo could have affected this when he attempted to convince one prisoner to stay in the experiment when he wanted to leave. Further, although Zimbardo argued that the participants chose to remain in the experiment, the right to withdraw was compromised because 'the prisoners reinforced a sense of imprisonment by telling each other that there was no way out'.
Informed consent	This experiment lacked fully informed consent, as Zimbardo himself didn't know what would happen in the experiment (it was unpredictable). Further, the prisoners didn't consent to being 'arrested' at home.

In addition to these criticisms, one of the guards challenged the reality of the experimental set-up. He assumed that the purpose of the experiment was to reveal the brutal behaviour of guards, so he deliberately acted that way: 'Somebody ought to stir things up here', he said, further claiming that he was running 'his own little experiments'.

The volunteer prisoner who had the mental breakdown on the second day was initially told that he couldn't leave, so he decided to 'act crazy' to be released. Although he was acting, he also stated afterwards that he had never felt so hopeless, upset and out of control. Zimbardo agreed that this participant started from a state of 'make believe', but he also stated that he crossed a boundary into a state of being 'excessively disturbed' rather than 'really crazy'.

At the conclusion of a BBC documentary focusing on the Stanford Prison Experiment, Zimbardo said, 'None of the good guards ever intervened in the behaviour of the guards who gradually became more and more sadistic. We like to think there is this core of human nature that good people can't do bad things … the sad message is, in this case, the evil place won over the good people.'

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 2

1 How were the participants of the Stanford Prison Experiment selected?
2 Why were the guards and prisoners given uniforms to wear?
3 On the second day, what did the prisoners do to show their objection to their situation?
4 List three methods that the guards used to dehumanise the prisoners.
5 What eventually happened to the behaviour of the prisoners and guards?
6 How long did the experiment last? Why was it cut short?
7 Do you think the prisoners and guards experienced any lasting effects due to the experiment? Explain your answer.

Groupthink

Groupthink when group members' desire to maintain group loyalty becomes more important than making the best choices

Think about the last time you were part of a group – such as during a school project. Imagine that someone suggests an idea that you think is awful. However, everyone else in the group agrees that the idea is great, and the group seems intent on continuing with the idea. Do you tell them that you disagree or do you go along with the majority? If you chose to go along with the majority, then you have just experienced groupthink. **Groupthink** occurs when people's desire to maintain group loyalty becomes more important than making the best choices.

A group might encounter situations in which all group members think arriving at a unanimous decision is more important than carefully considering all options to find the most beneficial decision. Groupthink occurs when people set aside their personal beliefs or adopt the opinion of the rest of the group because they desire social cohesiveness – even if they disagree with the group's idea, thought or decision. Groupthink can range from not expressing doubts and judgements to ignoring the potential ethical or moral consequences of group actions. In many cases, people engage in groupthink when they fear that their protests might disrupt the group's harmony or when they are unsure whether their ideas might cause other members to reject them.

Figure 8A–8 Groupthink occurs when people's desire to maintain group loyalty becomes more important than making the best choices.

NOTE

Healthy disagreement has been linked to more creative thinking and greater innovation within organisations. Asking one person to deliberately take an opposing view and argue with the solutions proposed by the majority is one strategy that has been shown to be effective against groupthink.

Consider the following example. You are eating lunch with your friends when your best friend says that they like the new sci-fi show that just came out on Netflix. You haven't seen the show, but you don't like sci-fi, so you remain quiet. However, your other friends agree that it's a good show and start discussing the plot and characters in depth. Your best friend

ISBN 978-1-009-25401-4 Gallagher et al

suggests that you all go to her house after school to binge-watch the rest of the show. You are stuck. You don't want to watch the show at all! However, you agree to go because you don't want to 'rock the boat' and have your friends judge you negatively.

As group discussions follow this pattern over time, members with opposing opinions begin to believe that their views conflict with the majority. This encourages them to withhold information and ideas that they fear will be met with disapproval from other members.

Figure 8A–9 The eight symptoms associated with groupthink. Note that 'collective' in the term 'collective rationalisation' just means rationalisation by members acting as group, not a collective as defined earlier in the chapter.

Several factors can influence groupthink, and it is more likely to occur when:

- group members are highly similar (if there is a strong group identity, then group members tend to perceive their group as being right or superior, and they express scorn or dissatisfaction towards people outside the group)
- a powerful and compelling leader commands the group
- people lack personal knowledge of something or feel that other group members are more qualified
- the group experiences extreme stress or moral dilemmas.

ISBN 978-1-009-25401-4 Gallagher et al

Although groupthink allows groups to make decisions, complete tasks and finish projects quickly, it often results in poor decision-making. This in turn results in better options being overlooked and people ignoring their basic desire to provide alternatives, critiques or a new opinion. This further results in poor decision-making, unmet goals and unsuccessful problem-solving. Groupthink can be damaging in minor situations – but it can have dire consequences in other specific settings.

Figure 8A–10 Groupthink can result in poor decisions, ranging from the relatively innocuous, such as skipping class, to the deadly serious that cost lives and have long-lasting effects, such as the Vietnam War.

For example, after the space shuttle Challenger exploded 73 seconds after lift-off in 1986, investigators discovered that a series of poor decisions had led to the deaths of seven astronauts. The day before the launch, engineers had warned NASA flight managers that the O-ring seals on the booster rockets would fail in the freezing temperatures that were forecast for that morning. NASA personnel overrode the scientific facts presented by the experts in their fields and fell victim to groupthink. When flight readiness reviewers received approval for launch from lower-level NASA managers, no mention was made of the engineers' objections. The shuttle launched as scheduled, but the result was catastrophic.

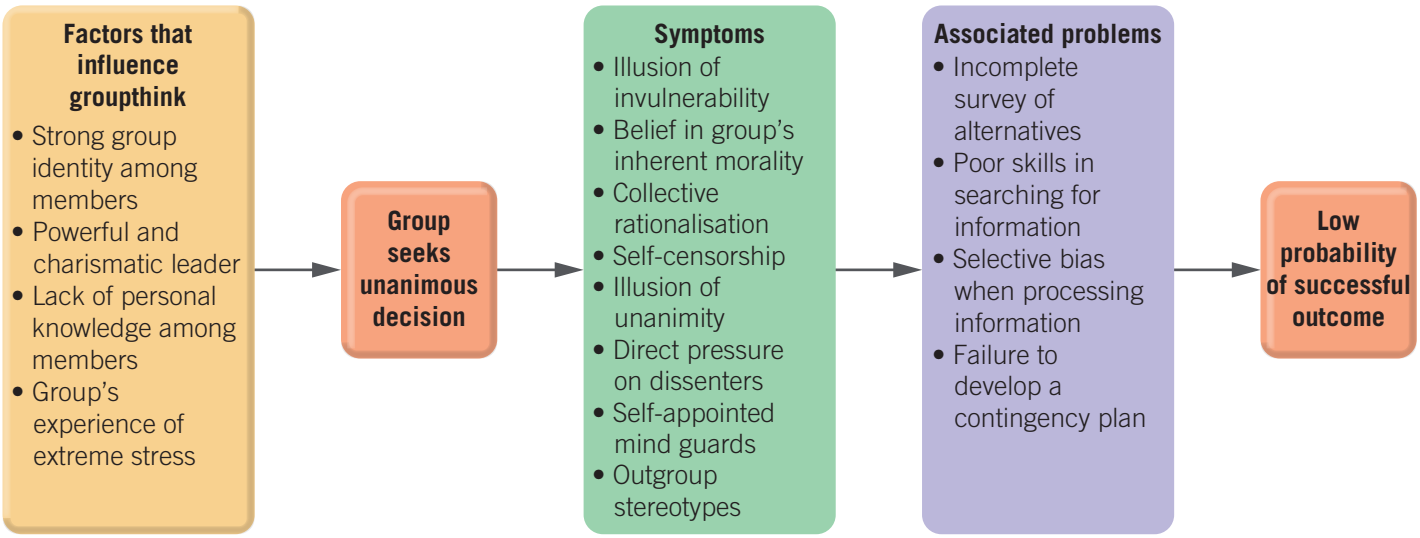


Figure 8A–11 The interaction between the factors that influence groupthink, the symptoms of groupthink and the associated problems

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 8A–4 EXAMPLES OF GROUPTHINK

There are many examples in human history of people participating in groupthink situations – and some of these situations have led to disastrous events. In small groups, research two of the following groupthink examples:

- the Salem witch trials
- the bombing of Pearl Harbour
- Kendall Jenner's Pepsi advertisement
- Nazi Germany.

Group shift

In 1961, an MIT student named James Stoner developed the 'risky shift' theory, which suggests that the decisions made as part of a group are much riskier than those made as an individual before the group has met. To prove this theory, Stoner conducted a test that presented subjects with a hypothetical situation in which they had to judge whether an individual's decision would prove beneficial or risky. After the subjects filled out a list of probabilities, Stoner recorded their results, and the subjects were asked to discuss the situation with a group. The findings showed that the subjects chose a safer course of action in their recordings, but a riskier approach when they were in the group discussion.

Stoner's theory inspired much research, and the idea was eventually renamed group shift. **Group shift** occurs when discussion leads a group to adopt attitudes or actions that are more extreme than the initial attitudes or actions of the individual group members. Consider a book club in which individuals read books ahead of time and discuss them with other group members. An individual might believe that the book was all right, though a little bland, and other members of the book club might also share this opinion. However, when the book club gathers and discusses the book, the group amplifies the good elements of the book – and the group members leave with a more favourable opinion of the book than when they arrived.

Group shift when discussion leads a group to adopt attitudes or actions that are more extreme than the initial attitudes or actions of the individual group members

Figure 8A–12 Group shift can result in antisocial behaviours, such as rioting and looting, as well as pro-social behaviours, such as charity work.

With this phenomenon, group debate causes a dramatic shift in members' attitudes, moving them towards a more extreme version of the attitude they were already leaning towards before the debate. As a result, conservative types become more cautious, and aggressive types end up taking more risks.

ISBN 978-1-009-25401-4 Gallagher et al

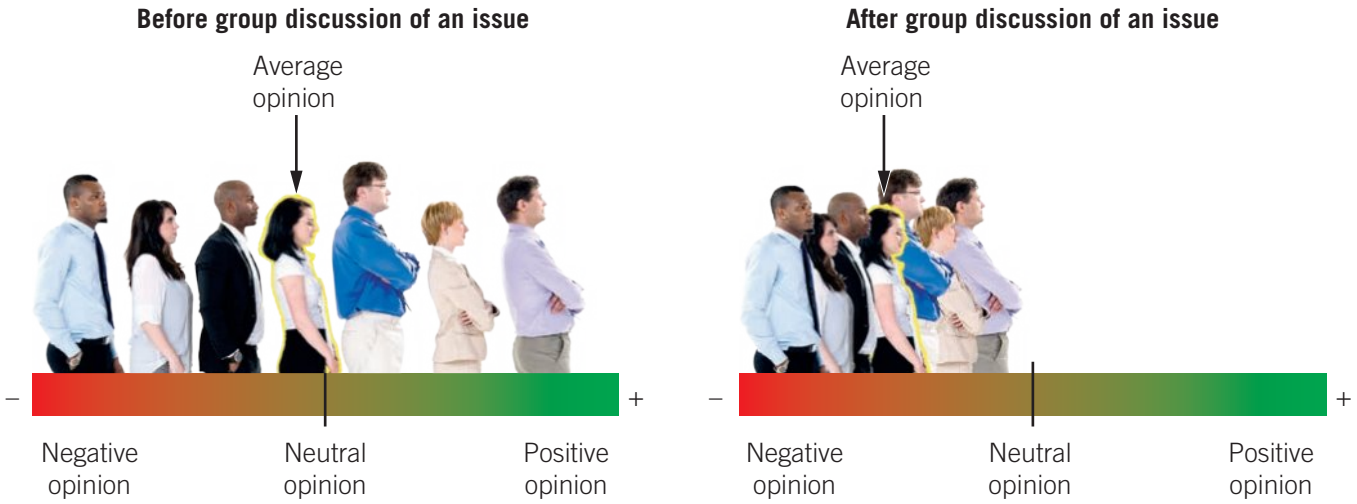


Figure 8A–13 Group shift results in a shift of attitude or opinion to a more extreme position when an issue or decision is discussed, compared to the individual's original position.

For example, one study explored what would happen if prejudiced students were forced to debate racial issues, and what would happen if less-prejudiced students were asked to discuss the same racial problems. Biased students became more prejudiced, while less-prejudiced students became even less prejudiced. Terrorist attacks, mob mentality, public policy, violent acts, peer pressure, college life and jury verdicts are examples of group shift in real life.

Varying explanations exist for why group shift occurs. Some of these are outlined in Table 8A–3.

Table 8A–3 Explanations of group shift

Diffusion of responsibility	Group members can behave in the way they think is best, because responsibility is diffused within the group. Individual members are not held responsible for the group's ultimate decision when that decision is made in a group setting. As a result, greater risk may be accepted (as no single member can be held entirely accountable for the decision).
Social status	Risk taking is frequently linked to social standing in groups. We admire people who are ready to take chances, and group conversations encourage members to demonstrate that they are as eager to take risks as their colleagues.
Familiarity of risk	Group members become more familiar with one another through the debate, and they become bolder and more radical as they become more at ease. Further, people become more accustomed to and comfortable with a potential action or decision the longer they pay attention to it, perceiving less danger in it over time.

Group shift may be regarded as a subset of groupthink. When a group has a discussion or debate about how they will behave in a situation, the group decision on whether they will indeed change their behaviour is influenced by the ideas of those with the highest status in the group. However, how they change their behaviour is influenced by a set of existing norms that indicate whether the group is likely to engage in cautious or risky behaviour.

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 8A–5 DEMONSTRATING GROUP SHIFT

In your psychology class, find a large space in the classroom and place a line down the centre of the room using tape, string or chalk. One end of the line should be labelled 'strongly disagree' and the other end 'strongly agree'.

As individuals, consider the statements below one at a time and stand on the line to show your position on the issue. Pay attention to where your classmates are standing as well.

Statements:

- The legal age of drinking should be brought down to 16 years old.
- Corporal punishment should be brought back into schools.
- We should wear casual clothes to school.

For each issue, discuss the statement as a class and try to reach a common position (with the discussion taking no longer than 10 minutes for each statement). After the discussion, stand on the line again to show your position on the issue. What do you notice? Has your attitude or opinion changed after the discussion? What about your classmates' opinions and attitudes? Describe why this might be the case.

Check-in questions – Set 3

1 Explain what groupthink in your own words.
2 Think of a situation in your life in which you experienced groupthink. Describe what happened and how you felt in this situation.
3 Outline the factors that affect whether groupthink will occur.
4 List the strengths and limitations of groupthink.
5 Define group shift with reference to an example that hasn't been used in the text.
6 Describe three reasons why group shift occurs.
7 What is the relationship between groupthink and group shift?

Deindividuation

Most of the time, people have a general sense of individuality and self-awareness that makes it easier for them to monitor their interactions with others, judge their behaviour according to their values and recognise themselves as separate entities from others. However, there are times when people lose their sense of identity. For example, think about the story in the Engage section of those people caught up in looting and firebombing during the London riots. Why did these people engage in antisocial behaviour – in a kind of behaviour that they would probably never engage in if they weren't in that situation? When a person's identity within a group overrides their own identity and self-awareness, this is called **deindividuation**. More specifically, deindividuation refers to when people act in a certain way because of the anonymity that a group provides. The more a person is drawn into the group, the less self-aware they become, including aware of their principles, personalities and beliefs. The group's identity gradually replaces these characteristics, and the individual then begins to adopt the group's principles and qualities. For example, imagine that you are at a home game for your favourite football team, and you are surrounded by supporters. Everyone is shouting and banging their hands on their chests, and you are bouncing around. If you were standing alone, then you likely wouldn't display these behaviours. On the other hand, being part of the crowd allows you to remove yourself from your identity and do things you otherwise wouldn't do.

Deindividuation when people act a certain way because of the anonymity (loss of identity) that a group provides

ISBN 978-1-009-25401-4 Gallagher et al

Figure 8A–14 A shy person will likely participate in a Mexican wave because then they won't stand out.

Because anonymous people immersed within a group cannot be easily found or blamed for their conduct, deindividuation might lessen accountability in certain contexts. As a result, deindividuation effects such as rioting, stealing or physical fighting are frequently considered socially undesirable. Consider the aftermath of Hurricane Katrina in Louisiana in 2005. The damage brought the city to a halt, and widespread looting ensued. In footage obtained by helicopters, people can be seen casually strolling out of stores with televisions and anything else you can think of. Most people wouldn't usually engage in such behaviour, but it became prevalent during the crisis. They didn't know they would be held accountable for their acts, so they did things they wouldn't have done otherwise.

Figure 8A–15 Deindividuation can lead to positive acts, such as a group clearing rubbish from a polluted park, or negative acts, such as rioting and violence against others.

Studies have also demonstrated how deindividuation improves adherence to group norms. These norms occasionally conflict with societal norms, although they aren't necessarily harmful. The consequences of deindividuation might even be minor or beneficial. For example, when individuals feel like they are part of a major charity event, they are more likely to give and raise higher quantities of money. Others are inspired to donate larger sums of money due to the significant gifts they receive in return. In another example, a group of like-minded volunteers who want to counteract climate change band together to plant trees, and their friendship helps them plant far more than they would have had the energy to plant on their own.

ISBN 978-1-009-25401-4 Gallagher et al

According to psychologist Philip Zimbardo, several factors can make deindividuation more likely to occur. These factors are outlined in Figure 8A–16.

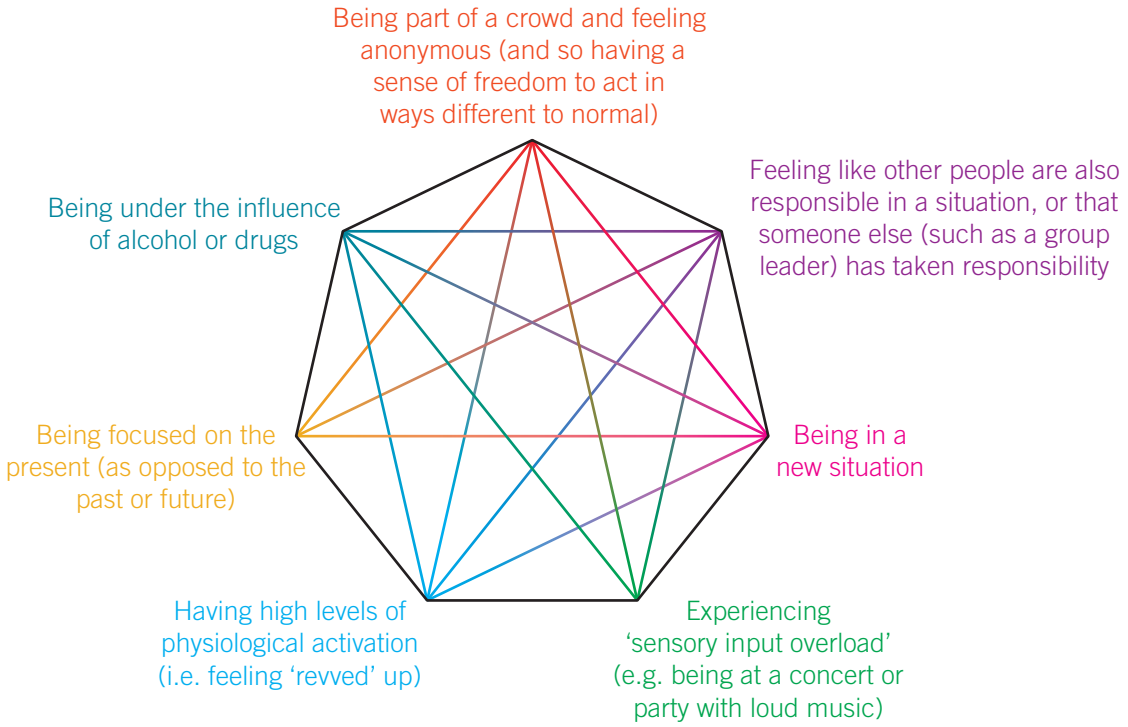


Figure 8A–16 Factors that can contribute to deindividuation

Zimbardo suggested that, although each of these factors can make experiencing deindividuation more likely, it is not necessary for all of them to occur for someone to experience deindividuation.

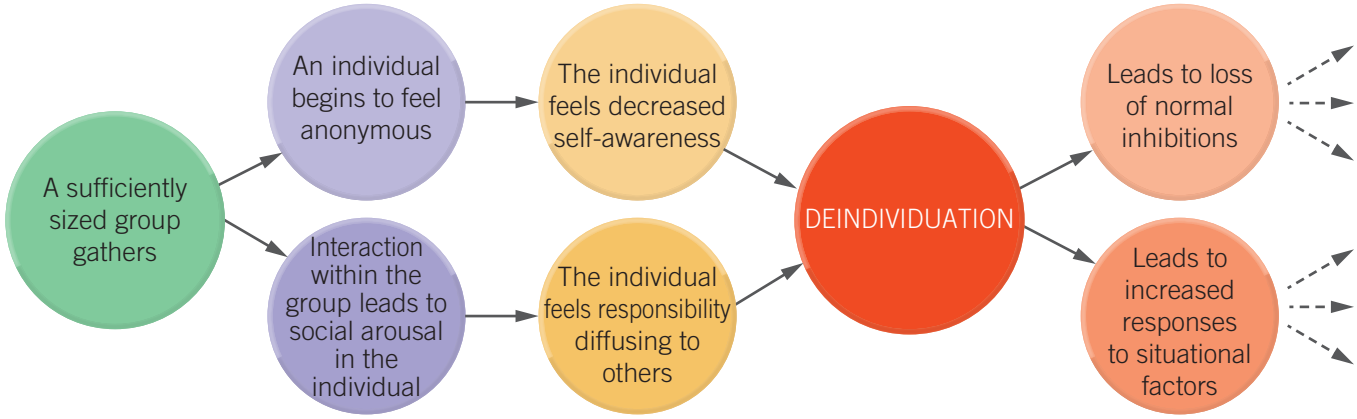


Figure 8A–17 How deindividuation occurs

The impact of culture on individual behaviour

Culture refers to the many characteristics of a group of people, including their attitudes, behaviours, customs and values that are transmitted from one generation to the next. Cross-cultural psychology is a branch of psychology that focuses on how cultural factors influence human behaviour. Regarding cultural factors, many parallels exist across cultures worldwide – but significant differences can also be observed. For example, people of all cultures feel happiness, but how they communicate this feeling differs from one culture to the next.

Culture the many characteristics of a group of people, including their attitudes, behaviours, customs and values that are transmitted from one generation to the next

ISBN 978-1-009-25401-4 Gallagher et al


Figure 8A–18 There are some significant differences between collectivist and individualist cultures.

Collectivist cultures cultures that emphasise the needs and goals of the group as a whole over the needs and desires of each individual

Cross-cultural psychologists frequently study the similarities and differences between individualist and collectivist societies. A **collectivist culture** might be found in countries like North and South Korea, China, Japan, Indonesia, Ecuador, India, Brazil, Guatemala and Venezuela. In collectivist societies, the interests and aims of the group are prioritised over the wants and wishes of each individual. Unlike the definition of a *collective* in psychology, whose members don't interact, 'collectivist' here is a sociological term meaning a group whose members do all interact. In such societies, each person's identity is shaped by their interactions with other members of the group and their interconnections. Long-term connections are essential in a collectivist society because they help the group achieve its goals. A person's interest extends beyond themselves and their immediate family to include others, and others may in turn be counted on in times of need. As a result, kinship and community are fundamental. Non-Western civilisations frequently exhibit this cultural tendency.

Individualist cultures cultures that stress the needs of the individual over the needs of the group as a whole

Individualist cultures prioritise the needs of the individual over those of the group. People in this kind of culture are considered self-sufficient and autonomous, and their individual attitudes and preferences have a strong influence on social behaviour. Individualist cultures are distinct from collectivist cultures, which prioritise tradition and community aims. People are deemed 'good' in individualist societies if they are strong, distinctive, self-reliant, forceful and independent. This is in contrast to collectivist cultures, in which traits such as self-sacrifice, dependability, generosity and helpfulness are valued more highly. The United States, Australia, Germany, South Africa and Ireland are considered individualist. However, it has been found that individualist cultures are becoming more prevalent worldwide, which might be linked to rising socioeconomic levels. (The implication is that improving one's financial and social condition is connected to becoming self-sufficient and driven to pursue personal goals. There are notable exceptions to this trend however, such as the collectivist China.)

Table 8A–4 Common characteristics of individualist and collectivist cultures

Individualist cultures	Collectivist cultures
• Individuals define themselves according to their personality traits. • Depending on others is often considered shameful or embarrassing. • Independence is highly valued. • Individual rights are prioritised. • People often emphasise the traits of standing out and being unique. • People tend to be self-reliant. • The rights of individuals tend to be ranked higher than those of groups.	• Individuals define themselves in relation to others. • Group loyalty is encouraged. • Decisions are based on what is best for the group. • Working as a group and supporting others is essential. • Common goals are emphasised more than individual pursuits. • The rights of families and communities come before the rights of individuals.

ISBN 978-1-009-25401-4 Gallagher et al

Collectivist and individualist cultural differences are pervasive, and they can influence how societies function. Whether people are from a collectivist or individualist culture, how they shop, dress, learn and conduct business can all be affected. More specifically, psychologists have discovered clear differences in how these types of cultures affect people's self-image and how they engage in relationships, use social support and make decisions. These differences are summarised in Table 8A–5.

Table 8A–5 Cultural differences between individualist and collectivist cultures regarding behaviour

Behaviours	Individualist cultures	Collectivist cultures
Creating a self-image	• Individualist cultures foster self-concepts that emphasise independence above interdependence. As a result, individuals express themselves through personality traits and characteristics, such as 'I am analytical, cautious and athletic'.	• People from collectivist cultures are more likely to self-describe and characterise themselves in terms of their social connections and duties, such as 'I am a decent spouse and devoted friend'.
Maintaining relationships	• People in individualist cultures dedicate more time and energy to actively sustaining personal connections, as they have more fragile relationships than those in collectivist societies. Further, partnerships are frequently viewed as a choice, and people tend to leave relationships that are no longer helpful.	• People in collectivist societies often have secure, robust and long-lasting relationships. Rather than being developed by personal choice, these connections are frequently formed by considerations such as family and geography. • Creating new relationships in a collectivist culture is difficult, partially because it is more challenging to meet new people in general.
Using social support	• Individualist cultures emphasise the importance of people handling issues and achieving goals without outside help. • People in an individualist society are more inclined to prioritise their wellbeing over the benefit of the group.	• People in collectivist societies are reluctant to seek social help due to the fear of upsetting others, destroying group unity, losing face and exacerbating the issue. However, they are more likely to seek implicit social support (e.g. spending time with loved ones without discussing what is causing stress). • People in collectivist societies are more inclined to help their family and friends in tough times, and they may be willing to sacrifice their comfort for the greater welfare of everyone.
Making decisions	• Workplaces in individualist cultures tend to be highly competitive because they encourage employees to believe that performing their best will help them reach their professional goals. • Employees tend to be highly productive and self-motivated, and when they make decisions, they are often more rational and autonomous. However, the competitiveness they face can also induce insecurities, stress and anxiety. • Collaboration might be regarded as worthless or an inconvenience, and some research indicates that individuals are more likely to put in less effort when working in a team. • When groups with members from individualist cultures engage in a group shift, they are more likely to experience risky shifts.	• Workplaces in collectivist cultures prioritise the good of the team and the company over the individual. Decisions are made through collaboration and group consensus. • People in these cultures focus on the importance of team or organisation goals and needs, and they work harder when they are in groups compared to when they work alone. • Collectivist company cultures are more likely to exist in uniform environments. Employees are strongly encouraged to adopt the group's values, views and motivations, and they are discouraged from expressing their individual values, beliefs and incentives. • When groups with members from collectivist cultures engage in group shift, they are more likely to experience cautious shifts.

ISBN 978-1-009-25401-4 Gallagher et al

WORKSHEET 8A–2 SOCIAL GROUPS, CULTURE AND BEHAVIOUR

The organisational chart in Worksheet 8A–2 contains components and factors that relate to how social groups and culture impact behaviour. It is set up for you to complete by adding explanations, definitions and examples.

ACTIVITY 8A–6 INDIVIDUALIST OR COLLECTIVIST CULTURE?

Decide whether the following statements describe an individualist or collectivist culture. Organise the statements in a simple two-column table.

a People at work answer the phone by giving the name of the organisation.
b Employee-of-the-year awards are offered.
c People adhere to tradition.
d People feel a need to affiliate with others.
e People give cocktail parties.
f People are promoted based on production and results.
g People feel a need for autonomy.
h People change jobs frequently.
i Decisions are made by consensus.
j Short-term relationships are common.
k People believe that it's okay to stand out.
l Marriages are arranged.
m It's common for mothers to ask their preschool children what they want to wear each day.
n Self-help books are popular.
o Grandparents normally live with their families.

Check-in questions – Set 4

1 In your own words, explain what deindividuation is, with reference to an example.
2 Outline the positive and negative effects of deindividuation.
3 Outline three factors that might cause deindividuation to occur, with reference to an example.
4 Outline the difference between the key characteristics of a collectivist and individualist culture.
5 Explain how both a collectivist and individualist culture influence the following behaviours:
   a Self-image
   b Relationships
   c Use of social support
   d Decision-making.

ISBN 978-1-009-25401-4 Gallagher et al

8A SKILLS

VIDEO 8A–2 SKILLS: TACKLING EXTENDED RESPONSE QUESTIONS

How to tackle extended-response questions in psychology

In VCE Psychology, you will be expected to know how to analyse and respond to a range of extended-response questions. Like a normal short-answer question, an extended-response question can cover all areas of study, including key science skills. However, an extended-response question is different from a short-answer question, as it is scored out of 10 marks and is marked globally. This means that an examiner must evaluate your response as a whole rather than give marks based on specific aspects of the content that you may have included in your response.

Although response approaches can be different, some 'rules of thumb' can be used to elevate an extended response. Let's explore these rules of thumb by seeing how they can be applied to the following question.

Question

Describe how the work of Philip Zimbardo has contributed to our understanding of the relationship between status and power and how both of these factors affect our behaviour in a group situation. Be sure to discuss the relevant types of power and use examples of these from the study. Evaluate the overall contributions of Zimbardo's study in terms of ethics. (10 marks)

Explanation

The first step is to read through the question and decipher what it wants. Your aim is to analyse the question so that you understand its key criteria. When analysing the question, you should be looking for the command terms (as these will tell you how to write about the key content) and the key content areas (as these will indicate what theory or theories you must include). To score a 5 or higher, your response must correctly address all key criteria.

When you are allowed to write, you might want to annotate or highlight the scenario (see example below) so that you can easily refer to the command terms and key content when you write your response.

Example

Yellow highlighting is used for the command term and green for the key content.

Describe how the work of Philip Zimbardo has contributed to our understanding of the relationship between status and power and how both of these factors affect our behaviour in a group situation. Be sure to discuss the relevant types of power and use examples of these from the study. Evaluate the overall contributions of Zimbardo's study in terms of ethics. (10 marks)

Explanation

The second step is to make a small plan for how you will organise your response. This plan should be brief (e.g. by using dot points). A plan is a useful tool to ensure that you both address the key criteria and create a response that uses the correct terminology.

ISBN 978-1-009-25401-4 Gallagher et al

Example

Describe how the work of Philip Zimbardo has contributed to our understanding of the relationship between status and power and how both of these factors affect our behaviour in a group situation.

- Define key terms, such as groups, status and power.
- Explain how status and power are interrelated.
- Explain Zimbardo's study and how it demonstrates the influences of status and power on behaviour.
- Use examples from Zimbardo's study to show the interaction between status and power.

Explanation

The third and last step is to write your response. When you do, ensure that you have a clear structure (e.g. by using subheadings to organise your response), and keep in mind that your response must be written in paragraphs rather than dot points. Your response is an opportunity to show the examiner what you know about the content area. You can do this by writing in a detailed manner and ensuring that you use the IDEA acronym – Identify, Describe, Explain/Evaluate and Apply.

Example

Describe how the work of Philip Zimbardo has contributed to our understanding of the relationship between status and power and how both of these factors affect our behaviour in a group situation. Be sure to discuss the relevant types of power and use examples of these from the study. Evaluate the overall contributions of Zimbardo's study in terms of ethics.

In 1971, Phillip Zimbardo conducted an experiment at Stanford University to explore how status and power affected people's adherence to social roles. A role is the behaviour adopted by an individual or assigned to them that influences how they function or act in different situations. A role can be temporary or permanent, and it carries expectations of how people should behave in different situations. In his experiment, Zimbardo designated participants into two roles: prisoners and guards. To recruit participants for this experiment, he placed an advertisement in the university newspaper. All 75 applicants were interviewed and given personality tests. The 24 applicants who showed the highest levels of physical health and mental stability were selected. Equal numbers of participants were randomly allocated to one of the two experimental conditions: 'mock guards' or 'mock prisoners'. The role of prison guard carried considerable power and status, while the role of prisoner carried minimal power and little to no status. Status refers to the importance of an individual's position in the group as perceived by members of the group, while power refers to an individual's ability to control or influence the thoughts, feelings or behaviour of another person or group. The participants were then placed in a mock prison, and their behaviour was observed by Zimbardo (who was the experimenter and 'mock prison warden'). Over the course of six days, the participants' roles and associated status and power influenced the behaviour of each group. The guards became increasingly authoritarian, brutal and aggressive, such as by restricting access to the bathrooms and making the prisoners perform humiliating acts, like walking like a monster and telling other inmates that they 'loved' them. Consequently, the prisoners became increasingly traumatised, passive and dehumanised – so much so that the experiment had to be ended early after only six days due to the prisoner participants' acute distress.

ISBN 978-1-009-25401-4 Gallagher et al

Section 8A questions

1 A school principal holds many different types of power. Identify two and explain how a principal could implement each type of power in a school environment.
2 Explain why psychologists do not consider four people waiting in line at an ATM to be a group.
3 In 2017, seventeen people were injured after a mass brawl broke out during a soccer game between two rival teams in Belgrade, Serbia. Trouble erupted in the home section of Partisan Stadium, and the police were forced to intervene to separate the brawlers. Some of the supporters left the ground with blood streaming down their faces, and others were led away by the police to avoid further conflict. Some of the supporters were very apologetic about their behaviour and said that they wouldn't have behaved that way if they had been alone.
Explain why some of the supporters were involved in such antisocial behaviours.
4 With reference to Zimbardo's Stanford Prison Experiment, explain the relationship between status and power.
5 Outline one ethical consideration that was breached during the Stanford Prison Experiment.
6 Sheryl realises that during team meetings, members never share their opinions about new and/or existing ideas. She speaks to one of her manager peers about the issue and asks for advice. Identify and explain the issue presenting in Sheryl's team meetings.
7 In Asia, it is much more likely that a family unit, including grandparents, will live together in the same house for their whole life. However, in Australia, children are expected to move out of their family homes at a relatively young age. With reference to culture, explain why this is the case.

ISBN 978-1-009-25401-4 Gallagher et al

8B The relative influence of obedience and conformity on individual behaviour

Study Design:
The concepts of obedience and conformity, and their relative influence on individual behaviour

Glossary:
Confederate
Conformity
Group pressure
Group size
Informational influence
Legitimacy of the authority figure
Normative influence
Obedience
Social loafing
Social proximity
Unanimity

ENGAGE

When following orders is extreme

In Nazi Germany and the neighbouring nations under Nazi authority, six million Jews, Romani people, communists and trade unionists were deported to extermination camps and slaughtered. However, neither Hitler nor a few key individuals could have killed them all unaided. What compelled all the guards and staff in the extermination camps to carry out the commands issued to them? Did they obey because they were terrified, or did they have a psychological trait that made them obey? To obey authority, the individual doing the obeying must believe that the command is genuine.

In 1962, Adolf Eichmann was executed for his role in the Holocaust. He was a logistical genius who planned the brutally effective collection of Jews during the Holocaust.

Figure 8B–1 Adolf Eichmann at his trial for war crimes committed during the Holocaust

ISBN 978-1-009-25401-4 Gallagher et al

During his 1961 trial, Eichmann expressed astonishment at being disliked by Jews, claiming that he had only followed orders and that obeying orders could only be positive. 'The commands were, for me, the highest thing in my life, and I had to fulfil them without question,' Eichmann wrote in his prison journal. Six psychiatrists declared Eichmann insane, but he had an everyday family life and his trial observers assessed him as typical. Given that Eichmann's behaviour does not seem to be especially unique, we must confront the unsettling prospect that his actions were a product of the social setting in which he found himself – and that, in this line of thought, we are all capable of doing horrible deeds in certain circumstances.

EXPLAIN

Obedience

Every day, we change our behaviour to meet the norms of society. We do this in multiple ways – such as changing our behaviour to align with a group or changing our behaviour in response to a request or command. **Obedience** occurs when people change their behaviour in response to direct commands from an authority figure. You are being obedient when you stop talking to your friend and listen to a teacher's instruction, or when you pull over when a police car flashes its lights at you. We learn from a young age that we must obey when someone in a position of legitimate power over us instructs us to act in a specific way. Our boss, parents, president of our sports club and instructor who grades us on our driving exam are all examples of authoritative people who can influence our behaviour in specific areas of our lives. We typically obey when they ask us to do something that is obviously in their area of control. When we defy them, we generally do so with the expectation of negative repercussions. We may even do things that we'd otherwise never do and believe were ethically wrong, had we not been ordered to do them by an authority figure.

Obedience the act of people changing their behaviour in response to direct commands from an authority figure

Figure 8B–2 Obedience occurs when you behave in accordance with an authority figure's orders, such as picking up rubbish if a teacher asks you to, or following the directions of police officers.

ISBN 978-1-009-25401-4 Gallagher et al

Milgram's 1963 obedience experiment

In the Nuremberg war trials and at Adolf Eichmann's trial, the most common form of defence was the claim that the defendants were 'just following orders'. Was this an excuse of willing participants, or were they genuinely just following orders as they claimed? American psychologist Stanley Milgram wanted to investigate the factors that contributed to people obeying others, specifically what factors influenced someone to inflict pain on another person. In 1963, at Yale University, he undertook what is now one of the most famous psychology experiments ever conducted.

Milgram placed an advertisement in the local paper and recruited 40 males aged between 20 and 50. The participants included men from all professional levels and socioeconomic backgrounds, who were paid US$4 for one hour of their time (a substantial amount at the time).

Public Announcement

WE WILL PAY YOU $4.00 FOR ONE HOUR OF YOUR TIME

Persons Needed for a Study of Memory

*We will pay five hundred New Haven men to help us complete a scientific study of memory and learning. The study is being done at Yale University.

*Each person who participates will be paid $4.00 (plus 50c carfare) for approximately 1 hour's time. We need you for only one hour: there are no further obligations. You may choose the time you would like to come (evenings, weekdays, or weekends).

*No special training, education, or experience is needed. We want:

Factory workers	Businessmen	Construction workers
City employees	Clerks	Salespeople
Laborers	Professional people	White-collar workers
Barbers	Telephone workers	Others

All persons must be between the ages of 20 and 50. High school and college students cannot be used.

*If you meet these qualifications, fill out the coupon below and mail it now to Professor Stanley Milgram, Department of Psychology, Yale University, New Haven. You will be notified later of the specific time and place of the study. We reserve the right to decline any application.

*You will be paid $4.00 (plus 50c carfare) as soon as you arrive at the laboratory.

Figure 8B–3 Stanley Milgram and the original advertisement for his 1963 experiment

The experiment was designed to test the participants' obedience in following the orders that they were given; it was therefore important that they not know this, or they might deliberately perform their disobedient or compliant roles. To ensure that their behaviour was natural, the volunteers didn't even know that they were the subjects of the experiment.

The experimental set-up and equipment

Volunteers were told that they would be helping the experiment administrators test whether punishment in the form of electric shocks could affect a person's ability to memorise something. Each volunteer met separately with the experimenter in charge of the session – one of Milgram's staff, who was dressed in a white lab coat to convey a sense of authority and expressed himself in a serious, terse manner. A third person was brought in and introduced themselves as another volunteer. In fact, this was an actor – a **confederate** of the experimenter – who was pretending to be a volunteer. The experimenter had the real and fake volunteers draw slips of paper to determine who would be the 'teacher' and who would be the 'learner'. In fact, both slips read 'teacher', so the real volunteer was always the teacher, and the fake volunteer pretended their slip said 'learner'.

Confederate in an experiment, someone who is part of the team of experimenters but pretends to be the subject of the experiment (or neutral)

ISBN 978-1-009-25401-4 Gallagher et al

The experimenter then placed the teacher (real volunteer) and learner (confederate) into the set-up shown in Figure 8B–4.

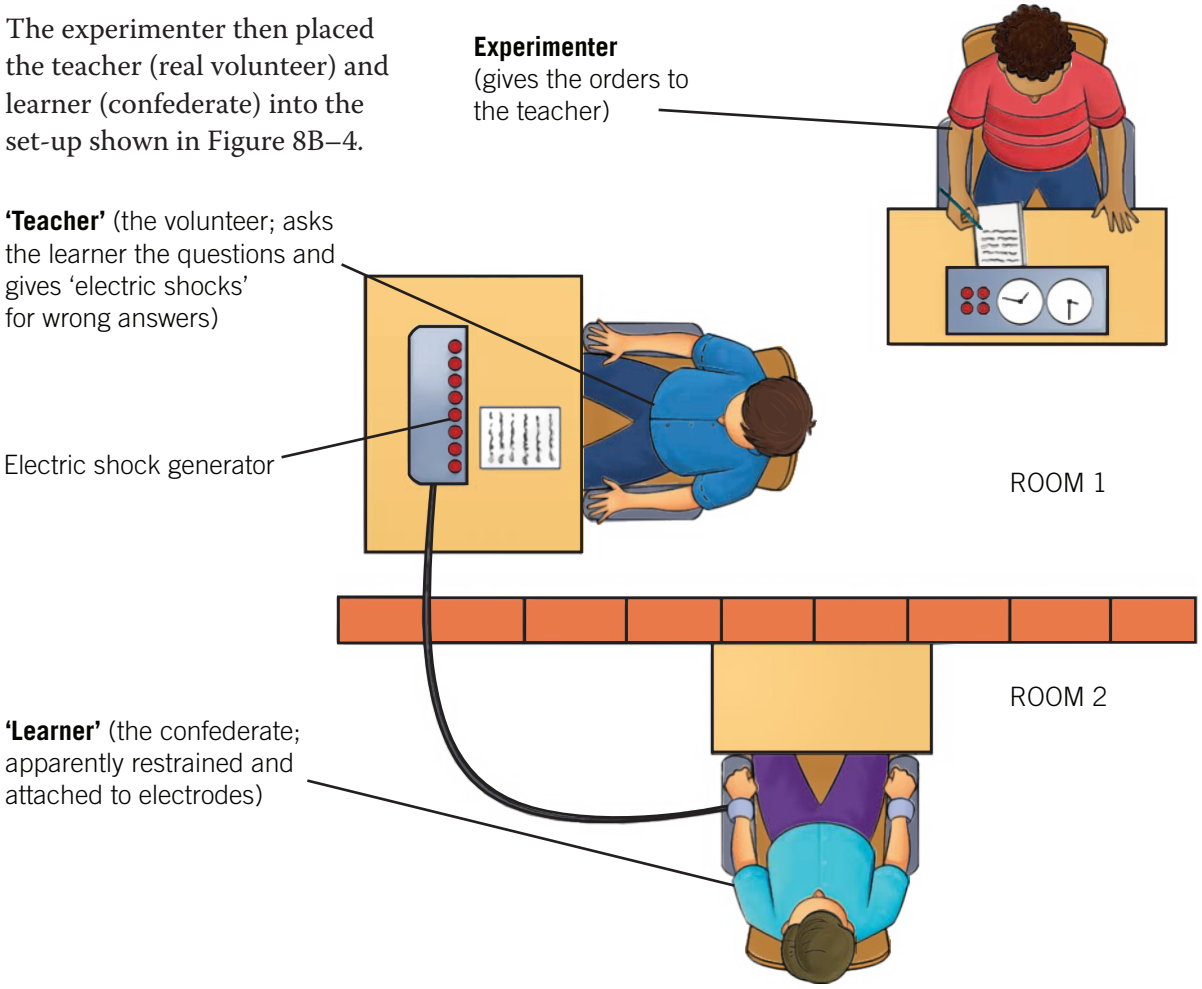


Figure 8B–4 Layout of the rooms used for the Milgram experiment. The 'teacher' saw the 'learner' being restrained and fitted with electrodes before they were taken to their own desk in a separate room. The two rooms were linked for sound by microphones and loudspeakers so that participants could talk to and hear each other.

The shock generator (Figure 8B–5) had 30 toggle switches, each of which had a red indicator light, labelled with a value in volts from 15 V to 450 V. Beneath the switches were labels describing the strength of the shock, as shown in Figure 8B–6.

Figure 8B–5 An accurate replica of the electric shock generator used in the Milgram experiment, shown here in the movie *Experimenter: The Stanley Milgram Story* (2015).

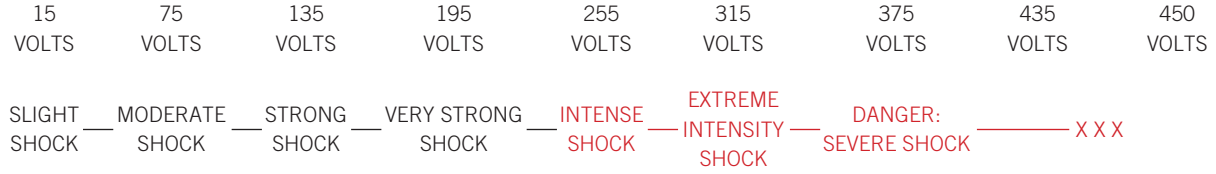


Figure 8B–6 The strengths of electric shock indicated under each switch on the electric shock generator used in the Milgram experiment

ISBN 978-1-009-25401-4 Gallagher et al

The procedure set-up

Regarding the experiment's set-up and procedure, the following steps were taken:

1. The experimenter supervised the learner being strapped to his chair and having electrodes from the shock generator attached, while the teacher looked on.
2. The teacher was seated at the desk with the generator in another room, and was given sheets of paper with lists of words in pairs.
3. The teacher was also given a slight shock from the generator so they would believe it was a working machine.
4. The experimenter would then tell the teacher that their job was to read out loud the pairs of words for the learner to memorise.
5. The learner was then told to memorise and repeat the pairs of words out loud.
6. When the learner made a mistake, the teacher was instructed to flip the first switch and give the learner a slight shock. The experimenter assured both participants that the shocks were safe.
7. During the test, the teacher and learner could hear each other but not see each other.

The procedure from the teacher's perspective

From the teacher's perspective, the experiment proceeded as follows:

1. The experimenter started the memory test by instructing the teacher to read out the word pairs, write down the learner's responses and give the electric shock as needed.
2. The teacher read out the first set of word pairs.
3. The learner recited the word pairs out loud from memory.
4. At the learner's first mistake, the experimenter told the teacher to administer the slight shock. The teacher heard the learner gasp in pain.
5. At the learner's next mistake, the experimenter told the teacher to administer a stronger shock this time. The teacher heard the learner cry out again.
6. Each time the learner made a mistake, the experimenter told the teacher to administer a stronger shock, and the teacher heard the learner react more loudly to the pain each time.
7. When the teachers were told to apply a stronger shock, it was usual for them to question why this was being done, to object that the learner was in pain and to suggest the experiment be stopped. The experimenter would reply in a firm, matter-of-fact voice with one of these four prompts:
   - 'Continue please' or 'Go on'.
   - 'The experiment requires that you continue'.
   - 'It is absolutely essential that you continue'.
   - 'You have no choice'.
8. The experimenter would record the point at which the teacher finally refused to go on, or whether they had reached the end of the session by flipping the highest voltage switch – beyond 'danger, severe shock' on the control panel.

After receiving one or more of the experimenter's prompts, approximately two-thirds of the teachers continued to administer stronger and stronger shocks. At 150 volts, the teachers would hear the learner yelling cries like 'Get me out of here!' and 'I can't go on!' Most teachers at this point told the experimenter statements like 'He's yelling in there' or 'I think he's hurt'. However, each time the teachers stopped to react to the learner's screams, the experimenter would just repeat the prompts.

ISBN 978-1-009-25401-4 Gallagher et al

The procedure from the learner's perspective

Remember that the learner was a confederate of the experimenter and that at the start of the experiment's set-up, the teacher saw the learner being restrained and fitted with electrodes attached to the electric shock generator. During the test, the teacher could hear, but not see, the learner.

From the learner's perspective, the experiment proceeded as follows:

1. After the teacher left for the other room, the learner released himself and placed a tape recorder on his desk.
2. When asked to repeat the memorised word pairs, the learner played back his pre-recorded responses into the microphone, which linked to the teacher's room. The learner was a skilled actor who had recorded himself making errors in his recall of the word pairs – his gasps, cries and screams of pain were also pre-recorded.
3. When the electric shock was applied from the generator, the learner would play back the required pre-recorded reactions as appropriate for the voltage. In reality, no electric shocks were applied to the learner.

The experimental results

The results of Milgram's experiment were unexpected. Before beginning the experiment, Milgram asked undergraduate psychology students to predict the results, and they estimated that only 1–2% of the population would administer the supposed 450 volts. Psychiatrists agreed, stating that only 'the true psychopaths' would go the whole way. Indeed, they believed that most participants would refuse to flip switches labelled more than 150 volts. However, the results contradicted these predictions. Of the 40 participants in Milgram's study, 26 administered the (supposed) 'lethal' 450 volts. About 90% of the participant teachers went above 150 volts ('strong to very strong' shock).

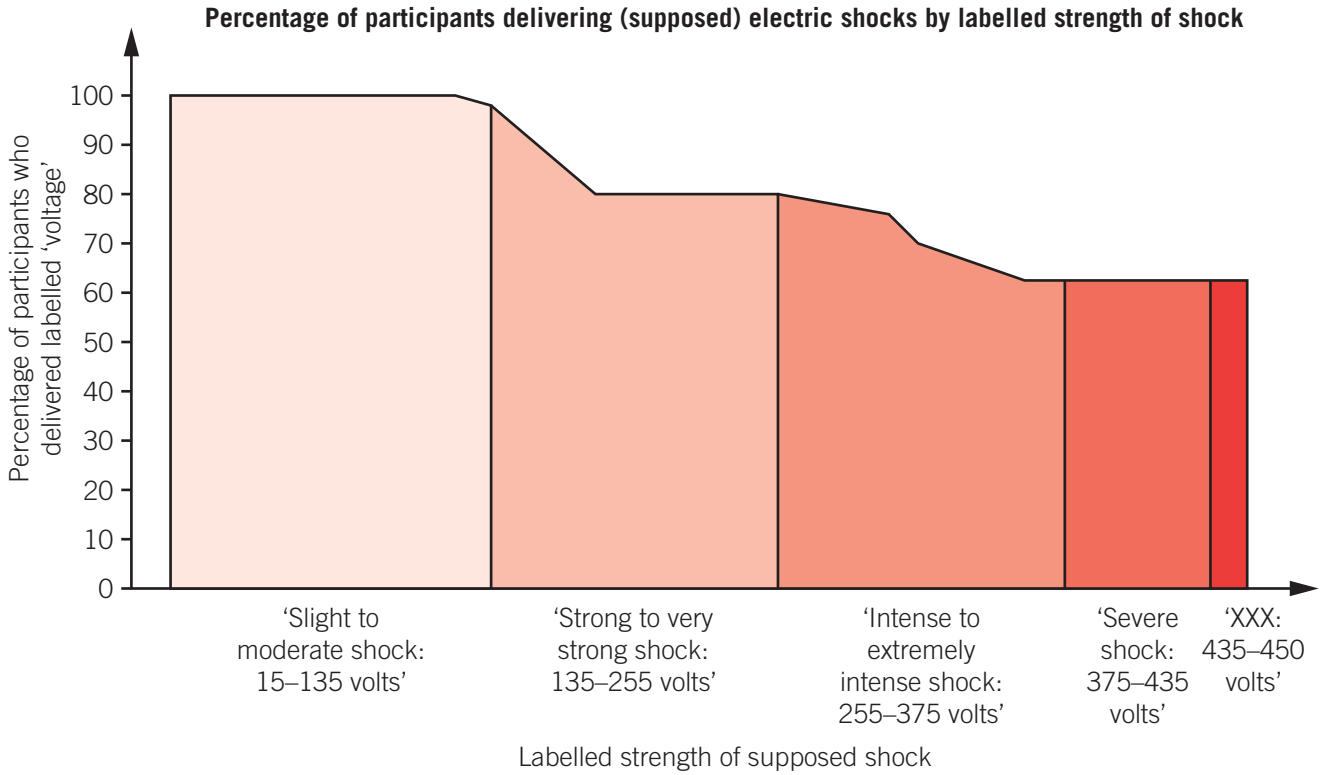


Figure 8B–7 Graph outlining the results of Milgram's study

ISBN 978-1-009-25401-4 Gallagher et al

The task was difficult for many of the participants. They often looked to the experimenter for guidance, and many voiced their discomfort at having to administer lethal shocks to a fellow human being; however, despite these hesitations, most of these normal, healthy, mentally stable men continued to obey the experimenter.

Milgram concluded that when we are confronted with someone we perceive as a legitimate authority figure, we defer our proper and moral judgements and comply without giving much thought to it. Milgram's experiments revealed that we all have the capacity to inflict great pain and suffering on others under certain conditions. This claim was overwhelming for many people. How could normal, healthy and well-adjusted people be capable of potentially killing another person, simply because someone else told them to?

Milgram's findings have also been replicated in various cultures, and most of the studies have drawn the same conclusions as Milgram's original study. In some cases, they resulted in even higher obedience rates and also revealed that women are as likely to obey as men. In a follow-up study in 1974, Milgram found that women demonstrated the same level of obedience as the men in the original study – 65% of them administered shocks of 450 volts!

DOCUMENT 8B–1 MILGRAM'S EXPERIMENTS FURTHER RESOURCES

More information about Milgram's experiments can be found in the Interactive Textbook, which contains details regarding the volunteers' actions and responses; videos and articles that describe the experiment in more detail, including critiques; and further information on studies in other cultures.

ACTIVITY 8B–1 ROLEPLAY MILGRAM'S EXPERIMENT

In groups of three, create a roleplay or dialogue that demonstrates Milgram's electric shock experiment. Your play should be around three minutes long, and it should demonstrate the set-up and procedure of the experiment. It should also show the experimenter's role in persuading the participant to continue with the study when they start having misgivings about the experiment.

Check-in questions – Set 1

1 Define 'obedience' and provide two examples that you have experienced in your own life.
2 What was Milgram's motivation to study obedience?
3 Explain the set-up of the electric shock experiment.
4 Summarise the main results of the electric shock experiment.
5 As a 'teacher', how obedient do you think you would be in Milgram's experiment? Explain your response.

Replications of Milgram's experiment on factors affecting obedience

Milgram conducted more experiments like his original, but he varied the basic procedure. By doing this, Milgram could identify which factors affected the number of participants who administered the maximum 450 volts (26 participants in the original study). In total, 636 participants were tested in 18 different variation studies. Figure 8B–8 summarises the results of Milgram's studies.

ISBN 978-1-009-25401-4 Gallagher et al

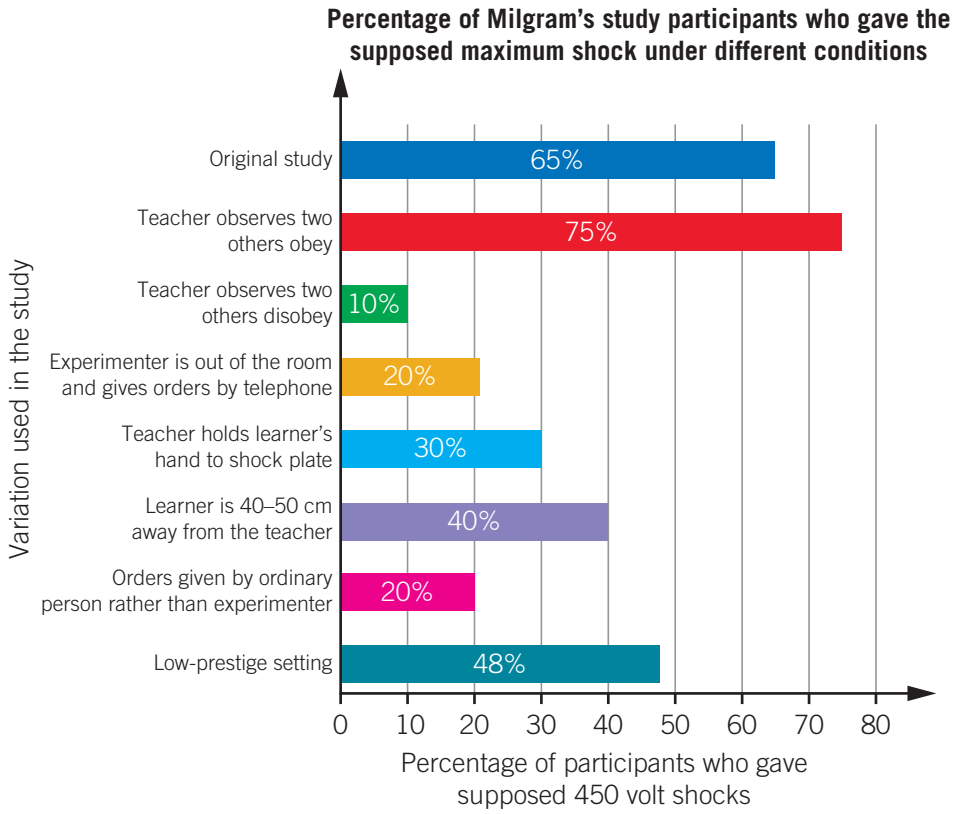


Figure 8B–8 Summary of the results from Milgram's further studies with variations. As before the participants who are the subject of the studies are the 'teachers'.

Let's now look more closely at some of the key findings from Milgram's studies, which include the roles of social proximity, the legitimacy of the authority figure and group pressure.

Social proximity

In psychology, **social proximity** refers to how physically close one or more people are to each other. Milgram found that the physically closer the learner and teacher, the more likely the teacher was to disobey the experimenter and not administer a shock. The percentage of entirely obedient teachers fell from 65% to 40% when they were in the same room as the learners and standing 45–50 cm away from them. The number of entirely obedient teachers fell to 30% when they had to push the learners' hands down onto an electric plate to give them the shock. Further, greater physical distance between the teachers and experimenter led to lower levels of teacher compliance. Obedience to administering the full 450 volts fell from 65% to 20% when the experimenter gave the teacher instructions over the phone from another room or via a tape recording.

Social proximity in the field of psychology, how physically close one or more people are to each other

We can also see real-world examples that replicate these results. Soldiers are more likely to kill if they can use a long-range weapon than if they are ordered to kill someone face-to-face. It also makes sense that when a criminal is sentenced to death by electric chair, the person who pushes the switch is situated outside the room. The physical distance between them and the criminal makes it much easier for them to follow their orders.

Figure 8B–9 Today, advanced military forces can launch missile or drone strikes from the other side of the world via computer.

ISBN 978-1-009-25401-4 Gallagher et al

Legitimacy of the authority figure a concept referring to an authority figure who has a higher position or status in a social hierarchy

Legitimacy of the authority figure

Another variation of Milgram's original study explored whether the status and **legitimacy of the authority figure** were determining factors in how frequently the participant obeyed their commands. The original experiment was conducted at Yale University, and the experimenter was easy to recognise because he wore a white lab coat (a symbol of authority).

Figure 8B–10 A teacher might wear a lanyard, or a police officer will wear a unform as a symbol of their legitimate status.

Figure 8B–11 If you and your sibling dislike eating Brussels sprouts, then you are less likely to obey your parents and eat them if your sibling disobeys them first.

In this new experiment, Milgram wanted to determine whether an institution's prestige affected obedience. To do this, Milgram leased a run-down building in Connecticut in the United States, and placed an advertisement in the local paper about his study. He didn't mention that he was a professor at Yale University and claimed that the research was sponsored by a private firm. Milgram hypothesised that without university prestige, compliance would drop substantially. It did – but not as much as Milgram had anticipated. His results showed that 48% of participants still administered shocks to the full 450 volts.

The research was then repeated, but with the experimenter wearing different clothes. When they appeared in the clothes of a janitor or holding a broom instead of wearing a white coat (as expected of a professor), compliance dropped to 20%. Finally, to focus on the legitimacy of the authority figure, the research was repeated, but this time the experimenter received a phone call that forced him to leave the laboratory. When he left, another confederate (who appeared as a participant teacher) entered the room and took command, stating that the shock should be raised for each incorrect answer. He acted like he had decided this and told the other teachers to do what they were told. When the absolute authority figure was removed from the equation, the compliance rate plummeted to barely 20%. Eighty per cent of those who participated flatly refused to obey. The participant teacher (confederate) sat in front of the shock machine and attempted to give the jolt himself to add authenticity to the experiment. When this occurred, most of the participants expressed displeasure. Some even tried to unplug the device!

The legitimacy of authority figures is evident in our everyday lives. Individuals in authority tend to display signs of their authority that are easy to see. Uniforms are worn by police officers, paramedics, firefighters and security guards. Politicians and CEOs of influential organisations wear suits. Doctors wear white coats and stethoscopes around their necks. These emblems of power elicit obedience.

ISBN 978-1-009-25401-4 Gallagher et al

Group pressure

In another experiment, Milgram found that **group pressure** – an occurrence in which other members reveal whether they are obedient to the authority figure or not – is an important variable for the levels of obedience shown in response to an authority figure. In the experiment, he set up a different condition compared to his original study using three teachers. Teacher 1 was a confederate and read the words to the learner, who was also a confederate, as with all these experiments. Teacher 2 was also a confederate and had to indicate whether the learner answered correctly or not. Finally, Teacher 3 (the actual participant) had to deliver the shock when an incorrect answer was given. As in previous experiments, the learner complained that the shocks were painful at 150 volts. When this happened, Teacher 1 refused to participate any longer and left the room, refusing to come back when the experimenter asked. Teachers 2 and 3 were instructed to continue. They continued until 210 volts, at which point Teacher 2 refused to continue, proclaiming that the learner was experiencing too much pain. The experimenter then asked Teacher 3 (the actual participant) to continue. In this experiment, only 10% of the participants continued administering shocks to the lethal 450 volts – a clear difference compared to the 65% who continued in the original study. Conversely, when two confederate teachers indicated that they supported the experimenter's commands entirely, the participant teachers' obedience levels rose from 65% to 72.5%!

Group pressure an occurrence in which other members reveal whether they are obedient to the authority figure or not

ACTIVITY 8B–2 A REAL-LIFE EXAMPLE OF EXTREME OBEDIENCE

There have been many examples of extreme obedience in society. In small groups, choose one of the following examples of extreme obedience (every group should have a different example):

- The so-called 'Strip search phone call scam' involving fast-food outlets in the USA
- the Jonestown massacre
- the bombing of Hiroshima and Nagasaki
- Charles Manson and his cult.

Research your chosen example, then pair up with another group that has researched a different example. Consider the following questions together:

1 What are some similarities and differences between your examples?
2 How might social proximity, legitimacy of the authority figure and/or group pressure influence the levels of obedience seen in your examples?

Check-in questions – Set 2

1 Explain the relationship between the following factors and levels of obedience, with specific reference to Milgram's experiments.
   a Social proximity
   b Legitimacy of the authority figure
   c Group pressure
2 Give a real-life example in which social proximity could influence levels of obedience.
3 Provide an example in which you have changed your behaviour due to group pressure.
4 Can you think of areas in present-day society in which people's beliefs are frequently overridden by an authority figure? Explain why this occurs.

ISBN 978-1-009-25401-4 Gallagher et al

Limitations of Milgram's studies

Although Milgram's findings have been replicated in various cultures, his studies have also been widely criticised by the scientific community for methodological and ethical issues. Some of these issues are outlined in Table 8B–1.

Table 8B–1 Methodological and ethical issues in Milgram's experiment

Methodological issues	
Biased sample	The study sample was not representative of Milgram's population (the United States public) because they were all white males. Further, Milgram used a convenience sample: people that responded to his newspaper advertisement.
Artificial experimental setting	The Milgram studies were conducted in laboratory-type conditions. Participants may have been affected by demand characteristics, which are aspects of the experiment or environment that provide the participants with cues to the study's aims or expected findings. These characteristics could influence behaviour and result in unwanted effects on the participants' behaviour under study. These cues can suggest to a participant how they should behave, which means that their behaviour is no longer completely natural and unhindered.
Ethical issues	
No harm principle	Participants were exposed to highly stressful situations that could have caused psychological harm. Many of the participants were visibly distressed by the idea that they were shocking other people.
Withdrawal rights	Withdrawal rights states that participants have the right to leave the experiment at any time, and they cannot be forced to stay and participate against their will. Participants in Milgram's experiments tried to leave and told the experimenter that they were uncomfortable with the situation; however, they were offered responses that suggested they had to stay and continue, such as 'you must continue'.
Deception	The ethical principle of deception was evident in Milgram's experiment, as the participants weren't told about the true nature of the experiment. Although he was criticised for this, Milgram defended his choice, claiming that all participants were debriefed at the conclusion of the experiment. They were told the true nature of the experiment and were given the option of withdrawing their results from the pool of data. As part of the debriefing procedure, all participants were told that their behaviour was 'normal', and the 'learner' was revealed to the participants as being in perfect physical health (evidence that no harm had come to them). Milgram also sent a survey to the men who had participated in his experiments, as he was interested in their long-term thoughts about their participation. In all, 84% of participants indicated that they were glad they had participated as they learned something valuable about themselves, and they thought that their experience was worthwhile. Only 2% of participants felt that their experience wasn't positive.

Check-in questions – Set 3

1 According to today's ethical standards, did Milgram breach the ethical guideline on the use of deception? Justify your answer.
2 If Milgram's experiment was to be replicated, describe how the following issues could be controlled for:
   a Methodical issues
   b Ethical issues.
3 In your opinion, how closely do the participants' actions in Milgram's experiment represent what happens in real life? In your response, refer to both the methodological issues in Milgram's study and the replications of the study.

ISBN 978-1-009-25401-4 Gallagher et al

Conformity

Conformity the process by which people modify their ideas, attitudes, behaviours or perceptions to more closely reflect those held by groups to which they belong or aspire to belong

Before Milgram conducted his experiments on obedience, another social psychologist named Solomon Asch was interested in the factors that made people conform. **Conformity** occurs when people modify their ideas, attitudes, behaviours or perceptions to more closely reflect those held by the groups to which they belong or aspire to belong. We conform because in certain social situations we want to 'fit in', even if we don't agree with a group's specific belief, attitude or action. Think of the times that you have conformed to something – such as using the same words as your friends or laughing at a joke along with everyone else, even though you didn't get it. We have all done that.

When you enter a crowded elevator, you will almost certainly stand and face the door like everyone else; you conform to the expectations and customs of the people already in the elevator. Try being a non-conformist. Enter the elevator and stand facing the people in it. What would happen? You'd probably receive some very confused looks.

LINK **8D** THE DEVELOPMENT OF INDEPENDENCE AND ANTICONFORMITY

Figure 8B–12 People who style their front lawns in the same way as their neighbours or who dress in similar business clothes as their workmates are displaying conformity.

Asch's conformity studies

In the 1950s, Asch was fascinated by the elements that lead us to conform to the expectations of others. To determine the factors that affect or influence conformity, he investigated how group pressure could lead people to conform, even when they know that the rest of the group is wrong.

Asch used a line test as part of his experiment. You can get a glimpse of this test by looking at the lines in Figure 8B–13.

Consider Line X in the first box. Which line in the second box is the same length? The answer seems simple, doesn't it? Clearly, Line B is the same length as Line X. Anyone without vision impairment could see this.

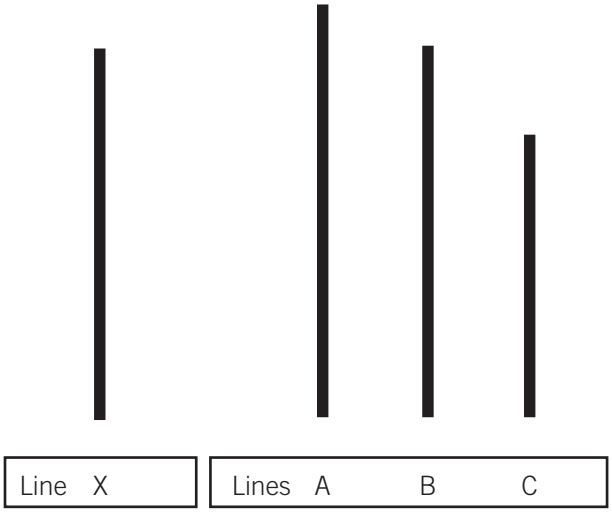


Figure 8B–13 Asch's original stimulus list. Which line matches the length of line X?

ISBN 978-1-009-25401-4 Gallagher et al

Figure 8B–14 The actual participant was asked to judge the length of lines after the other group members had applied group pressure on him by unanimously selecting the same wrong answer.

In 1956, Asch recruited 50 male students from Swarthmore College in the United States to participate in what they thought was a 'vision test'. The experiment was conducted with seven other participants. Everyone in the room other than one participant were confederates who were told in advance what their responses would be when presented with the line task. The real participant didn't know this and was led to believe that the seven confederates were also real participants. The participants were shown the stimulus line (Line X) and were instructed to identify another line that was the same length. The participant and confederates were all seated around a table in a semi-circle and were asked to call out their answer in turns. The actual participant was seated last, so that he heard the answers of the confederates first.

The confederates answered the questions correctly in the first portion of the test. However, they soon started giving false replies, as instructed by the experimenters. There were 18 separate trials in the experimental condition, and the confederates answered incorrectly in 12 – which Asch referred to as the 'critical trials'. The goal of these critical trials was to examine whether participants would adjust their answers to match the one selected by the other members of the group.

The experiment also included a control group of 37 people who had to write the correct answer individually, to ensure that the average person could appropriately judge the length of the lines. From this, it was found that participants were accurate in their line judgements – they picked the correct response 99% of the time.

In the critical trials, Asch counted how many times each participant agreed with the majority. On average, approximately one-third of the individuals in this situation (32%) went along with the wrong majority, and approximately 75% of participants conformed at least once throughout the 12 trials (while 25% did not). Compare this to the control group, in which less than 1% of individuals answered incorrectly, as they were not pressured to conform by their peers.

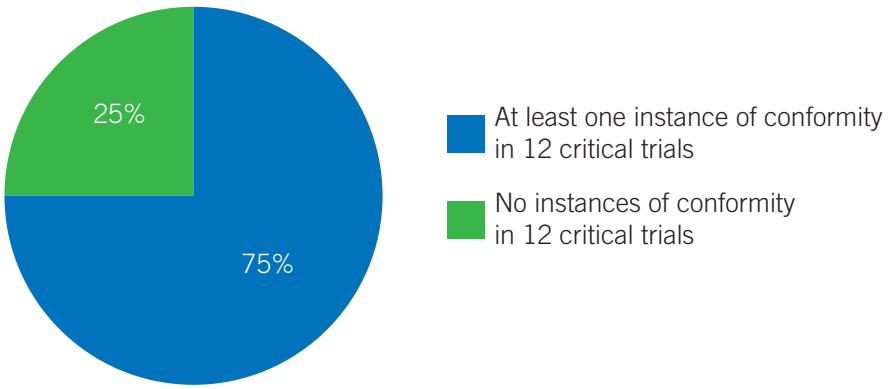


Figure 8B–15 Percentages of participants who conformed or didn't conform in the critical trials

ISBN 978-1-009-25401-4 Gallagher et al

As part of the debriefing procedure after the experiment, the participants were told about the true nature of the experiment. They were asked why they chose the line that was obviously incorrect. Many participants reported that they ignored what was obviously correct because, since everyone else answered with the same response, their own answer had to be wrong. After all, it is more likely that one person would be incorrect about an obvious answer than four or five people. Other participants claimed that they chose the obviously incorrect answer because they feared being the odd one out. Even though they knew that everyone else was wrong, they still chose the same answer as the majority to fit in. Asch concluded that people conform for these two main reasons: because they want to fit in with the group and because they believe that the group is more informed than they are.

ACTIVITY 8B–3 STORYBOARD ASCH'S EXPERIMENT

Individually or in small groups, create a storyboard that demonstrates Asch's line experiment. Your storyboard should have at least five panels, and it should show the experiment's set-up, procedure, results and conclusions.

Limitations of Asch's research

Like the other experiment examples in this chapter, Asch's experiment has received many criticisms. Table 8B–2 outlines the methodological and ethical issues in Asch's study.

Table 8B–2 Methodological and ethical issues in Asch's experiment

Methodological issues	
Biased sample	Asch's sample only contained males of a certain age, so his results cannot be generalised to other genders or age groups.
Artificial experimental setting	Asch's studies were conducted in laboratory-type conditions, which do not reflect the conditions in which we would normally conform.
Ethical issues	
No harm principle	Participants were not protected from psychological stress or embarrassment, which might have occurred if they disagreed with the majority.
Deception	Asch deceived the student participants, claiming that they were participating in a 'vision' test. However, deception was necessary to produce valid results, as the participants' response to the confederates' behaviour would have been influenced.

Check-in questions – Set 4

1 Define conformity with reference to an example that has not been used in the text.
2 Describe how conformity can be beneficial to society.
3 Briefly describe the procedure Asch used to study conformity.
4 What was Asch's conclusion? Do you agree with it? Explain your answer with reference to the results obtained in the experiment.
5 Asch's experiment has been criticised for breaching key ethical standards. Is the criticism justifiable? Answer with reference to relevant ethical standards.
6 To what degree do the participants' answers in the Asch experiment reflect what happens in normal life outside the lab?

ISBN 978-1-009-25401-4 Gallagher et al

Factors that affect conformity

Asch's findings sparked the interest of other psychologists, which stimulated research that helped establish the factors responsible for conformity. These include normative influence, culture, informational influence, unanimity, group size, deindividuation and social loafing.

Normative influence

Normative influence the occurrence in which we conform with others because we want to be liked by them – and we assume that our conformity will make them like us more

According to **normative influence**, we conform with others because we want to be liked by them – and we assume that our conformity will make them like us more. The social norms that a group adopts guide our behaviours within that group. When we are aware of social norms for a certain situation, this awareness can influence both the likelihood that we will conform and the strength of conformity that occurs. This is explained by our desire to be liked and accepted rather than rejected. It is almost automatic that we are more likely to conform with people we like, admire and want to be like. This is because a valuable way of meeting our need for acceptance and approval is to be as similar to others as possible. Studies have found that people who care very little about what others think of them are less likely to conform than people who care a lot.

Culture

Not only does it matter how much you want your peers to accept you, but your culture also plays a vital part in determining how likely you are to conform. Asch's experiment has been replicated in many countries using the original format, but it has also been conducted in slightly altered forms.

Psychologists Bond and Smith compared the results of 133 different experiments based on Asch's original experiment. These 133 studies were conducted at various times in 17 countries. In their investigation and analysis, the researchers found cultural differences. Countries such as Japan, Fiji and those in Africa demonstrated higher levels of conformity than 'western' countries such as the United States, Canada, France and Portugal.

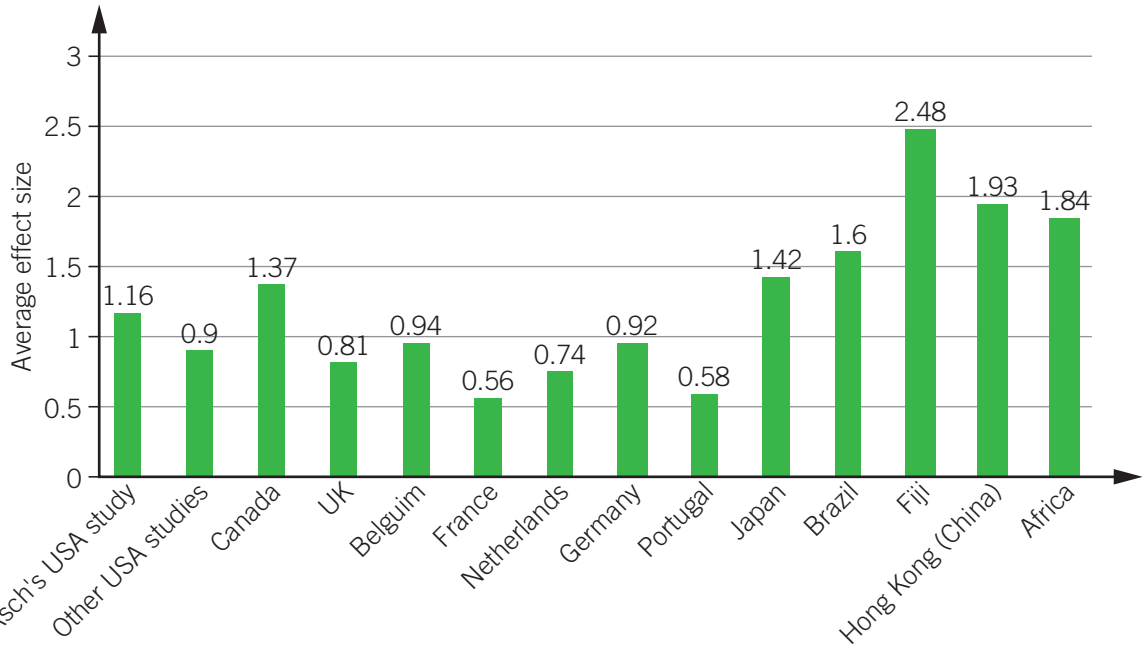


Figure 8B–16 Results of conformity studies across different countries or regions. The smaller the effect size, the lower the conformity, and the greater the effect size, the higher the conformity.

ISBN 978-1-009-25401-4 Gallagher et al

Why was this the case? The researchers concluded that it was due to a fundamental difference in how these countries operated. Specifically, a great difference was observed between individualist and collectivist cultures. Individualist cultures focus on individuality, personal achievement and independence. In contrast, collectivist cultures work towards group goals and encourage uniformity and values that promote group aims. Participants from individualist cultures tended to have lower levels of conformity. Conforming would be undesirable in an individualist society, as it would be regarded as promoting weakness. Conversely, participants from collectivist cultures showed the highest levels of conformity. In these countries, it is considered rude to step out of line with everyone else, as this would be regarded as working against the group's goal of cohesion.

LINK **8A** THE INFLUENCE OF SOCIAL GROUPS AND CULTURE ON INDIVIDUAL BEHAVIOUR

Figure 8B–17 Western cultures are more likely to be individualist, while Eastern cultures are more likely to be collectivist.

Informational influence

Informational influence involves people conforming because they want to be correct, so they look to others whom they believe might have more information. When a person is unsure about a situation or lacks expertise, they will conform to a group's behaviour or viewpoint because they assume it is more informed. Some participants in Asch's experiment believed that they were wrong because no one else agreed with them, so they changed their responses to be 'correct'.

Informational influence an occurrence in which a person conforms because they want to be right, so they look to others they believe might have more information

We see this in real life as well. For example, if someone went to a fine restaurant for the first time, saw multiple forks on the table and didn't know which one to use, they might look to a nearby individual to see which fork to use first. As another example, when we travel to different countries, we are usually unclear about how to act, so we rely on the observations of others to guide us. We demonstrate informational conformity when we adjust our behaviour in response to the behaviours of the people who live there.

Figure 8B–18 Jurors who are unsure whether an individual committed a crime might succumb to informational influence.

ISBN 978-1-009-25401-4 Gallagher et al

Unanimity

Unanimity the complete agreement that group members experience in terms of knowing the answer

Unanimity refers to the complete agreement that group members experience in terms of knowing the answer. It appears that group unanimity is one of the reasons underlying Asch's results. If the majority are unanimous in their beliefs, then people experience great pressure to conform. However, if just one person disagrees with the majority after it has agreed about something, then conformity for other members drops significantly. This was demonstrated in Asch's experiments: when Asch set up just one confederate to disagree with the majority's views, the participants' conformity dropped to under 10%.

You may have experienced this in your own life. If all of your friends express their dislike of a certain teacher, then you might do the same, even though you don't have a problem with that teacher. Because all your friends feel the same way and express their views together, you conform to their beliefs. However, if just one of your friends admitted that the teacher was all right, then you would be more likely to admit that you also don't mind that teacher.

Group size

In his 1951 experiment on conformity, Asch manipulated the number of confederates present. The number of confederates ranged from one to 15. Up to a point, the larger the dominant group (number of confederates), the more frequently people conformed. Conformity was calculated to be 3% in a 'group' of one person, 12% in a group of two, 13% in a group of three and 32% (about a third) in a group of threefour or more. However, at sizes greater than this, conformity did not increase significantly (Figure 8B–19).

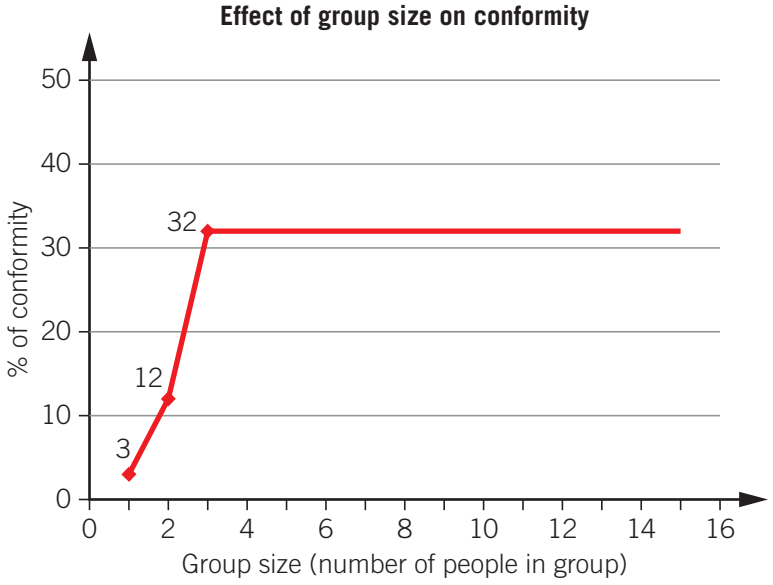


Figure 8B–19 Results for Asch's study on the effect of group size

Group size the number of individuals within a group; increase in group size can correspond to a rise in conformity (but only up to a point)

Further research by David Wilder, however, suggests that a group's size is not what matters most. Although conformity can increase with **group size**, how the relevance of an individual's response is perceived in the group is also an important factor. This is known as the psychological size of a group. If everyone in a group gives the same verbal answer, then you'd probably only regard the first few responses as independent assessments of the situation. After three or four people have responded in the same manner, you'd probably assume that they were just going along with everyone else's responses. Therefore, you'd only take the first few responses into account when considering your response.

ISBN 978-1-009-25401-4 Gallagher et al

Wilder found that when people's responses are perceived to be independent, conformity increases with group size. An example of this could be in the classroom. Imagine that your teacher asks everyone in the class to say their response to a maths question out loud. Lucky for you, you are sitting at the back of the classroom. You listen to the first few answers given by the students at the front of the room, but your answer is different. The teacher continues to ask around the room, and everyone else responds with the same answer as the first few students. You would probably experience disbelief that everyone got the same answer, but when it comes to your turn, you'd likely restate the answer like everyone else. It wouldn't matter whether your class had 24 students or five – as long as the first four students give the same answer, you'd likely conform to their responses and go with the majority.

Figure 8B–20 We might see the influence of group size in a classroom.

Social loafing

Social loafing refers to a person's tendency to reduce their effort when working in a group, as opposed to when working alone. For example, we might see social loafing occur when a group needs to complete an assignment or work project and one person contributes minimally. We might also observe social loafing in team sports or games in which one person makes less of an effort to win the game. In terms of conformity, when a task requires some effort (e.g. if the lines in the Asch experiment are similar in size and require careful scrutiny to distinguish the correct answer), an individual may conform with the majority simply to avoid the effort involved in making a personal judgement.

Social loafing a person's tendency to reduce their effort when working in a group, as opposed to when working alone

Figure 8B–21 In a study on social loafing, it was found that in team sports such as a tug of war, the collective effort exerted by each team did not match the total of individual efforts.

ISBN 978-1-009-25401-4 Gallagher et al

Deindividuation

You learned about deindividuation earlier in this chapter when Phillip Zimbardo deliberately removed the individual identifying characteristics of the Stanford prison guards and prisoners. Deindividuation is a final reason why people might be more conformist when in a group than when they are by themselves. Deindividuation occurs when people act in a certain way because they have 'disappeared' into a group. That is, they become 'faceless'. Deindividuation can best be described as the loss of individuality and the gained sense of anonymity that can occur in a group situation. In terms of conformity, if an individual is anonymous or they have no social status within that group, then they are more likely to absolve themselves of any responsibility for having to provide a correct answer. In Asch's conformity experiments, the individuals believed that they were part of a group, and therefore, their individual responses didn't matter. They could justify an incorrect response by believing that 'everyone else was doing it' and responding in the same manner.

8A THE INFLUENCE OF SOCIAL GROUPS AND CULTURE ON INDIVIDUAL BEHAVIOUR LINK

WORKSHEET 8B–1 COMPARING OBEDIENCE AND CONFORMITY DOC

Figure 8B–22 If we are in a large group, we are more likely to experience deindividuation and act in a way we probably wouldn't otherwise, such as all facing the same way.

Check-in questions – Set 5

1 Copy and complete the table below by describing each factor that affects conformity and explaining how it does so.

Factor	Description	How it affects conformity
Group size		
Unanimity		
Normative influence		
Informational influence		
Culture		
Social loafing		
Deindividuation		

2 Describe a situation in which you were influenced by another's thoughts or actions. Interpret your conformity in terms of social influence (both informational and normative).

3 Imagine someone is on a jury, and they are the only one who believes that the defendant is innocent. What techniques could they employ to persuade the majority?

ISBN 978-1-009-25401-4 Gallagher et al

4 For each of the scenarios below, identify the factor that affects conformity.
   a Ikenna is attempting to master the art of surfing. On the recommendation of his surfing teacher, he purchases a two-fin surfboard rather than a single-fin surfboard.
   b Liam dislikes drinking in hotels, but he joins his co-workers at the neighbourhood pub on Fridays because 'everyone else wants to go'.
   c Security personnel remove their identifying numbers, wear reflective sunglasses and become overly-rough when engaged in crowd control.
   d Nancy always sings more quietly in the choir.
   e Cassy's friends all agree that tacos are better than burritos. Cassy agrees with the group, even though she secretly disagrees.
   f When Trinh visits the United States, he is surprised at how independent everyone is. At home in Vietnam, everyone is much more dependent on each other.
   g A group of students discuss the answers they gave on an exam. After the first four students give the same answer, you resolve to also give that answer, even though your answer is different.

8B SKILLS

VIDEO 8B–1 SKILLS: TECHNIQUES FOR REMEMBERING CONTENT

Techniques for remembering content in psychology

In VCE Psychology, it is sometimes difficult to recall all the information that you have learned. The good news is that there are many ways to enhance your memory and make remembering key content easier. Techniques to enhance memory are known as mnemonics, and they work in surprising ways. You might think that they simplify the content that you are trying to learn and recall, but they actually make the information more detailed. There are many ways to use mnemonics. Below are some examples that you can use for your psychology learning.

- **Use music.** To do this, pick a particular song that you know very well. Try changing the lyrics so that they contain the core information of the subject that you are trying to learn. For example, you might adapt a different song for each of Zimbardo, Milgram and Asch's experiments.
- **Use acronyms.** Acronyms are words or names in which each letter represents a word or phrase to be remembered. For example, to recall the elements that influence conformity, you might use the acronym DINGUS to remember deindividuation, informational influence, normative influence, group size, unanimity and social loafing.
- **Use acrostics.** Acrostics are similar to acronyms, but instead of a word or name, you would use a phrase or sentence in which the first letter of each word corresponds to the words or phrases you need to remember. For example, to recall the aspects that affect obedience, you could use an acrostic such as 'Sophie likes grapes' to remember social closeness, legitimacy of the authority figure and group pressure.
- **Connect new knowledge to real-life examples.** One mnemonic approach for remembering new information is to associate it with something you already know or understand. This gives it added meaning and helps you remember it better. For example, consider an event in your own life that convinced you of the legitimacy of the authority figure. Map your new information against the information in your event. This will help you recall the information much more effectively because you have added an extra layer of memory to your recall.

ISBN 978-1-009-25401-4 Gallagher et al

- **Use the method of loci.** This method involves the learner visualising a room or a familiar path through a building and mentally linking facts or information to specific locations or objects along the way. To recall what you have learned, you revisualise moving through that room or along that path, and each stop along the way triggers another piece of information. For example, if you try to remember the factors affecting conformity, you might start by using the rooms of your house. First, you might visualise entering the front door and you see all your extended family, which you might connect to the concept of group size. You might then go to the kitchen, where you see a loaf of bread on the kitchen counter, which might symbolise social loafing. When you need to recall the information, you just visualise yourself walking through your house or along the path.

Section 8B questions

1 Copy and complete the table below by matching the terms with their definitions.

Term		Definition	
1	Obedience	A	Cultures that work towards group goals and encourage uniformity and values that promote group aims
2	Confederate	B	Cultures that focus on individuality, personal achievement and independence
3	Social proximity	C	Validity or respect given to a person who has a higher position or status in a social hierarchy
4	Legitimacy of the authority figure	D	An occurrence in which other members are shown to be obedient to the authority figure or not
5	Group pressure	E	An occurrence in which a person conforms because they want to be right, so they look to others they believe might have more information
6	Conformity	F	A person's tendency to reduce their effort when working in a group (but not when working alone)
7	Normative influence	G	An individual who participates in an experience while being aware of the experimental aims and procedures
8	Individualist cultures	H	The notion that people act a certain way due to the anonymity that a group provides
9	Collectivist cultures	I	The process by which people modify their beliefs, attitudes, actions or perceptions to more closely match those held by groups to which they belong or aspire to belong
10	Informational influence	J	The complete agreement that group members experience in terms of knowing the answer
11	Unanimity	K	The act of people changing their behaviour in response to direct commands from an authority figure
12	Social loafing	L	The occurrence in which we conform with others because we want to be liked by them – and we assume that our conformity with them will make them like us more
13	Deindividuation	M	In psychology, how physically close one or more people are towards each other

ISBN 978-1-009-25401-4 Gallagher et al

2 Copy and complete the comparative table below.

	Milgram's experiment	Asch's experiment
Aim		
Sampling and participants		
Procedure		
Results		
Conclusion		
Ethical issues		

3 Outline how obedience differs from conformity.

4 Asch studied how culture affected levels of conformity. He found that people in North America and Europe were less likely to conform than people in Asia. Explain why this variation is believed to occur.

5 A psychologist was conducting a study on obedience in which a confederate approached people on the street and instructed them to take a piece of rubbish off the ground and put it in a nearby bin. In half of the cases, the confederate was dressed in jeans and a T-shirt; in the other half, the confederate was dressed in a paramedic uniform. The psychologist then recorded how many people in each group picked up the rubbish.

Discuss the likely results of this study in relation to relevant psychological terminology.

6 Identify and explain the factor that influences conformity in the following scenarios.

a Oliver goes out with a group of friends to the city during the holidays. He feels like playing Laser Tag, but his five friends want to go bowling. Oliver chooses not to say anything and goes along with the group because he doesn't want them to think he's difficult.

b Scott is at a soccer game, and some of the crowd members start fighting with the opposing fans and throwing objects at them. Scott also starts throwing objects, as he secretly thinks that since everyone else is doing it, it must be okay.

Figure 8B–23 We will often be inclined to change our behaviours in order to better fit into society around us

ISBN 978-1-009-25401-4 Gallagher et al

8C Positive and negative influences of media on individual and group behaviour

Study Design:
Positive and negative influences of different media sources on individual and group behaviour, such as the changing nature of social connections, social comparison, addictive behaviours and information access

Glossary:
Addiction
Advertising
Dopamine
Downward social comparison
Fear of missing out
Information access
Media
News
Social comparison
Social connections
Social media
Television (TV)
Upward social comparison
Video game

ENGAGE

The influence of racial stereotypes and video games on violent crime

Researchers analysed more than 200 000 news articles about 204 mass shootings over a 40-year period and found that video games were eight times more likely to be mentioned when the shooting occurred at a school and the perpetrator was a white male than when the shooter was an African American male.

'When a violent act is carried out by someone who doesn't match the racial stereotype of what a violent person looks like, people tend to seek an external explanation for the violent behaviour,' said lead researcher Patrick Markey, PhD, a psychology professor at Villanova University. 'When a white child from the suburbs commits a horrific violent act like a school shooting, then people are more likely to erroneously blame video games than if the child was African American.'

Numerous scientific studies have not found a link between violent video games and mass shootings, but some politicians and media coverage often cite violent video games as a potential cause, particularly for school shootings. Video games are often associated with young people even though the average age of players is in the 30s, Markey said.

ISBN 978-1-009-25401-4 Gallagher et al

'Video games are often used by lawmakers and others as a red herring to distract from other potential causes of school shootings,' Markey said. 'When a shooter is a young white male, we talk about violent video games as a cause for the shooting. When the shooter is an older man or African American, we don't.'

In one experiment in this study, 169 college students (65 per cent female, 88 per cent white) read a mock newspaper article describing a fictional mass shooting by an 18-year-old male youth who was described as an avid fan of violent video games. Half of the participants read an article featuring a small mug shot of a white shooter, while the other half saw a mug shot of an African American shooter. In their responses to a questionnaire, participants who read the article with the photo of a white shooter were significantly more likely to blame video games as a factor in causing the teen to commit the school shooting than participants who saw an African American shooter.

Participants who didn't play video games also were more likely to blame violent video games for school shootings. Participants were asked if the perpetrator's 'social environment' contributed to the school shooting, but their responses to that question did not affect the findings.

Source: American Psychological Association. (2019). *Violent video games blamed more often for school shootings by white perpetrators*. Science Daily.

EXPLAIN

Modern media

Where do you go when you want to hear your favourite song, watch your favourite show, see the latest current events or quickly check what time you are meeting your friend for coffee? You will more than likely go to your smartphone or computer rather than a television or radio to access the required information. Traditionally, the general public obtains news, entertainment and information through various **media** sources, such as television, newspapers or radio. Using new technologies, we can access information from personal devices such as our phones, tablets or computers – from virtually any location. Since much of this information is now literally at our fingertips, we can connect with others on a global scale. The evolution of media has changed how we gather information, entertain ourselves and communicate with others.

Media
the various broadcasting mediums, such as the internet, newspapers, magazines, TV, radio, billboards and smartphones

Figure 8C–1 Evolution of the media: newspapers once dominated the news media world, but now most people get the news on their smartphones.

ISBN 978-1-009-25401-4 Gallagher et al

Whether we are aware of it or not, the messages and information that we absorb from the media can influence our attitudes and behaviour. As we consume more and more information through images, sounds, slogans and branding, we are integrating what we see in the media into our existing knowledge of the world – for better or worse. In this section, we explore different types of media sources and then investigate the positive and negative effects that media can have on individual and group behaviour.

Types of media sources

A person can choose to gather information from a wide array of media sources. The specific kinds of media sources we choose are important because the medium in which we receive a message shapes the message, which in turn influences how we might behave. For example, imagine that a company is advertising a new diet product. They might persuade their audience to consider the product by having a celebrity praise the product and show the difference in their weight via a social media post. Individuals who see this visual and straightforward, appealing post might buy the product. However, consider those who don't use social media; for example, if they prefer the radio, then an advertisement that contains an image of an attractive person will not work. Instead, advertisers could create an advertisement that outlines the product's health benefits. Although this might persuade someone who listens to the radio to buy the product, an advertisement that only has text – and that isn't visually appealing – likely won't generate many sales if it is presented on social media or television.

Over the last 20 years, Australian consumers have increasingly incorporated digital media into their everyday lives. The majority of Australians (60.8%) now say that the internet is a leading source of news, including 37.7% who nominated social media specifically as a leading news source. The number of Australians who use TV as their primary source of news has dropped to 59.4% as at 2020. However, TV is still considered one of the most trusted sources of information, with nearly 33.4% of Australians nominating it as the leading source – ahead of any other traditional or digital media forms. Other conventional types of media used as primary news sources include radio and printed newspapers, although both have declined in popularity since 2018. In 2001, four out of five people (80%) reported using social media at least sometimes, 59% said they access social media every day or most days, and more than a third of people claimed they access social media more than five times a day (35%, up from 26% in 2020). Among people aged 18 to 29 years, 89% check their social media at least once a day.

Figure 8C–2 Social media use continues to increase.

ISBN 978-1-009-25401-4 Gallagher et al

With the ever-changing media landscape, it is no wonder that society is witnessing changes in group and individual behaviour. Advertising, TV, news sources, social media and video games all play an essential role in shaping individuals and society. These media sources are summarised in Table 8C–1.

Table 8C–1 Sources of media

Media source	Description	Examples
Advertising 	**Advertising** is an activity and industry designed to use different psychological techniques to sell a product, service or idea to a wide range of individuals. It can be performed through many channels, including newspapers; TV; radio; leaflets, flyers and brochures; posters and billboards; direct mail; business cards; different types of guerrilla marketing (e.g. ambush marketing, ambient marketing, undercover marketing or experiential marketing); social media; email marketing; chatbots; SMS; web push notifications; podcasts; landing pages; video marketing; and pay-per-click advertising.	When you watch TV in the morning before school, you might see a shampoo advertisement, which usually has a celebrity flicking their glossy locks as they tell us that since they started using product X, their hair is shinier and more manageable than ever before. When you catch the bus to go to school, you might see a poster on the side of the bus that is advertising a new type of shoe. On your way to school, you see multiple billboards trying to persuade you to switch to a new low-fat brand of milk.
Television 	**Television (TV)** is a telecommunication medium used to transmit moving images in black and white or colour, with sound. TV is a mass medium for advertising, entertainment, news and sports, and watching TV is still one of the most common forms of media use; in fact, Australian adults spend about 15 hours a week watching TV. However, the way that individuals use TV has changed. Although individuals and families still use free-to-air TV to watch the news and sports, paid entertainment subscriptions are becoming increasingly popular for listening to music and watching movies, shows and educational resources.	When they get home from day care, a child watches an educational program on an educational channel. On a Saturday night in, a family might watch a movie via an entertainment subscription service. Before leaving for work, a couple might watch the news on free-to-air TV.

Advertising the activity and industry of creating messages and using different psychological techniques to promote or sell a product, service or idea

Television (TV) a telecommunication medium used to transmit moving images in black and white or in colour, with sound

ISBN 978-1-009-25401-4 Gallagher et al

Table 8C–1 *(Continued)*

Media source	Description	Examples
Video games 	A **video game** or computer game is an electronic game that involves a person interacting with a user interface or input device (e.g. a joystick, controller, keyboard or motion-sensing device) to generate visual feedback. Video games have many genres, including social network games, educational and art games, roleplaying games, simulation games and arcade games. Video games appeal to and are used by many age groups, schools, workplaces, research facilities, parents and students for numerous reasons, including as entertainment, a distraction, a method for making social connections, to keep fit and for educational purposes.	A young woman plays Candy Crush Saga on her phone while she waits to meet her friend. A young child uses their tablet to play a game designed to improve their vocabulary. A group of friends play for fun at a party. A couple spend the afternoon playing an online roleplaying game that links them to players across the world.
News sources 	**News** refers to information about current events. News is consumed in many formats, including TV, newspapers, online newspapers, the radio, internet sources and social media. More recently, Australian consumers have preferred to obtain their news from internet sources rather than TV or newspaper sources. A current challenge in modern media is the concept of 'fake news', in which people, groups and organisations use self-publishing and social media posts to rapidly create and share false or misleading information, which reaches many people before anyone has even stopped to ask whether the information is true.	A man reads a newspaper on the train. A group of girls discuss the latest breaking news item that they saw on Facebook. A teacher scours an online news website for an article that his English class can analyse.

Video game an electronic game that involves a person interacting with a user interface or input device (e.g. a joystick, controller, keyboard or motion-sensing device) to generate visual and auditory feedback

News information about current events

ISBN 978-1-009-25401-4 Gallagher et al

Table 8C–1 *(Continued)*

Media source	Description	Examples
Social media 	**Social media** refers to an internet-based technology that facilitates the sharing of ideas, thoughts and information through virtual networks and communities, including smartphones, smartwatches, tablets and computers. As of October 2021, more than 4.5 billion people had used social media. Even governments and politicians use social media to engage with constituents and voters. Social media can take the form of numerous technology-enabled activities, including photo sharing, blogging, social gaming, social networks, video sharing, business networks, virtual worlds and reviews. The most popular social media websites in January 2021 were Facebook, YouTube, WhatsApp, Facebook Messenger, Instagram, WhatsApp, TikTok, QQ, Douyin and Sino Weibo.	A family who want to travel to another country look at online reviews of hotels before they decide where to stay. Two friends keep in touch via Facebook. A group of girls produce a dance that goes viral on TikTok.

Social media internet-based technology, accessible on devices including smartphones, smartwatches, tablets and computers, that facilitates the sharing of ideas, thoughts and information through virtual networks and communities

ACTIVITY 8C–1 MEDIA SOURCES JIGSAW

In small groups, choose one of the following media sources and do some research to find out more about it:

- advertising
- social media
- television
- news sources
- video games.

Spend 30 minutes researching your chosen media source and prepare a two-minute class presentation that includes:

- a description of the media source
- examples of the media source (visual examples are best)
- an evaluation of how often the average Australian uses this media source
- an outline of how this media source influences both individual and group behaviour.

After preparing your presentation, present it to your class.

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 1

1 In your opinion, why might Australians prefer to get their news from internet sources rather than watching it on TV?
2 Provide one example each for advertising, social media, television, news sources and video games that has not been used in the text.
3 Based on your existing knowledge, outline some of the positive and negative effects of using the following types of media sources:
   a Advertising
   b Social media
   c Television
   d News sources
   e Video games

Positive and negative influences of media

Media sources are the primary means of communication used to reach the general public. The public typically relies on various media sources to provide information regarding political issues, social issues, entertainment and news in pop culture. News outlets use media sources to influence public opinion regarding specific topics. Historically, print and broadcast news sources were the public's only way to access information about world events. For example, when Neil Armstrong landed on the moon in 1969, news sources via TV and radio made it possible for the public to witness the historic event. Consumers can now easily access almost any information through news sources, social media and the internet.

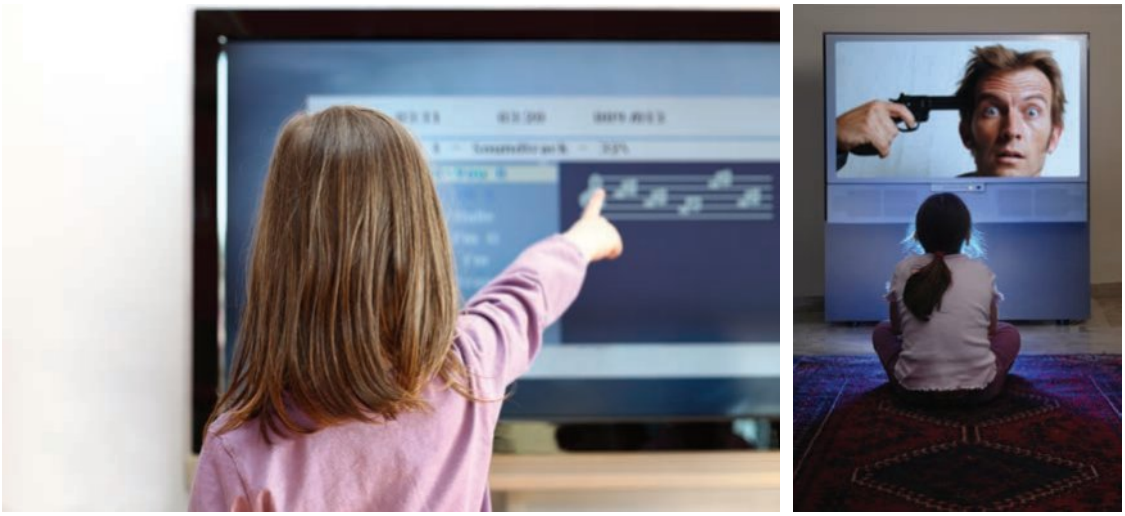


Figure 8C–3 Although media sources can help educate individuals through educational shows, they might also give rise to violence.

In the following section, we will explore the positive and negative influences of media sources in terms of the changing nature of social connections, social comparison, addictive behaviours and information access.

The changing nature of social connections

Social connections the relationships that individuals have with the people around them

Social connections are the relationships that individuals have with the people around them. These people can be close to a person (e.g. family, friends and co-workers) or more distant (e.g. casual acquaintances). In physical terms, they can be as close as next door or so far away that they can only be communicated with by telephone or social media. One's network of relationships might be large or small; for example, one or two close family members or friends might be all that a person needs to feel supported and loved. Scientific evidence strongly suggests that solid social connections are a central psychological need and vital for satisfaction in life. Even more so, social connections have also been linked to better mental health.

ISBN 978-1-009-25401-4 Gallagher et al

Research suggests that people with strong social connections show lower rates of anxiety and depression, higher levels of self-esteem and greater empathy – and they enjoy more trusting and cooperative relationships. In comparison, social isolation and loneliness are harmful to our health. The more socially isolated older adults are, the more they tend to be inactive, smoke and have higher blood pressure and other risk factors for heart disease. Several studies suggest that socially isolated adults also have an increased risk of death.

How we interrelate and form relationships has changed considerably over the past decade. Traditional neighbourhoods in which everyone knows each other are less common due to the effects of longer working hours, differing family structures, more movement and changes regarding where we live, and the emergence of online technologies and social media applications. Facebook and other social media networks have changed how we socialise, especially for younger people. Research suggests that the increase in social media use has positively influenced communication and supported social networking opportunities for individuals and professional groups. Many people have also reported that social media has strengthened their relationships with family and friends. These networks can help individuals stay connected with friends and family regardless of geographical distance between individuals, clashing social schedules and busy work lives. Additionally, social media can facilitate communication between like-minded people, which can result in global friendships. For individuals who are introverted or have poor social skills, social media can help them overcome barriers to connectivity because they feel more secure behind a screen.

Figure 8C–4 Having strong social connections is a protective factor that allows an individual to recover from illness more quickly – or even prevent it altogether.

Social media has also provided a platform for people to voice opinions, join in environmental conversations, raise money for charities and call for help on a range of political, social, environmental or other issues. Global issues such as family violence, climate change and the prevention of certain illnesses have all been highlighted as significant social issues via social media, which has led to increased awareness of these issues. For example, in 2019, Grace Tame spoke out against those who abused children in institutional settings. From age 15, Grace was groomed and raped by her 58-year-old maths teacher, who was found guilty and eventually jailed for his crimes. Grace's story was met with outrage, and it engendered a change to overturn specific laws that prevent sexual assault survivors from publicly telling their stories.

On the other hand, concerns have been raised about the negative influence of social media and video games on social skills due to the absence of face-to-face contact. Using social media too much makes it harder for people to identify the emotions being expressed by the people with whom they are talking, making it harder to respond appropriately. It has also been suggested that social media sites and video games make it more difficult to distinguish between the meaningful relationships that are made in the real world and the casual relationships that are formed through social network sites. One study found that 76% of females and 54% of males check social media platforms at least 10 times when they are out with friends. This physical detachment from others hinders social development and can lead to mental health issues in some cases.

ISBN 978-1-009-25401-4 Gallagher et al

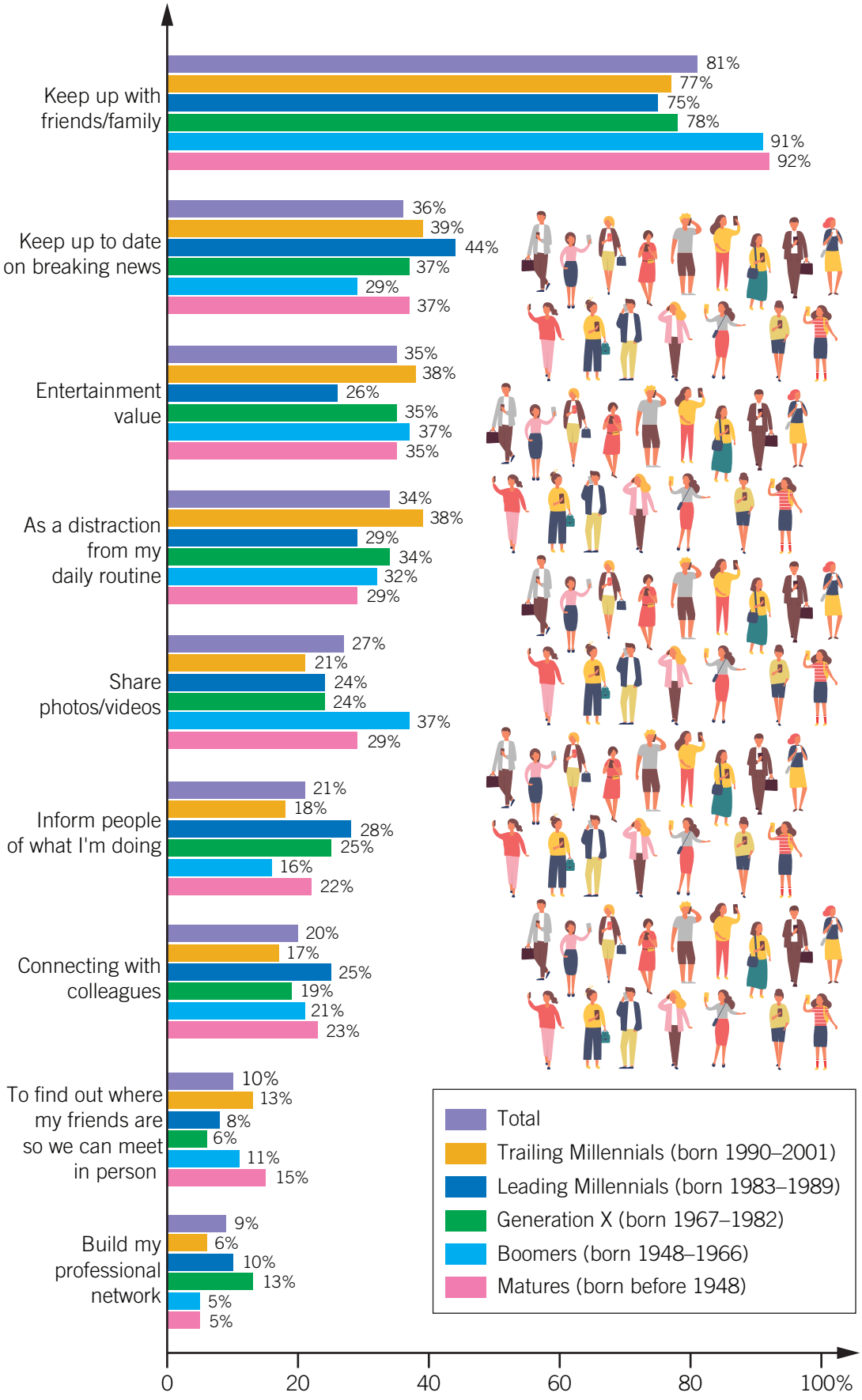


Figure 8C–5 The reasons for using social networks across generations

ISBN 978-1-009-25401-4 Gallagher et al

Social comparison

How often have you compared yourself to your friends or colleagues by using a trait that you consider desirable, such as money or success? This comparison is known as **social comparison**, a behaviour in which we compare certain aspects of ourselves – such as our behaviour, opinions, status and success – to other people so that we can assess ourselves better. Leon Festinger first developed the theory of social comparison in 1954. He hypothesised that we cannot self-judge our opinions and abilities accurately, so we rely on comparing ourselves to other people to form an evaluation. In developing an evaluation, we judge our skills and views to determine whether we are good enough, and we set a benchmark for what we aim to achieve in our lives.

Figure 8C–6 Those who play video games excessively may not understand how to make meaningful real-world connections with others.

Social comparisons are described as being either upward or downward. When we engage in **upward social comparison**, we compare ourselves to someone we perceive to be better than we are. Upward comparisons often focus on our desire to improve our current status or level of ability, which motivates our comparisons. In contrast, when we engage in **downward social comparison**, we compare ourselves to someone we perceive to be worse than we are. Downward comparisons often make us feel better about our abilities or traits, thereby raising our self-esteem.

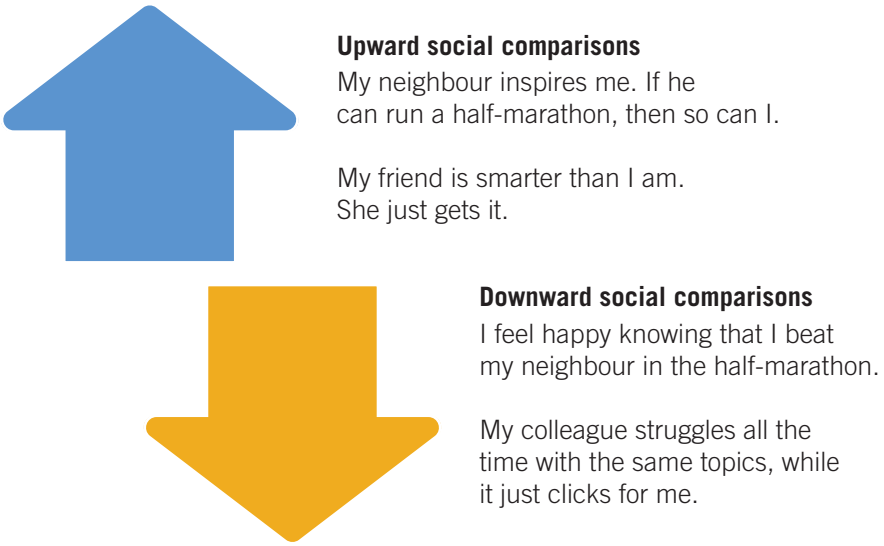


Figure 8C–7 Examples of upward and downward social comparison

Social comparison can be helpful because it gives us a way to determine whether we are 'on track'. However, it can also be incredibly harmful and result in negative thoughts and behaviours. Instead of the desired effect, in which we assess our abilities and opinions against a realistic, achievable benchmark or role model, social comparisons can result in the opposite outcome: we compare our behaviour according to an unrealistic standard and subsequently develop low self-esteem.

VIDEO 8C–1 SOCIAL CONNECTIONS AND COMPARISON

Social comparison a behaviour in which we compare certain aspects of ourselves – such as our behaviour, opinions, status and success – to other people to assess ourselves better

Upward social comparison a behaviour in which we compare ourselves to someone we perceive to be better than we are

Downward social comparison a behaviour in which we compare ourselves to someone we perceive to be worse than we are

ISBN 978-1-009-25401-4 Gallagher et al

Social media platforms (e.g. Twitter, Facebook and Instagram) are good examples of modern-day opportunities for social comparison. Users may see other users posting about their new car, attractive boyfriend or girlfriend or beautiful home and feel inspired or motivated to achieve the same result. However, others may see these pictures and engage in upward social comparisons, which results in feelings of inferiority and envy. Further, the constant bombardment of filtered images on social networking sites, TV and in advertising can cause low self-esteem and disordered eating in young adults. Specifically, the pervasive circulation of filtered and photoshopped images promotes unrealistic expectations of how young people should look and behave. When these expectations are not met, the effect on self-esteem can be harmful; it could result in teens altering their appearance and engaging in negative behaviours like excessive exercise, drug use or food restriction. One study from the University of Pittsburgh found a correlation between time spent scrolling through social media apps and negative body image feedback. Compared to their peers who spent less time on social media, users who had spent more time on social media had 2.2 times the risk of reporting eating and body image concerns.

Figure 8C–8 Photoshopped images on social media and in advertising that show men as being unnaturally muscular create unrealistic expectations of how men should look. This can result in food restriction, excessive exercise, the use of steroids or diet pills and even plastic surgery.

Fear of missing out (FOMO) the extreme fear of not being included in or missing a social event

Online media use can also trigger **fear of missing out (FOMO)** – the extreme fear of missing out on a social event or not being included in it. For example, individuals may see pictures of parties or fun events that they were either not invited to or unable to attend due to work or school obligations. This leads the individual to experience anxiety and the belief that no one misses them, or the belief that they will be forgotten because they are not at the event. A fear of missing out can take a toll on self-esteem and lead people to compulsive social media checking to ensure that they aren't missing out on anything, which can ultimately lead to potential workplace and classroom problems. For example, a Harvard University study found that social media has a significantly detrimental effect on the emotional wellbeing of chronic social media users and their lives – that is, social media negatively impacts the users' real-life relationships and academic achievement.

Figure 8C–9 Social media users might become stressed because they believe that they are not having as much fun as the people they are connected to on social media.

ISBN 978-1-009-25401-4 Gallagher et al

Addictive behaviours

The topic of online technologies, such as social media and video games, has been increasingly studied over the last decade. Although these technologies have been associated with many positive attributes, concerns have been voiced regarding their excessive use – especially in terms of users potentially becoming addicted to using them. An **addiction** refers to a person being driven by an uncontrollable motivation to perform certain behaviours (e.g. online activities) and devoting so much time and effort to these behaviours that it impairs their other important life areas. Individuals who are engrossed in their phones, video games or online shopping and ignore other everyday activities such as housework, homework or socialising with a friend in real life meet this definition.

Addiction the state in which a person feels an uncontrolled motivation to perform certain behaviours (e.g. online behaviours) and devotes so much time and effort to these behaviours that it impairs their other important life areas

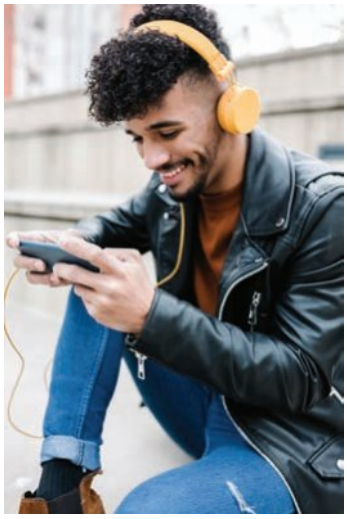


Figure 8C–10 Extensive internet use and playing of video games may be a sign of increase in addictive behaviours.

Internet gaming disorder has been listed as a potential behavioural addiction in section 3 of the latest edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5-TR). It is defined as 'persistent and recurrent use of the internet to engage in games, often with other players, leading to clinically significant impairment or distress, as indicated by five (or more) diagnostic criteria in 12 months' (APA, 2013). A growing number of studies have shown that addictive use of the internet and addictive playing of video games looks much like any other substance use disorder, and includes similar criteria, such as:

- mood modification – engaging in internet use and video game playing results in escaping from problems and seeking to relieve negative moods or feelings
- salience – a person being preoccupied with internet use or video gaming
- tolerance – needing to use the internet or play video games for increasing periods of time
- withdrawal symptoms – experiencing unpleasant physical and emotional symptoms when internet use or video game playing is restricted or stopped
- conflict – interpersonal problems being caused by internet use or video game play
- relapse – addicted individuals quickly reverting to excessive internet use or video game playing after an abstinence period.

LINK **4A** CRITERIA USED TO CATEGORISE TYPICAL AND ATYPICAL BEHAVIOUR

Although anyone who can access the internet or video games can potentially develop an addictive use of technology, specific demographic factors, such as young age, tend to increase the risk. A large part of the younger generation's social culture involves communicating via digital media, whether through, social media, texting or email. Research has also demonstrated that people can become 'addicted' to technology regardless of their gender, but that males and females engage in different online activities.

ISBN 978-1-009-25401-4 Gallagher et al

Males are more likely to become 'addicted' to online video gaming, cyber pornography and online gambling, while females tend to develop addictive use of social media, texting and online shopping.

Table 8C–2 Symptoms of social media, video gaming and online shopping addiction

Social media addiction	Video game addiction	Online shopping addiction
The main social media addictions include: • spending a lot of time thinking about social media or planning to use social media • feeling urges to use social media more and more • using social media to forget about personal problems • often trying to reduce social media use without success • becoming restless or troubled if you can't use social media • using social media so much that it affects your job or studies	The main video game addictions include: • becoming isolated from family and friends • lying to others about how often you play video games and playing in secret • becoming upset and irritable when you don't play video games • neglecting work or school to play video games • avoiding activities that you once enjoyed • skipping meals to focus on gaming • often becoming tired because you don't get enough sleep • developing physical problems from playing video games too much (e.g. carpal tunnel syndrome, migraines and eye strain)	The main online shopping addictions include: • feeling like you can't stop online shopping even if you wanted to, or trying to stop without success • feeling like online shopping has caused harm to your relationships, work or financial security • family members, partners or friends being concerned about your online shopping habits • thinking about shopping all the time • getting angry or upset if you can't shop online • believing that online shopping is the only thing that makes you feel better • hiding bought items because you are afraid that others will think it's a waste of money. • feeling guilt or regret after online shopping • spending less time doing what you enjoy due to online shopping • buying things you don't need or didn't plan on, even when you can't afford it

Dopamine a naturally occurring 'feel-good' chemical that motivates us to do what we think will bring us pleasure

The phenomena of social media, internet shopping and video game addiction can be explained by the release of dopamine in the brain. **Dopamine** is a naturally occurring 'feel-good' chemical that motivates us to do what we think will bring us pleasure. For example, as the brain's major reward and pleasure neurotransmitter, dopamine drives us to buy pizza when we are hungry. Social media, video games and online shopping prompt dopamine release when we get likes and comments, when we move up a game level and when we receive our purchase in the mail. According to a new study by Harvard University, getting likes, receiving purchases and being successful in video games activate the same part of the brain that is activated when a person takes an addictive substance. When someone experiences something rewarding, neurons in the dopamine-producing areas in the brain are activated and dopamine levels rise. Therefore, the brain receives a 'reward' and associates the activity with positive reinforcement. This is observable in social media usage. For example, when an individual sees a notification (e.g. someone liking a post), the brain receives a dopamine rush and sends it along reward pathways, causing the individual to feel pleasure. Through this positive reinforcement, the brain rewires itself – which ultimately prompts people to desire likes and comments on their social media posts.

ISBN 978-1-009-25401-4 Gallagher et al

Figure 8C–11 Receiving likes and comments on social media platforms (e.g. TikTok or Instagram) stimulates the release of dopamine, which in turn makes people desire more likes and comments.

ACTIVITY 8C–2 THE BERGEN FACEBOOK ADDICTION SCALE

The Bergen Facebook Addiction Scale includes six items. For each item, respondents must select the frequency with which they exhibit that behaviour. The choices are (1) very rarely, (2) rarely, (3) sometimes, (4) often or (5) very often. Using this scale, respond to the following questions.

1 You spend a lot of time thinking about Facebook or plan use of Facebook.
2 You feel an urge to use Facebook more and more.
3 You use Facebook in order to forget about personal problems.
4 You have tried to cut down on the use of Facebook without success.
5 You become restless or troubled if you are prevented from using Facebook.
6 You use Facebook so much that it has a negative impact on your job or studies.

Answering with a '4' or '5' for four or more of the above statements may suggest an addiction to Facebook.

Information access

Information access is the ability to identify, retrieve and use information effectively. Traditionally, data has been circulated through word of mouth, public libraries or media (e.g. newspapers, radio and TV). More recently, advances in computer technology have revolutionised information access, making vast amounts of business, education, health, government and entertainment information accessible through the internet (e.g. digital news sources).

Information access the ability to identify, retrieve and use information effectively

ISBN 978-1-009-25401-4 Gallagher et al

Figure 8C–12 Media sources like the internet allow us to learn about different cultures that we wouldn't otherwise be exposed to.

One benefit of the wide range of media sources that individuals have available to them is the development of cultural and political awareness. Exposure to media allows people to become informed about state, national and global issues, as well as develop artistic and political understanding. Television, films, magazines and social media sites provide individuals with some access to other cultures, so they can learn about different ethnic and cultural backgrounds. Moreover, some news programs and documentaries can robustly educate, inform and often challenge discriminatory or extreme views. For example, TV shows like *Go Back to Where You Came From* and *You Can't Ask That* highlight and challenge prejudicial views and stereotypes about numerous marginalised social groups.

Access to news sources through the internet is beneficial due to the many news items, weather updates, educational resources and entertainment available at any given time to multiple users. Notifications through social media and news media sites are posted and updated regularly. When a disaster hits or extreme weather occurs, it is often broadcast through these channels before we read it in newspapers or see it on the news.

Being connected via the internet or social media offers people access to international TV shows, movies, magazines, news channels and educational resources. A diverse range of information that can be accessed through tools like wikis, blogs, online texts, books, quizzes, activities and discussion forums helps promote learning and the revision of countless subjects in engaging ways. Social media and streaming services such as YouTube allow people to access comprehensive information, from cooking shows and new music to recommendations for the best products to buy. Many new musicians began their careers by uploading videos of themselves singing onto YouTube – Justin Bieber, Charlie Puth, Alessia Cara and Shawn Mendes are some examples.

Figure 8C–13 Online platforms like YouTube provide us with the ability to learn any skill, from cooking to welding.

However, access to such a wealth of information can decrease a person's ability to focus (e.g. when students are trying to complete their homework). Distraction due to social media or TV can significantly increase the time it takes to complete a task and decrease the quality of the work at the same time. For example, studies have found that students who checked Facebook at least once during a 15-minute study period achieved lower grades than students who didn't check their Facebook.

Individuals are also becoming increasingly aware of the potential negative consequences of posting personal information. Many sites like Instagram and Facebook sell your personal

ISBN 978-1-009-25401-4 Gallagher et al

information to online advertisers, who use it to sell you their products. Data leaks can compromise passwords, which can reveal your name, address, where you go to school and even your bank details. Additionally, once photos are uploaded online, you can never truly erase all traces of them. Many employers look at potential candidates on social media to confirm that they have the right person for the job. In many cases, inappropriate images or comments on a person's Instagram or Facebook have resulted in them being passed over for a job or an opportunity. Other potentially negative influences of social media include the adverse consequences of losing privacy or your identity, theft and cyber safety issues. For example, research has found that in a 12-month period, young social media users were exposed to cyberbullying, to obscene content or to contact with paedophiles and other dangerous individuals.

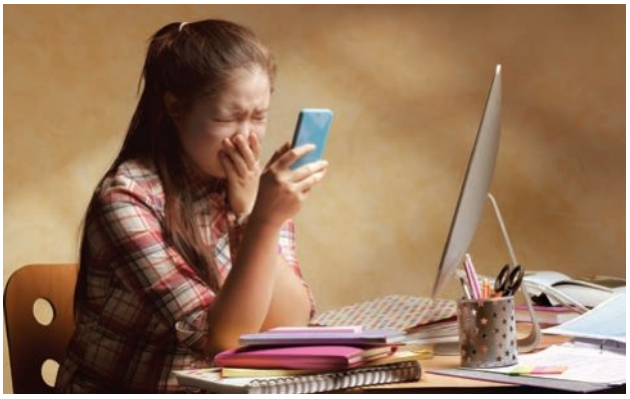


Figure 8C–14 Social media can have many negative effects, such as cyberbullying, which can have a severe psychological impact on a person.

With the explosion in our use of online media, we are now exposed to more advertising than ever before. Much like the way we access information from news sources, we can also glean information from advertisements. Many advertisements serve the public good or protect us from harm, such as warning about the hazards of drink-driving, driving while tired, speeding, cigarette smoking, sun exposure and illicit narcotics. Other advertisements advise us to be aware of signs of illness, violence or terrorist activities. Yet others inform us about new or improved products or services that might result in advantages to our health, and methods or new information that can better our lives and so on. Advertising also allows us to compare the cost of products to get the best value for our money.

While much of what we see and hear in advertisements is accurate, some is purposefully deceptive or untrue. For example, since children comprise such a large market sector, a lot of advertising is aimed at them. Much of this advertising is for unhealthy meals and beverages that are heavy in fat, salt and sugar, which can significantly affect children's health and lifestyles. Substantial money that was previously spent on TV and newspaper advertising to target children has been redirected to the internet and digital media instead. For example, many children's shows on YouTube contain advertisements for fast food or toys.

WORKSHEET 8C–1 MODERN MEDIA

Figure 8C–15 Advertising may also serve the public good by trying to prevent harmful behaviour. For example, drink-driving advertisements warn us about the dangers of getting behind the wheel when intoxicated.

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 8C–3 INFORMATION ACCESS IN NORTH KOREA

Not all countries have the same access to information. Some countries, such as Iran, have blocked certain websites like Facebook, Instagram and YouTube, as well as search engines like Google and Wikipedia. More extremely, North Korea has no access to the internet and limited access to other media sources. In small groups, spend 10 minutes conducting some research to explore what technological limitations the citizens of North Korea experience with regard to accessing information. How has this shaped their society? In your groups, discuss the benefits and drawbacks of having limited access to information.

Check-in questions – Set 2

1 Identify some examples of who might be included in an individual's social connections.
2 What are the benefits of having strong social connections?
3 In general, how does social media influence the changing nature of social connections?
4 Define and describe the social comparison theory.
5 With reference to examples, compare upward and downward social comparisons.
6 How can social media influence fear of missing out?
7 Identify three symptoms of social media or video game addiction.
8 Describe the underlying explanations of why social media and video game addiction occur.
9 Explain how advertising increases access to information.

VIDEO 8C–2 KEY SCIENCE SKILLS: EVALUATING INVESTIGATION METHODS

2B DRAWING CONCLUSIONS AND COMMUNICATING SCIENTIFIC IDEAS

8C KEY SCIENCE SKILLS

Evaluating investigation methods

In VCE Psychology, you will be expected to know how to assess proposed or completed scientific investigations. These investigations can be evaluated according to their appropriateness to the research context, as well as whether they contain any possible sources of error or uncertainty. You should then make suggestions to improve the validity of the investigation and reduce any uncertainty regarding the findings.

When evaluating an investigation, it is best to first determine which of the below methodology and methods were used, and then consider the strengths and limitations of each.

- investigation methodology: case study; classification and identification; controlled experiment; correlational study; fieldwork; literature review; modelling; product, process or system development; simulation
- investigation design in a controlled experiment: within subjects, between subjects or mixed design
- sampling technique: random or stratified
- sample size
- allocation technique
- data collection method: who collected the data and what methods or equipment they used
- any ethical concerns raised.

Let's have a look at how this might be applied in a question.

ISBN 978-1-009-25401-4 Gallagher et al

Question

Researchers at a university are planning to examine the effects of advertising platforms on number of online purchases. A sample of 500 participants will be randomly selected from all students enrolled at the university. All participants will complete a self-reported online shopping diary for two weeks that includes information such as type of advertisements seen, whether the advertisement left a positive or negative impression and any online purchase made during that time.

The participants will be randomly assigned to one of the following three conditions for two weeks:

- a condition in which participants will be exposed to advertisements on TV
- a condition in which participants will be exposed to advertisements on social media
- a 'no treatment' condition.

Evaluate the proposed design for this study by considering the investigation method and procedures, how they might affect the interpretation of results and the possible conclusions that may be drawn.

Suggested answer

Suggested points to discuss:

- Sampling technique – random sampling from the population of university students allows for a good representativeness of the population.
- Sample size – 500 participants is an appropriately large sample size in comparison to the university population, which allows for good representativeness of the population.
- Investigation design – a mixed design was used, including a within subjects element (two weeks of online shopping diary entries) and a between subjects element (allocation to one of three conditions). The use of a mixed design improves validity by reducing some extraneous variables; however, there may be demand characteristics due to the repetitive nature of completing the shopping diary.
- Allocation – the random allocation of participants to the three conditions allows for good representativeness of the population in each condition. Additionally, the use of a control group allows for a baseline comparison between the two experimental conditions.
- Validity of the data collection methods – the self-reported online shopping diary is a subjective measure, and the accuracy and precision of this data should be investigated before conclusions can be made.

8C SKILLS

Knowing your definitions

As you have been using this book, you should have been keeping track of important definitions.

In VCE Psychology, you must know the critical definitions in each area of study. Key definitions are important because they are often used as short-answer questions. One way to make sure that you are keeping track of the key definitions is to compile them into a glossary.

A glossary is a list of key terms and their associated explanations. You can create a glossary in the back of your psychology exercise book, on a document on your computer,

VIDEO 8C–3
SKILLS: KNOWING YOUR DEFINITIONS

ISBN 978-1-009-25401-4

using flashcards or via an online application such as Quizlet. Online applications and flashcards are often advantageous because you can use them to test your knowledge either by yourself or with others.

You can also use glossary terms to help you make comparisons between concepts. For example, consider the terms 'TV' (TV is a telecommunication medium used to transmit moving images in black and white or in colour, and in sound) and 'news' (news is information about current events). We can know from these two definitions that a news source can be watched on TV.

Section 8C questions

1 Copy and complete the table below by matching each term to its definition.

Term	Definition
1 Media	A The extreme fear of not being included in or missing a social event
2 Advertising	B The ability to identify, retrieve and use information effectively
3 Television or TV	C A behaviour in which we compare ourselves to someone we perceive to be better than we are
4 Video game or computer game	D Internet-based technology, including smartphones, smartwatches, tablets and computers, that facilitates sharing ideas, thoughts and information through virtual networks and communities
5 News	E A state in which a person feels an uncontrollable motivation to perform certain behaviours (e.g. online behaviours) and devotes so much time and effort to these behaviours that it impairs their other important life areas
6 Social media	F The relationships that individuals have with the people around them
7 Social connections	G An electronic game that involves a person interacting with a user interface or input device (e.g. a joystick, controller, keyboard or motion-sensing device) to generate visual and auditory feedback
8 Social comparison	H A naturally occurring 'feel-good' chemical that motivates us to do what we think will bring us pleasure
9 Upward social comparison	I An activity and industry of creating messages and using different psychological techniques to promote or sell a product, service or idea
10 Downward social comparison	J A collection of various broadcasting mediums, such as the internet, newspapers, magazines, TV, radio, billboards and smartphone
11 Fear of missing out	K A telecommunication medium used to transmit moving images in black and white or in colour, in two or three dimensions and in sound
12 Addiction	L A behaviour in which we compare certain aspects of ourselves – such as our behaviour, opinions, status and success – to other people to assess ourselves better
13 Dopamine	M Information about current events
14 Information access	N A behaviour in which we compare ourselves to someone we perceive to be worse than we are

ISBN 978-1-009-25401-4 Gallagher et al

2 For statements **a–g** below, identify whether each statement is considered positive or negative, and whether it refers to the changing nature of social connections, social comparison, addictive behaviours or information access.

- **a** Social media can facilitate communication between like-minded people, resulting in global friendships.
- **b** Individuals who are engrossed in their phones, video games or online shopping might ignore other everyday activities such as housework, homework or socialising with a friend in real life.
- **c** Distraction due to social media or TV can significantly increase the time it takes to complete a task and decrease the quality of the work done.
- **d** Using social media too much makes it harder for people to identify the emotion being expressed by the people with whom they are talking. This in turn makes it harder to respond appropriately.
- **e** Users may see others posting about their new car, attractive boyfriend or girlfriend or beautiful home and feel inspired or motivated to achieve the same result.
- **f** Many advertisements provide warnings about the hazards of drink-driving, driving while tired, speeding, cigarette smoking, sun exposure and illicit narcotics.
- **g** Individuals may see photos of parties or fun events that they were either not invited to or unable to attend due to work or school commitments. This leads them to experience anxiety because they think that no one misses them or that they will be forgotten because they are not at the event.

3 Explain the relationship between upward social comparison and social media.

4 Outline how advertising can both positively and negatively affect information access.

5 Kate is a 39-year-old woman who lives with her husband and three children. Kate has many close friends and relatives who live overseas. With reference to the changing nature of social connections, explain how social media might influence Kate's wellbeing.

6 A European social media platform is interested in how time spent on social media affects general knowledge. To investigate this, they released an advertisement in the United Kingdom asking for social media users to participate in a research study. The 20 participants who qualified were first given a general knowledge test, and their mean score was calculated out of 100. For the next six months, all participants spent two hours on social media per week. Participants were again given a similar general knowledge test, and their mean score was calculated out of 100. The mean scores were compared to determine whether time spent on social media influenced general knowledge.

- **a** Evaluate this investigation, considering the methods and possible sources of error or uncertainty.
- **b** The researchers want to increase the external validity of their study to see whether their findings can be relevant to a population of shift workers. Suggest two changes to the investigation method to help improve external validity.

ISBN 978-1-009-25401-4 Gallagher et al

The development of independence and anti-conformity

Study Design:
The development of independence and anti-conformity to empower individual decision-making when in groups

Glossary:
Anti-conformity
Deviate
Immediacy
Independence
Modal
Non-conformity
Psychological reactance
Situational strength
Slider
Social impact theory
The need for uniqueness
Trans-situational strength
Uniqueness

ENGAGE

Scandalous dresses on the red carpet

Celebrities have long used the red carpet to shock crowds or make a social or political statement. During the 2001 Academy Awards, Icelandic singer Björk wore a dress that resembled a swan. As part of her dress, Björk accessorised with a trail of eggs that she 'laid' as she walked down the red carpet. Björk's dress was met with a barrage of criticism, with American comedian Joan Rivers suggesting that she should be put into an asylum and many others expressing their confusion regarding the message of the gown. Björk herself was bemused by the negative reaction. She said that some of the reporting implied she was trying to be chic to fit in, but of course, she wasn't trying to fit in.

At the 2010 MTV Video Music Awards, Lady Gaga wore a dress made from raw meat. She originally wore an Alexander McQueen dress on the red carpet, but then changed into the meat dress, which came with a beef purse and headpiece, before accepting the Video of the Year Award for her song, 'Bad Romance'. Following the MTV awards, many groups condemned the dress.

On the *Ellen DeGeneres Show*, Lady Gaga told Ellen that her reason for wearing the dress was linked to her decision to walk the white carpet with gay and lesbian

ISBN 978-1-009-25401-4 Gallagher et al

members of the military to voice her distaste for the US military's 'don't ask, don't tell' policy. Gaga said, 'Well, it is certainly no disrespect to anyone that is vegan or vegetarian. As you know, I am the most judgement-free human being on the Earth. However, it has many interpretations, but for me this evening … If we don't stand up for what we believe in and if we don't fight for our rights, pretty soon we're going to have as much rights as the meat on our own bones. And I am not a piece of meat.'

Source: Kaufman, G. (2010). *Lady Gaga talks VMA meat suit with Ellen DeGeneres*. MTV News.

EXPLAIN

Conformity, anti-conformity and independence

In Section 8B, we focused on why individuals conform to the group and the factors that increase levels of conformity. Although conformity is a vital mechanism for strengthening social bonds, history is littered with individuals who took an independent view against the tide of popular opinion, such as Jesus Christ or Galileo. There are also many examples of individuals who, when exposed to social pressure, deliberately challenged the position or actions of the group. In this section, we will examine several responses to social pressure and discuss how these responses influence an individual's decision-making when they are in a group.

LINK **8B** THE RELATIVE INFLUENCE OF OBEDIENCE AND CONFORMITY ON INDIVIDUAL BEHAVIOUR

As you saw in Section 8B, Asch's conformity study – which asked a participant to answer a question after hearing a number of confederates give an incorrect answer to the question – found that 75% of participants conformed to the group at least once. Asch concluded that individuals would conform to a group to fit in or because they thought other group members had more information than they did. However, what about the 25% of participants who didn't conform even once? How is their behaviour explained?

One explanation can be attributed to **non-conformity**, which refers to any behaviour that is not conformity. Just as there are different forms of conformity, there are also different forms of non-conformity: independence and anti-conformity. **Independence** occurs when a person perceives group pressure but doesn't respond to it at the public or private level. The goal of the independent person is to be true to themselves, regardless of how others might receive their views. For example, young people might express their individuality by not using social media or even smartphones when nearly everyone else does. An independent person refuses to change their opinions when confronted with disagreement, and they move neither towards nor away from the group's position. In contrast, **anti-conformity** refers to deliberate behaviour that acts against the position of one or more people. When confronted with a disagreeing group opinion or decision, an anti-conformer becomes more extreme in their initial position.

Non-conformity any behaviour that is not conformity

Independence a situation in which a person perceives group pressure but doesn't respond to it at either the public or private level

Anti-conformity deliberate behaviour that acts against the position of one or more people

ISBN 978-1-009-25401-4 Gallagher et al

Figure 8D–1 When discussing a sculpture in a group, an independent person would maintain their original assessment of the artwork when met with group dissent. An anti-conformist, on the other hand, would became even more extreme in their position in the face of group dissent.

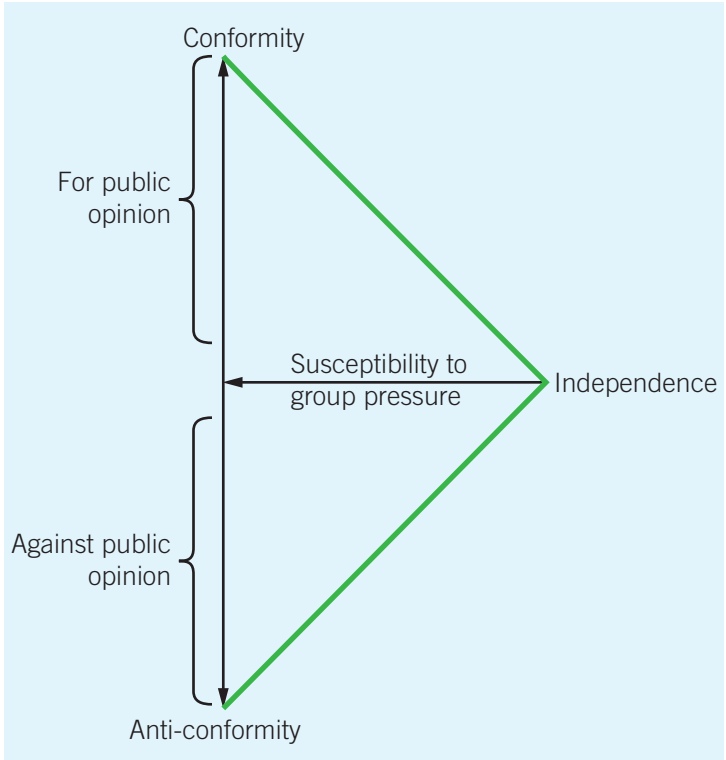


Figure 8D–2 Richard Willis and Richard Crutchfield suggested that conformity, anti-conformity and independence represent the vertices of a triangle. The vertical black axis represents an individual's position in relation to public opinion, and the horizontal axis represents the individual's position in relation to group pressure. Susceptibility to group pressure decreases towards the right.

Consider the following scenario. During Christmas in 1994, a man from Little Rock, Arkansas, was served with a court injunction, raised at the request of his neighbours, which ordered him to remove some of the over 3 million lights from the Christmas display at his home. The display attracted too many sightseers and too much traffic to his exclusive residential neighbourhood for his neighbours' liking. The man could have conformed to his neighbours by removing some of his lights. He could have shown independence by neither adding nor removing any lights. Instead, the man chose anti-conformity. Soon after the injunction was served, he defied it by increasing the number of lights in his Christmas display.

In the early 1960s, Richard Crutchfield and Richard Willis published the earliest theoretical work on distinguishing between anti-conformity, conformity and independence. Working independently, both proposed that conformity and anti-conformity are essentially opposites. With conformity, an individual is motivated to cooperate, follow and fit in with the group, while with anti-conformity, the individual is motivated to disagree with, disrupt and oppose the group. In research settings, conformity is usually measured by movement towards the majority opinion and anti-conformity by movement away from it. Further, anti-conformist individuals are motivated by rebelliousness and are not influenced by social forces or norms. Although anti-conformity and conformity are opposite in terms of underlying motives and measurement, they are similar in that both are susceptible to group pressure. As such, conformity and anti-conformity are considered forms of dependent behaviour that are determined by the group's position. Both contrast with independence, in which the individual is not influenced one way or another by social forces. Independence can look like anti-conformity, but its motives are different.

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 8D–1 HISTORICAL EXAMPLES OF NON-CONFORMITY

Throughout history, many individuals have deviated from the expectations of social forces. Interestingly, we tend to idolise people who have been deviant, often referring to them as freedom fighters, prophets or great leaders. In small groups, research three of the following examples of non-conforming individuals. Note down how their behaviour changed the world.

- Marie Curie
- Abū Bakr al-Rāzī
- Galileo Galilei
- Alan Turing
- Billie Holiday

Check-in questions – Set 1

1 Describe the two types of non-conformity, with reference to an example for each.
2 Outline the similarities and differences between conformity and anti-conformity.
3 Explain the difference between independence and anti-conformity.

Factors affecting non-conformity

As part of his original 1981 study, Asch found that some participants were consistent non-conformers. As you know from Section 8B, Asch experimented with several variations to his original line perception experiment; he wanted to examine the factors that affected conformity and non-conformity. In these experiment variations, Asch and other theorists found several factors that specifically influenced the levels of anti-conformity and independence in participants' responses.

LINK **8B** THE RELATIVE INFLUENCE OF OBEDIENCE AND CONFORMITY ON INDIVIDUAL BEHAVIOUR

The minority versus the majority

Non-conformists can profoundly affect a majority – even if only for the majority to laugh at them or argue against them because they perceive the non-conformist as an 'outsider'. Asch was interested in the dynamics of a group that included just one non-conformist. To explore this, Asch conducted a study using the line task, in which one confederate among 16 actual participants gave incorrect answers. The results showed that the majority treated the confederate's answers with disbelief and ridicule.

In 1951, Stanley Schachter, using the Asch experiment design, had participants read and discuss a juvenile delinquent case study. Each group had five to seven participants, and Schachter introduced an additional, paid confederate to each group, whose task was to play one of the following roles:

- **deviate** – a group member who took the opposing view to the group's general opinion
- **modal** – a group member who took the view that conformed to the average of the real participants
- **slider** – a group member who initially took the same view as the deviate but then changed to the view of the modal participant.

In nearly all the experiments, more communication was directed towards the deviate than the other two roles. In highly cohesive groups, the communication towards the deviate rose to a peak and then fell away to the point that the deviate was virtually ignored.

Deviate
in Asch's 1951 experiment, a group member who took the opposing view to the group's general opinion

Modal
in Asch's 1951 experiment, a group member who took the view that conformed to the average of the real participants

Slider
in Asch's 1951 experiment, a group member who initially took the same view as the deviate but then changed to the view of the modal participant

ISBN 978-1-009-25401-4 Gallagher et al

Figure 8D–3 The majority will try to persuade a non-conformer to conform to group norms, but when this does not occur, the majority will isolate the non-conformer.

Figure 8D–4 The majority are more likely to accept minority non-conformists' views as legitimate.

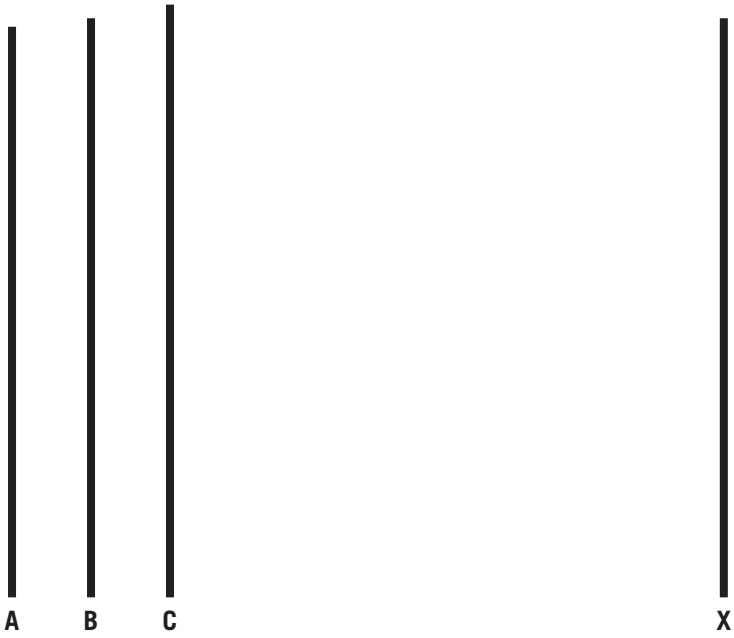


Figure 8D–5 Asch modified his original line experiment by making the stimuli more ambiguous.

Little attention was paid to the modal participant because they conformed. The slider drew much attention until they conformed, and then communication towards them reduced. This result suggests that rather than ridicule the deviate, the groups chose to persuade them and, when this didn't work, they ostracised the deviate. We can conclude from this that individual independence or counter-conformity may come at the price of ridicule and isolation from the group majority.

Minorities do not seem to suffer the same extreme disapproval. Asch was also interested in what would happen to conformity rates when two or more people from minority backgrounds were confronted with a unanimous majority. In another variation of his baseline study, Asch used 11 actual participants against nine deviant participants. Unlike his previous experiment, which involved one non-conformist participant, the general atmosphere was not one of mockery but of seriousness. This seems to show that the minority had some influence over the majority, though not enough to change their minds about the length of the line. Rather than being censured or ridiculed, the minority group was viewed as an independent group with an equally valid difference of opinion.

Task ambiguity

Asch conducted other experiment variations, such as making the task obvious or ambiguous. Ambiguity was achieved by making the differences between the lines so slight that it was difficult to be sure which was the right answer, as shown in Figure 8D–5. In the case of ambiguous tasks, the participants were much more likely to behave independently of the group. When tasks are ambiguous, everyone becomes an expert witness – and individuals don't seem to mind being the odd ones out and acting independently in these cases.

ISBN 978-1-009-25401-4 Gallagher et al

Personality factors

In addition to conducting studies in conformity, Crutchfield and other theorists collected data regarding the personality traits and intelligence of their participants. In doing so, they found some typical differences between conformers and individuals who were more independent of the group. These differences are outlined in Table 8D–1.

Table 8D–1 Intelligence and personality differences between conformers and non-conformers

Trait	Conformers	Non-conformers
IQ	Less intelligent	More intelligent
Emotions	More anxious	Less anxious
Self-concept	Lack self-confidence and are less insightful	Have realistic self-perception
Interpersonal relations	Have poor judgement of others	More self-contained and autonomous
Attitudes/values	Conventional and moralistic	More original

These findings support the general view that conformers tend to rank low in self-esteem, IQ and status, and high in anxiety and insecurity. On the other hand, non-conformers tend to be more intelligent and less anxious, and they don't need the group's social approval to the same degree that conformers do. In this sense, conformers might depend more on informational and normative influences than their non-conformist counterparts. Due to their higher intelligence and realistic outlook, non-conformers may resist the implicit and explicit social pressure of group influences more successfully.

Culture

LINK **8B** THE RELATIVE INFLUENCE OF OBEDIENCE AND CONFORMITY ON INDIVIDUAL BEHAVIOUR

In 1973, Meade and Barnard conducted a study that examined anti-conformity behaviours in American and Chinese college students. A group of one participant and five confederates (either all male or all female) were presented with six statements about controversial issues and asked to verbalise their opinions and the strength of those opinions to their group. The delay between the participants hearing the controversial statement and sharing their opinions was recorded. The participants and confederates were also permitted to change their responses at any point. It was found that the Chinese participants hesitated longer before responding compared to the American participants, and the American participants showed a far greater tendency towards anti-conformity than did the Chinese participants. This may be explained by the cultural differences between the two countries: the United States has an individualist culture, while China has a collectivist culture.

Figure 8D–6 Meade and Barnard's 1973 study demonstrates that people from an individualist culture are more likely to engage in anti-conformity behaviour than people from collectivist cultures.

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 2

1 Outline the three roles that confederates played in Stanley Schachter's experiment. Describe how these groups were treated by the majority.
2 Explain how the majority is likely to treat members of a minority compared to an individual non-conformist.
3 Describe how the following factors affect levels of non-conformity.
   a The ambiguity of the task
   b Culture
4 Outline the difference regarding intelligence and personality levels between conformers and non-conformers.

Explanations for non-conformity

Social psychologists have proposed several causes of anti-conformity and independence. For example, studies show that people are often motivated to disagree with dissimilar, disliked or unattractive others, or with people they consider not part of their social circle. The following section explores how psychological reactance, the need for uniqueness and the social impact theory motivate anti-conformity and independence.

WORKSHEET 8D–1 ANTI-CONFORMITY AND INDEPENDENCE CASE STUDY

Psychological reactance theory

Psychological reactance an unpleasant motivational arousal that emerges when people experience a threat to or loss of their free behaviours

Developed in 1966 by Jack Brehm, the **psychological reactance** theory focuses on how individuals react when their freedom to choose or act in a certain manner is restricted. Brehm defined psychological reactance as an unpleasant arousal that occurs when people experience a threat to or loss of their free behaviours, which motivates the individual to act in a manner that reduces the threat. He suggested that people often react by taking steps to restore that freedom when this occurs. One way to reclaim threatened freedom is to do the opposite of what the source of the threat suggests. For example, teenagers told by their parents that they cannot date until a certain age might feel motivated to increase their dating behaviour to reclaim their freedom.

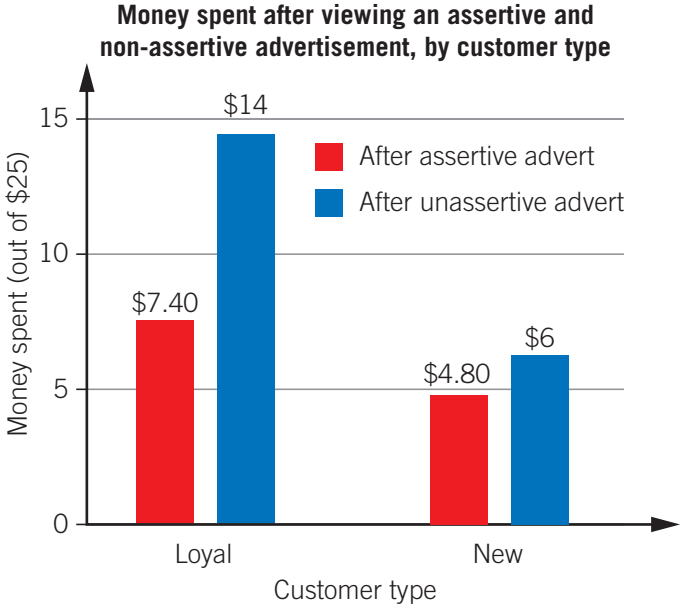


Figure 8D–7 A psychological reactance study with 84 participants showed that people spent less money after viewing an assertive advertisement than after viewing a non-assertive advertisement. The effect was greater among loyal customers of the product than among new customers.

The study shown in Figure 8D–7 shows that loyal customers of a product spent less on it after seeing an assertive advertisement for it. Psychological reactance theory would say that they felt their freedom to decide was threatened, and they reacted by spending less. The effect was smaller for new customers, perhaps because the product did not seem so important to them. This latter effect was also suggested by Brehm, that psychological reactance would be more extreme if the perceived freedom being threatened was important to the person. A person will even act against their own self-interest to reassert their freedom. Imagine a mother telling her child not to eat so many cupcakes because it will make them feel sick. The child, perceiving that their mother's order restricts their freedom and right to make choices, then eats as many cupcakes as they can.

ISBN 978-1-009-25401-4 Gallagher et al

The child predictably feels sick afterwards. It was good advice not to eat 10 cupcakes, but the child still chose to act in a contrary manner. Brehm finally noted that a choice must be present for psychological reactance to occur. If there were no cupcakes in the house, then the child wouldn't have the option to eat as many cupcakes as they wanted, nor could they note their mother's advice and not eat so many. If no options exist, then a person cannot feel as though their freedom to explore their options and make a choice is being threatened.

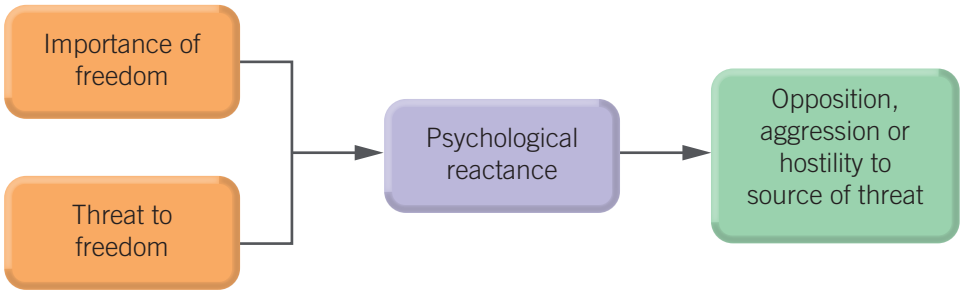


Figure 8D–8 The conditions that must be present for psychological reactance to occur

The need for uniqueness

Uniqueness involves a person's distinctiveness in relation to other people. People can vary in the degree to which they want such distinctiveness, with some being highly eager to be special (they have a high need for uniqueness) and others not wanting to stand out from the crowd (they have a low need for uniqueness). **The need for uniqueness** is a psychological state in which individuals feel indistinguishable from others, which then motivates compensatory acts to restore a sense of uniqueness. In certain conditions, the state of perceiving oneself as being too similar to others has been likened to experiencing a negative feeling – and it prompts actions that will allow the person to compensate for this feeling. One situation that triggers this is when an individual feels too similar to the others who make up the majority. This, in turn, makes the majority position undesirable. In this case, an individual might choose non-conformity to feel different from the majority. For example, individuals who have a high need for uniqueness might reject certain products like a popular brand of clothing or devices, or they might use products that are unusual or even unpopular because using products outside social norms might be a recognisable symbol of uniqueness and specialness.

Uniqueness
a person's distinctiveness in relation to other people

The need for uniqueness
a psychological state in which individuals feel indistinguishable from others, which motivates compensatory acts to restore a sense of uniqueness

Figure 8D–9 Those who dress in the punk style may reject how the rest of society dresses, as they aim to emphasise their uniqueness through their dress. Similarly, someone who is vegan may feel that overtly refraining from eating animal products makes them special.

ISBN 978-1-009-25401-4 Gallagher et al

Social impact theory

Social impact theory a theory suggesting that the degree of influence that a person experiences in group settings depends on three factors: the group's strength, the group's immediacy and the number of people in the group who are exerting the social influence

Trans-situational strength characteristics that group members hold that give them a higher level of status and power

Situational strength roles that group members play that give them a higher level of status and power

Immediacy the physical, temporal and social closeness between the influencing group members and the individual being influenced

Latané and Wolf (1981) drew on the **social impact theory** to try to explain independent behaviour. Social impact theory suggests that the degree of influence that a person experiences in group settings depends on three factors: the group's strength, the group's immediacy and the number of people in the group who are exerting social influence. These factors are summarised in Table 8D–2.

Table 8D–2 The three factors that affect levels of conformity and non-conformity

Social force	Description	Examples
Strength	Strength refers to the group's perceived status and power, which can relate to the group members themselves (**trans-situational strength**) or to the roles that the group members play (**situational strength**).	Trans-situational strength: age, the type of authority held, perceived intelligence and physical characteristics Situational strength: a doctor giving information about a virus or an influencer giving information about the next big trend
Immediacy	**Immediacy** refers to the closeness between the influencing group members and the individual being influenced. This closeness can be physical, temporal or social.	Physical immediacy: geographical location, seat spacing and crowding Temporal immediacy: the time between contacts and the duration of contact Social immediacy: the perception that others are similar to the person being influenced
Number of people	Number of people refers to the number of influencing group members who influence an individual's decision.	Number of people in a crowd, a class or in an online community

Source: Adapted from Vega, R. P., Waite, K., & O'Gorman, K. (2016). Social impact theory: An examination of how immediacy operates as an influence upon social media interaction in Facebook fan pages. *The Marketing Review*, *16*, 299–321.

8A THE INFLUENCE OF SOCIAL GROUPS AND CULTURE ON INDIVIDUAL BEHAVIOUR LINK

If the level or degree of these social impact theory factors is significantly high or low, then they will seriously affect how much the individual is being influenced. For example, a group that has many members (rather than a few), high power (rather than low power) and close proximity (rather than distant proximity) should exert the most influence on an individual. Equally, if the strength of the person exposed to the social influence increases, then the immediacy of the group decreases; or, if the number of influencing group members decreases, then the level of influence exerted by the group on the individual decreases, resulting in higher levels of non-conformity.

ACTIVITY 8D–2 ANALYSING REAL-LIFE INDEPENDENCE

Describe an occasion when independence was shown. The occasion can be from your own life or a movie, or it could be something that you observed or heard about. In pairs, describe the occasion to each other. Analyse your partner's occasion in terms of the factors leading up to it, what happened and the consequences of the behaviours shown on the occasion. Swap and let your partner analyse your occasion in the same way.

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 3

1 Describe psychological reactance in your own words, with reference to an example not used in the text.
2 Identify the two factors that influence whether psychological reactance will occur.
3 In what conditions does the need for uniqueness occur?
4 Explain how the social impact theory influences non-conformity, with reference to an example.

WORKSHEET 8D–2 INDEPENDENCE AND ANTI-CONFORMITY

8D SKILLS

VIDEO 8D–1 SKILLS: MAKING CONNECTIONS BETWEEN CONTENT

Making connections between content in VCE Psychology

As you are using this book, you may have noticed various links to other chapters and sections. The links are there to help you make connections between ideas and concepts. By making these links, you are giving the information more meaning, which increases the chance that the information will be retained in your long-term memory.

LINK CHAPTER 1

For example, in Chapter 1, you learned about the ethical principles and guidelines that must be upheld in any psychological experiment. Knowing these makes it easier to understand how experiments such as the Stanford Prison Experiment or Milgram's shock experiment breached certain ethical standards. Likewise, understanding the processes of group shift and deindividuation explained in Section 8A will help you grasp how status and power influenced the changes in behaviour of the prisoners and guards in the Stanford Prison Experiment.

In general, mind maps and concept maps are highly recommended as a revision tool, as they visually link a large amount of information – which can ultimately enhance your learning. You can try it for yourself. Using the list of terms from this section's glossary, draw a concept map that shows the links between the key concepts. Label each connecting line to indicate the relationship between the concepts being linked. For added benefit, add definitions and specific examples where possible. An example of how to create a concept map was given in Section 7A.

LINK 7A THE ROLE OF PERSON PERCEPTION

Knowing how concepts in psychology link together across different areas is important because you will be tested on this knowledge via crossover questions, which combine theory from two or more areas of content. Consider the following crossover question, which requires you to understand content from Section 8A.

LINK 8A THE INFLUENCE OF SOCIAL GROUPS AND CULTURE ON INDIVIDUAL BEHAVIOUR

Question

Explain how the relationship between status and power can result in anti-conformist behaviour in a classroom according to the social impact theory.

Suggested answer

The position or importance of someone in a group (status) determines their ability to influence the thoughts, feelings and behaviours of the group members (power). According to the social impact theory, a group of students might try to convince a targeted student to conform and skip class with them. If the group of students has a low level of strength (a low status and thus less power), then the targeted student is more likely to reject their suggestion of skipping class.

ISBN 978-1-009-25401-4 Gallagher et al

Section 8D questions

1 Compare the following terms.
   a Psychological reactance and the need for uniqueness
   b Trans-situational strength and situational strength
   c Immediacy and number of people in the group
2 Outline the relationship between conformity, anti-conformity and independence, with reference to an example.
3 In 1957, British psychologist Michael Argyle published what was probably the first study to demonstrate anti-conformity under controlled conditions. Argyle asked male students to evaluate a painting by Marc Chagall, *Le Poète Allongé*, which was chosen deliberately because of its 'unusual and ambiguous character'. Participants were told that they were working with a student partner when, in fact, their partner was Argyle's confederate. In one condition, each student learned that his opinion of the painting had been rejected by his partner (e.g. 'What you say is trivial, for the picture is so meaningful as a whole'). Participants were then given an opportunity to rate the painting a second time, and social influence was measured by the change in participants' ratings towards or away from the rating given by the 'partner'.
   In the experiment above, explain how the participants might demonstrate the following concepts.
   a Conformity
   b Independence
   c Anti-conformity
4 According to Stanley Schachter's experimental results, explain how the majority might try to influence a non-conformist's behaviour.
5 A young family have just moved into a new home and are told that they must conform to a certain lawn design. This makes them motivated to decorate their front lawn with outrageous figurines and lawn ornaments. Explain the young couple's behaviour, with reference to psychological reactance and the need for uniqueness.

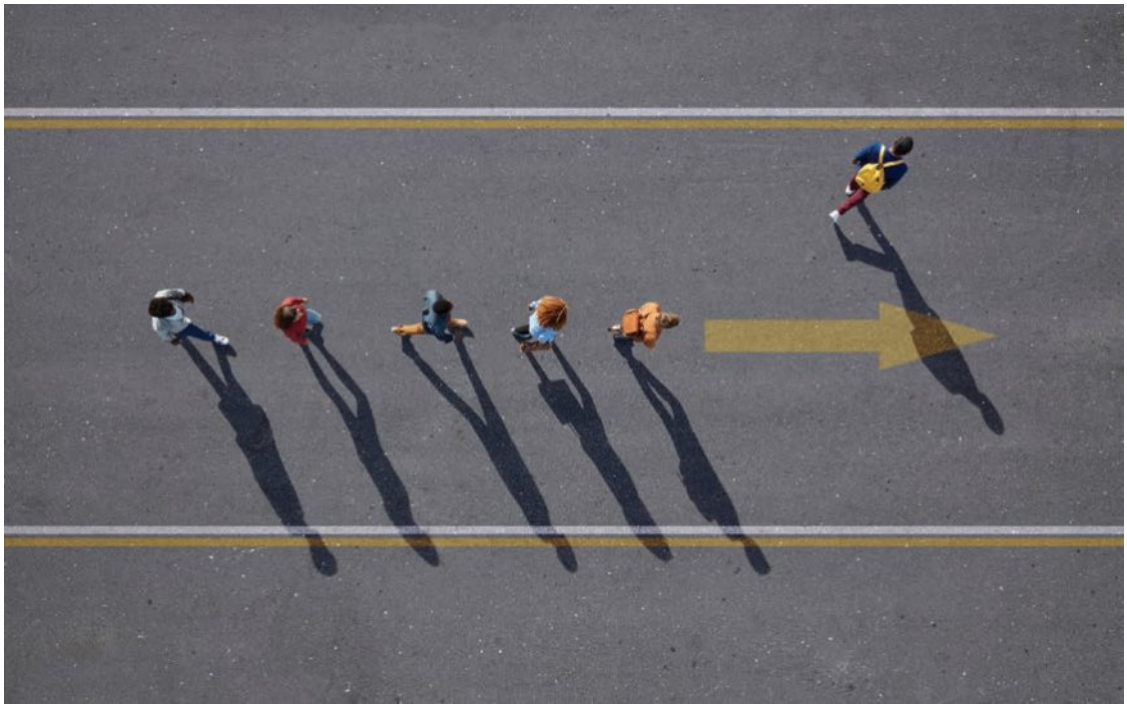


Figure 8D–10 An independent person will follow their own path, regardless of social pressure.

ISBN 978-1-009-25401-4 Gallagher et al

Chapter 8 review

Summary

Create your own set of summary notes for this chapter on paper or in a digital document. A model summary is provided in the Teacher Resources, which you can use to compare with yours.

Checklist

In the Interactive Textbook, the success criteria are linked from the review questions and will be automatically ticked when answers are correct. Alternatively, print or photocopy this page and tick the boxes when you have answered the corresponding questions correctly.

Success criteria – I am now able to:		Linked questions
8A.1	Explain what is meant by a group and a collective, with reference to their key characteristics and appropriate examples	1☐, 16a☐
8A.2	Explain what is meant by status and power (including the types of power), with reference to Zimbardo's Stanford Prison Experiment	2☐, 16b☐
8A.3	Explain what is meant by groupthink, group shift and deindividuation, with reference to the reasons why these processes occur and appropriate examples	3☐, 19☐
8A.4	Explain what is meant by individualist and collectivist cultures and outline how this influences individual behaviour, with reference to self-image, relationships, use of social support and decision-making processes	4☐
8A.5	Apply my understanding of the concepts of social groups and culture, as well as my understanding of their relative influence on individual behaviour, with reference to appropriate examples	5☐
8B.1	Explain what is meant by obedience, with reference to Milgram's 1963 experiment on obedience, the influences on obedience (i.e. social proximity, group pressure and legitimacy of the authority figure) and the ethics of Milgram's study	6☐, 16c☐
8B.2	Explain what is meant by conformity, with reference to Asch's 1951 experiment on conformity, the influences on conformity (i.e. normative influence, informational influence, group size, culture, unanimity, social loafing and deindividuation) and the ethics of Asch's experiment	7☐
8B.3	Apply my understanding of the concepts of obedience and conformity and my understanding of their relative influence on individual behaviour, with reference to appropriate examples	8☐, 17☐
8C.1	Explain what is meant by different media sources, such as advertising, TV, video games, news sources and social media	9☐
8C.2	Outline how different media sources (e.g. advertising, TV, video games, news sources and social media) can positively and negatively influence individual and group behaviour, with reference to the changing nature of social connections, social comparison, addictive behaviours and information access	10☐, 20☐
8C.3	Apply my understanding of how different media sources positively and negatively influence individual and group behaviour to real-world scenarios and examples	11☐

ISBN 978-1-009-25401-4 Gallagher et al

Success criteria – I am now able to:		Linked questions
8D.1	Explain what is meant by independence and anti-conformity in relation to decision-making, with reference to the differences between conformity, anti-conformity and independence and to the factors that affect anti-conformity and independence (i.e. majority versus minority, personality, culture and ambiguity of the task)	12☐
8D.2	Outline how independence and anti-conformity develop, with reference to psychological reactance, the need for uniqueness and the social impact theory	13☐
8C.3	Apply my understanding of the development of independence and anti-conformity to empower individual decision-making to real-world scenarios and examples	14☐, 18☐

Key Science Skills

Skills	Questions and Skills boxes
Evaluate investigation methods and possible sources of error or uncertainty, and suggest improvements to increase validity and to reduce uncertainty	Chapter review – 21a, b, c
Distinguish between opinion, anecdote and evidence and scientific and non-scientific ideas	Chapter review – 15

Multiple-choice questions

1 Which of the following is a collective?
- **A** thirty people standing at a bus stop
- **B** the Year 11 Psychology class at a school
- **C** your family
- **D** the local football team

2 Zimbardo's Stanford Prison Experiment found that
- **A** the results were negligible because the experiment was too unethical.
- **B** the role everyone was assigned determined their status and power, which impacted behaviour.
- **C** the prisoners ruled over the guards and abused their power.
- **D** the experimenters influenced how the prisoners and guards behaved.

3 Group shift can be explained by that fact that
- **A** there is a charismatic leader.
- **B** there is a charismatic follower.
- **C** the responsibility of the decision is diffused across the group.
- **D** all of the above.

4 Which of the following statements is a person from an individualist culture more likely to associate with their self-concept compared to a person from a collectivist culture?
- **A** I am a good friend.
- **B** I am a determined mother.
- **C** I am intelligent and empathetic.
- **D** I like to play sports.

ISBN 978-1-009-25401-4

5 A police officer pulling over a motorist who was speeding is exercising _____ power.
- **A** coercive
- **B** referent
- **C** legitimate
- **D** reward

6 Milgram's experiment found that obedience is influenced by
- **A** social proximity; the relationship between experimenter and learner; culture.
- **B** social proximity; gender; group pressure.
- **C** social proximity; legitimacy of the authority figure; group pressure.
- **D** social proximity; gender of the experimenter; gender of the participant.

7 Which of the following is likely to have the least influence on level of conformity?
- **A** normative influence
- **B** informational influence
- **C** culture
- **D** social proximity

8 George was at a party when Sasha fell over and split her lip. Sasha's mother ran into the room and told George to call the ambulance. George did what he was asked and Sasha was quickly taken to the hospital for stitches. George's behaviour is an example of
- **A** conformity.
- **B** compliance.
- **C** obedience.
- **D** coercive power.

9 _____ refers to information about current events, while _____ refers to the act of creating messages and using different psychological techniques to promote or sell a product, service or idea.
- **A** Video games; TV
- **B** News sources; social media
- **C** Social media; advertising
- **D** News; advertising

10 What is the neurotransmitter that plays a role in addictive behaviours?
- **A** serotonin
- **B** dopamine
- **C** adrenaline
- **D** GABA

11 Riana is scrolling through her social media feed and sees that one of her friends just got a brand new iPhone for her birthday. Riana feels very self-conscious about her old Android phone and 'forgets' to bring it to school for the next week. Riana's embarrassment is an example of
- **A** addictive behaviour.
- **B** the changing nature of social connections.
- **C** information access.
- **D** social comparison.

ISBN 978-1-009-25401-4 Gallagher et al

12 One difference between anti-conformity and independence is that

- **A** anti-conformity behaviours are susceptible to group pressure, while independent behaviour is not influenced one way or another by social forces.
- **B** independence is usually measured by movement towards the majority opinion, and anti-conformity is measured by movement away from it.
- **C** anti-conformity and independence are not susceptible to group pressure.
- **D** independence is characterised by being motivated to cooperate, follow and fit in with the group, while anti-conformity is characterised by not being motivated to disagree with, disrupt and oppose the group.

13 Non-conformity can be explained by which of the following theories?

- **A** Personality, culture and ambiguity of the task
- **B** Psychological reactance, the need for uniqueness and the social impact theory
- **C** Personality, social impact theory and ambiguity of the task
- **D** Non-conformity

14 A young boy who was told not to eat any sweets before lunch proceeds to eat a bag of chips. This is an example of

- **A** conformity.
- **B** independence.
- **C** anti-conformity.
- **D** non-conformity.

15 When reading scientific information, it is vital to be able to distinguish between _____, which is a judgement not necessarily based on proof; _____, which is a short, personal account of an event; and _____, which is verified fact, and determine whether they are scientific or non-scientific ideas.

- **A** evidence, opinion, anecdote
- **B** opinion, anecdote, evidence
- **C** anecdote, evidence, opinion
- **D** opinion, data, evidence

Short-answer questions

16 Read the following post that appeared on social media:

As a victim of a home invasion, I feel better placed than others to provide insight into this issue. First, the people who invaded my home were a gang; there were four of them. They carried weapons, but they were so shameless that they did not wear masks. The oldest of the four slapped and punched me, and then he pushed me to the ground. He then directed the other three, telling them what to grab as they robbed my house. The youngest of them, who was about 14, looked at me with pity. It was like he was saying, 'I'm sorry; I don't have a choice'.

- **a** Provide three reasons why the intruders in this scenario would be a group. (3 marks)
- **b** Identify and explain the type of power that the oldest gang member demonstrated. (2 marks)
- **c** Identify and outline a factor that would have influenced the level of obedience displayed by the youngest gang member. (2 marks)

ISBN 978-1-009-25401-4 Gallagher et al

17 Raine is normally a well-behaved adolescent. During a concert, she became involved in an incident in which the crowd threw rubbish onto the stage and shouted at the performer. Although Raine initially refused to participate, she became an active participant after a while. In terms of factors that affect conformity, outline two reasons why Raine was involved in this behaviour. (4 marks)

18 Sarah is in Year 9 at Stonehurst High School. On free-dress days, she comes to school wearing sneakers because they are comfortable. Recently, she noticed that most of the girls in her year level are wearing the newest style of ballet flats on free-dress days. There is a school excursion coming up, and a few of the popular girls have tried to convince Sarah to wear ballet flats instead of sneakers because her shoes are ugly. With reference to conformity, anti-conformity and independence, explain how Sarah might react to the girls trying to convince her to wear ballet flats. (3 marks)

19 Compare and contrast groupthink and deindividuation. (2 marks)

20 Outline one positive and one negative effect that social media has on the following factors.

a The changing nature of social connections (2 marks)

b Access to information (2 marks)

21 An Australian drug company wants to research how a new medication affects the reduction of symptoms in people with social media addictions. Based on some research, the company decides to test four different amounts of the drug to see which one best reduces addiction symptoms. The company sends out an email to their Victorian customers and asks those with a social media addiction to volunteer for the study. They end up with 120 participants. Each participant is randomly allocated to a group and is sent either 0 grams, 5 grams, 10 grams or 15 grams of the drug. They are instructed to take the drug for two weeks and keep track of their symptoms via a rating scale.

a Evaluate this investigation, considering the methods and possible sources of error or uncertainty. (4 marks)

b Explain the appropriateness of the sample for the external validity of the company's conclusions. (2 marks)

c Explain the benefit of repeating this investigation with different participants. (2 marks)

ISBN 978-1-009-25401-4

UNIT 2

HOW DO INTERNAL AND EXTERNAL FACTORS INFLUENCE BEHAVIOUR AND MENTAL PROCESSES?

CHAPTER 9

PERCEPTION

Introduction

Have you ever heard the phrase 'the world is your oyster'? As this phrase suggests, there is an entire world around us to be explored, interacted with, adventured in and learned from. With this interaction comes new knowledge and understandings about our world, with a flow-on effect for our perceptions of the things around us. In this chapter, we look at how our sensory perceptions function and are shaped, with a specific focus on types of attention, the processing of perception and the psychosocial factors affecting our perceptions.

By this stage in your studies, you will be aware that people's unique physiologies combine with their unique set of life experiences to shape various aspects of their psychological development. Likewise, these factors affect how people perceive their world. There are approximately 7.9 billion people on Earth, yet we are all different. Each person has a unique combination of strengths, interests, goals, experiences, beliefs, values, emotions and behaviours. The result is that no two people think or interpret information in exactly the same way.

This chapter builds on these concepts to investigate how such individual differences result in varied interpretations of taste and visual information.

Curriculum

Area of Study 2 Outcome 2
Perception

Study Design:	Learning intentions – at the end of this chapter I will be able to:	
• The role of attention (sustained, divided, selective) in making sense of the world around us	**9A**	**Understanding the role of attention in perception**
	9A.1	Explain the importance of attention in making sense of the world around us
	9A.2	Describe the key features of sustained attention, divided attention and selective attention
	9A.3	Explain how sustained attention allows us to make sense of the world around us
	9A.4	Explain how divided attention allows us to make sense of the world around us
	9A.5	Explain how selective attention allows us to make sense of the world around us
	9A.6	Apply my understanding of sustained, divided and selective attention to real-world examples
	9A.7	Compare and contrast sustained, divided and selective attention

ISBN 978-1-009-25401-4 Gallagher et al

Study Design:	Learning intentions – at the end of this chapter I will be able to:
• The role of perception in the processing and interpretation of sensory information, as demonstrated through top-down and bottom-up processing	**9B Processing of visual and gustatory information** **9B.1** Explain the role of perception in the processing and interpretation of sensory information including vision and taste **9B.2** Explain the role of top-down and bottom-up processing in both visual and gustatory perception **9B.3** Compare and contrast the roles of top-down and bottom-up processing **9B.4** Apply my understanding of top-down and bottom-up processing to examples of visual and taste perception
• The influence of biological, psychological and social factors on visual perception and gustatory perception	**9C Applying the biopsychosocial model to visual and gustatory perception** **9C.1** Understand that there are different biological, psychological and social factors that influence visual and gustatory perception **9C.2** Identify and describe biological, psychological and social factors that can influence both visual and gustatory perception **9C.3** Explain how these biological, psychological and social factors influence both visual and gustatory perception **9C.4** Apply my understanding of biological, psychological and social factors to examples of visual and gustatory perception

Key Science Skills

- Evaluate data to determine the degree to which the evidence supports the aim of the investigation, and make recommendations, as appropriate, for modifying or extending the investigation
- Evaluate data to determine the degree to which the evidence supports or refutes the initial prediction or hypothesis
- Use reasoning to construct scientific arguments, and to draw and justify conclusions consistent with the evidence and relevant to the question under investigation
- Identify, describe and explain the limitations of conclusions, including identification of further evidence required
- Discuss the implications of research findings and proposals, including appropriateness and application of data to different cultural groups and cultural biases in data and conclusions

Glossary

Accommodation
Attention
Automatic cognitive process
Binocular depth cues
Biological depth cues
Biopsychosocial model
Bottom-up processing
Camouflage
Closure
Context
Controlled cognitive process
Convergence
Culture
Depth perception
Divided attention
Figure–ground
Food culture
Gestalt principles
Gustation
Memory
Monocular depth cues
Motivation
Orientation constancy
Past experience
Perception
Perceptual constancy
Perceptual set
Proximity
Retinal disparity
Retinal image
Salient
Schema
Selective attention
Sensations
Shape constancy
Similarity
Size constancy
Sustained attention
Taste buds
Top-down processing
Vigilance
Visual perceptual principles

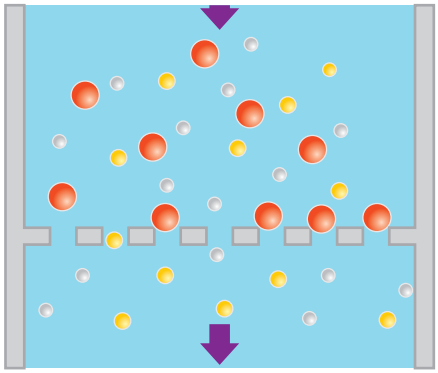
ISBN 978-1-009-25401-4

Concept map

Perception allows us to make sense of the world

Attention filters stimuli from our external world

9A The role of attention in perception



Perception has a role in the processing and interpretation of sensory information as demonstrated through top-down and bottom-up processing

9B Processing of visual and gustatory information

Top-down processing

Drawing on past experiences and knowledge to interpret sensations

Interpreting information according to expectations

A perception is formed

Bottom-up processing

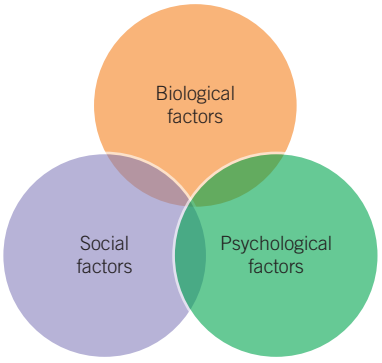
Analysing the specific features or elements of a stimulus

Creating a whole picture from the individual elements

A perception is formed

Biological, psychological and social factors influence visual and gustatory perception

9C Applying the biopsychosocial model to visual and gustatory perception



See the Interactive Textbook for an interactive version of this concept map interlinked with all concept maps for the course.

ISBN 978-1-009-25401-4

Understanding the role of attention in perception

Study Design:
The role of attention (sustained, divided, selective) in making sense of the world around us

Glossary:
Attention
Automatic cognitive process
Controlled cognitive process
Divided attention
Salient
Selective attention
Sustained attention
Vigilance

ENGAGE

Getting caught out by a small child

Joey Mahoney is a well-behaved child who has a healthy relationship with his parents. Recently, Joey and his family met with their friends, the Miller family, for a barbeque at a local park. The weather was excellent, the food was delicious and the time socialising together was even better.

After the Millers left, Joey sat in the car playing with a computer game while his parents finished packing up. As they loaded the car, Joey's parents spoke to each other about how Mr and Mrs Miller were 'cheap' for only contributing a loaf of bread to the barbeque, while the Mahoneys had brought the meat, salad and condiments. Mr and Ms Mahoney assumed that Joey wasn't listening; after all, he was focused on his computer game.

The next weekend, Joey and his dad ran into the Millers at the supermarket. The adults started chatting. Suddenly, Joey interrupted: 'Mrs Miller, my Mum and Dad said you are cheap because you didn't bring anything good for the barbecue. Next time, you should bring some dessert.'

Joey's dad was mortified. He stood in shock awkwardly for a minute, confessed to the conversation at the park (which had obviously been overheard by Joey) and apologised for his rudeness.

Joey's parents hadn't thought he was paying attention because he had been doing other things at the time. They soon realised their mistake! They concluded that not only do they need to be kinder in the way they talk about their friends, but they also need to be more mindful of who is paying attention.

ISBN 978-1-009-25401-4 Gallagher et al

EXPLAIN

Attention

Every day, our perceptual systems are bombarded by incoming sensory stimuli from our environment, such as lights, sounds, touch, tastes and smells. These stimuli are registered by our sense organs and carried by sensory nerves and neural pathways to their relevant brain areas for processing. In order to avoid becoming overwhelmed, our brain uses **attention** as a filter to determine what is important and what is not.

Attention the level of awareness directed towards certain stimuli to the exclusion of others

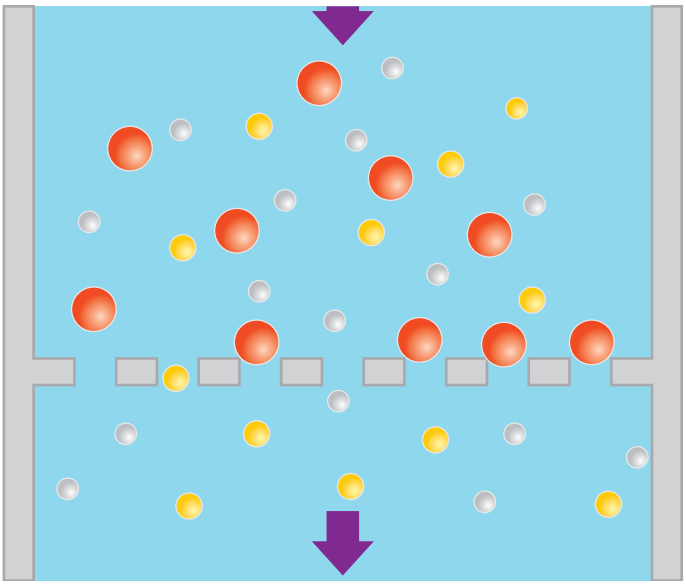


Figure 9A–1 Attention acts like a filter or sieve, blocking stimuli that are unimportant to us at the time (the red particles in this analogy), while letting the important ones (yellow and white) through to be paid attention to.

Our ability to pay attention to certain stimuli while ignoring others allows us to filter incoming information and concentrate on what is important at the time, enabling us to make sense of the world around us more easily. For example, if you were completing a Psychology SAC, it would be beneficial for you to be able to focus on the questions, and your answers to them, rather than the ticking of the clock or the birds tweeting outside your classroom.

Attention is defined as the level of awareness directed towards certain stimuli to the exclusion of others. How much awareness, or attention, a person exhibits will depend on the situation. For example, while taking your probationary licence driving test, you could expect to be in a heightened state of awareness, and thus, be paying much more attention to external stimuli such as the traffic and road signs than if you were a passenger, lost in your thoughts daydreaming during a long journey. Research suggests that attention is also affected by a combination of genetics and environmental experiences. Let's look more closely at the three main types of attention that we use to help make sense of the world around us: sustained attention, selective attention and divided attention.

Figure 9A–2 Different situations can require different levels of awareness.

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 9A–1 IDENTIFYING WHERE YOUR ATTENTION IS

Put on a timer for two minutes and write down everything that comes into your conscious mind, even if it seems insignificant. At the end of the two minutes, reread your list, and then have a discussion with a partner using the following prompts:

- What did I pay attention to?
- How do I know that I was paying attention to that?
- Did I focus on anything new during the two minutes? What was it?
- Was I able to focus on multiple tasks at one time (e.g. watching the time and writing)?
  - What type of tasks were they?
  - Were they important tasks?
  - Were they familiar tasks?

Sustained attention the maintenance of a high degree of attention over a prolonged period

Vigilance another name for sustained attention

Sustained attention

Sustained attention, also known as **vigilance**, involves maintaining a high degree of attention over a prolonged period. During this state, an individual has a greater readiness to detect rare and unpredictable stimuli. A key characteristic of sustained attention is that the more rare or unique a stimulus is, the greater a person's vigilance is likely to be when attending to it. An example might be that you are likely to be more vigilant when listening to your teacher explain important information about your SAC in VCE Psychology than you will be during a conversation with a friend about your favourite TV show.

Figure 9A–3 You use sustained attention when focusing on new material to be learned.

Similarly, measures of sustained attention are greater when there is uncertainty about the location in which the stimuli will be presented. The probationary driving test example illustrates this point – you would be vigilant throughout the test, looking out for potential events that require a response (e.g. a merging vehicle or pedestrian crossing).

Sustained attention takes significant effort. In general, attention can be sustained for only a limited time; however, breaks can refresh one's ability to maintain attention. Nevertheless, the likelihood of missing information increases the longer an individual has remained vigilant, and when paying attention is difficult, the risk of misperceiving information increases. Indeed, being able to refocus after a distraction is a key aspect of sustained attention.

This kind of attention is required for a range of tasks, including reading books, playing video games and listening to lectures. Driving, cooking and travelling in new places would also be impossible without sustained attention. Most professions require at least a basic degree of sustained attention; for many, it needs to be highly developed.

ISBN 978-1-009-25401-4 Gallagher et al

Selective attention

Selective attention focusing on a single activity while disregarding other environmental stimuli

Controlled cognitive process a cognitive task that requires a high level of conscious awareness and mental effort

Salient a descriptor for anything that is prominent, conspicuous or otherwise noticeable when compared to its surroundings

While sustained attention is best suited to situations in which the stimuli are new or we cannot be certain when the stimuli will be presented, in other instances, we may need to focus our attention on a single activity and disregard other environmental stimuli. This is called **selective attention**. Selective attention is usually required when we complete a **controlled cognitive process**; that is, a task that involves a high level of conscious awareness and mental effort. It is used when a task to be completed is complex (e.g. learning to dribble a soccer ball) or when the desired stimulus is known (e.g. scanning your room with your eyes, looking for your phone).

In selective attention, although your focus is on one stimulus, you can still be consciously aware of other things happening in the environment. For example, in the example of learning to dribble a soccer ball, although your attention would be directed towards the ball and your own body's movements, you would also be aware of other people on the field and any equipment that might be in your way. Generally, when using selective attention, you are more likely to focus on **salient** stimuli; that is, stimuli that are prominent, conspicuous or otherwise noticeable when compared to their surroundings.

As another example, imagine yourself in a busy restaurant enjoying a celebratory meal with lots of family and friends. It's exceptionally noisy because you have been seated near the kitchen, everyone has broken off into conversations around the table, music is playing over the restaurant's stereo system, and there is a baby crying across the room. Yet, despite the noise, you are able to engage in an interesting conversation with people sitting near you. You can ignore much of the noise going on around you and focus your attention on the people you are speaking with. This is the 'cocktail party effect' – the ability to focus one's attention on a stimulus while ignoring a range of others.

There is also another side to the cocktail party effect that helps us understand selective attention. Imagine yourself in that busy restaurant, with your attention focused on the conversation described. Suddenly, you hear someone at the other end of the table say your name. You stop your conversation and turn your attention towards the person who said your name. In this case, even though you were not attending to the source (the person at the other end of the table) of the salient stimulus (your name), your brain was able to filter that stimulus from your surroundings and direct your attention to it.

Figure 9A–4 You use selective attention while learning a complex skill such as dribbling a football and focusing on a conversation in a noisy environment.

ISBN 978-1-009-25401-4 Gallagher et al

Divided attention

Unlike selective attention, in which attention is focused on one stimulus, **divided attention** involves distributing one's attention to allow for the processing of two or more stimuli at the same time. Divided attention can generally be used when an **automatic cognitive process** is being performed, which requires little conscious awareness or mental effort. This may be because the tasks to be focused on have become well learned through repetition or because of their simplicity. A task may start out as a controlled process requiring selective attention but become automatic with practice. For example, dribbling a soccer ball may initially require selective attention, but with sufficient repetition, it will become an automatic cognitive process. Once that skill has become automatic, attention is freed up so that you can divide your attention between dribbling the ball and some other skill, such as looking for openings to pass the ball.

Divided attention distributing attention to allow the processing of two or more stimuli at the same time

Automatic cognitive process a task that requires a low level of conscious awareness or mental effort

Divided attention can only be effectively used when it is not necessary to concentrate fully on either stimulus. If one of the stimuli is too complex (e.g. driving a car), divided attention cannot be used without seriously affecting performance (or safety, in the case of driving a car). Some examples of when divided attention can be used include chatting with a friend while playing a familiar video game or listening to music while exercising.

Interestingly, where two or more stimuli rely on similar sensory systems (e.g. visual or auditory), it is harder to pay attention and process the information. This is why it is difficult to talk to someone and pay attention to the lyrics of a song at the same time, and why when you try to browse your phone while watching TV, you can only really focus on one screen at a time. By contrast, if the two stimuli rely on different sensory systems, they can be processed simultaneously with little difficulty (e.g. chatting [auditory] and playing video games [visual, somatosensory]).

Figure 9A–5 Having learned balls skills and made them an automatic cognitive process, a footballer can also watch the motions of the other players and decide when and where to pass the ball, dividing their attention between ball control and tactics.

Figure 9A–6 A novice circus performer divides their attention between riding a unicycle and juggling

ISBN 978-1-009-25401-4 Gallagher et al

Comparing attention types

WORKSHEET 9A–1 APPLYING ATTENTION

The three types of attention – sustained, selective and divided – are all useful in different situations. Which type of attention is most suitable depends on what is required by the individual in that situation. Table 9A–1 compares the attention types in terms of the type of cognitive processing they use and the mental effort they require, what they can be used to focus on, the kinds of situations they are most suitable for, and limitations that can cause misperceptions.

VIDEO 9A–1 TYPES OF ATTENTION

Table 9A–1 Comparing attention types

	Sustained attention	Selective attention	Divided attention
Type of cognitive processing required	Controlled cognitive processing	Controlled cognitive processing	Automatic cognitive processing
Mental effort required	A high level of mental effort required	A lot of mental effort required	Little mental effort required
Focus of attention	Stimuli with some unpredictability	Limited range of salient stimuli	Multiple stimuli across tasks
Best suited for	Contexts in which new stimuli are likely to be encountered	Focusing on particular stimuli and blocking out others	Multitasking and switching between tasks
Type of task focused on	Can be used for simple and complex tasks	Complex tasks	Simple tasks
Potential for misperceptions	The risk of misperception increases: • the longer you try to pay sustained attention • the more difficult it is to pay attention.	The risk of misperception is reduced because target stimuli are known.	Performance decreases if one or more of the tasks focused on are complex.

Figure 9A–7 When you pay attention to a conversation at a party, you are using sustained attention.

Consider, for example, that you are at a friend's birthday party. There are lots of people there that you don't know, and it is really loud. The first thing you want to do is say hello to your friend, so you scan the room for them, trying to pick them out of the crowd (sustained attention). As you walk towards them, your body starts moving to the music. You also notice a refreshment table, so you stop off for a handful of chips and a soft drink. All the while, you are keeping track of your friend so that you don't lose them in the crowd (divided attention). Finally, you get to your friend, who has just started a deep conversation with another person you know, about global warming.

ISBN 978-1-009-25401-4 Gallagher et al

You know a bit about this topic, but not enough to have an in-depth conversation, so you pay close attention, trying to follow the thread of the discussion in case you have anything to add (sustained attention). To achieve this, you have to block out the surrounding noise and other stimuli vying for your attention (selective attention). The global warming conversation continues for a while, and it starts to become harder to pay attention (sustained attention can only be applied for so long). Suddenly, you hear your name called (selective attention) and briefly you are trying to continue listening to your friends' conversation and also look for the source of your name. These are both complex tasks, so you cannot use divided attention (a limitation of that attention type), so you drop out of the conversation completely and wander off to find the person who called you over (selective attention), dancing as you go (divided attention).

As you can see from this example, the kind of attention you apply depends on the situation. Some kinds of attention work well for certain tasks (e.g. dancing while walking), but not others (e.g. paying attention to a conversation). It is normal to move between attention types as your needs change.

Check-in questions – Set 1

1 Name the type of attention that:
   - **a** allows for focusing on two or more tasks simultaneously
   - **b** involves attending to one stimulus while ignoring others
   - **c** involves maintaining vigilance for a prolonged period.

2 Which cognitive processing style involves a high level of conscious awareness and mental effort?

3 Julio is an experienced taxi driver. On this day, his geolocation isn't working, so he can't use a map app for directions. Julio's next passenger lives on a side street off a road that Julio is not familiar with. As he drives his taxi along the road, he reads the street signs to find the side street he needs.
   - **a** What type of attention is Julio using while he drives the car and reads the street signs?
   - **b** For Julio, the task of driving a car involves mostly _____ cognitive processing, whereas searching for the correct street involves mostly _____cognitive processing.

4 Viyara has started a new job as a babysitter for her neighbours' children, aged four and seven.
   - **a** Viyara and the four-year-old are colouring in together while Viyara makes some afternoon tea for the children. What type of attention is the four-year-old most likely using?
   - **b** When Viyara arrived earlier that afternoon, the seven-year-old was sitting in the living room making bracelets out of colourful beads. When Viyara checks on her after an hour, she hasn't moved and is still making bracelets. What kind of attention is the seven-year-old most likely using?

ISBN 978-1-009-25401-4 Gallagher et al

VIDEO 9A–2
SKILLS: UNDERSTANDING AND APPLYING VCE COMMAND TERMS

9A SKILLS

Understanding and applying VCE command terms

In VCE Psychology, if you are asked to *distinguish, contrast, differentiate* or *compare* concepts, you need to make sure that your answer does this using 'congruent' (similar, alike) aspects of the concepts. So, rather than simply defining the two terms, you need to choose some aspect that is alike (or congruent) between the concepts and design your answer around that aspect. You should also use 'whereas' in your answer to show that you are pointing out a difference of some kind. Let's look at how this works.

Question

Distinguish between selective attention and divided attention.

Key points to remember

This question asks you to *distinguish* the two concepts of 'selective attention' and 'divided attention'. Therefore, you need to find one or more aspects of these concepts that are congruent and can be used to distinguish between them.

- You know that both types of attention are used to focus on a certain number of things (one thing or multiple things), so that is a congruent aspect of the concepts as well as a point of difference that you can use to distinguish them.
- You also know that the two types of attention require a certain amount of awareness and conscious effort (congruent aspect), but not the same type (point of difference).

Now, you need to make sure that your answer compares the concepts congruently. Take a look at the following incorrect response. Does it compare congruent or incongruent (dissimilar) aspects?

Attempted answer

Selective attention involves a high level of conscious awareness and mental effort, whereas divided attention is when a person focuses on two or more events simultaneously.

Analysis

As you can see, the aspects compared are dissimilar, or incongruent. Although the response is factually correct, it does not answer the command term 'distinguish' because the aspects are not congruent. Let's see how these concepts could be correctly distinguished.

Suggested answer

Selective attention is the act of focusing on one event to the exclusion of others, whereas divided attention is when a person focuses on two or more events simultaneously.

OR

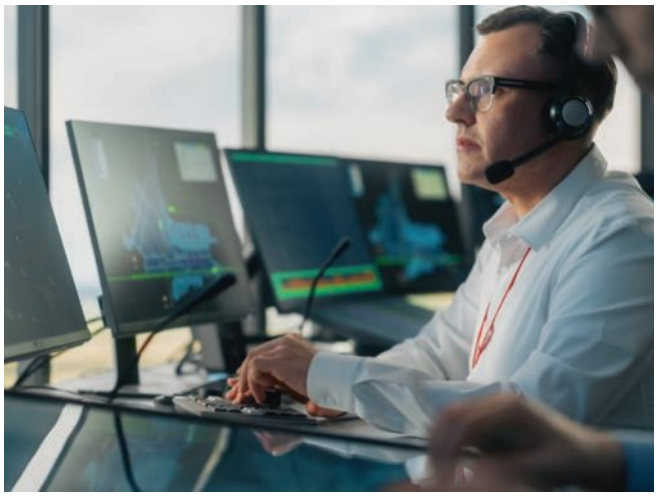
Selective attention requires a high level of conscious awareness and mental effort, whereas divided attention requires minimal conscious awareness and mental effort.

ISBN 978-1-009-25401-4 Gallagher et al

Section 9A questions

1 Candice was playing Fortnite and didn't even notice her friend Mary arrive at her house. Mary was trying to tell Candice about all the work she had been doing for Psychology that morning, but Candice told her to be quiet because she couldn't concentrate on the game.
   a Explain why Candice did not hear Mary come into the house.
   b What type of cognitive processing was Candice using when she was playing Fortnite? Justify your response.
   c After Candice finished her game, Mary wanted to play Fortnite. When Mary started playing, she was able to listen to Candice and still concentrate on the game. With reference to attention types, explain why Mary could play Fortnite and listen to Candice at the same time.

2 Jonathon has a new job as an air traffic controller. He often finds his shifts highly stressful, as he must ensure the successful coordination of multiple aircraft simultaneously. Describe the kind of attention and cognitive processing required for this job.



3 Lin was in his family living room, learning his lines for the school play. In the same room, his sister was practising the piano, and his father was playing a game on his phone. Nevertheless, Lin was able to focus on learning his lines without being distracted.
   a In terms of levels of awareness, Lin's ability to focus on learning the words of the play is best explained as a _____ process that involves _____ of mental effort.
   b True or false? During the time when he was learning the words of the play, it would be expected that Lin's cognitive processing directed his attention towards learning the words while simultaneously filtering out the sounds around him.

4 Imagine you are visiting a busy shopping centre with your friend. Using examples, explain how you might use each of the attention types (sustained, selective and divided) while you are at the shopping centre.

5 Compare sustained attention and selective attention.
6 Compare selective attention and divided attention.
7 Explain why you should use selective and sustained attention during Psychology class rather than divided attention.

ISBN 978-1-009-25401-4 Gallagher et al

9B Processing of visual and gustatory information

Study Design:
The role of perception in the processing and interpretation of sensory information, as demonstrated through top-down and bottom-up processing

Glossary:
Bottom-up processing
Gustation
Perception
Schema
Sensations
Top-down processing

ENGAGE

The Ig Nobel Prizes for improbable research

The satirical magazine and website *Annals of Improbable Research*, which has informal connections with Harvard University in the United States, awards the annual Ig Nobel Prizes (a humorous parody of the Nobel Prizes) to honour scientific achievements 'that first make people laugh, and then make them think'.

Examples of research recently awarded an Ig Nobel Prize include:

- magnetic levitation of a live frog
- whether it is safe to transport an airborne rhinoceros upside down
- whether knives made of frozen human poop work
- whether you can tell if someone is a narcissist from their eyebrows.

Figure 9B–1 The 2000 Ig Nobel Prize in physics was awarded to Andre Geim, Radboud University Nijmegen, and Michael Berry, University of Bristol, for the magnetic levitation of a live frog.

Coverage of the Ig Nobel Prizes in popular media often ridicules the winners, ignoring the second criterion for the award – that it makes people think. The 2008 Ig Nobel Prize for Nutrition was no exception. It went to Massimiliano Zampini and Charles Spence of the Department of Experimental Psychology at Oxford University for electronically modifying the sound of crunching potato chips to make a person believe that some were crisper and fresher than others. They gave their research subjects identical potato chips to eat while wearing headphones that played the sound of crunching into the chips, then asked the subjects to rate the chips for taste and freshness. Unknown to the subjects, the sounds through the headphones were electronically modified in various ways. The subjects rated the chips as tasting fresher and better if the crunch they heard was louder and deeper, even though all the chips were identical.

It makes you think, doesn't it?

In this section, the issue of how our senses affect one another is taken up as part of a broader focus on how we process our sensations and, therefore, perceive the world we experience.

ISBN 978-1-009-25401-4 Gallagher et al

EXPLAIN

Types of processing

As we attend to stimuli in our environment and take in sensory information, our brains process this information using either top-down or bottom-up processing. In **top-down processing**, **perception** is informed by prior knowledge and expectations. In contrast, in **bottom-up processing**, perception begins with salient sensory data, which is then integrated to form a bigger picture. In this section, we examine these two kinds of processing, first generally and then with specific reference to visual (sight) and gustatory (taste) sensory information.

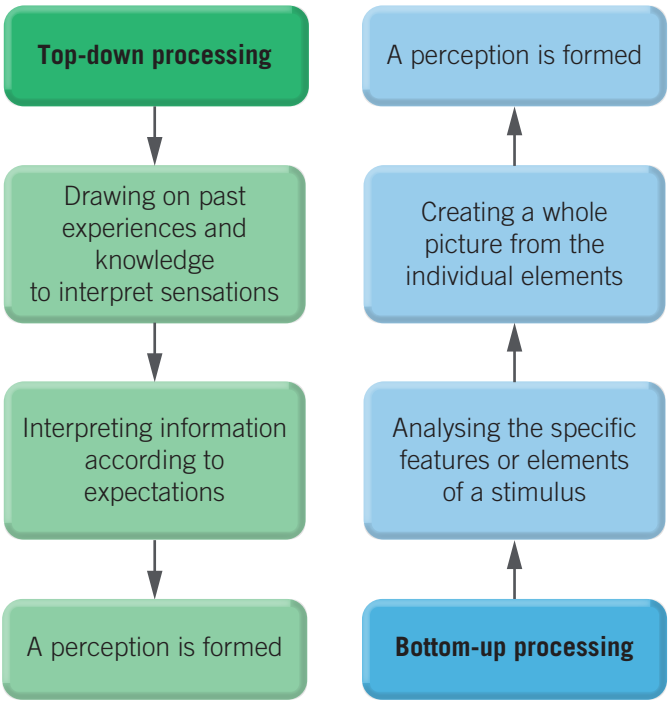


Figure 9B–2 Top-down and bottom-up processing

Top-down processing the processing of sensory information by applying prior knowledge and expectations

Perception the mental process of recognising, interpreting and giving meaning to the information received by the sense organs

Bottom-up processing the processing of sensory information beginning with salient sensory data, which is then integrated to form a bigger picture

Schema our pre-existing mental ideas relating to a given concept that help us organise and interpret new information

Top-down processing

When we process sensory data from the top down, we apply our prior knowledge and expectations to a situation, which changes how we perceive it. The various elements that help us to organise and interpret these expectations, our **schemas**, are different for everyone, as each person's mental organisation and interpretations are different. This shapes how we individually perceive stimuli using top-down processing.

As an example, consider Figure 9B–3. Have you seen a sign like this before? If you quickly glance at the message on the sign, what does it say? Did you spot the error? If you were relying on top-down processing, your brain would have read the sign as you expected to see it. It is only when you look closer at the individual elements of the sign that you will see the problem. The same thing happens when you proofread an assignment. Because you are already very familiar with what the text should say, you are more likely to read the words as you *think* they should be, causing you to miss simple spelling errors in your work. However, if you proofread a friend's work with which you are less familiar, you will have fewer top-down resources to draw on and are more likely to catch mistakes. This is why your teacher may tell you to have a friend read your work or to read your work out loud.

LINK 3C THE PROCESS OF PSYCHOLOGICAL DEVELOPMENT

Figure 9B–3 What does the sign say? When relying on top-down processing, most people will perceive the sign as saying what they expect: shallow, rather than swallow.

ISBN 978-1-009-25401-4 Gallagher et al

Using top-down processing, our experiences and expectations provide a structure for directing our attention, thereby influencing what we perceive. It is a time-efficient way of interpreting the world, as it allows us to quickly link new information to old information and draw conclusions based on that. However, as the examples on the previous page show, it can also cause sensory information to be perceived inaccurately.

ACTIVITY 9B–1 READING WITH A TOP-DOWN APPROACH

> Reda htis etxt and see if ouy can udnerstadn whta it is asyign. Oyu ese, htis si an xeampel of otp-odwn rpocessign. Yuo ees hte ivsula tsimuli as a hwole nda erthefore cna preceive it.

Can you read the above text? Discuss with a partner how this is possible.

Bottom-up processing

9A UNDERSTANDING THE ROLE OF ATTENTION IN PERCEPTION LINK

Sensations the information from the environment detected by the sensory organs and transmitted to the brain

In contrast to top-down processing, when we perceive something using bottom-up processing, we begin with salient sensory information, which is then processed and integrated to produce meaning. Bottom-up processing is also called data-driven processing because it relies on sensory data. This is typically an automatic process. Furthermore, what is perceived depends on what sensory data is attended to and how that sensory information is interpreted in real time. It is interesting to examine the differences in what people perceive through bottom-up processing, as it depends largely on the **sensations** each individual pays attention to. As discussed earlier with regard to selective attention, if an individual is more interested in a construct, they are more likely to be motivated and directed in their focus and, therefore, may perceive more sensory data than they would if they were not as interested.

Figure 9B–4 We use bottom-up processing of sensations to perceive when we are sick.

A common use of bottom-up processing is when we encounter an unfamiliar word when reading. We look closely at this new word, sound out its parts, and put them together to form a whole. As another example, when you feel sick, your first piece of information might be a sensation of nausea or pain. You would then focus your attention on detecting other sensations, which you might interpret together as symptoms of some illness.

Using bottom-up processing, we can make sense of stimuli for which we do not have prior experience or expectations. Interpreting information in this way takes longer compared to top-down processing, but our resulting perception tends to be more accurate.

ISBN 978-1-009-25401-4 Gallagher et al

Comparing top-down and bottom-up processing

Overall, there is a complex and dynamic interaction between top-down and bottom-up processing in perception. Rarely is one type of processing used without the other; instead, they are used in combination. Of course, some situations will allow for greater reliance on top-down processing, while others will require more bottom-up processing. Consider how these types of processing function in the following scenario.

You are sitting in your classroom when you notice someone opening the door. Your first thought, based on top-down processing and your schema of who would be entering a classroom, is that a student has arrived late to class. But, as the person's foot (all you can see of the person at this stage) enters the room, you notice (using bottom-up processing) a heavy man's boot, covered in paint – not the kind of shoe you would expect to see on a student (based on your schema of what a student might wear). This causes you to think of your school's groundskeeper, using your schema of adults with heavy boots that might be encountered at school. However, as the rest of the person passes through the door, you notice (using bottom-up processing of salient sensory stimuli) that it is a man wearing a high-vis shirt and a toolbelt. He gestures to your teacher, who points towards an electrical socket on the wall that is covered in protective tape. Finally, you can draw on your prior knowledge of that socket, which is faulty and needs to be fixed, and schema for tradespeople to perceive that the man is an electrician who has come to fix the electrical socket.

As you will have seen from this example, top-down processing is valuable for guiding our attention and making quick judgements about our world. However, these judgements can be inaccurate, especially when dealing with less familiar situations. Using bottom-up processing, we can attend to salient stimuli to draw better conclusions about unfamiliar things, although this takes longer and requires more mental effort.

A summary of the differences and similarities between top-down and bottom-up processing is shown in Figure 9B–5.

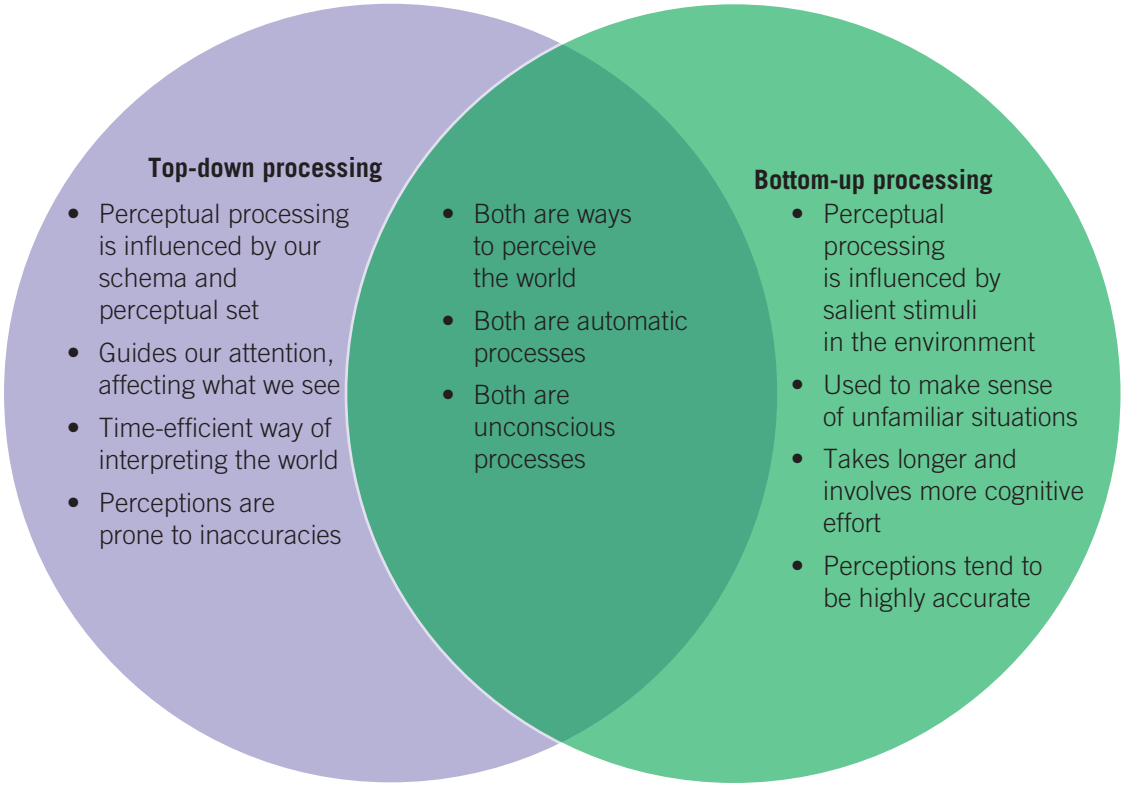


Figure 9B–5 Comparison of top-down and bottom-up processing

ISBN 978-1-009-25401-4 Gallagher et al

The remainder of this chapter will now consider top-down and bottom-up processing in relation to the perception of visual and gustatory sensory information.

Check-in questions – Set 1

1 Define top-down processing.
2 Define bottom-up processing.
3 Describe a situation in which both top-down and bottom-up processing are used. Explain how these types of processing are used in that situation.
4 Read the following statements and identify whether they are true or false.
   a Top-down processing is also known as data-driven processing.
   b Top-down processing is informed by an individual's experiences and expectations.
   c Bottom-up processing is a quicker neural process than top-down processing.
   d Top-down processing tends to be more accurate than bottom-up processing.

VIDEO 9B–1 PROCESSING VISUAL INFORMATION

Processing visual information

Visual information is the sensory information received by the brain through the eyes. In making sense of this visual information, both top-down and bottom-up processing are used. While our use of these types of processing is often dynamic, certain situations favour the use of one or the other kind of processing, as you learned above. Furthermore, how we process visual information is influenced by a range of factors, including our prior experience (at the top-down level) and ability to attend to salient stimuli (at the bottom-up level). This section explores how we process visual information to better understand how we interpret the world.

Figure 9B–6 Using top-down processing, our perceptual set suggests that this is a dalmatian dog.

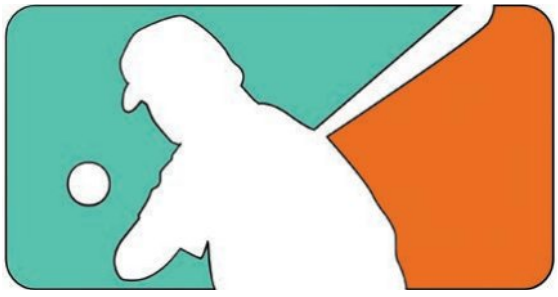


Figure 9B–7 Using top-down processing, our perceptual set suggests that this is a baseball player.

Top-down processing of visual information

When applying top-down processing to visual stimuli, we draw on our experiences and expectations to shape our perceptions. For example, even if you can only see half an object, you can use your experience about that kind of object to fill in what you can't see, so that you perceive the object as having a whole shape (even if you can't see part of it). Consider the image in Figure 9B–6. If you have seen a dalmatian before, or indeed any kind of similar-shaped dog, your mind will be able to fill in the spaces in this image based on your expectations about what a dalmatian should look like. Therefore, rather than seeing a number of black splodges, you will see a complete dalmatian dog.

Likewise, in the image in Figure 9B–7, you could use your understanding of the concept of baseball, and perhaps your familiarity with this kind of logo specifically, to perceive a baseball player hitting a ball, even though no baseball player has actually been drawn in the image. Using top-down processing, your brain fills in the image of the baseball player, bat and ball. You may even have an idea of what the baseball player's face looks like!

ISBN 978-1-009-25401-4 Gallagher et al

Bottom-up processing of visual information

When applying bottom-up processing to visual stimuli, we draw on salient sensory data to shape our perceptions. For example, consider that you are walking through a busy city with headphones on. Music is blaring in your ears, so you can't hear what is going on around you. You can only use your sight to make sense of your environment. Suddenly, you see a crowd of people rushing towards you. You look at their faces and see that they look excited. Some of them are reaching out their arms or digging in their bags for their phones. You have never seen anything like it, but by putting together each of these salient visual stimuli, you can perceive that they are rushing towards something worth seeing.

In this example, processing these salient visual stimuli (people running, excited faces, and everyone heading in the same direction) allows you to interpret the scene. Other visual stimuli might be available, but if they are not conspicuous or noticeable against their surroundings (i.e. salient), they are unlikely to contribute to how you perceive the situation.

Figure 9B–8 Using the available visual information and bottom-up processing, decide where you would see each of these crowds.

ACTIVITY 9B–2 DISTINGUISHING TOP-DOWN AND BOTTOM-UP PROCESSING

In pairs or small groups, locate images demonstrating top-down and bottom-up processing. Be prepared to explain to the class how these types of processing can be used to make sense of the figures.

Check-in questions – Set 2

1 For Figure 9B–9, describe what you would see if you were looking from the other direction, towards the front of the elephant. What kind of processing allows you to describe the part of the elephant you can't see?

2 Young children who have not grown up around horses are often surprised the first time they see a horse and may mistakenly interpret it as a big dog. Describe the salient visual data they might use to identify a horse as a big dog.

Figure 9B–9 Can you describe the parts of the elephant you can't see?

Processing gustatory information

Gustation is the technical term for the sense of taste, with 'gustatory' meaning 'to do with taste'. Taste information includes sensory information received by the brain through the olfactory (nasal) system and the taste buds within the mouth. As you saw for the processing of visual information, gustatory information is processed using a combination of top-down and bottom-up processing, influenced by a range of factors, including our experience and expectations of a taste (at the top-down level) and our ability to attend to the taste and olfactory stimuli that give foods their flavour (at the bottom-down level). This section explores how we process gustatory information and why we perceive tastes as we do.

Gustation
the sense of taste

ISBN 978-1-009-25401-4 Gallagher et al

Top-down processing of gustatory information

As with visual information, when applying top-down processing to gustatory information, we draw on our experience and expectations to shape our perceptions. In the case of gustatory information, this includes our familiarity with how a food or drink usually tastes and smells, and how it has reacted with our body in the past. It can also include our expectations about how something should taste.

Have you ever put only a tiny amount of chocolate (or some other food you love and are familiar with) in your mouth? Did you notice how you still get a full flavour experience, even from a small fragment? This is because top-down processing is filling in the gaps based on your past experience of chocolate (e.g. the smell, taste, texture and even your associated feelings).

Perhaps you have also noticed that two people can have quite different reactions to the same food. Let's keep using the example of chocolate. One person, Riku, absolutely loves chocolate. He doesn't have it very often, but when he does, he savours it. If he does well on a test or finishes off a big project, he likes to buy a chocolate bar to reward himself for his efforts. The last few chocolate bars he has had have been particularly delicious. His friend, Carmen, likes chocolate, but her last few chocolate bars have been disappointing and have made her feel ill. Today, they are at Riku's house. Riku picked up some of his favourite chocolate bars from the shop as a surprise for his friend. They have the chocolate bars while watching a movie. Riku thinks it is some of the nicest chocolate he has ever had, but he thinks Carmen didn't like it as much as he did. He asks her about it, and she agrees: the chocolate was okay, but not great.

Figure 9B–10 Some people may love a food, while others don't care for it.

In the scenario above, the two friends ate the same type of chocolate, but their different past experiences and expectations concerning chocolate meant that they perceived the taste of the chocolate in quite different ways. This demonstrates how top-down processing shapes our perceptions. If the last time we ate a food we had a strongly positive experience, we will likely expect our experience to be positive this time. Likewise, if our experience of a food has been disappointing or negative, we may have low expectations or even actively avoid a food. If you have ever had food poisoning, you may still be able to name the food responsible and find that you cannot eat that food now without feeling ill.

ISBN 978-1-009-25401-4 Gallagher et al

9B KEY SCIENCE SKILLS

Evaluating evidence, drawing conclusions and discussing implications

In VCE Psychology, you may be asked to design a piece of research or an experiment that looks at the relationships between concepts covered within the study design. You could also be asked to draw conclusions and justify the reasoning behind scientific arguments with evidence relevant to the investigation.

VIDEO 9B–2 KEY SCIENCE SKILLS: EVALUATING EVIDENCE, DRAWING CONCLUSIONS, DISCUSSING IMPLICATIONS

Let's consider a relevant topic by taking on the role of experimenter to design, evaluate and implement your own study to test a hypothesis.

Research question: Does the knowledge of how much sugar is in a drink impact the perception of its taste?

Research aim: To investigate whether knowing how much sugar is in a drink affects the perception of its flavour.

Hypothesis: Victorian school students will perceive a drink to be sweeter when they know its sugar content than when they do not know its sugar content.

Method

1. Pour five different drinks that contain sugar into similar cups, hiding all labels and identification from the participants. Ensure you, as the experimenter, can tell which cup is which, such as by numbering the cups.
2. Direct participants to taste the drinks and put them in order from least sweet to most sweet.
3. Then (or later on the same day), repeat steps 1 and 2, but make the information about each drink's sugar content (found on the packaging, in grams of sugar per 100 mL) available to the participants. You could write it on the cup.

Experimental design: Choose an appropriate experimental design to suit the suggested method and collate the data for analysis.

Follow-up questions for discussion

1. Did knowing the sugar content affect participants' perception of the drinks' taste? Did they taste sweeter or less sweet than initially?
2. During the first stage of the experiment, how might participants have used bottom-up processing to perceive the taste of each drink?
3. During the second stage of the experiment, what processing types might the participants have been using, and how would this affect their perception of taste?
4. Which stage of the experiment (first or second) gave the most accurate data? Why?

NUTRITION INFORMATION			
SERVINGS PER PACK: 1			SERVING SIZE: 375 mL
	AVE QTY PER SERVING	% DI* PER SERVE	AVE QTY PER 100 mL
ENERGY	750 kJ	9%	200 kJ
PROTEIN	0.2 g	0.4%	0.05 g
FAT - TOTAL	0 g	0%	0 g
- SATURATED	0 g	0%	0 g
CARBOHYDRATE	43.1 g	14%	11.5 g
- SUGARS	43.1 g	48%	11.5 g
SODIUM	68 mg	3%	18 mg
*PERCENTAGE DAILY INTAKES ARE BASED ON AN AVERAGE ADULT DIET OF 8700 kJ, YOUR DAILY INTAKES MAY BE HIGHER OR LOWER DEPENDING ON YOUR ENERGY NEEDS.			

Figure 9B–11 Australian nutrition information labels on drink packaging show sugar content in grams per serving and per 100 mL.

Finally, using the data you collected, prepare a short presentation about your findings and the implications for your research aim. Within your presentation, critique your chosen experimental design and suggest modifications that could be used in the future to reduce the study design's limitations.

ISBN 978-1-009-25401-4 Gallagher et al

WORKSHEET 9B–1 APPLYING PERCEPTIONS

Bottom-up processing of gustatory information

When applying bottom-up processing to gustatory experiences, we gather a range of salient sensory data, using our sense of smell as well as taste, to form our perceptions. The complexity of the perception of taste means that seldom are you solely relying on only a bottom-up sense of taste. However, as an example of when you might be, imagine you are sitting in class, grinding your teeth a little as you concentrate. Suddenly, you sense an unexpected and unknown taste in your mouth. You brush your tongue around your mouth to try to identify the source of the taste. You find it, hidden in a crevice between your teeth – a tiny fragment of food. You fold it onto your tongue and suck at it until you finally feel like you have identified its source. You have just used bottom-up processing to focus on a range of salient sensations to put together the bigger picture of the taste.

Figure 9B–12 When you taste something while blindfolded, you rely on bottom-up processing.

Another time that you need to rely on the bottom-up processing of taste is when you are trying a food you have no schema for. Maybe it is an unusual fruit from a friend's home country or a dish you have never heard of. One way to recreate the experience of trying a food for which you have no schema and thus cannot use top-down processing is to taste an unfamiliar food while blindfolded. Without your sense of sight and prior knowledge about the food you are tasting, you will need to rely on environmental information alone (including the food's smell and taste) to create your perception of it. By focusing on these salient stimuli, you are using bottom-up processing to understand what you are tasting, and whether you like it or not. When you finally remove the blindfold and take in the visual stimuli from the food, your bottom-up processing should give way to top-down processing as you connect your sensory experience of the food with your knowledge of it – helping you to perceive the food more completely.

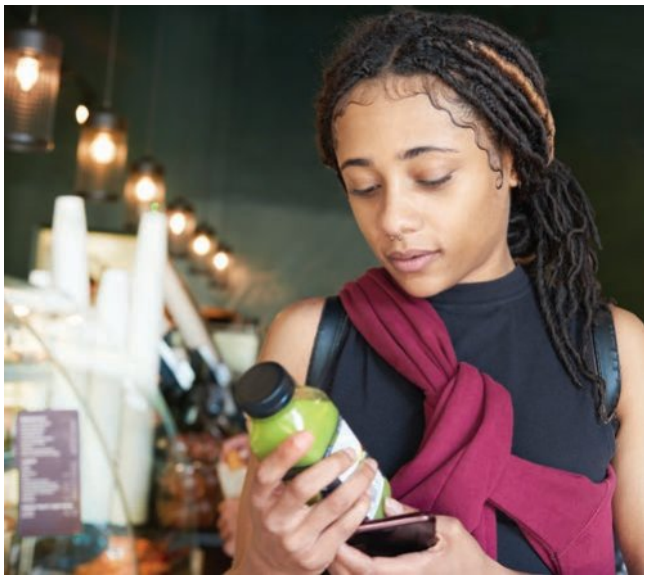


Figure 9B–13 When you are trying a food or drink you've never had before, you have no schema for it. When you taste it, with bottom up processing you will combine its smell, taste, texture, colour and other information such as its description on the packaging, to form your gustatory perception of it.

ISBN 978-1-009-25401-4 Gallagher et al

9B SKILLS

VIDEO 9B–3 SKILLS: ACCURATELY APPLYING CONCEPTS TO SCENARIOS

Accurately applying concepts to relevant scenarios

In VCE Psychology, a question that asks you to *apply* or *explain with an example* requires that specific examples from and references to the question's scenario should be given. You should also ensure that you clearly address each question as it is asked, and that your application of psychological knowledge is clearly linked to an example from the scenario.

Question

Peter invites Anne to his local ice-cream shop, which he visits regularly. He suggests that Anne try his favourite ice-cream flavour, cherry, which he orders every time. They both order the cherry ice-cream; however, on this particular day, that ice-cream has gone bad due to having been improperly stored. Anne describes the ice-cream as disgusting, but Peter still describes it as his favourite flavour.

Identify and describe how Peter and Anne may have used top-down and bottom-up processing in forming their different perceptions of the cherry ice-cream.

Key points to remember

VCAA's feedback continually suggests that generic responses to such questions cannot be awarded full marks. Therefore, for this question, your response should describe how Anne and Peter used different processing styles, with examples from the scenario to support your answer.

Attempted answer

Top-down processing of taste includes drawing on past experiences and knowledge to interpret sensations, to then interpret the information according to expectations and form a perception of taste. Bottom-up processing of taste includes analysing the specific features or elements of a stimulus to then create a whole picture from the individual elements and form a perception of taste.

Analysis

This answer lacks application and is too generic, as it only identifies and describes the types of processing without any link to the scenario.

Suggested response

With reference to Peter and Anne's experience at the ice-cream shop, Peter may have used top-down processing of taste to interpret his experience of the cherry ice-cream. Peter most likely would have drawn on his positive past experiences and knowledge about cherry ice-cream to interpret the taste of the ice-cream. This led him to interpret the taste according to his expectations and form a positive perception of the cherry ice-cream. Conversely, Anne most likely would have used bottom-up processing to gather and analyse salient stimuli (e.g. the olfactory and taste sensations) as the basis for her perception of the cherry ice-cream. Since on this particular day, the ice-cream had gone bad, she would have perceived this accurately using her bottom-up processing and formed a negative perception of the cherry ice-cream.

ISBN 978-1-009-25401-4 Gallagher et al

Check-in questions – Set 3

1 What is the difference between visual information and gustatory information?
2 Explain, with reference to a type of processing, why a person's taste perception of their birthday cake might be influenced by their previous birthday cakes.
3 What is bottom-up processing of gustatory information? Give an example that has not been elaborated on in the text.

Section 9B questions

1 What is the difference between visual top-down and bottom-up processing? Give an example of each.
2 Explain how gustatory perception is affected by top-down processing.
3 It was Somchai's first day in Australia. That night, when his homestay family served him dinner, he realised he had no idea what the dish was. He was too polite to ask, so he did his best to work it out for himself. He took a spoonful of the food and smelled it. It smelled rich and aromatic. He put some in his mouth. It tasted sweet, with a little sourness. He tasted unfamiliar spices and a nice amount of salt. He decided, whatever it was, that it was delicious! Describe the processing type Somchai used to make sense of the dish. Why did he use this processing type?
4 Think about a time you were looking at something you hadn't seen before and explain how you used bottom-up processing to support your interpretation of it.

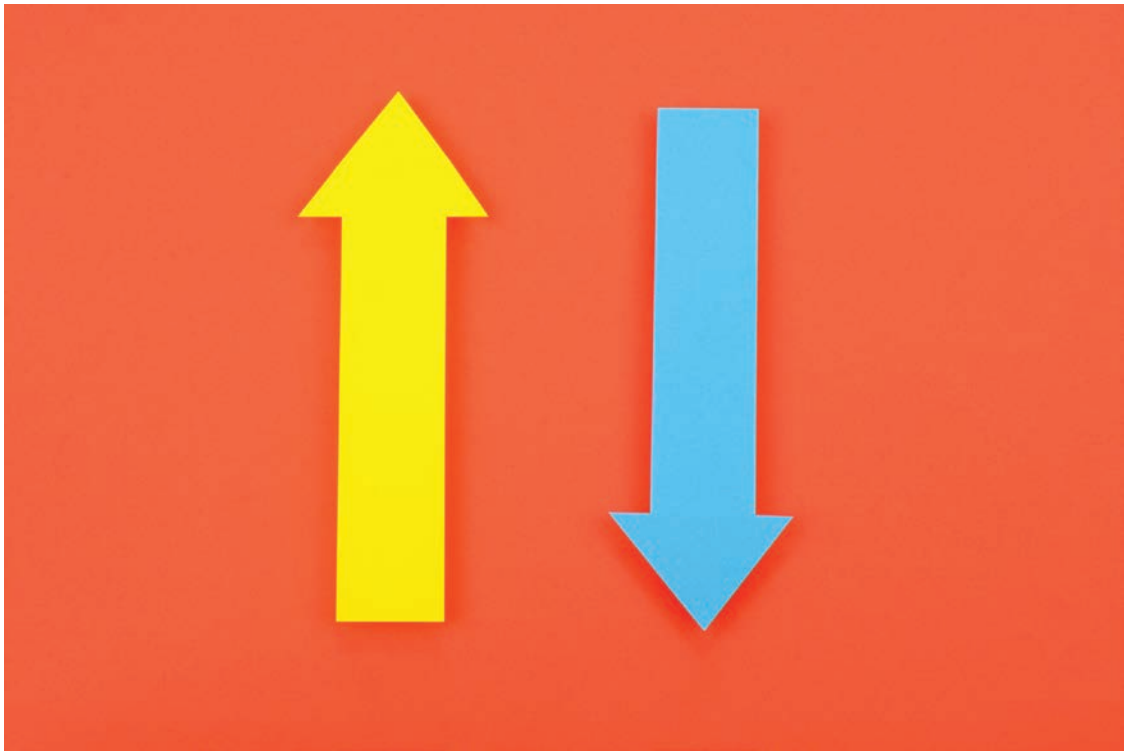


Figure 9B–14 Consider when you have used top-down or bottom-up processing to make sense of something new around you

ISBN 978-1-009-25401-4 Gallagher et al

9C Applying the biopsychosocial model to visual and gustatory perception

Study Design:
The influence of biological, psychological and social factors on visual perception and gustatory perception

Glossary:

Accommodation
Binocular depth cues
Biological depth cues
Biopsychosocial model
Camouflage
Closure
Context
Convergence
Culture
Depth perception
Figure–ground
Food culture
Gestalt principles
Memory
Monocular depth cues
Motivation
Orientation constancy
Past experience
Perceptual constancy
Perceptual set
Proximity
Retinal disparity
Retinal image
Shape constancy
Similarity
Size constancy
Taste buds
Visual perceptual principles

ENGAGE

‘I’d keep it on the down low’: the secret life of a super-recogniser

Police employ them and scientists study them, but what is life like for the rare few who can never forget a face? As a child, Yenny Seo often surprised her mother by pointing out a stranger in the grocery store, remarking that it was the same person they passed on the street a few weeks earlier.

It was only as she got older and started using social media that Seo became self-conscious about her skill. ‘I would start a new class in uni or I would meet people through social gatherings and I would remember visually what kind of photos I’d seen them in. I’d already be so familiar with them and I’d know in my head: “Oh, you are that person’s sibling, or you used to date so-and-so,”’ she says.

‘But I also knew it’d be really creepy if I said that out loud, so I’d keep it on the down low and just say: “Oh, nice to meet you.”’

ISBN 978-1-009-25401-4 Gallagher et al

Once, while working at a part-time job at a clothing store when she was at uni, Seo had cause to show her skill. Staff were shown grainy, hard-to-decipher CCTV footage of a habitual shoplifter; the next time this person entered the shop, Seo instantly recognised them and alerted the security guard. 'I knew I must have some kind of skill, but I still didn't think it was anything special, because I just had so many instances like that happen.'

Less than 2% of the population are super-recognisers, those who, even after just a glimpse, can remember strangers' faces. The cause is not known, but genetics plays a role, since identical twins have similar abilities. In addition, the number of neurons in the part of the brain that processes face recognition, which is genetically determined, has been shown to be linked with super-recognition ability.

Super-recognisers are being recruited by the police and other security agencies around the world to examine surveillance videos of crime scenes.

So, how does visual perception function? How does information from the environment create our perceptions of the world? How is it that one person can walk the same world as another and yet be able to recall a completely different experience? How is it that Yenny Seo can have similar genetics to her mother, but have different perceptual abilities? Through this section, we will explore the dynamics of perception in sight and taste, as well as the factors that influence one's perception, for example genetics and past experiences.

EXPLAIN

The biopsychosocial model

3B BIOPSYCHO-SOCIAL APPROACH LINK

Biopsychosocial model an inter-disciplinary model that looks at the interconnection between biology, psychology and social factors

In the previous sections, you read about type of attention and processing, and their role in perception. Let's now look more closely at the various external and internal factors influencing how we perceive our world. Applying the **biopsychosocial model**, introduced in Chapter 3, allows us to identify the biological, psychological and social factors that influence, often in combination, a person's perceptions. As in Section 9B, this section focuses on the sensory systems of vision and taste, discussing in turn how biological, psychological and social factors shape visual perception, before turning to how these factors influence gustatory perception.

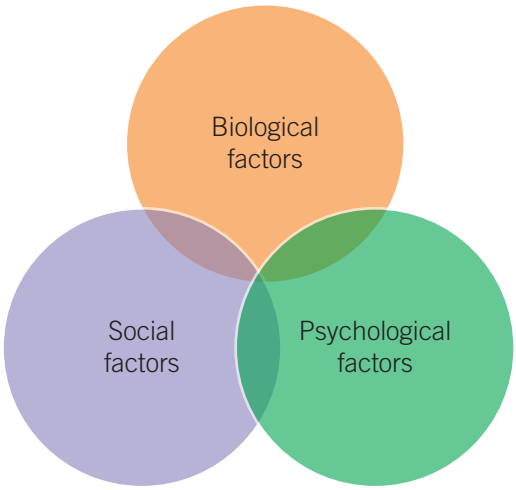


Figure 9C–1 The biopsychosocial model

Applying the biopsychosocial model to visual perception

Biological factors

Unlike the psychological and social factors that will be discussed below, the biological factors affecting visual perception are grounded in physiology (functions of the body) and so are similar for most people, except where some difference functionality is experienced by an individual due to genetics, injury, age or some other biological reason.

One example of a biological factor that affects how people perceive the world is colour blindness, also known as colour vision deficiency. The most common kind of colour vision

ISBN 978-1-009-25401-4 Gallagher et al

deficiency is red–green colour blindness, which prevents a person from being able to distinguish between reds, greens, browns and oranges or accurately differentiate between blue and purple hues. Imagine not being able to tell the difference between the red, green and orange traffic lights or tell if a banana is still green before you bite into it!

Another important biological factor that can affect how people see their world is depth perception. **Depth perception** is the ability to judge distances and see the world in three dimensions. This relies on our ability to correctly process **biological depth cues**, which help us determine how near or far an object is from another object or ourselves. Our eyes receive visual stimuli as two-dimensional images, which are then converted, using depth cues, into a three-dimensional reality. There are two types of depth cues: binocular depth cues and monocular depth cues.

Depth perception the ability to judge distances and see the world in three dimensions

Biological depth cues a physiological signal or piece of information that helps us to determine how near or far an object is from another object or ourselves

Binocular depth cues

Binocular depth cues require both eyes to send information to the brain to perceive depth. Individuals with sight in only one eye are therefore unable to use these depth cues and thus cannot perceive depth. Convergence and retinal disparity are the two main binocular depth cues.

Binocular depth cues depth cues that require both eyes to send information to the brain to perceive depth

Convergence

Convergence involves the inward turning of the eyes, which is detected by the brain as tension changes in the muscles surrounding the eye; for example, the eyes turn inwards to focus on objects that are close. When the brain detects an increase in muscle tension in both eyes, the visual cortex in the brain is activated by this cue to assist in determining the depth and distance of an object. The further away an object, the less inward turning of the eyes and the less muscle tension. An object that is close to the observer, on the other hand, requires greater inward turning of the eyes and stronger muscle tension to keep it in focus. Convergence occurs when an object is within approximately seven metres of the viewer. Beyond seven metres, convergence does not take place, as the eyes remain parallel.

Convergence a biological depth cue that involves the brain interpreting tension changes in the muscles around the eyes

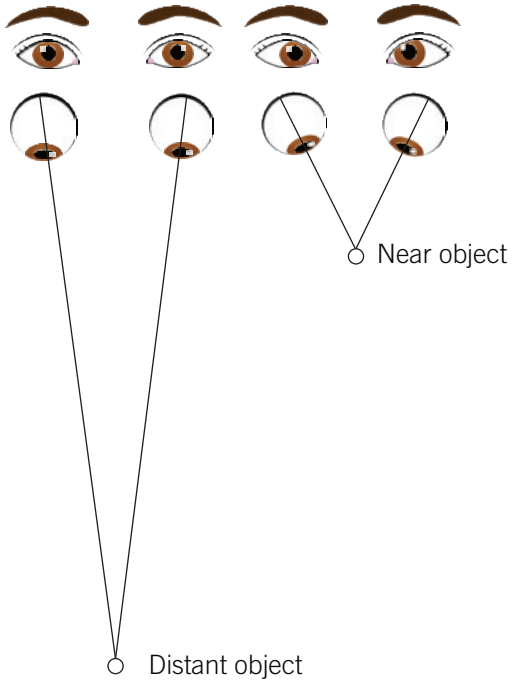


Figure 9C–2 The closer an object is, the more the eyes converge, or turn inwards, to focus on the object.

ACTIVITY 9C–1 CONVERGENCE

Hold a pen with an outstretched arm. Keeping the pen's tip in focus, slowly move the pen closer to your face until it almost touches your nose. Notice the muscle tension in your eyes. This internal tension provides the brain with information that the pen is close. Now watch a partner complete the same exercise and take note of the movement of their eyes. Notice how their eyes converge, or turn inwards, to keep the pen in focus.

ISBN 978-1-009-25401-4 Gallagher et al

Retinal disparity

Retinal disparity the brain detecting similarities and differences between the information being sent from each eye, due to the eyes being 6–7 cm apart

Retinal disparity refers to the brain detecting similarities and differences between the information being sent from each eye, due to the pupils of our eyes being 6–7 cm apart. The mismatch between the sensory information provides cues about the object's depth and distance. When the disparity, or difference, between the images is greatest, the object is perceived as close to the observer. Less disparity between the two images indicates that the object is further away. Retinal disparity can be used on objects up to 10 metres away from the viewer. Beyond 10 metres, the images received on each retina are virtually the same. This is why it is difficult to detect depth in distant objects.

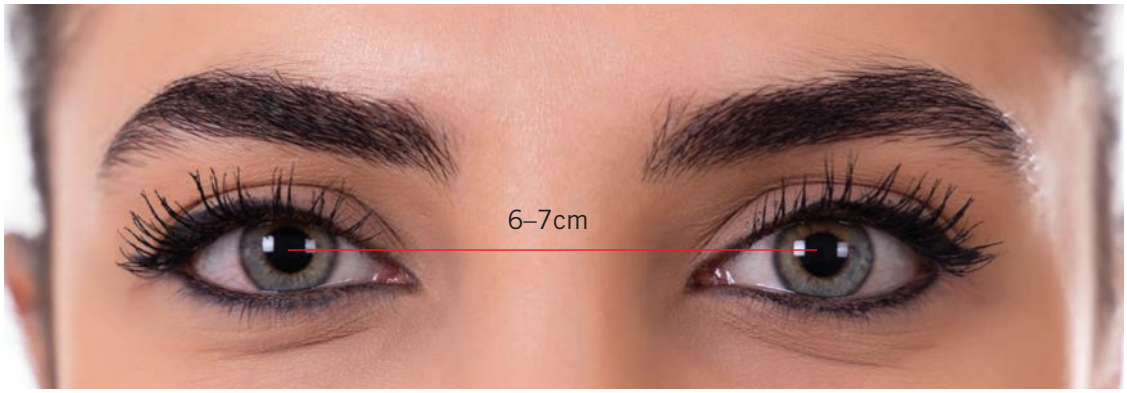
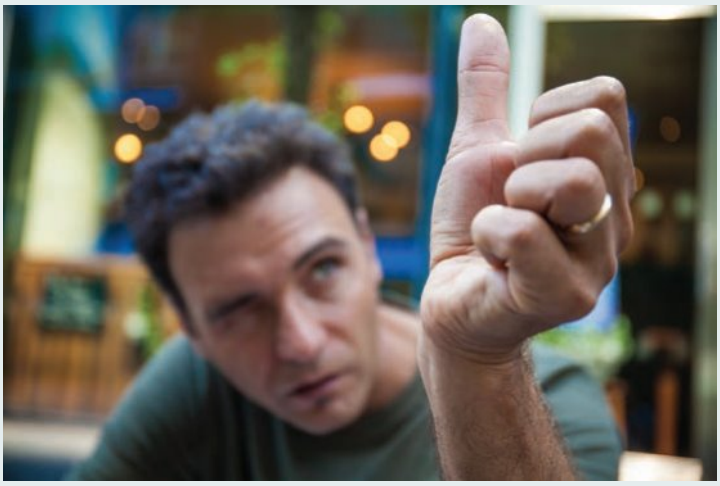


Figure 9C–3 Because our pupils are spaced 6–7 cm apart, the images sent by each eye to the brain are slightly different.

ACTIVITY 9C–2 RETINAL DISPARITY



Hold up a thumb with your arm extended. Close one of your eyes and look at your thumb through one eye. Now, while keeping your thumb still, switch to looking at it with the other eye. Holding your thumb still, switch back and forth between your eyes. See how your thumb moves in contrast to the background? To better understand how this helps you perceive depth, move your thumb closer to your face so that it is only around 30 cm away from you. Close one eye and repeat the process of switching between eyes while holding your thumb in this new position. Again, take note of how the thumb moves in contrast to the background.

With a partner, explain why your thumb appeared to be moving against the background. Try to use concepts from this chapter.

ISBN 978-1-009-25401-4 Gallagher et al

Monocular depth cues

Monocular depth cues require only one eye to send information to the brain to perceive depth. Here, we will just discuss one of these – the biological monocular depth cue of accommodation. Importantly, unlike convergence and retinal disparity, accommodation requires only one eye to function. Therefore, a person with vision in only one eye can still perceive depth using accommodation, although this is more difficult without the ability to use convergence and retinal disparity.

Monocular depth cues
depth cues that only require one eye to send information to the brain to perceive depth

Accommodation

Accommodation is the ability of the eye to change focus from near to distant objects and back again. Through accommodation, the brain detects movement in the muscles of the eye as it changes the shape of the lens to focus on nearby or distant objects. Muscles and ligaments attached to the eye enable the shape of the lens to change. When focusing on nearby objects, the lens bulges as the ciliary muscle contracts (or shortens) and the suspensory ligament relaxes (Figure 9C–4). Conversely, to focus on more distant objects, the lens stretches as the ciliary muscle relaxes and the suspensory ligament tightens. The brain receives important information about the shape of the lens from the muscle tension surrounding the eye, which assists in its interpretation of an object's distance. Accommodation occurs when an object is within three metres of the viewer. Beyond three metres, the shape of the lens does not change significantly.

Accommodation
the ability of the eye to change focus from near to distant objects and back again

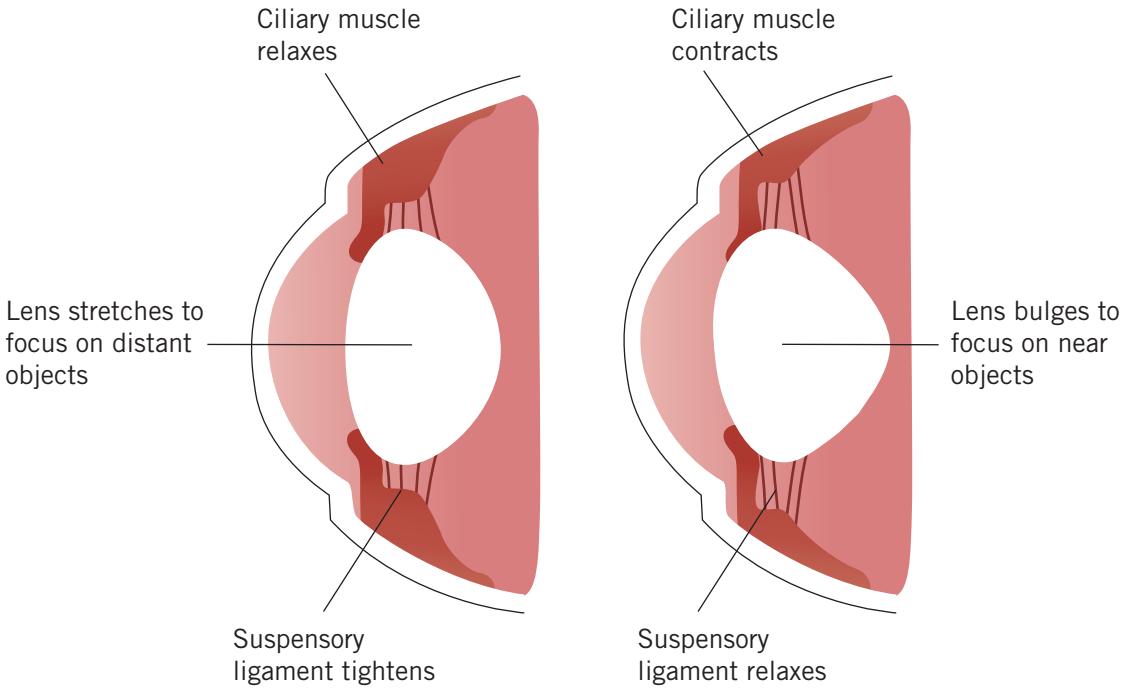


Figure 9C–4 When the ciliary muscle relaxes and the suspensory ligament tightens, the lens stretches to focus on more distant objects. When the ciliary muscle contracts (or shortens) and the suspensory ligament relaxes, the lens bulges to focus on nearby objects.

Check-in questions – Set 1

1 Describe the biopsychosocial model in reference to visual perception.
2 Describe why depth perception is useful in experiencing the world around us.
3 Distinguish between binocular and monocular depth cues and name an example of each.
4 Explain how convergence allows us to perceive depth.

ISBN 978-1-009-25401-4 Gallagher et al

Psychological factors

How we perceive visual sensations is shaped by a range of psychological factors, including our perceptual set (i.e. the combined effect of our past experience, motivations, memory and the context in which we are perceiving the stimuli), visual perceptual principles and perceptual constancy. Unlike the biological factors, which are associated with physiological function, the psychological factors are learned mental processes. Each individual has a unique combination of these mental processes, causing them to interpret environmental stimuli in a highly personal manner. This is why no two people interpret visual information in exactly the same way. We will now consider the psychological factors mentioned above in relation to their influence on how we perceive visual information.

Perceptual set

Perceptual set the tendency to view things in a certain way due to a readiness to receive certain stimuli

As already mentioned with regard to top-down processing, each person's perceptual set is different and shapes how they perceive stimuli. Your **perceptual set** leads you to view things in a certain way due to your readiness to receive certain stimuli. It is informed by your past experiences and memory, your motivations and the context in which you are experiencing the stimuli. Let's look at each of these in turn.

9A UNDERSTANDING THE ROLE OF ATTENTION IN PERCEPTION LINK

Figure 9C–5 Depending on your perceptual set, you may perceive this park as quiet, crowded or as you'd expect. You may first notice all the bikes, the pigeon, that something interesting is happening in the back right corner, or something else entirely. There are many ways to perceive this image, and how you perceive it depends on your perceptual set.

Past experience

Past experience the situations and events we have encountered throughout our life prior to the present

The situations and events we have encountered throughout our lives prior to the present are collectively referred to as our **past experience**. Our experiences are influenced by an enormous range of factors, including, but not limited to, our physiology, cultural and social background, familial and friendship relationships, education, even the conversations we have had, the places we have been, and the texts we have consumed. In short, it is the sum of our life experiences. Moreover, since every person has had a unique set of life experiences, no two people will have the same set of past experiences.

ISBN 978-1-009-25401-4 Gallagher et al

Our past experiences are an important component of our perceptual sets. They inform our ideas and expectations about the world, and thus how we process stimuli from the top down. They also shape which stimuli appear to be the most salient, affecting how we perceive stimuli from the bottom up. This explains how different people can perceive the same set of visual stimuli in markedly different ways.

Figure 9C–6 What do you think of when you see a tent?

Consider an image of a tent. For one person, this tent might make them think about the fun family memories they have of camping. They would likely perceive the image of the tent as positive. Another person may be reminded of the time they didn't have a permanent home and lived in a tent on the streets. For this person, the image of the tent would likely trigger negative emotions and thus be perceived as negative. For yet another person, the image might make them recall the time when they were forced to volunteer for a whole day at a welcome tent for their local town carnival. If this was a negative experience for them, they will likely perceive the image negatively.

As another example, consider two friends standing at Flinders Street Station in Melbourne at rush hour. One of the friends lives close to the city and regularly uses the train station. The other friend grew up in a small town, far from the city, and this is their first time using Flinders Street Station. How might the two friends perceive their environment differently based on their past experiences of train stations generally, this station specifically, crowds and rush hour? It is likely that the friend who is familiar with the city will perceive the crowds as expected, the location as familiar and will be able to focus easily on salient stimuli (e.g. where to stand, the train's arrival time and moving people to avoid). In contrast, the friend from the small town will likely be overwhelmed by the amount of unexpected and unfamiliar stimuli and find it far more difficult to focus. Neither interpretation of the situation is incorrect. The friends are just bringing different past experiences to their perceptions.

ACTIVITY 9C–3 WHAT DO YOU SEE?

In your notebook or on some paper, spend a few minutes making notes about what you see in the image on the right. What do you notice? How does it make you feel? What does it remind you of?

Next, find a partner and compare your notes.

Discuss:

- Did you notice the same things?
- Did you notice things in a different order?
- Why do you think that is?
- How might your past experience have informed your perceptions?

ISBN 978-1-009-25401-4 Gallagher et al

Memory

Memory an information processing system that actively receives, organises, stores and recovers information

Another component of our perceptual set is our **memory**, the system that actively receives, organises, stores and recovers information. Our memory is shaped by our experiences of the world, and it helps us understand how our world works. It plays an important role in our expectations of how the world should operate. Imagine, for example, that you are watching a plane fly across the sky. In the middle of the sky, there is a fluffy cloud. The plane flies into the cloud and is obscured from your vision. Your memory helps you track where the plane should be in the sky, even though you can't see it. Your expectation is that the plane will become visible to you again once it emerges from behind the cloud. This expectation is based on your knowledge of planes and their movement through the sky and your memory of where the plane was when you last saw it. If the plane does not appear, you may feel surprise or even concern.

Motivation

Motivation our desires, which cause us to perceive stimuli that align with our goals as more salient

Visual perception is also influenced by our individual desires, otherwise known as our motivation. Depending on our **motivation**, we will perceive certain stimuli that align with our goals as more salient than others. More specifically, the stimuli that become salient will be directed by our past experiences and expectations through top-down processing.

For example, if you are shopping in a large department store with the aim of finding a present for someone important in your life, your perceptions of the items in the store will be different from if you entered the store with no clear motivation other than to browse. You will have past experiences of what the person likes and doesn't like. You will also have your own ideas about what makes a good gift. You will likely find that certain items emerge as salient, drawing your attention. Meanwhile, your eyes pass over other items that do not fit your motivation for shopping.

Now, consider how your perception of the items in the store might be different if you enter the store knowing exactly what you want to buy. You will pass by the majority of items in the store without seeing them. You would then scan the shelf with the product type you want, looking for a specific stimulus – the gift you wish to buy.

Figure 9C–7 If your motivation for shopping is to buy your mum a new wok, you will pay more attention to the woks than the other items in the store.

ISBN 978-1-009-25401-4 Gallagher et al

Context

Finally, **context** informs our perceptual set, affecting how stimuli are perceived, including visual stimuli. Context is the situation or conditions in which something occurs. For our purposes, it is the location and circumstances in which the visual stimuli are being processed. Consider the visual stimulus of a bright light in the sky, with a tail streaking behind it. How might this stimulus be perceived in the context of New Year's Eve? Perhaps it is a firework. What about in the context of a war zone? Perhaps it is a missile. What about in the context of a clear night sky away from the lights of the city? A meteor!

Figure 9C–8 The context of this image will affect how you perceive it.

From this, you can see that our past experiences shape our expectations of what we will perceive in a given context. In turn, the context will determine which experiences and expectations we bring to mind when presented with a stimulus. This often improves the accuracy and speed of our interpretation of visual information.

Context
the situation or conditions in which something occurs

An interesting effect occurs when a familiar stimulus is encountered outside of its usual context. Have you ever had the experience of seeing a teacher, whom you would immediately recognise at school, in a different context? Perhaps you had trouble 'placing' them: you recognised their face, but you couldn't immediately identify who they were.

In 1955, Bruner and Minturn conducted a study to investigate the effect of context on people's perceptions of a visual stimulus. Participants were shown either a series of letters or a series of numbers, with both series types including an ambiguous B/13 figure (similar to the one shown in Figure 9C–9). The ambiguous figure could be perceived as either a B or a 13. Bruner and Minturn found that, when their study participants saw this figure within a series of letters, 92% identified the B/13 figure as a B. However, when the figure was seen within a series of numbers, 83% of the participants interpreted it as 13. This study showed how the context sets us up to expect certain stimuli. For example, in the context of a series of numbers, the viewer expects to see another number, so sees a 13.

Figure 9C–9 The ambiguous figure in the centre of this image can be interpreted as either a B or a 13. How you perceive it will depend on the context in which it is seen. Try reading the image from left to right. You will likely perceive this stimulus as a B. Now try reading from top to bottom. Did you perceive the stimulus as a 13?

Indeed, our perception can be directly shaped in this way by various other psychological factors. In the remainder of this section, we consider two of these: the principle of perceptual constancy, and the Gestalt visual perceptual principles.

ISBN 978-1-009-25401-4 Gallagher et al

Perceptual constancy

In a dynamic and ever-moving world, the visual information sent to our brains is also ever-changing. However, to function effectively, our brains need to perceive our visual world with consistency and without distortion. Imagine, for example, that you are playing frisbee with your friend. The frisbee is moving towards you, and you are tracking it with your eyes. The visual information that is sent to the brain about the frisbee is constantly changing in shape, size, brightness and orientation; however, you perceive the actual object as remaining constant rather than as distorted.

We rely heavily on our perceptual set to keep our perception of the world constant as we interact with it. This ability to process shifting information sent to the brain about an object and know that the object hasn't actually changed in size, shape or orientation is known as perceptual constancy. **Perceptual constancy** is used to perceive a visual stimulus as remaining constant. There are four types of perceptual constancy: size constancy, shape constancy, orientation constancy and brightness constancy.

Perceptual constancy the mind's ability to perceive a visual stimulus as remaining constant even though the visual information sent to the brain about the object shows changes in shape, size, brightness and orientation

Size constancy the ability to perceive an object's actual size, despite changes in our retinal images of the object

Retinal image the image of an object formed on the retina of the eye

Shape constancy the ability to perceive an object's actual shape, despite changes in the retinal image of the object

Size constancy

Size constancy occurs when an individual recognises that a stimulus's actual size remains the same despite changes in the information sent to the brain about the size of the stimulus. When we observe moving objects in the environment, the image cast onto the retina is likely to change in size. For example, when we look at a car driving down a street, our **retinal image** of the car becomes progressively smaller the further away the car gets. However, we do not perceive the car to be shrinking in size – we perceive the car's size as remaining stable and unchanging.

Figure 9C–10 In this image, some of the balls are close and some are far. The retinal images of the balls sent to the brain are of different sizes, depending on their distance from us. However, rather than perceiving the balls as all different sizes, we perceive them as all the same size in reality.

Shape constancy

Shape constancy occurs when an individual recognises that a stimulus's actual shape remains the same despite changes in the shape of the retinal images sent to the brain. When you view a book from different angles, you will notice that the shape of the book changes – from a large rectangle when viewed from the front to a narrow rectangle if viewed from the spine, or as the shape of a 'V' if the book is open. However, we do not perceive the book to be changing shape. In all cases, the book's actual shape is perceived as remaining constant and unvarying.

Figure 9C–11 In this image, the shapes of the open doorways are slightly different, as some are open wider than others. The retinal images sent to the brain are different shapes. However, rather than perceiving the doors as all different shapes, we tend to perceive them as the same shape in reality.

ISBN 978-1-009-25401-4 Gallagher et al

Orientation constancy

Orientation constancy occurs when an individual recognises that a stimulus's actual orientation remains the same despite changes in the orientation of the retinal images sent to the brain. For example, think about the last time you lay down to watch television. When you viewed the screen at a 90° angle compared to your normal upright position, did you think that the whole world had tilted? Probably not. While the orientation of the retinal images sent to your brain changed, you would have continued to perceive the world as constant in its orientation.

Figure 9C–12 In this image, the boy is hanging upside down on some monkey bars. His view of the world is therefore inverted, as are the retinal images being sent to the brain. However, he doesn't perceive the world as inverted – he continues to perceive it as he would if he were standing upright.

Orientation constancy the ability to perceive an object's actual orientation, despite changes in our retinal image of the object

Visual perceptual principles a set of consistent instructions that enable us to organise and interpret visual information in a reliable and meaningful way

Gestalt principles a set of principles that explain how we interpret visual information most efficiently by grouping individual elements together to perceive a whole object

Figure–ground the tendency to perceive part of a visual stimulus as more relevant (the figure) and standing out against its less relevant surroundings (the ground)

Gestalt principles

The way in which visual information is organised, grouped together and given meaning partly relies on our application of visual perceptual principles. **Visual perceptual principles** are a set of consistent instructions that enable us to organise and interpret visual information in a reliable and meaningful way. Visual perceptual principles enable the brain to group together information into a recognisable whole, to identify an object's actual size, shape and orientation and to determine the depth and distance of an object in our environment. Visual perceptual principles are a set of mental rules applied in the same way by all people, providing the eye, brain and associated pathways are intact and healthy. We use visual perceptual principles automatically and unconsciously, and they help improve the efficiency with which we perceive our visual world. In VCE Psychology, a particular set of visual perceptual principles is called the Gestalt principles.

'Gestalt' is the German word for form, shape, organisation or configuration. The **Gestalt principles** hold that we interpret visual information most efficiently by grouping individual elements together to perceive a whole object. Moreover, Gestalt theory states that the whole is greater than the sum of its parts. Here, we consider four of the Gestalt principles: figure–ground, closure, proximity and similarity.

Figure–ground

The Gestalt principle of **figure–ground** describes the tendency to perceive part of a visual stimulus as more relevant (the figure) and standing out against its less relevant surroundings (the ground). The line of separation between the figure and the ground is termed the contour, and it helps to differentiate the figure from the ground. In general, the figure has more relevance and meaning for the individual and is perceived as closer and brighter than the ground.

Traffic signs and photographs apply the figure–ground principle. The viewer's attention is drawn to the prominent figure in the image, allowing for an efficient interpretation of the image. The following figures show this principle in action. In the first (Figure 9C–13), the black elements of the image are the more salient, so they emerge as the figure, standing out against the white ground.

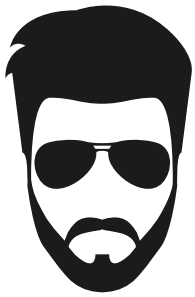


Figure 9C–13 Hair, sunnies and beard are the relevant features that enable us to perceive this image as a person's head.

ISBN 978-1-009-25401-4 Gallagher et al

Figure 9C–14 The white space is the figure, and the black shape is the ground. In this way, viewers perceive a heart.

In contrast, in Figure 9C–14, the heart may be the most salient aspect of this image. Therefore, it comes to the front as the figure, standing out against the black ground of the hand shape.

Just as the principle of figure–ground can be used to help features stand out, it can be used to hide features as well. **Camouflage** is a famous example of this. When an otherwise prominent object is similar in colour to its surroundings, the contour vanishes, confusing our interpretation of figure compared to ground. Camouflage is used throughout the animal kingdom, by backstage crew wanting to blend into the background at a stage performance, and by military personnel attempting to avoid detection.

Figure 9C–15 This owl is well camouflaged against the tree bark.

Camouflage when a figure appears to mix with the background

Closure our ability to fill in or ignore gaps in visual stimuli and perceive objects as a meaningful whole

Closure

The Gestalt principle of **closure** refers to our ability to close up, fill in or ignore gaps in visual stimuli and perceive objects as a meaningful whole. It helps us to perceive incomplete stimuli, potentially reducing the mental effort required. You saw this in Section 9B when we discussed top-down processing. There, you learned that our brain uses our perceptual set (our experiences and expectations) to fill in stimuli. Remember the image of the dalmatian? Another example of this principle can be seen in Figure 9C–16. We mentally join the parts of the visual stimulus to perceive it as a complete image – probably a soccer ball. Likewise, when we see a cat standing behind a paling fence, we do not perceive the cat as a series of separate sections (the ones that we can see through the fence). Rather, we perceive it as a whole cat.

9B PROCESSING OF VISUAL AND GUSTATORY INFORMATION LINK

Figure 9C–16 We apply the Gestalt principle of closure to this image when we perceive it as a soccer ball.

Similarity

The Gestalt principle of **similarity** holds that we tend to group together as a whole any stimuli that are alike in size, shape or colour. Consider the shapes shown in Figure 9C–17. Do you perceive them as a series of rows or columns? Applying similarity, you will likely perceive these as a series of columns based on the shapes they contain. The principle of similarity is also useful for teachers supervising students on excursions. Using this principle, teachers can quickly distinguish and group their students together based on their uniforms.

Similarity the tendency to group together as a whole any stimuli that are alike in size, shape or colour

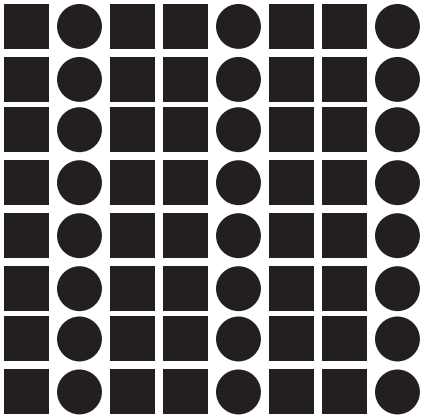


Figure 9C–17 Do you perceive this image as a series of rows or columns?

ISBN 978-1-009-25401-4 Gallagher et al

The principle of similarity also plays an important role in the famous test for colour blindness (also known as colour vision deficiency) – the Ishihara test (Figure 9C–18). This test comprises a series of images made up of coloured dots. To read the numbers, the viewer needs to be able to group similar colours together. If the person is not colour blind, they will be able to perceive one colour group as the figure (a number) and the other colour group as the background. If they are colour blind, they will not be able to group the coloured dots in this way.

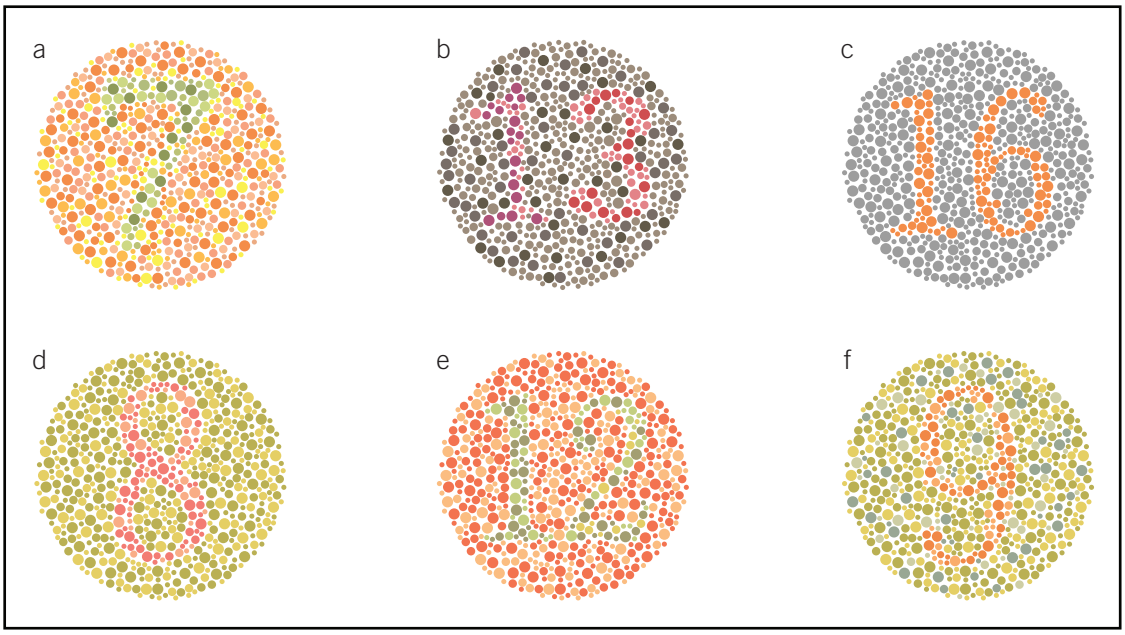


Figure 9C–18 The Ishihara test for colour blindness. Can you read the numbers?

Proximity

The Gestalt principle of **proximity** is the tendency to perceive the parts of a visual stimulus that are close together, rather than spaced far apart, as belonging to a group. In Figure 9C–19, how many groups do you see? By applying the principle of proximity, you should see three groups. This is useful when you need to make sense of many stimuli at once. For example, imagine that you are at a music festival, and you are trying to find your friends. You know they are sitting in a group somewhere near the main stage. Thanks to the principle of proximity, you can perceive groups of people (rather than a sea of individuals) based on how close they are to one another. Now, rather than having to look at each person, you can look at one person in each group until you find your friends.

Proximity the tendency to perceive the parts of a visual stimulus that are close together as belonging to a group

If you have ever worked in retail or food service, this principle has also helped you deliver good-quality customer service. Using the principle of proximity, you can see which people entering a store are together; you can look at any items they bring to the register as a set, rather than as individual items; and you can see when their whole order is ready, rather than looking confusedly at a bunch of individual items on a counter.

Figure 9C–19 The differences in proximity of the people in this image suggest that they are three separate groups.

ISBN 978-1-009-25401-4 Gallagher et al

WORKSHEET 9C–1 APPLYING BIOPSYCHO-SOCIAL FACTORS TO VISUAL PERCEPTION

ACTIVITY 9C–4 GESTALT PRINCIPLES IN DESIGN

Use the internet to find at least five company logos that use the Gestalt principles in their design. Analyse the logos for their use of figure–ground, closure, similarity and/or proximity and then present your findings to the class.

Check-in questions – Set 2

1 Copy and complete this table by matching each term to its definition.

Past experience	Our desires, which cause us to perceive stimuli that align with our goals as more salient
Motivation	Our mind's storage and retrieval of information
Context	The situations and events we have encountered throughout our life prior to the present
Memory	The situation or conditions in which something occurs

2 Explain how our past experiences influence our visual perceptions. Give an example.

3 Using an example not found in the text, describe how context influences our visual perceptions.

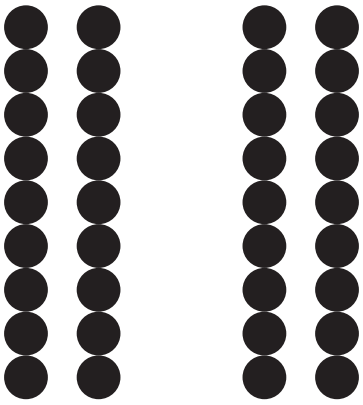
4 How does the principle of figure–ground aid in perception? Illustrate your explanation with an example.

5 Explain how the principle of closure aids in perception, using an example.

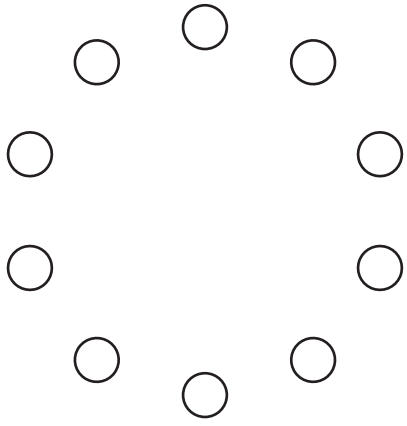
6 What is the difference between similarity and proximity? Provide supporting examples.

7 For each of the images below, name the Gestalt principle illustrated and how this principle determines our perception of the image. The images may demonstrate more than one principle.

a



b



8 What is perceptual constancy and how does it assist with accurate visual perception?

9 Define size constancy, shape constancy and orientation constancy. Provide a real-life example for each.

ISBN 978-1-009-25401-4 Gallagher et al

Social factors

Culture

How we perceive visual sensations is shaped by a range of social factors, including the effects of **culture**. Unlike biological factors, which are associated with physiological function, and psychological factors, which are learned mental processes, social factors are unique to our culture/s and the norms of that society.

Culture the many characteristics of a group of people, including their attitudes, behaviours, customs and values that are transmitted from one generation to the next

The community in which we live, including the people we are surrounded by and associate with, helps to shape how we see the world. This influence can take the form of traditions, value systems, attitudes and beliefs, and can be traditional (passed down through generations) or modern (e.g. popular culture). Our perceptual set is shaped by our culture, which causes us to see the world in a particular way.

LINK **8A** THE INFLUENCE OF SOCIAL GROUPS AND CULTURE ON INDIVIDUAL BEHAVIOUR

Each culture has a unique way of perceiving visual stimuli. Consider an image of a cow. Someone from a culture in which cows are sacred (e.g. India and Bali) would perceive the image as showing an object of veneration. However, someone from a culture in which beef features prominently in the diet (e.g. Australia) might perceive the image as showing a source of food.

In addition, our culture can affect how we attend to and perceive images. Let's look closely at two examples of this: the effect on visual perception of the direction in which we read (i.e. left to right or right to left) and our ability to perceive depth in an image. The effect of both these factors has been shown to result in distinct differences in visual perception between cultures.

Figure 9C–20 A person of the Hindu faith would probably perceive this cow as sacred.

ISBN 978-1-009-25401-4 Gallagher et al

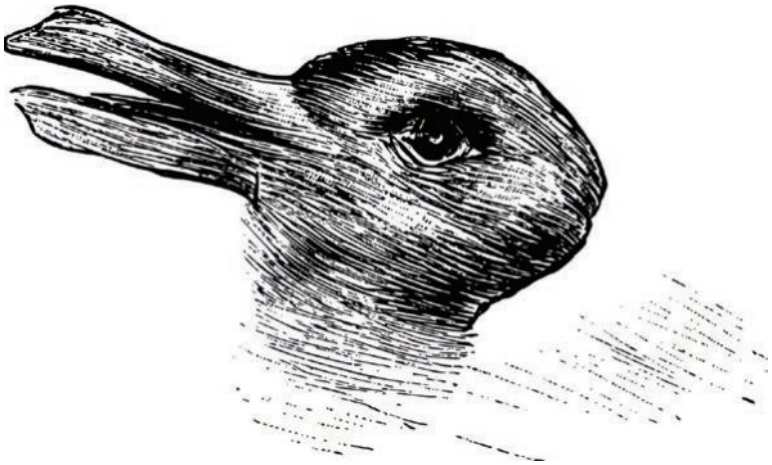


Figure 9C–21 The ambiguous rabbit-duck image

Look at Figure 9C–21. What animal do you see first? According to a famous study conducted using this image, if you grew up in an English-speaking culture, or one in which words are read from left to right, you are more likely to have seen a rabbit first. However, if you grew up in a culture that reads from right to left (as did the Hebrew-speaking participants in this study), you may be more likely to see the duck first. This is because your eyes are used to moving in that direction when you read, so you are more likely to perceive the image from one direction or the other.

In another famous experiment, William Hudson (1960) showed images like that in Figure 9C–22 to 85 Black southern African factory workers of different tribal origins, educational levels and degrees of urbanisation. A Western viewer would interpret this image as showing a man about to spear an antelope, with an elephant standing in the distance. However, the participants tended not to perceive depth in the images, instead interpreting them in two dimensions. This changes how such images are perceived. In fact, when asked 'What is the man doing?' about an image like the one below, most of the African participants replied that the man was aiming for the elephant.

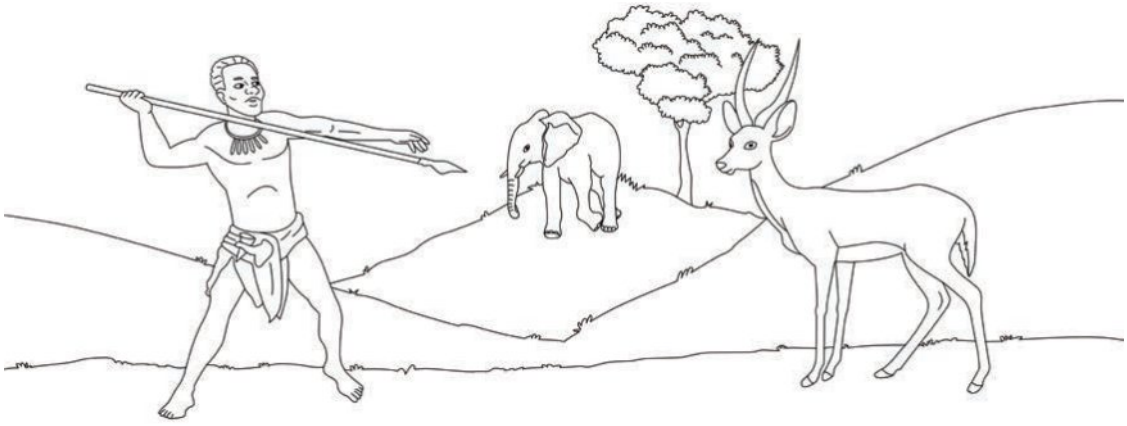


Figure 9C–22 William Hudson's perception test used simple black line drawings like this, asking participants what the man was doing.

As you know, research can have its limitations. For cross-cultural studies, a main limitation is that it is difficult to ensure that the measures by which data is collected are fair and appropriate, regardless of the participants' cultures. This can cast doubt on the findings but also represents an opportunity for future research to seek to overcome this problem.

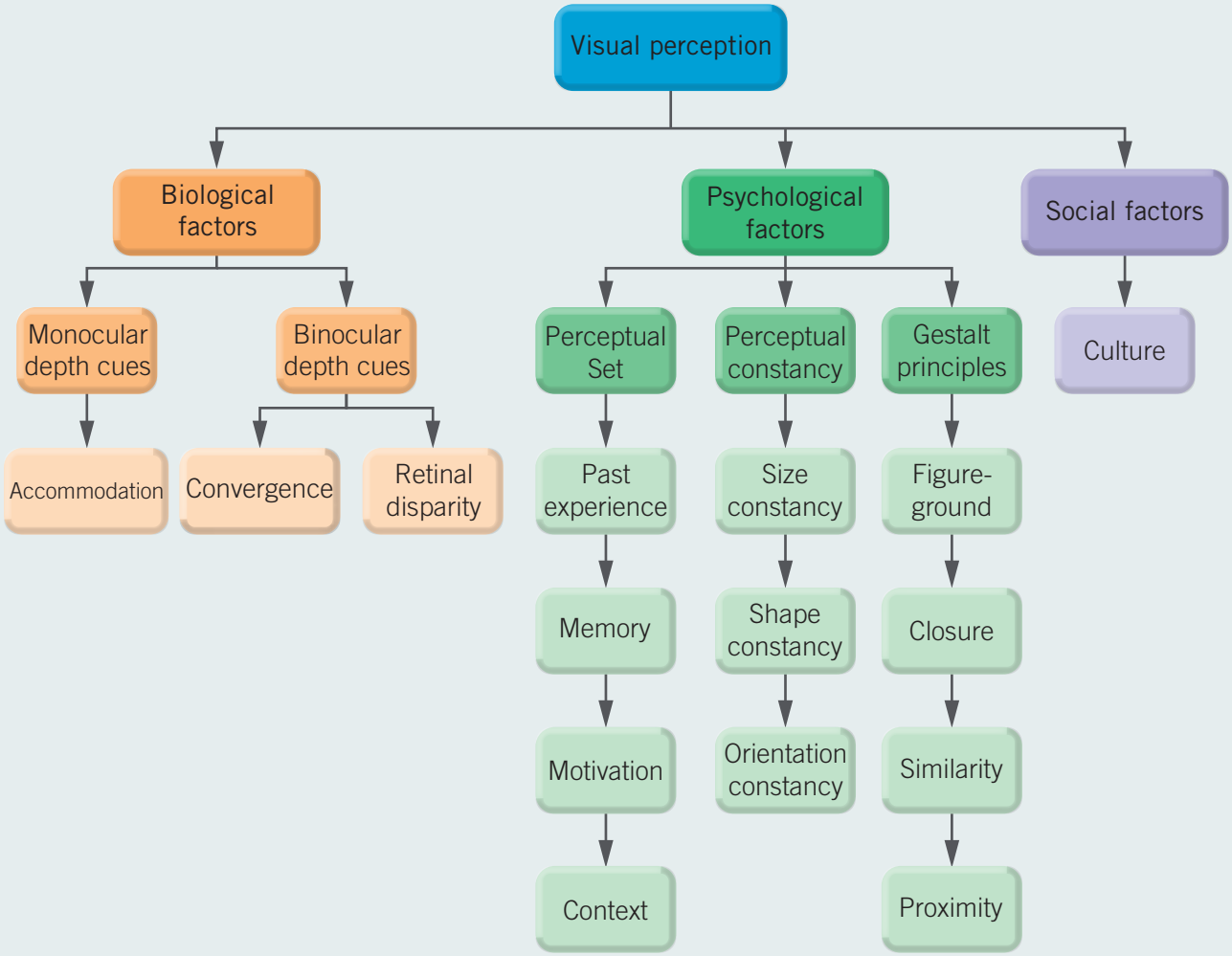
Check-in questions – Set 3

1 Identify and explain a social influence on visual perception.
2 Describe the importance of understanding the cultural differences that exist in society and their impacts on visual perception.
3 Explain the cultural difference in depth perception that was discovered in Hudson's experiment.

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 9C–5 BIOPSYCHOSOCIAL INFLUENCES ON GUSTATORY PERCEPTION

Using this graphic organiser, summarise each of the biological, psychological and social factors that influence the process of visual perception. Be sure to include an example of each.



Applying the biopsychosocial model to gustation

Biological factors

Unlike visual perception, where the biological factors influencing perception tend to be similar for most people who are not affected by some loss of vision, a person's sense of taste can vary significantly depending on a range of biological factors. For example:

- younger people tend to perceive taste differently to older people
- some people genetically inherit either more or fewer taste buds than 'normal'
- illness can affect our perception of taste (both temporarily and permanently)
- the hormones associated with pregnancy can change taste perception, often in quite strong and weird ways!

Notably, unlike vision, where perception is driven by one set of sensory organs (our eyes), gustation is a multisensorial process that relies on information from both our **taste buds** and our sense of smell. As you will see throughout this section, our sense of smell plays a role in how we perceive taste, from both a biological perspective and a psychological perspective.

Taste buds cells in the mouth and throat that send sensory information to the brain for taste perception

ISBN 978-1-009-25401-4 Gallagher et al

Figure 9C–23 Older people have fewer taste buds, so their food starts to taste bland.

Age and genetics

A taste bud only lasts approximately 10 days, but they are regenerated regularly. Early in life, this regeneration occurs quickly, with children having a larger number of functional taste buds compared to adults of any age. Over the life span, however, regeneration slows, so that by the time a person reaches old age, their taste buds do not regenerate fast enough to replace the ones they lose. You may have heard an older person commenting that their food tastes bland. It isn't the food – they just don't have enough taste buds remaining to perceive the full depth of the flavour.

As you will learn in Chapter 10, about a quarter of all people are born with more than the average number of taste buds, while a further quarter are born with fewer than the average number. The number of taste buds we have changes how bitter or sweet a food tastes, which accounts in part for the significant diversity in how we perceive taste.

From this, you can see that, depending on our genetics and our age, we are likely to have a different number of taste buds to someone else, and our number of taste buds will change as we age. Since our taste buds are vital to our ability to detect gustatory sensations, this has a significant impact on our perception of taste.

10B THE FALLIBILITY OF GUSTATORY PERCEPTION LINK

Figure 9C–24 A blocked nose restricts your sense of smell, dulling your perception of taste.

Illness

Have you noticed that when you get sick, your food tastes weird or has no taste? Loss of taste is a very common symptom of a viral infection (e.g. cold, flu or COVID-19). However, while it may seem like your taste buds are to blame, the problem is actually your sense of smell. If your sense of smell is reduced, such as from a blocked nose, your brain is not receiving the full range of sensations that combine to give food its flavour. As a result, your food might taste bland, or even totally different.

In some instances, a change in your sense of taste can actually be used to diagnose medical conditions, from gingivitis or a vitamin B_{12} nutrient deficiency, to exposure to chemicals or an autoimmune condition.

ISBN 978-1-009-25401-4 Gallagher et al

Pregnancy

Another condition that affects a person's sense of taste is pregnancy. You probably know that people who are pregnant are very sensitive to smells and tastes. You may also have heard of the tendency of pregnant people to seek out unusual flavour combinations or to be suddenly repulsed by foods they used to love.

Research has found that there can be a biological change in taste during pregnancy (i.e. an increased bitter or decreased sweet response); however, specific differences between pregnant people remain uncertain. For example, some people have reported not enjoying the taste of meat anymore, while others have reported craving the flavour of chalk!

Figure 9C–25 Pregnancy is associated with changes in taste perception, leading to some unusual cravings.

While this change in taste is generally attributed to hormones associated with pregnancy, it may not be as simple as that. A large number of biological factors are affecting a person's body during pregnancy, including changes in weight and immune system functionality. Therefore, this is an interesting area in need of further research.

Check-in questions – Set 4

1 Describe the influence of age on our taste perception.
2 Describe with an example how pregnancy can change a person's taste perception.

Psychological factors

As you saw in relation to visual perception, how we perceive gustatory sensations is significantly shaped by our perceptual set (i.e. the combined effect of our past experience, motivation, memory and the context in which we are perceiving the stimuli), which is a psychological factor. With reference to gustatory stimuli in particular, our perceptions can be affected by our experiences of a food and the emotions we associate with it, as well as by the appearance of the product packaging and the food itself. These psychological factors are learned mental processes that each individual has in a varied combination. Compounding the effect of the biological factors, these psychological factors drive the significant differences we see in gustatory perception.

LINK **9B** PROCESSING OF VISUAL AND GUSTATORY INFORMATION

Past experience

You have already read about the role of perceptual set in the top-down processing of gustatory information in Section 9B, so we will not go into this in detail here. As you saw in that section, our past experiences of a food stimulus shape how we perceive that or similar food stimuli in the future. For example, if you grew up eating a dish prepared in a certain way (let's say spaghetti bolognaise), then you will probably base your perception of other spaghetti bolognaise dishes on your experience with that dish. If your family's bolognaise recipe is very tasty to you, you may be less likely to perceive bolognaise prepared in a different way favourably, and vice versa.

Figure 9C–26 Who do you think makes the best spaghetti?

ISBN 978-1-009-25401-4 Gallagher et al

Emotion

Our emotional reaction to tastes is closely related to our past experiences with them. For example, eating a dish that was a favourite as a child may give a nostalgic feeling of happiness. Each time you eat that dish, the associated feeling of happiness can influence your taste perception, making it more positive. Likewise, strong negative emotions associated with a food (e.g. from being forced to eat it as a child, or from having had a bout of food poisoning) can make your gustatory perception of that food negative. You saw this effect in the example of Riku and Carmen's different perceptions of chocolate in the section on the top-down processing of gustatory information.

9B PROCESSING OF VISUAL AND GUSTATORY INFORMATION LINK

You may also have noticed that your emotions can make you crave certain tastes. Imagine you are standing in front of your refrigerator at home. You are feeling energised and strong after doing some exercise, and you are very hungry. What kind of taste might you desire at that moment? You would probably reach for something fresh and crunchy, like a carrot or some salad. Now, imagine that it is raining outside and you are tired. It might be time for some leftover spaghetti!

In this latter example, a tired or dreary mood can make us crave 'comfort food'. In the presence of this emotion, no other type of food is perceived as satisfying. Comfort foods are typically high in fat or sugar, and eating them causes a release of dopamine – commonly known as the pleasure hormone. Another factor at play in our choice of comfort foods is the emotions we attach to them. Think about your favourite comfort food for when you are feeling down – you will likely associate the taste of that food with something comforting, like a night in with your family, a grandmother's hugs or feeling otherwise safe and loved.

Figure 9C–27 The positive memory of this meal may mean a lifelong association of happiness with this particular food.

Product packaging

Our perceptual response to the taste of food stimuli is also influenced by their packaging. This is an area of intense research, as there is a lot of money at stake for food and beverage manufacturers. It has been extensively proved that branding and packaging can trigger our perceptual sets and emotions, thereby influencing how we perceive a product's taste. Let's look at some examples from research on how product packaging can influence our gustatory perception.

ISBN 978-1-009-25401-4 Gallagher et al

In one study, it was found that when yoghurt containers were heavier, people perceived the yoghurt to be more filling. While the researchers did not explain their findings in terms of the psychological factors involved, perceptual set may play a role. Our memories tell us that the heavier something is, the more it should contain. This may lead to an expectation of fullness, influencing perception.

As another example, many companies have taken advantage of research findings that show that children have a more positive experience with foods that have cartoons on the packaging. You will likely have seen the various cartoon characters that adorn products marketed to children. In this case, the strong positive emotions and experiences that children associate with these characters influence them towards a favourable gustatory perception of the product.

Figure 9C–28 The heavier the yoghurt container, the more filling you might perceive the yoghurt to be.

Check-in questions – Set 5

1 Describe how psychological factors influence taste perception.
2 Explain how our emotions influence taste perception.
3 You have developed a new type of healthy yoghurt for children. Now it is time to market it. With reference to the psychological factors affecting gustatory perception, how could you help ensure that children enjoy your product?

Social factors

Research suggests that taste preferences develop early in life, and that they are influenced by learned experiences and cultural factors at both the family and societal levels. In particular, we tend to prefer flavours and tastes that we have grown up eating, and our perceptual set for any given food will be influenced by how that food is regarded in our culture. Therefore, culture is a key social factor affecting our perception of taste.

Food culture

Have you grown up in a particular food culture? Even if you answer 'no', as many European Australians who have been here for many generations may, the answer is actually 'yes'. Recall that culture is the many characteristics of a group of people, including their attitudes, behaviours, customs and values that are transmitted from one generation to the next. **Food culture** is therefore the attitudes, behaviours, customs and values around food with which we were raised. Consider the humble meat pie – often ranked as one of Australia's national foods. Do you like meat pies? What does the flavour of a meat pie remind you of?

Figure 9C–29 The classic Australian meat pie

Food culture the attitudes, behaviours, customs and values around food with which we were raised

ISBN 978-1-009-25401-4 Gallagher et al

Now, think about the following scenario: Arun and his friends are walking down a busy street in their city. They have spent the morning playing soccer and are now looking to buy something for lunch. Most of them are in a hurry to get home, so they decide to grab something quick and easy. They make their purchase of a familiar favourite snack and happily munch away – a delicious bowl of giant honey crickets.

The meat pie and the honey cricket are not that dissimilar. They are both a great source of protein and quick to grab and go. But would you eat a cricket? If you didn't grow up in a country where this food is normal to eat, such as Cambodia where Arun is from, you would probably feel disgusted by the idea of eating a cricket. Your schema for 'crickets' does not include that they are a delicious snack, and they may conjure an expectation of a dirt taste or similar. This demonstrates the powerful effect of culture on our gustatory perceptions.

Historical experiences

A country's food culture is largely shaped by its history. In Cambodia, crickets have been consumed for over a thousand years and have historically been an important source of protein for poor, rural communities. This practice does not exist in the European countries that initially shaped Australian culture after colonisation, so insect consumption is not part of the mainstream food culture in this country.

Another country with a strong food culture is Thailand. The distinct flavours that comprise Thai cuisine are based in the historical experiences of the country. Before refrigeration, foods would often spoil quickly. This was a particular problem in tropical climates like Thailand. Chilis grow readily in Thailand, and they can be used to preserve unstable ingredients and kill bacteria in foods that have started to go bad. This is why Thai food is so spicy!

From this, we can see that the food culture of Thailand, as in other countries around the world, developed as a practical solution to everyday problems, using the ingredients that were available. Now, even though refrigeration is available and spoilage is no longer the problem it once was, people growing up in Thailand are regularly exposed to high levels of chili and other spices. What would a person growing up with these kinds of flavours think of a meat pie? They would probably find it quite bland!

Figure 9C–30 Your cultural upbringing affects your perception of flavours.

ISBN 978-1-009-25401-4 Gallagher et al

Songlines

The interweaving of food and culture is also apparent in the cultures of Aboriginal and Torres Strait Islander peoples. Songlines are a powerful example of this. Songlines contain the memories and knowledge of Aboriginal peoples. Some songlines mark walking routes connecting important sites and locations, sometimes over distances of thousands of kilometres. While many of these songlines are no longer used (having been superseded by signposted roads), their purpose, among other things, was to help the traveller find their way safely, including by knowing where to find food and which foods to eat.

Figure 9C–31 Ginger root (left) and native ginger (right).The taste of ginger may be perceived differently by people from different cultures.

Aboriginal and Torres Strait Islander peoples' connection with Country means their perceptual sets, including their schemas for foods, and thus perception of flavours, may differ markedly from a non-Indigenous person without the same knowledge. For example, consider two people tasting a piece of native ginger. Assume that the non-Indigenous person has no experience of eating native ginger (blue 'berries' that grow wild in Australia, with a taste similar to ginger root). They may bring a perceptual set that includes knowledge of ginger root, but much of their perception will be based on the bottom-up processing of gustatory sensations. They may perceive the native ginger as only mildly spicy and as blander than ginger root.

On the other hand, an Aboriginal person from that Country who has access to relevant cultural knowledge may perceive the bitterness of the ginger that marks it as useful for fighting off infection. They may remember a time when they ate some native ginger to help with an infection and feel an emotion of thankfulness for the relief that the plant offers. This may be only a small part of their perception of the taste, which could be associated with a range of memories, emotions and past experiences tied to culture, spirituality and Country.

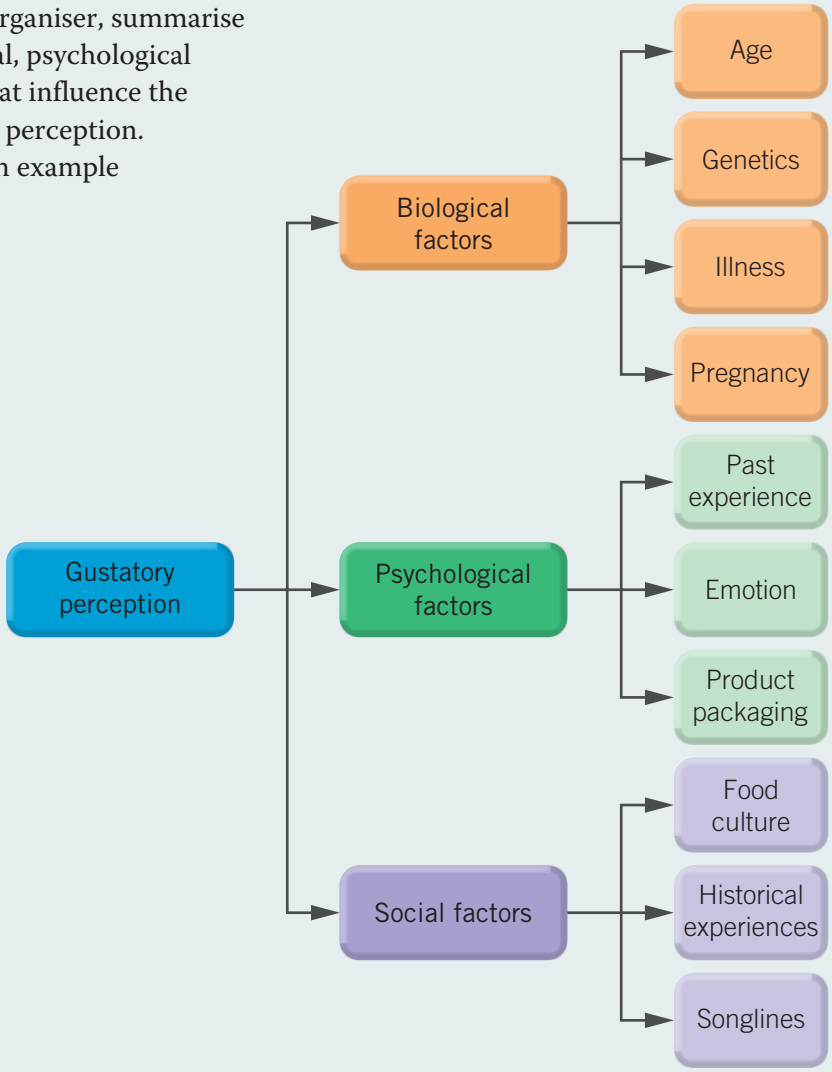
Check-in questions – Set 6

1 Using an example, explain a social influence on gustatory perception.
2 Describe how different historical experiences can influence the gustatory perceptions of people from different cultures.

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 9C–6 BIOPSYCHOSOCIAL INFLUENCES ON GUSTATORY PERCEPTION

Using this graphic organiser, summarise each of the biological, psychological and social factors that influence the process of gustatory perception. Be sure to include an example of each.



Section 9C questions

1 Identify what a songline is, and how these relate to the gustatory experience of an Aboriginal or Torres Strait Islander traveller.
2 How might an Aboriginal or Torres Strait Islander person's cultural knowledge affect their gustatory experience?
3 Identify and describe a biological factor that could impact an individual's visual perception.
4 Describe, with an example, how past experiences can influence one's taste perception.
5 With reference to an example, explain a social influence that affects both gustatory and visual perception.
6 For each of the following illustrations, identity a Gestalt principle that may have been used when designing the image, and explain how it was used.

a 

b 

c 

7 Describe retinal disparity and explain why it only works for objects within 10 metres.

ISBN 978-1-009-25401-4 Gallagher et al

Chapter 9 review

Summary

Create your own set of summary notes for this chapter on paper or in a digital document. A model summary is provided in the Teacher Resources which can be used to compare with yours.

Checklist

In the Interactive Textbook, the success criteria are linked from the review questions and will be automatically ticked when answers are correct. Alternatively, print or photocopy this page and tick the boxes when you have answered the corresponding questions correctly.

Success criteria – I am now able to:		Linked questions
9A.1	Explain the importance of attention in making sense of the world around us	21☐
9A.2	Describe the key features of sustained attention, divided attention and selective attention	12☐
9A.3	Explain how sustained attention allows us to make sense of the world around us	10☐
9A.4	Explain how divided attention allows us to make sense of the world around us	18☐
9A.5	Explain how selective attention allows us to make sense of the world around us	1☐, 14☐
9A.6	Apply my understanding of sustained, divided and selective attention to real-world examples	2☐, 3☐, 4☐, 14☐
9A.7	Compare and contrast sustained, divided and selective attention	4☐, 12☐
9B.1	Explain the role of perception in the processing and interpretation of sensory information including vision and taste	22☐
9B.2	Explain the role of top-down and bottom-up processing in both visual and gustatory perception	19a☐, b☐
9B.3	Compare and contrast the roles of top-down and bottom-up processing	17☐
9B.4	Apply my understanding of top-down and bottom-up processing to examples of visual and taste perception	19a☐, b☐
9C.1	Understand that there are different biological, psychological and social factors that influence visual and gustatory perception	13☐
9C.2	Identify and describe biological, psychological and social factors that can influence both visual and gustatory perception	5☐, 8☐, 9☐
9C.3	Explain how these biological, psychological and social factors influence both visual and gustatory perception	11☐, 16☐
9C.4	Apply my understanding of biological, psychological and social factors to examples of visual and gustatory perception	6☐, 7☐, 15☐

ISBN 978-1-009-25401-4 Gallagher et al

Key Science Skills

Skills	Questions and Skills boxes
Evaluate data to determine the degree to which the evidence supports the aim of the investigation, and make recommendations, as appropriate, for modifying or extending the investigation	9B Key Science Skills Chapter review – 20a, c
Evaluate data to determine the degree to which the evidence supports or refutes the initial prediction or hypothesis	9B Key Science Skills Chapter review – 20a
Use reasoning to construct scientific arguments, and to draw and justify conclusions consistent with the evidence and relevant to the question under investigation	9B Key Science Skills
Identify, describe and explain the limitations of conclusions, including identification of further evidence required	9B Key Science Skills Chapter review – 20b, c
Discuss the implications of research findings and proposals, including appropriateness and application of data to different cultural groups and cultural biases in data and conclusions	Chapter review – 20a

Multiple-choice questions

1 Angela has been learning to play the guitar for four years. At first, she had to concentrate very hard and could not sing at the same time. In the last year, she has been able to focus on her singing while she plays, but it still takes a lot of effort. When Angela sings while playing the guitar, she is likely using

A divided attention, as the skills required to sing and play guitar require little mental effort.
B sustained attention, as the task of playing the guitar requires her to catch new information.
C selective attention, as the skills required to sing and play guitar require focused mental effort.
D an automatic process in which high levels of awareness and mental effort are necessary.

2 Roy was in a room, learning the lyrics of a song that he was to perform at a school concert. While he was learning the lyrics, a clock was ticking noisily in the room. However, Roy was able to focus and concentrate on learning the lyrics without being distracted by the sound of the clock. What type of attention is Roy applying?

A selective attention
B divided attention
C sustained attention
D focused attention

3 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 execute complex sequences of steps on stage. To do this, he is using

A divided attention.
B sustained attention.
C selective attention.
D controlled attention.

ISBN 978-1-009-25401-4 Gallagher et al

4 Victor has been driving a manual car for 5 years, while Hugo has just got his licence. When Miranda is a passenger in their cars, she finds that she can have a sensible conversation with Victor, but Hugo does not seem to pay any attention to her. Which is the most likely explanation for this?

A For Victor, driving requires his sustained attention.
B For Victor, driving requires his selective attention.
C For Hugo, driving requires his divided attention.
D For Hugo, driving requires his selective attention.

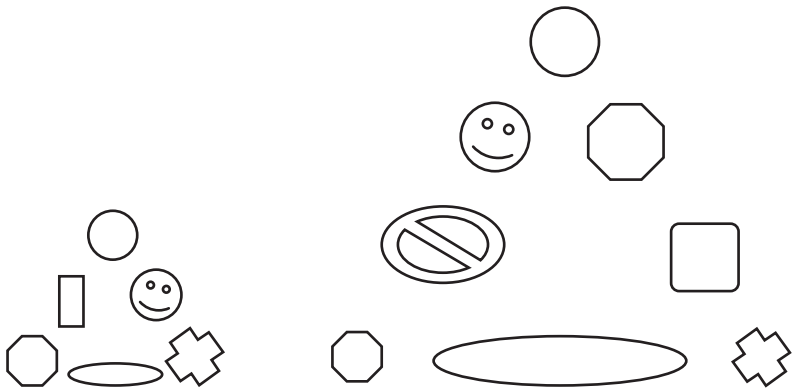
5 The pattern on soldiers' uniforms is designed to assist with camouflage. Which Gestalt principle is used to confuse our perception and produce camouflage?

A figure–ground
B proximity
C closure
D similarity

6 Jemima has had an operation on one eye and has to wear a protective eye patch. She will probably have some difficulty perceiving depth because she cannot use

A retinal disparity.
B accommodation.
C Gestalt principles.
D size constancy.

7 When Ricky views this diagram, he perceives two triangles.



On closer inspection, he notices that one triangle is made up of six parts and the other triangle is made up of eight parts. When Ricky perceived the diagram as two triangles, he applied the Gestalt principle(s) of

A closure and proximity.
B closure and similarity.
C figure–ground only.
D closure only.

8 Which of the following principles is not a Gestalt principle?

A proximity
B closure
C linear perspective
D figure–ground

ISBN 978-1-009-25401-4

9 The shape of the _____ changes to focus on an object. This is called _____.

A face; accommodation
B lens; accommodation
C two eyes; retinal disparity
D pupil; retinal disparity

10 Another term for sustained attention is

A multiple stimuli.
B vigilance.
C salience.
D perceptual set.

11 You are standing at the airport, waving off a friend's plane. As the plane flies away, the retinal image sent to your brain for processing gets smaller and smaller. Despite this, you know that the plane's size remains stable and unchanging. You are applying

A closure.
B relative size.
C size constancy.
D shape constancy.

Short-answer questions

12 Copy and complete the following table with the key features of sustained, selective and divided attention. (6 marks)

	Sustained attention	Selective attention	Divided attention
Type of cognitive processing required			
Mental effort required			
Focus of attention			
Best suited for			
Type of task focused on			
Potential for misperceptions			

13 Gianna and Akila are preparing to go on a school camping trip. Gianna regularly goes camping with her parents and has slept in a tent on many occasions. Akila has never been camping for fun before, but she spent some time at a refugee camp before living in Australia. The girls see a photo of the camp site they will be staying at. The site is in a remote area of the bush, with only one building: a drop toilet. Gianna is excited by the photo and is looking forward to the trip; however, the photo makes Akila feel anxious about attending the camp. For both Gianna and Akila, identify a psychological factor for each girl that might have influenced her visual perceptions of the campsite photo and describe how this factor has shaped her perceptions. (4 marks)

ISBN 978-1-009-25401-4 Gallagher et al

14 Ingrid has taken ninja warrior classes for the last six months, where participants have to negotiate an obstacle course that involves climbing and jumping. She had never attempted ninja obstacles before the classes started and found it quite difficult, even though she already had a high level of physical fitness. Now, she is quite good and can easily carry on a conversation while completing the obstacles. She often demonstrates for groups of beginners.
Do you think Ingrid would have been capable of carrying out a conversation during her first attempts at negotiating the course?
How might this have changed over time? Explain your answer with reference to the types of attention she would have been using and their features. (3 marks)

15 Lois and Kirk view an ambiguous image. Lois perceives the image as showing a tree. Kirk perceives it as showing two faces in profile. Identify one psychological factor that may account for this difference in perception. Describe for both Lois and Kirk how this factor may have influenced their perception. (3 marks)

16 Define the biopsychosocial model and explain how we can use it to understand gustatory perception. Give one example of a factor affecting a person's perception of taste. (3 marks)

17 Write three sentences comparing top-down and bottom-up processing styles. Make sure you are comparing *congruent* aspects of these concepts. (3 marks)

18 Define divided attention and give an example of how this would be helpful in a school setting. (2 marks)

19 Explain, with an example, how a child may use:
- **a** bottom-up processing in either visual perception or gustation. (2 marks)
- **b** top-down processing in either visual perception or gustation. (2 marks)

20 A researcher is investigating how people perceive the freshness of green salad leaves. They think that people will be more likely to perceive the taste as fresh when the salad leaves are cold compared to room temperature. The researcher asks a selection of their friends and family to taste cold and room-temperature salad leaves and to rate their perception of freshness out of five (five being the freshest). The researcher collated the data and determined that cold green salad leaves are perceived as fresher compared to room-temperature salad leaves.
- **a** Determine whether the researcher's hypothesis was supported by their findings. (1 mark)
- **b** With reference to sampling, explain one limitation of the investigation's conclusion. (1 mark)
- **c** Suggest one example of further evidence that would be useful to improve the identified limitation. (1 mark)

21 Explain the importance of attention in making sense of the world around us. (1 mark)

22 Explain the role of perception in the processing and interpretation of sensory information. (2 marks)

ISBN 978-1-009-25401-4 Gallagher et al

UNIT 2

HOW DO INTERNAL AND EXTERNAL FACTORS INFLUENCE BEHAVIOUR AND MENTAL PROCESSES?

CHAPTER 10

DISTORTIONS OF PERCEPTION

Introduction

In Chapter 9, you learned that perceptions are formed from sensory information received by the sensory organs and processed in the brain. However, as you know from that chapter, various factors affect what information is attended to, how it is processed and how you come to perceive it. It should therefore come as no surprise that perceptual systems are fallible: they can make mistakes, be tricked or be affected by disorders.

This chapter expands on what you learned in Chapter 9 to explore the fallibility of visual and gustatory perceptual systems, and the vision and taste distortions that can result from this. The distortions covered in this chapter arise from the processing of sensory information in the brain. While some distortions are associated with genetic variation or mental disorders, many others are normal and simply reflect the limits of human perception or adaptations in functioning – you may even have experienced some of them yourself.

Curriculum

Area of Study 2 Outcome 2
Distortions of perception

Study Design:	Learning intentions – at the end of this chapter I will be able to:
• The fallibility of visual perceptual systems, for example, visual illusions and agnosia	**10A The fallibility of visual perception** **10A.1** Understand that the visual perceptual system is fallible **10A.2** Explain what is meant by visual illusion and provide examples that illustrate the fallibility of the visual perceptual system **10A.3** Explain the term agnosia, with examples **10A.4** Explain how visual agnosia demonstrates that the visual perceptual system is fallible
• The fallibility of gustatory perception, for example, supertasters, exposure to miraculin and the judgement of flavours	**10B The fallibility of gustatory perception** **10B.1** Understand that gustatory perception is fallible **10B.2** Explain what is meant by a supertaster and how it illustrates the fallibility of gustatory perception **10B.3** Describe what miraculin is and how it illustrates the fallibility of gustatory perception **10B.4** Describe how judgement of flavours is influenced by the fallibility of gustatory perception

ISBN 978-1-009-25401-4 Gallagher et al

Study Design:	Learning intentions – at the end of this chapter I will be able to:
• Distortions of perception of taste and vision in healthy individuals, such as synaesthesia and spatial neglect	**10C Vision and taste distortions** **10C.1** Understand that healthy individuals can have distortions of their perception of taste and vision **10C.2** Describe synaesthesia and explain how it can distort perception of taste and vision **10C.3** Describe spatial neglect and explain how it can distort perception

Key Science Skills

- Use appropriate psychological terminology, representations and conventions, including standard abbreviations, graphing conventions and units of measurement
- Discuss relevant psychological information, ideas, concepts, theories and models and the connections between them
- Analyse and explain how models and theories are used to organise and understand observed phenomena and concepts related to psychology, identifying limitations of selected models/theories
- Critically evaluate and interpret a range of scientific and media texts (including journal articles, mass media communications and opinions in the public domain), processes, claims and conclusions related to psychology by considering the quality of available evidence
- Analyse and evaluate psychological issues using relevant ethical concepts and guidelines, including the influence of social, economic, legal and political factors relevant to the selected issue
- Use clear, coherent and concise expression to communicate to specific audiences and for specific purposes in appropriate scientific genres, including scientific reports and posters
- Acknowledge sources of information and assistance, and use standard scientific referencing conventions

Glossary

Agnosia
Ames room
Apparent distance theory
Apperceptive visual agnosia
Associative visual agnosia
Binocular depth cues
Bistable perception
Broca's area
Carpentered-world hypothesis
Convergence
Culture
Grapheme–colour synaesthesia
Hemispheric specialisation
Lexical–gustatory synaesthesia
Miraculin
Monocular depth cues
Müller-Lyer illusion
Non-taster
Papillae
Perceptual constancy
Perceptual distortions
Prosopagnosia
Retinal image
Shape constancy
Size constancy
Spatial neglect
Spinning dancer illusion
Supertaster
Synaesthesia
Visual illusion

ISBN 978-1-009-25401-4

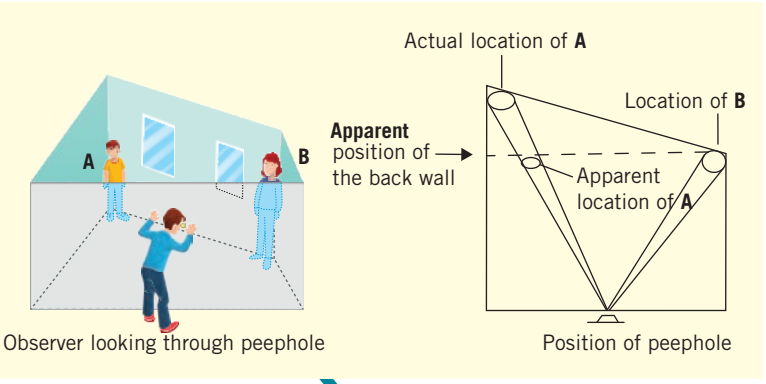
Concept map

Sensory processing errors make perceptual systems fallible

Visual perceptual system can be tricked, and is affected by disorders

Gustatory perceptual system can be tricked, and is affected by genetics

10A The fallibility of visual perception



10B The fallibility of gustatory perception

Even healthy people are susceptible to distortions of perception

10C Vision and taste distortions

SYNAESTHESIA

0123456789

See the Interactive Textbook for an interactive version of this concept map interlinked with all concept maps for the course.

ISBN 978-1-009-25401-4 Gallagher et al

The fallibility of visual perception

Study Design:
The fallibility of visual perceptual systems, for example, visual illusions and agnosia.

Glossary:
Agnosia
Ames room
Apparent distance theory
Apperceptive visual agnosia
Associative visual agnosia
Binocular depth cues
Bistable perception
Carpentered-world hypothesis
Convergence
Culture
Monocular depth cues
Müller-Lyer illusion
Perceptual constancy
Prosopagnosia
Retinal image
Shape constancy
Size constancy
Spinning dancer illusion
Visual illusion

ENGAGE

A life with face blindness

Sadie Dingfelder had a problem: she just couldn't seem to remember faces. At work, she would mistake co-workers for one another, and even spent months thinking two of her colleagues were the same person. Even her husband wasn't instantly recognisable to her, causing her to mistake other men for him. These experiences left Sadie embarrassed and the people around her confused.

Figure 10A–1 A person with prosopagnosia will struggle to recognise or differentiate faces

Eventually, she was diagnosed with a rare neurological disorder known as prosopagnosia, or face blindness. Finally, her experiences started to make sense to her. She was even led to reach out to former classmates, to ask whether her inability to recognise faces was the reason she didn't have any friends. As it turned out, Sadie had not been unpopular at school. She just hadn't been able to recognise her friends!

Sadie has come to accept her condition and feel at ease with her life. Her 40th birthday celebration was attended by many friends, and although she couldn't recognise them, she was satisfied knowing that they understood.

Sadie recalled her story for the *Washington Post* in an article titled, 'My life with face blindness'. Use your favourite search engine to access the article to read more.

EXPLAIN

Visual illusions and agnosia

In most cases, our perception of the world is accurate and reliable; however, as you know, there are exceptions. Our perception is not infallible. In Section 9B, you saw how top-down processing can lead to errors in perception, shaped by factors such as our perceptual set. Yet, typically, if more than one person looks at a given stimulus, such as a photograph of a dress, they are all seeing the same dress. Or are they? Here, we look at two fascinating examples that demonstrate the fallibility of the visual perceptual system: visual illusions and agnosia. This fallibility of our visual perception can arise from the stimulus itself or from how the sensory information is processed in the brain, or both.

LINK **9B** PROCESSING OF VISUAL AND GUSTATORY INFORMATION

VIDEO 10A–1 VISUAL ILLUSIONS

ISBN 978-1-009-25401-4 Gallagher et al

9C APPLYING THE BIOPSYCHO-SOCIAL MODEL TO VISUAL AND GUSTATORY PERCEPTION

LINK

Visual illusions

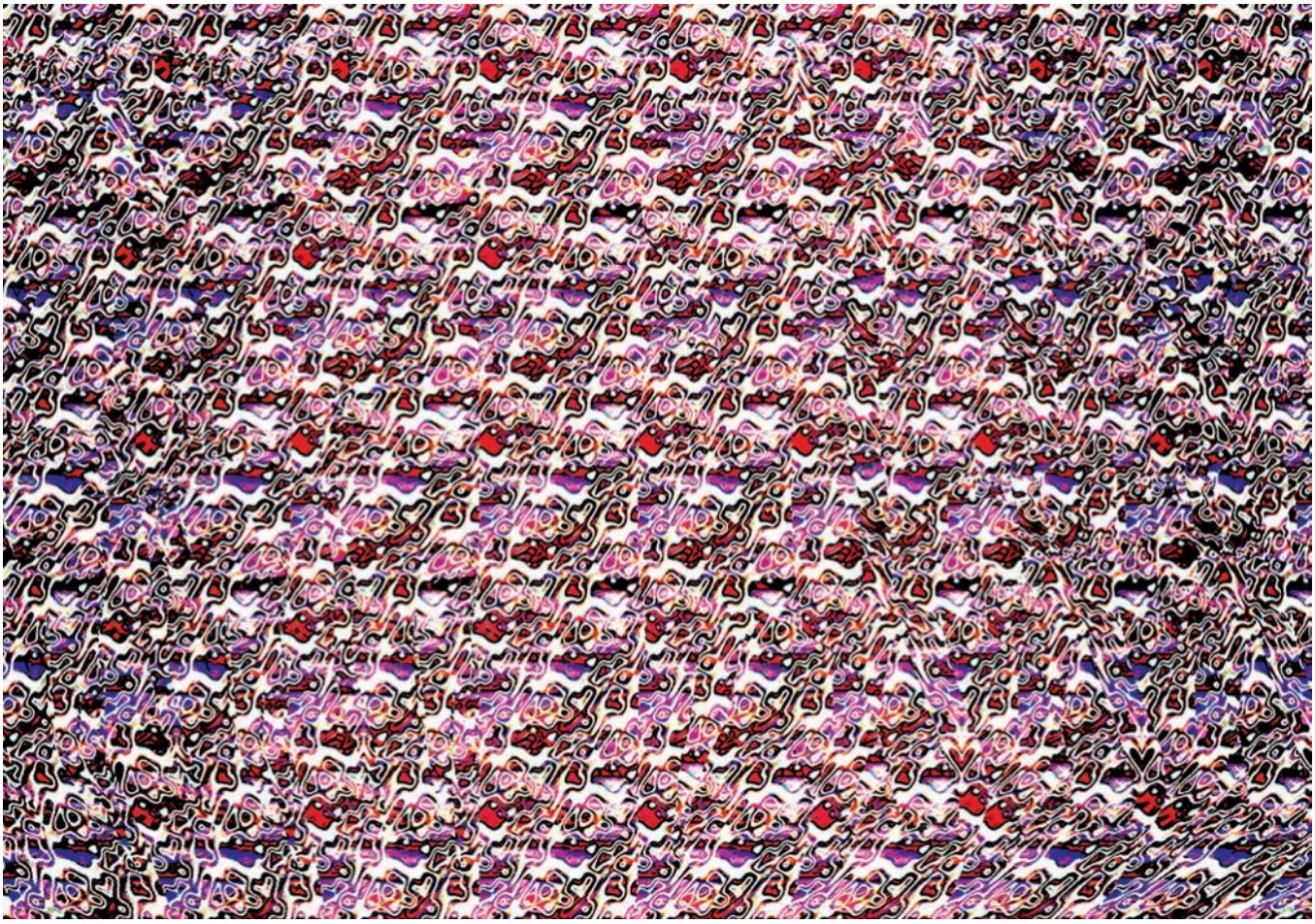
Visual illusion an illusion created by a misinterpretation (distortion or mistake) of the reality of a visual stimulus

As you learned in Section 9C, our perceptions are influenced by a range of biological, psychological and social factors, which together explain why one person's 'accurate' perception may differ from another person's 'accurate' perception. However, did you know that most people perceive visual illusions in the same way? For something to be a **visual illusion**, our perception of it must consistently differ from the objective reality. The illusion is created by a misinterpretation (distortion or mistake) of the reality of a visual stimulus. This illusory effect is unavoidable; even when we know that we are looking at an illusion, our perception is nonetheless confused. Thus, these stimuli, in and of themselves, trick our visual perceptual system, demonstrating its fallibility. Let's consider two famous examples: Magic Eye® books and '#thedress'.

DOCUMENT 10A–1 VISUAL ILLUSIONS FURTHER RESOURCES

DOC

Have you ever seen a Magic Eye® 3D visual illusion? An example is provided in Figure 10A–2. To use this image, hold the coloured pattern 5 cm from your eyes so that it is blurry. Now, focus your eyes beyond the page. Look 'through' the image. Keeping your focus steady, slowly move the page away from your face. A 3D image should start to emerge.



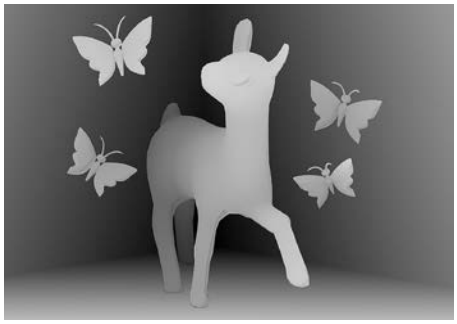


Figure 10A–2 Top image: A Magic Eye® 3D illusion. Hold the coloured pattern 5 cm from your eyes so that it is blurry (your eyes are focused beyond the page). Move the page slowly away and you should perceive a 3D shape of deer and butterflies coming into focus. Bottom image: The picture shows where the shapes are located (though not what you actually see; you will see the shapes with the multi-coloured surface pattern). Visit magiceye.com for more guidance if you can't see the illusion, or to explore more examples. © 2022 Magic Eye Inc.

ISBN 978-1-009-25401-4 Gallagher et al

Figure 10A–3 Is this dress blue and black, or white and gold?

Visual illusions do not need to be created or overly complex, as in the case of Magic Eye® illusions. A case in point is shown in Figure 10A–3. This photograph, known as #thedress, became a viral phenomenon in 2015. It shows a blue and black dress. Or is it white and gold? In the wake of the global internet community becoming fascinated with this question, it was confirmed that the photographed dress is blue and black, yet some people see it as white and gold. This raises interesting questions about how the human brain perceives colour, and in mid-2022 these had not been fully answered. Some research suggests that people's assumptions about whether the dress is assumed to have been photographed in artificial or natural light affects the perception of its colour.

Visual illusions demonstrate the important role the brain plays in constructing our view of the world. Let's look more closely at three well-known visual illusions: the Müller-Lyer illusion, the Ames room illusion and the spinning dancer illusion.

Müller-Lyer illusion

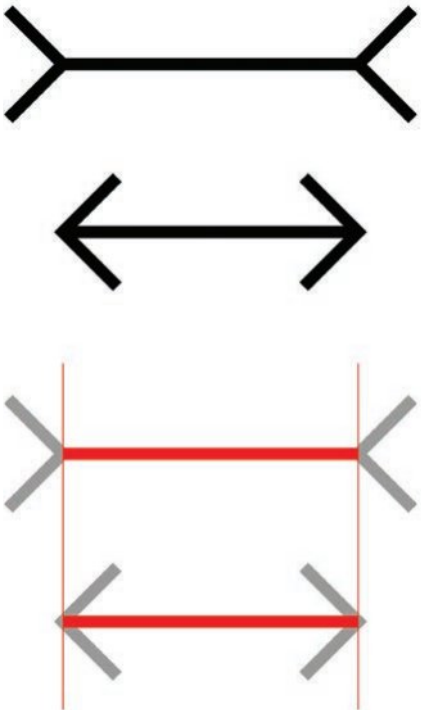


Figure 10A–4 The Müller-Lyer illusion

The **Müller-Lyer illusion** (Figure 10A–4) is the misinterpretation of two lines of equal length, each with different-shaped ends. One line has arrowheads at each end of the line, while the other line has feathertails at each end. Explanations of the Müller-Lyer illusion point to biological and social factors, which were discussed in Chapter 9.

Recall our discussion of the biological depth cue of **convergence**, which involves sensory information being interpreted by the brain based on changes in muscle tension surrounding the eyes. It has been suggested that the line with the arrowheads at the end causes the eyes to turn inwards, creating more tension in the muscles surrounding the eyes, and causing us to perceive the line as being closer to us. In contrast, the feathertail line causes the eyes to turn outwards, creating less tension and leading us to perceive that the line is further away (and thus necessarily longer) than the arrowhead line. However, research has shown that the Müller-Lyer illusion persists even if there is no eye movement; therefore, this theory is no longer supported.

Another proposed explanation of the Müller-Lyer illusion is **culture**, a social factor. For example, the **carpentered-world hypothesis** suggests that the perception of the two lines is influenced by one's familiarity with modern, Western building designs (regular rectangular shapes and right angles).

Müller-Lyer illusion
the misinterpretation of two lines of equal length, each with different-shaped ends

Convergence
a biological depth cue that involves the brain interpreting tension changes in the muscles around the eyes

LINK 9C APPLYING THE BIOPSYCHO-SOCIAL MODEL TO VISUAL AND GUSTATORY PERCEPTION

Culture
the many characteristics of a group of people, including their attitudes, behaviours, customs and values, that are transmitted from one generation to the next

Carpentered-world hypothesis
the theory that the two figures in the Müller-Lyer illusion represent three-dimensional objects viewed in our environment, for example, a Western rectangular house

ISBN 978-1-009-25401-4 Gallagher et al

9C APPLYING THE BIOPSYCHO-SOCIAL MODEL TO VISUAL AND GUSTATORY PERCEPTION LINK

This theory was put forward by William Hudson, whom you met in Chapter 9 where we discussed his work on depth cues among Black southern African people. The idea is that people who have grown up in cultures in which society is restricted by rectangular internal walls, as is common with modern, Western building design, are more likely to perceive the Müller-Lyer illusion. However, those who have grown up in cultures with non-rectangular building designs not dominated by right angles (e.g. Figure 10A–5) are less likely to be tricked by this illusion.

Figure 10A–5 A traditional circular house of the Basotho people of southern Africa, of a type that would have been familiar to the people in Hudson's research

For example, Figure 10A–6 demonstrates our tendency in westernised cultures to perceive internal building walls (represented by the feathertail line) as being further away than external building walls (represented by the arrowhead line), which are perceived as being closer to us. This 'perceived depth' in the Müller-Lyer illusion creates further problems for our brain, which has a tendency to use **size constancy** (discussed in Section 9C), in which the **retinal images** it receives are processed to determine the actual size of an object. This is problematic because the two lines in the illusion produce the same-sized retinal images; however, the feathertail line, which is perceived as further away, should produce a smaller retinal image. This is referred to as the **apparent distance theory**, which states that if two objects cast the same-sized retinal image, but one is perceived to be further away, our brain interprets the more distant object as being larger. This occurs because our brain uses top-down processing (e.g. past experience and memory) to make sense of the discrepancy, and determines that the more distant feathertail line can only project the same-sized retinal image as the arrowhead line if it is longer in the first place. Hence, we incorrectly perceive the arrowhead line as being shorter and the feathertail line as being longer.

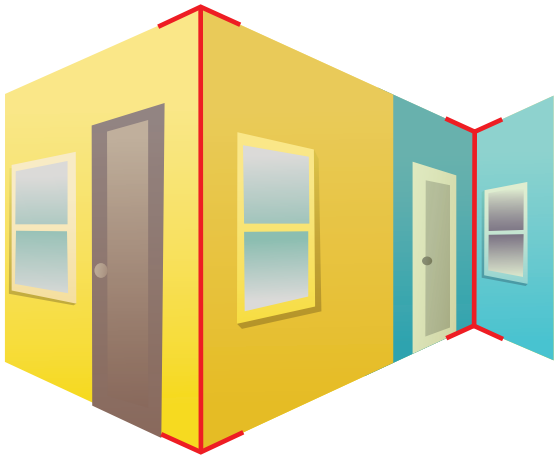


Figure 10A–6 The 'carpentered-world hypothesis' explains perception of the Müller-Lyer illusion as influenced by architecture.

9C APPLYING THE BIOPSYCHO-SOCIAL MODEL TO VISUAL AND GUSTATORY PERCEPTION LINK

Size constancy the ability to perceive an object's actual size, despite changes in our retinal images of the object

Retinal image the image of an object formed on the retina of the eye

Apparent distance theory the theory that, if two objects cast the same-sized retinal image, but one is perceived to be further away, our brain interprets the more distant object as being larger

Both the carpentered-world theory and the apparent distance theory are limited in explaining the Müller-Lyer illusion. This is because the illusion persists even if the feathertail and arrowheads are replaced with differently shaped ends and when the lines are turned on their side, which would not create perceived depth as a result of familiarity with Western building design. Overall, attempted explanations of the Müller-Lyer illusion are flawed, which is one of the reasons why this illusion is so interesting!

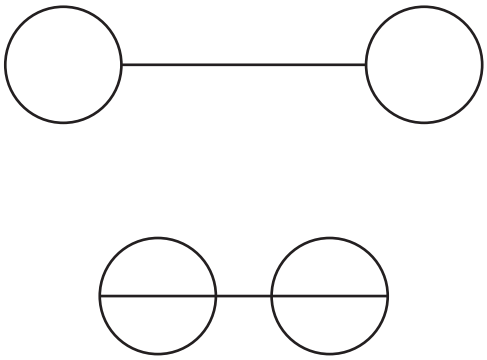


Figure 10A–7 Are these lines the same length?

ISBN 978-1-009-25401-4 Gallagher et al

Ames room illusion

An **Ames room** is a specially constructed, physical room, designed to create a visual illusion for an observer viewing the room through a peephole. Although an Ames room is built to look like a rectangular room to the observer, the dimensions of the room are not rectangular. As shown in Figure 10A–8, the floor plan is a right trapezoid (i.e. a trapezium with two right angles). The back wall is positioned at an oblique angle, with the back left-hand corner of the room double the height and double the distance away from the peephole compared to the back right-hand corner. To accommodate these dimensions, the room has a sloping floor and a sloping ceiling. The illusion is further enhanced by the addition of special flooring and wall decorations.

Ames room
a specially constructed, trapezoid-shaped room, designed to create the visual illusion that it is rectangular, for an observer viewing the room through a peephole

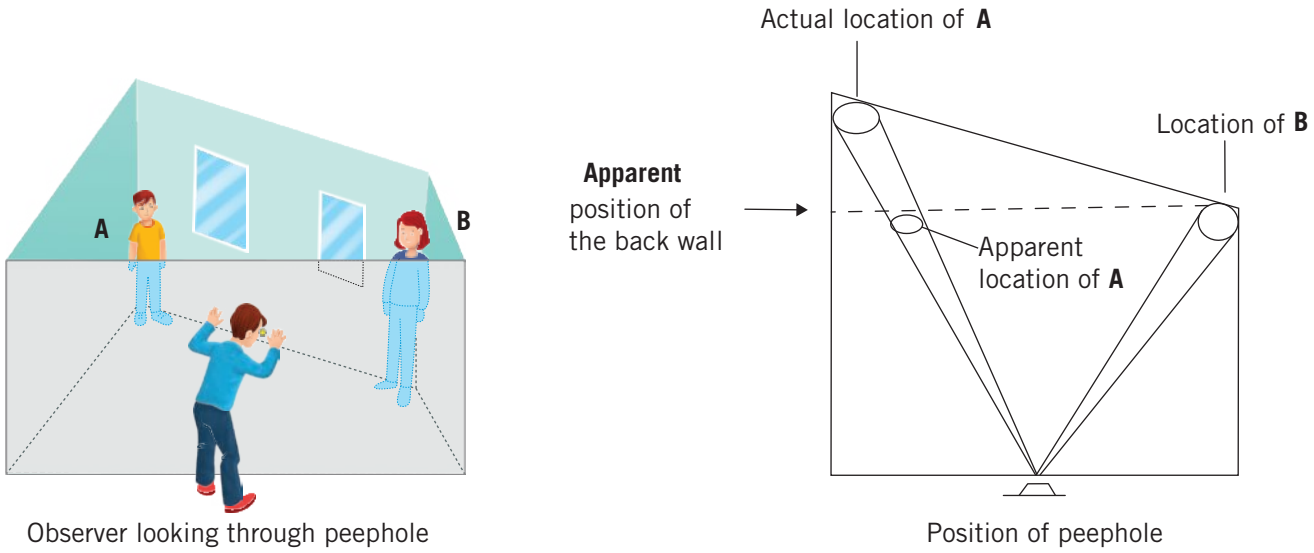


Figure 10A–8 The Ames room, shown in 3D on the left, and as a floor plan on the right.

To see what is happening inside the room, the observer must look through a peephole. They therefore can view the room using only one eye at a time, preventing them from using **binocular depth cues** (e.g. convergence and retinal disparity). Depth cues are important for perceiving the relative distance of objects. While depth can be perceived to some degree with **monocular depth cues** (e.g. accommodation), as you learned in Section 9C, these are much less effective when not supported by binocular depth cues. The Ames room illusion depends significantly on the observer's inability to perceive depth and thus recognise that the far left corner of the room is actually further away. This consistently creates the illusion of a standard rectangular room.

Figure 10A–9 Looking through the peephole into an Ames room

Binocular depth cues
depth cues that require both eyes to send information to the brain to perceive depth

Monocular depth cues
depth cues that only require one eye to send information to the brain to perceive depth

LINK **9C** APPLYING THE BIOPSYCHO-SOCIAL MODEL TO VISUAL AND GUSTATORY PERCEPTION

ISBN 978-1-009-25401-4 Gallagher et al

9A UNDERSTANDING THE ROLE OF ATTENTION IN PERCEPTION LINK

Perceptual constancy the mind's ability to perceive a visual stimulus as remaining constant even though the visual information sent to the brain about the object shows changes in shape, size, brightness and orientation

Shape constancy the ability to perceive an object's actual shape, despite changes in the retinal image of the object

The Ames room illusion is often explained with reference to **perceptual constancy** (i.e. size constancy and shape constancy), which was discussed in the previous chapter. This relates to one's ability (or inability) to use depth cues.

As mentioned, the shape of the room means that the far left corner is twice as far from the observer as the far right corner. To ensure the far left corner of the room casts the same-sized retinal image as the far right corner for the observer, it is constructed to be twice the height of the far right corner. The observer has no access to binocular depth cues and is forced to view the room with one eye through a peephole, and therefore cannot perceive that the far left corner of the room is actually further away. This creates the illusion of a standard rectangular room. This shape is maintained in the observer's brain by **shape constancy**. The illusion is reinforced by top-down processing where the observer has been raised in a culture in which rooms tend to be rectangular – this is what they expect to see.

The fact that this is not a standard rectangular room becomes apparent when two people, known to be similar in height, move towards or stand in the far left and right corners. Since the far left corner of the room is double the height of the far right corner, if two people of the same size stand in the far left and far right corners, the one on the left appears half the size of the one on the right. This confuses our ability to maintain size constancy – we hold the shape of the room constant, but then must account for the size of the people in the room relative to the height of the walls. This is why we see the people as shrinking or growing as they move around the room.

Spinning dancer illusion

Spinning dancer illusion an illusion in which a dancer can be perceived as spinning clockwise or anticlockwise, and the same viewer can alternate between perceiving a clockwise or anticlockwise spin

The **spinning dancer illusion** is a GIF image of a dancer pirouetting on one foot on a vertical axis (Figure 10A–10). The illusory effect is that the dancer can be perceived as spinning clockwise or anticlockwise, and the same viewer can alternate between perceiving a clockwise or anticlockwise spin. Figure 10A–11 explains this illusion. Notice, in that figure, how both the clockwise and anticlockwise interpretations are possible for the same silhouette. This is further made possible by the lack of depth cues, due to the silhouetted nature of the figure.

Figure 10A–10 A still from the spinning dancer illusion. Links to this an other resources can be found in Document 10A–1 in the Interactive Textbook.

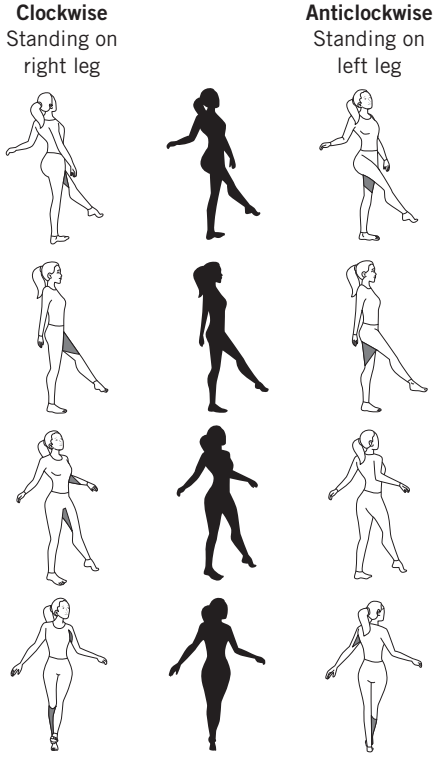


Figure 10A–11 The middle column shows four frames of the spinning dancer illusion. The left column imagines how the dancer might look in 3D if spinning clockwise, while the right column shows how the dancer might look in 3D if spinning anticlockwise.

ISBN 978-1-009-25401-4 Gallagher et al

The direction of spin that you perceive depends on whether you interpret the dancer as standing on her left or right leg. This can change for the same viewer depending on the angle from which they are viewing the GIF and the features of the image on which they are focusing at any given moment. This ability to spontaneously switch between two different interpretations of the same ambiguous visual stimulus is called **bistable perception**. However, while the GIF can be perceived either way, research has found that:

- people are more likely to perceive the dancer as spinning clockwise initially
- if someone sees the dancer spinning anticlockwise initially, they are significantly more likely to then reverse the perceived spin to clockwise
- the perception of clockwise spin is more likely when the image is viewed from above; anticlockwise spin is more likely to be perceived when the image is viewed from below.

Bistable perception the ability to spontaneously switch between different interpretations of the same ambiguous visual stimulus

Check-in questions – Set 1

1 Describe how someone from a westernised cultural background would perceive the Müller-Lyer illusion.

2 For the Ames room illusion to occur, the Ames room must
   - **A** be viewed through a binocular peephole.
   - **B** contain specialised furniture.
   - **C** be rectangular in shape but perceived as a trapezoidal shape.
   - **D** have one back corner that is further away from the viewer than the other back corner.

3 Clearly state how the Ames room is constructed in terms of its shape and the position of the peephole to create the illusion.

4 When an individual views the spinning dancer illusion, which direction are they more likely to perceive the dancer spinning in initially?

5 What kind of images are subject to bistable perception and why?

WORKSHEET 10A–1 PERCEPTUAL ILLUSIONS

ACTIVITY 10A–1 ANALYSING ILLUSIONS

With a partner, discuss what you see in the images below and why you may perceive them that way. Discuss whether you would classify them as visual illusions.

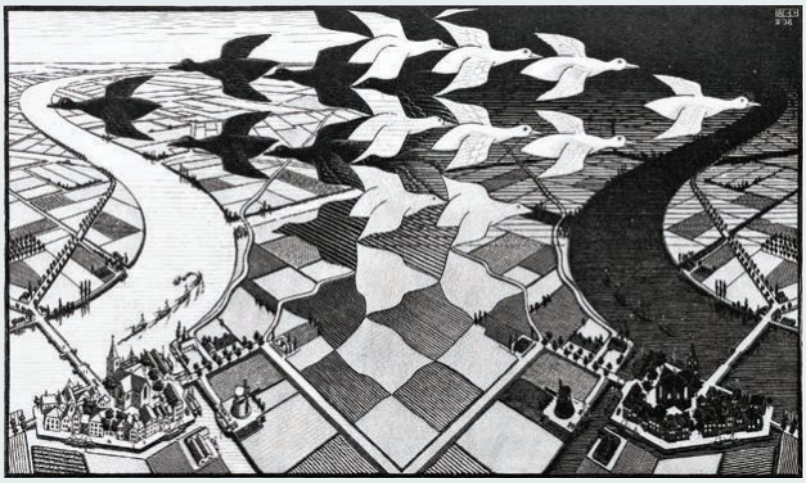


Figure 10A–12 M. C. Escher's illustration 'Day and Night'

Figure 10A–13 A Necker Cube

Figure 10A–14 Penrose stairs

ISBN 978-1-009-25401-4 Gallagher et al

Visual agnosia

Agnosia
a brain disorder that interferes with one's ability to recognise or identify objects, people or sounds using one or more of the senses, despite the affected sensory system being otherwise fully functioning

So far in this section, we have looked at instances in which a stimulus itself is responsible for a perceptual system making mistakes. But what if the problem is in how stimuli are processed in the brain? Here, we consider the neurological disorder **agnosia**, which interferes with the ability to recognise or identify objects, people or sounds using one or more of the senses. You were introduced to an example of this in the Engage section, which discussed Sadie Dingfelder, who has a form of visual agnosia called prosopagnosia (which will be considered further below). Agnosia is particularly interesting because the sensory system affected by the processing problem is otherwise fully functioning, and the distortion of perception cannot be explained by memory, attention or language problems, or a lack of familiarity with the stimuli.

Agnosia can affect the visual perceptual system (visual agnosia), auditory perceptual system (auditory agnosia) or somatosensory perceptual system (tactile agnosia). We will focus on visual agnosia, including apperceptive and associative visual agnosia generally, and the condition of prosopagnosia specifically.

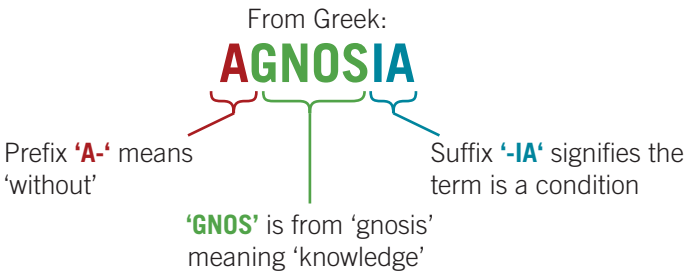


Figure 10A–15 The term 'agnosia' comes from classical Greek. It is directly translated as, 'a condition without knowledge'. In psychology, this term refers to conditions in which a sensory stimulus is recognised.

Apperceptive visual agnosia

Apperceptive visual agnosia
an inability to recognise familiar visual stimuli due to problems with processing perceptions

Someone with **apperceptive visual agnosia** cannot process or perceive certain stimuli (e.g. familiar objects or familiar places). This failure to perceive the stimulus occurs in the early stages of processing. Because no perception has taken place, people with apperceptive visual agnosia cannot even copy a drawing of the stimulus. The problem is not just in recognising it, but in perceiving it at all.

5B THE HINDBRAIN, MIDBRAIN, FOREBRAIN AND CEREBRAL CORTEX LINK

For example, a person with apperceptive visual agnosia may look at a dinner plate and not be able to recognise it as 'a dinner plate'. If you asked them what a dinner plate was, they could describe it to you, but if you showed them a picture of a dinner plate, they could not tell you what it was. If you asked them to get a dinner plate for you, they would likely use their sense of touch to identify the required item, using the shape and texture of the object to identify it as a dinner plate. A further marker of apperceptive visual agnosia is the inability to draw or copy objects visually. If you asked this person to copy an image of a dinner plate, the outcome would likely be a series of concentric scribbles.

Figure 10A–16 A person with apperceptive visual agnosia may not be able to recognise this as a dinner plate.

6B ACQUIRED BRAIN INJURIES LINK

Apperceptive visual agnosia is a neurological disorder that is typically caused by brain injury, particularly of the parietal and occipital lobes. As discussed in Section 6B, common causes of brain injury include physical injury, dementia and other degenerative brain diseases (e.g. Alzheimer's disease), oxygen deprivation (e.g. from stroke), carbon monoxide poisoning and brain tumours.

ISBN 978-1-009-25401-4 Gallagher et al

Associative visual agnosia

Someone with **associative visual agnosia** can perceive familiar objects but cannot translate that perception into recognition. If a person with associative visual agnosia is asked to copy an image of a familiar object, unlike those with apperceptive visual agnosia, they can actually do this task. However, they still cannot identify what the object is.

Associative visual agnosia an inability to recognise familiar visual stimuli, despite having no problems with processing perceptions

Using the dinner plate example from the previous page, a person with associative visual agnosia could also tell you what a dinner plate is, and they might use their other senses to locate a dinner plate in their kitchen. The key difference is that if given a drawing of a dinner plate to copy, they could draw the dinner plate. However, if you then asked them to say what they had just drawn, they could not name the object in the drawing. For this reason, associative visual agnosia can be described as normal perception stripped of meaning.

Like apperceptive visual agnosia, associative visual agnosia is a neurological disorder typically caused by brain injury. The difference lies in the area of the brain affected. While apperceptive agnosia is related to lesions in the parietal and occipital lobes of the brain, associative agnosia is more often associated with lesions in the temporal lobe.

LINK **5B** THE HINDBRAIN, MIDBRAIN, FOREBRAIN AND CEREBRAL CORTEX

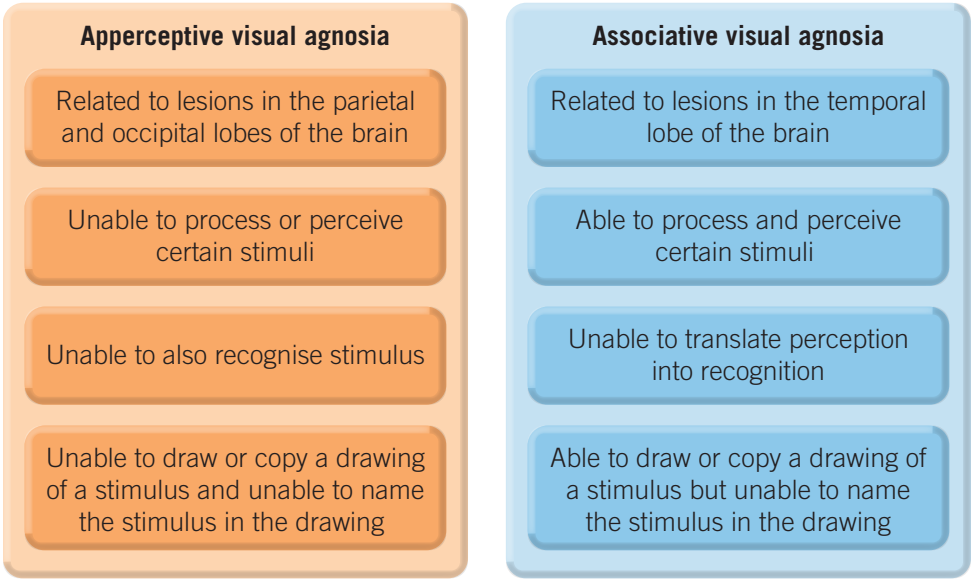


Figure 10A–17 Comparison of apperceptive and associative visual agnosia

Prosopagnosia

At the beginning of this section, you were introduced to Sadie Dingfelder, a woman living with **prosopagnosia**. This kind of visual agnosia involves an inability to recognise the faces of familiar people, despite having no memory dysfunction, memory loss or impaired visual sensation. People with this condition cannot perceive facial expressions and rely on other cues, such as hair and clothing, to identify people.

Prosopagnosia a type of visual agnosia involving an inability to recognise the faces of familiar people. Can be apperceptive or associative.

In some circumstances, prosopagnosia is congenital, and it has been associated with developmental differences, such as autism spectrum disorder. It results from abnormalities or lesions in the occipital and temporal lobes of the brain, and specifically in the neural systems that control facial perception and memory. Loss of the ability to recognise familiar faces can also occur in Alzheimer's disease. Depending on the individual's degree of prosopagnosia, issues may arise in telling faces apart, recognising one's own face, or even distinguishing faces from objects.

ISBN 978-1-009-25401-4 Gallagher et al

An example of the latter manifestation of prosopagnosia is the case of Dr P described by, neurologist Oliver Sacks in his book *The Man Who Mistook His Wife for a Hat*. Dr P, was a singer and music teacher. While working as a teacher, Dr P noticed that he could no longer recognise his students. Instead, he had to rely on their voices or on how they played their instruments to tell them apart. He would also see faces where there were none; he was known to pat fire hydrants, thinking they were children, only to be confused when 'they' didn't respond. Dr P had no issues with his memory or eyes – he had prosopagnosia.

Based on his work with Dr P, Sacks found that Dr P was able to recognise features of people (e.g. his brother's big teeth) and use those to guess at someone's identity. However, he could not combine those visual sensorial stimuli into a meaningful whole, as would be required to 'recognise' someone.

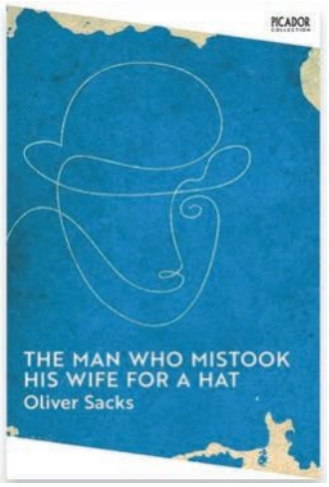


Figure 10A–18 Oliver Sacks' book *The Man Who Mistook His Wife for a Hat* presents a classic case of prosopagnosia.

Check-in questions – Set 2

1 Describe apperceptive visual agnosia and give an example of how this could affect someone's perception of a common household item.
2 Use an example to distinguish between apperceptive agnosia and associative agnosia.
3 Describe prosopagnosia and explain how it demonstrates the fallibility of the visual perceptual system.

ACTIVITY 10A–2 AGNOSIA RESEARCH TASK

Use the internet to research apperceptive visual agnosia and the effect it can have on a person. Critically evaluate and interpret a range of scientific and media texts (including journal articles, mass media communications and opinions in the public domain), claims and conclusions related to prosopagnosia by considering the quality of the evidence.

Create a short scientific poster to present your findings. Acknowledge all sources of information and assistance using standard scientific referencing conventions.

VIDEO **10A–2** SKILLS: KEEPING YOUR WRITING CONCISE AND COHERENT

10A SKILLS

Keeping your writing concise and coherent

When writing extended responses in VCE Psychology, keeping your writing concise and coherent will help maximise your marks. The acronym 'IDEA' can be used as a basic structure for your written responses. This stands for:

Identify
Define
Explain and Evaluate
Apply

ISBN 978-1-009-25401-4 Gallagher et al

Key points to remember

When using the IDEA structure, be sure to:

- specifically **identify** the relevant psychological terms, concepts or theories
- follow on from the identification with a **definition** of the psychological term, concept or theory, clearly listing all the appropriate details
- **explain** the psychological term, concept or theory using a detailed description and appraisal, weighing up the strengths and limitations of the construct
- **apply** the psychological term, concept or theory to the given scenario or provide a relevant and detailed example.

Let's see how to apply this in practice.

Question

Charlie suffers from an inability to recognise faces. Identify the condition that Charlie has and explain how he should respond to meeting Laura, whom he would like to be able to recognise again.

Suggested response

Charlie has prosopagnosia. Prosopagnosia is the inability to visually recognise the faces of familiar people, although other cues (e.g. hair) can be used to guess people's identity. Prosopagnosia is a form of agnosia and is not related to memory dysfunction, loss or impaired visual sensation. It results from abnormalities or lesions in the occipital and temporal lobes of the brain, and specifically in the neural systems that control facial perception and memory. It can be apperceptive or associative, and it may affect only Charlie's ability to tell faces apart or his ability to distinguish between faces and objects. It is recommended that Charlie attend closely to Laura's distinguishing non-facial features, such as her voice, colour and cut of her hair and the kinds of clothes or jewellery she wears. This will serve as a cue next time, to help Charlie guess Laura's identity.

Section 10A questions

1 Define a 'visual illusion'.
2 Describe the Müller-Lyer illusion and give one explanation of how this illusion works.
3 Identify whether each of the following statements about the Ames room is true or false and explain your answer.
   a The illusion occurs because binocular cues are used.
   b It is a carefully constructed rectangular room that is viewed through a peephole.
   c The illusion is dependent on our inability to maintain perceptual constancy for the people in the room.
4 Explain the importance of the peephole in the Ames room in creating the illusion and describe what an observer would see if they looked into the room through a window instead of the peephole.
5 Give an example of bistable perception.
6 What is agnosia?
7 What is the difference between apperceptive and associative visual agnosia?

ISBN 978-1-009-25401-4 Gallagher et al

10B The fallibility of gustatory perception

Study Design:
The fallibility of gustatory perception, for example, supertasters, exposure to miraculin and the judgement of flavours.

Glossary:
Miraculin
Non-taster
Papillae
Supertaster

ENGAGE

Are you tasting what I'm tasting?

There are natural variations between humans in our senses. We need different prescriptions to correct our eyesight. Some people say that vinyl sounds better than CDs or MP3s and will pay big money for audio equipment, while others can't tell the difference. So what about taste and smell? Many of us have heard of supertasters, but why – and how – do they exist? And how can you tell if you're one too?

It's the bitter taste that started all of this supertaster stuff. … In 1991, American psychologist Linda Bartoshuk conducted experiments … [and] noticed that … supertasters had a more dense covering of structures that contain taste buds (known as fungiform papillae) on their tongue. She concluded that the number of receptors is important …

Fewer than 15 tastebuds in an area the size of a hole punch indicates a 'non-taster', between 15 and 35 means you fall in the average range, while if you have more than 35 tastebuds in that area, you're a supertaster.

About one in four of us is a supertaster, one in four is a non-taster … and the rest of us are 'medium' or 'average' tasters. The proportions vary a little by culture and there is some variation within each group.

Supertasting is not restricted to bitterness. Supertasters often report that sweet or sour tastes are more intense. Salt appears to be a bit of a different beast – it seems that supertasters actually consume more salt, possibly because it masks bitterness.

So next time you're having an argument with someone over dinner about whether the meal is any good, keep in mind that their experience is probably very different to yours.

Source: Russsel, A. (2014). *Abhor asparagus and can't stand coffee? You may be a supertaster.* The Conversation.

EXPLAIN

Different factors that affect our perception of taste

VIDEO 10B–1 GUSTATORY PERCEPTION

In this section, we look at how our gustatory perceptual system is also fallible, being influenced by different factors that affect our judgement of flavour, including the role of genetics and the chemical effects of a protein called miraculin on our taste buds.

ISBN 978-1-009-25401-4 Gallagher et al

Supertasters

The existence of supertasters raises fascinating questions about how our perceptions of certain stimuli (e.g. bitter tastes) may be affected by how heightened our sensitivity is to those stimuli. Perhaps you have had the experience of enjoying a slice of cake, while your friend takes two bites and then complains it is too sweet. It may be that your friend is a supertaster, which makes them particularly sensitive to the sweet taste, and thus more likely to be overwhelmed by it.

As you already know, everyone has taste buds, which help them to perceive taste. These taste buds are found inside structures called **papillae** and are located throughout the mouth, with most clustered on the tongue. Your papillae collect sensory information about how salty, sweet, umami, sour or bitter something is. That information is then sent to the brain for processing. However, as you learned in the Engage box on the previous page, individuals can have different numbers of taste buds. This affects how they perceive taste, and thus which flavours or foods they enjoy, or don't enjoy.

Whether you are a **supertaster**, **non-taster** or just average depends on the number of papillae (which contain your taste buds) located on your tongue (Figure 10B–1). Supertasters are individuals who have inherited an unusually large number of papillae, meaning they have significantly more taste buds, and thus greater taste sensitivity, than someone with fewer papillae. Supertasters comprise approximately 25% of the population. The condition is passed down genetically, and females are more likely to inherit the gene.

Papillae
raised structures on the tongue containing taste buds

Supertaster
someone who has a higher number of papillae than the average, giving them a heightened sensitivity to taste

Non-taster
someone who has a lower number of papillae than the average, giving them a decreased sensitivity to taste

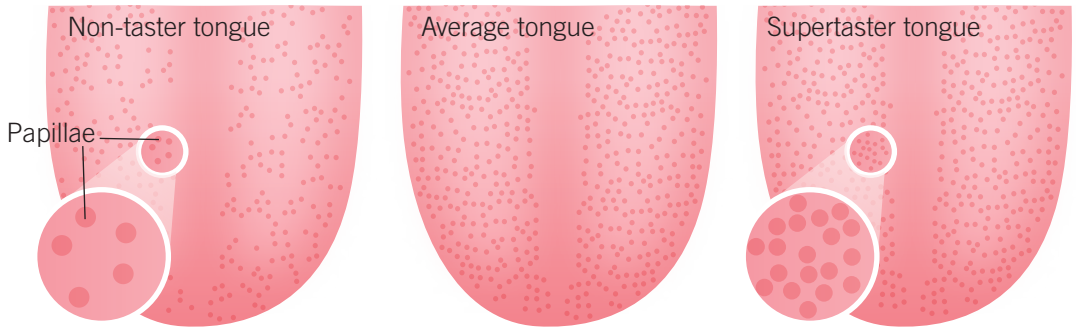


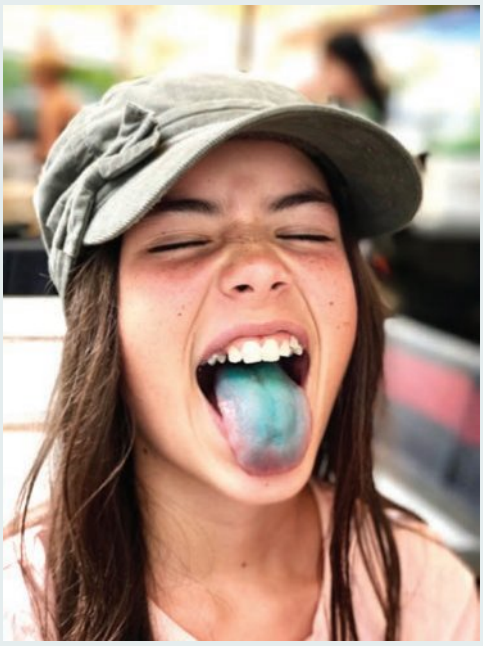
Figure 10B–1 How you perceive taste depends in part on how many taste buds you have.

So how does this heightened (supertaster) or decreased (non-taster) sensitivity to flavours affect how people perceive taste? Supertasters are more sensitive to bitter tastes than average or non-tasters. They may dislike (have an aversion to) bitter drinks such as coffee, and some vegetables may be perceived as too bitter, such as green capsicums, broccoli or asparagus. Supertasters tend to add more salt to their food, possibly to balance out bitter flavours. Some supertasters also dislike sweet foods, finding them overwhelming, as in the cake example above.

Non-tasters, on the other hand, tend to seek sweet and fatty foods. Indeed, without significant seasoning or sugar content, foods may taste bland. Non-tasters often enjoy hot, spicy food, and they use seasoning to make their food taste good. An exception to this is salt – non-tasters do not tend to use as much salt as supertasters, because they do not need to balance out bitterness.

ISBN 978-1-009-25401-4 Gallagher et al

ACTIVITY 10B–1 HOW MANY TASTE BUDS DO YOU HAVE?



Whether you are a supertaster, non-taster or average taster depends on the density of the papillae on your tongue. To work out whether you have more or less papillae than the average, stain your tongue with some food dye (blue or green works best), to help your papillae stand out and allow you to estimate how many you have in a given area.

Using a cotton bud, dip one end in some food dye and then apply the dye to an area of your tongue. There is no need to dye your whole tongue. You will just be examining an area with a diameter of 0.5 cm (about the size of an average hole punch hole).

Using a mirror or camera, examine a small area of your tongue (of 0.5 cm diameter) and estimate which category you are likely to fall into:

- non-taster: 15 tastebuds
- average: 15–30 tastebuds
- supertaster: 30+ tastebuds.

Discuss your findings with a partner. In your discussion, consider:

- how your number of tastebuds compares
- how your self-assessment of your tastebuds compares to your experience of taste (e.g. whether you like bitter foods or spicy foods, or seek sweet foods)

Check-in questions – Set 1

1 What sensory information do our taste buds gather?
2 What percentage of the population are supertasters?
3 Explain how the number of taste buds a person has affects their perception of taste.

Figure 10B–2 Heston Blumenthal's chicken-liver parfait is a savoury dish that has been made to look like something citrusy and sweet.

Judgement of flavour

As you saw for the visual perceptual system, it is possible to play tricks on our senses. One popular trend in the culinary world, brought to our TV screens by celebrity chefs such as Heston Blumenthal, is the creation of multisensory dishes and food illusions. An example of this is Blumenthal's chicken-liver parfait (Figure 10B–2), which is made to look like mandarins, complete with peel, leaf and stalk.

ISBN 978-1-009-25401-4 Gallagher et al

These kinds of dishes set up a conflict or confusion between the top-down and bottom-up processing of gustatory sensation. Using top-down processing influenced by vision, one may expect a sweet, citrusy, mandarin taste; however, bottom-up processing is based on the sensations experienced by the taste buds, which are receiving information about a savoury chicken-liver dish. These conflicts can change our judgement of flavour: at first, someone eating this dish may not taste chicken at all.

Figure 10B–3 Ben Churchill's carrot cake is composed of various elements made to look like something they are not, including a raw carrot and a plant pot.

As another example, consider chef Ben Churchill's carrot cake (Figure 10B–3). Everything on the plate is edible, including the plant pot, which is made of chocolate. What top-down and bottom-up messages might the brain receive when sitting down to this dish? It is likely that you wouldn't initially know what to expect. From context, you will know that the clay pot and dirt are unlikely to taste like clay and dirt – what kind of restaurant would you be in if they did! Moreover, aromas from the dish will conflict with the visual information, creating a mismatch in your expectations. As you start eating, your senses will likely come alive in surprise because of this mismatch between not knowing what to expect and the pleasurable sweet taste of the dessert.

Miraculin
a protein found in the pulp of the miracle berry that makes sour tastes seem sweet

As demonstrated by these food illusions, it is possible to influence how someone perceives a taste stimulus by manipulating top-down processing (e.g. expectations) to produce 'mistakes' in perceptions. Here, the fallibility of our gustatory perceptual system is used to create a pleasurable dining experience. We will now consider the example of miraculin, in which bottom-up processing influences our judgement of flavour.

Miraculin

Miraculin is a protein found in the pulp of the berry of the West African *Synsepalum dulcificum* shrub, known as the miracle berry or miracle fruit. This protein can be used to modify how we perceive taste, so that after miraculin enters the mouth, each time a sour stimulus is tasted, it will be perceived as sweet. This is despite the miracle berry itself not having a sweet taste.

Figure 10B–4 The miracle berry, after which miraculin is named

ISBN 978-1-009-25401-4 Gallagher et al

Miraculin works by binding to the sweet receptors in the papillae. While the pH in the mouth is neutral, the miraculin remains inactive; the taste-changing effect of miraculin is only activated in an acidic (low pH) environment. This means that if you consume any foods that are neutral (e.g. water) or alkaline (e.g. a banana), you will taste the food as normal. However, if you eat something sour or acidic (e.g. lemon or coffee), the pH level in your mouth will drop, causing miraculin to change its chemical shape, which stimulates the sweet receptor and sends a sweet signal to the brain (Figure 10B–5). Miraculin's effect lasts for around 20 minutes from the time it enters the mouth. During these 20 minutes, it is possible to perceive vinegar as tasting like sugar syrup!

WORKSHEET 10B–1 FALLIBILITY OF TASTE

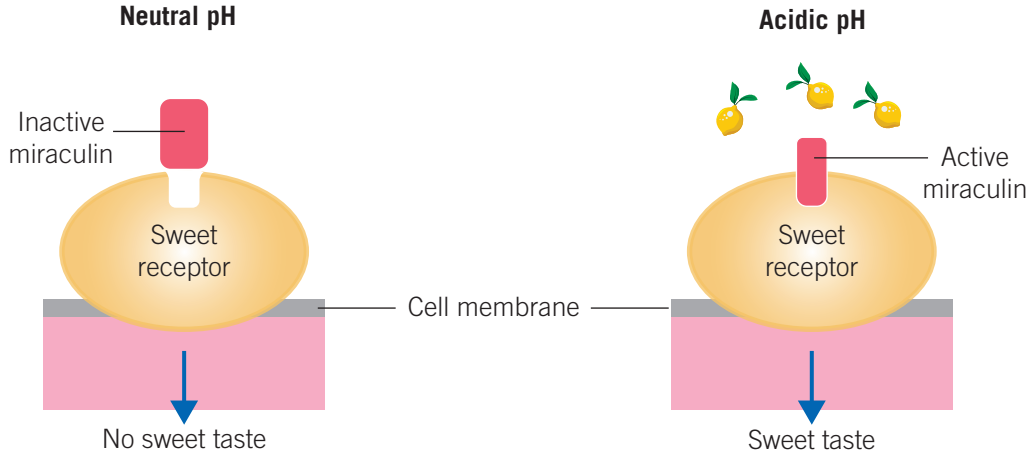


Figure 10B–5 A diagram of miraculin protein coming into contact with sweet receptors on the outer surface of taste cells on the tongue. At neutral pH the miraculin is the wrong shape to bind to the receptor in this lock and key analogy, and so is inactive. When the pH in your mouth becomes acidic, for example from lemon juice, it causes a change in the shape of the miraculin, which can now bind with the receptor, becoming active and stimulating it to send a sweet taste signal to the brain.

This ability to trick our gustatory perceptual system offers a range of benefits, including health benefits for individuals who seek out sweet tastes, and an improvement in the palatability of foods to which individuals may be sensitive (e.g. in the case of supertasters, or for those whose sensitivity to certain flavours has been affected by illness). In each case, miraculin could help to control how different foods are perceived, helping people with taste aversion enjoy a healthy, balanced diet.

Check-in questions – Set 2

1 What is miraculin?
2 Explain how miraculin affects gustatory perception.

VIDEO 10B–2 SKILLS: RESPONDING TO RESULTS IN A CONCLUSION

10B SKILLS

Responding to results in a conclusion

Assessment questions about the fallibility of gustatory perception are usually asked in the context of research or an experiment based on a particular psychological theory or construct. For example, you may be asked to write a conclusion about how people's perception was affected based on experimental results.

ISBN 978-1-009-25401-4 Gallagher et al

Question

Consider the following experiment. Then, using the information provided, propose a conclusion for this experiment. (Refer to Chapter 2 for how to write a conclusion.)

LINK 2B DRAWING CONCLUSIONS AND COMMUNICATING SCIENTIFIC IDEAS

Researchers wanted to examine the effect of being a supertaster on the perception of bitterness. They decided to conduct a study looking at people's enjoyment of bitter compared to non-bitter tastes, using supertasters as the test group and average tasters as the control group. They selected their sample from among the students at a large Victorian high school. The experimental group contained 30 students and the control group contained 10 students.

Hypothesis: The supertaster group will perceive the coffee (a bitter drink) as less enjoyable in terms of taste than the milkshake (a non-bitter drink).

The results of the experiment are shown in Table 10B–1. A higher score represents a more positive perception, and a lower score represents a negative perception.

Table 10B–1 Taste perception, score out of 10

	Coffee	Milkshake
Group A: Supertaster group	2	9
Group B: Control group	8	9

Suggested response

The results show that the supertasters found the bitter drink less enjoyable in terms of taste than the non-bitter drink. The control group enjoyed the taste of both drinks. Therefore, we can say that the hypothesis is supported: the supertaster group did perceive the bitter drink as less enjoyable in terms of flavour than the non-bitter drink. The limitations of this finding are that the results may only apply to this specific sample rather than the broader population of supertasters.

Section 10B questions

1. What is a supertaster?
2. What effect would being a supertaster have on your perception of taste?
3. Two friends (one is a supertaster, and one is a non-taster) decide to try coffee for the first time. They order the same kind of coffee, and it is prepared by the same barista. Explain how their perceptions of the taste of the coffee might be different.
4. Describe the potential benefits of miraculin.
5. With reference to top-down and bottom-up processing, explain how your senses would be confused if a restaurant served a chocolate cake and ice-cream dessert that looked like beef stew.

ISBN 978-1-009-25401-4 Gallagher et al

Vision and taste distortions

Study Design:
Distortions of perception of taste and vision in healthy individuals, such as synaesthesia and spatial neglect

Glossary:
Broca's area
Grapheme–colour synaesthesia
Hemispheric specialisation
Lexical–gustatory synaesthesia
Perceptual distortions
Spatial neglect
Synaesthesia

ENGAGE

Depicting synaesthesia

Synaesthesia is a rare condition in which certain sensations (e.g. sound) are perceived using another system (e.g. the visual perceptual system). You may have seen music videos or animations with colourful, abstract patterns swirling in time to music. These are inspired by visual synaesthesia.

The 2009 movie *The Soloist*, starring Jamie Foxx and Robert Downey Jr, was based on the true story of Nathaniel Ayers, a homeless musician in Los Angeles. In the movie, Ayers is depicted as a cellist with visual synaesthesia; that is, he perceives sounds as colours. The movie features a particularly interesting visualisation of this experience, showing an orchestral performance as successive bursts and swirls of brilliant colour.

Figure 10C–1 An artist's depiction of synaesthesia

EXPLAIN

Distortions in perception

9A UNDERSTANDING THE ROLE OF ATTENTION IN PERCEPTION

Stop for a moment and pay attention to your five senses: smell, hearing, sight, touch and taste. What do you perceive? If it's close to lunchtime, you might smell a pleasing aroma wafting from your school's canteen and hear your stomach rumbling. You might see the sun high in the sky, feel an ache in your legs from sitting too long and taste your own saliva, increasing in anticipation of your lunch. As you learned in Chapter 9, our sensory organs collect data about our world, which is then transmitted to our brains, where the complex process of perception takes place. Each of our senses provides us with separate but related information about the same experience. For example, the combined perception produced by the five senses' data might be that it is almost lunch time, and you are starving!

ISBN 978-1-009-25401-4 Gallagher et al

Now, imagine you can see the colour of the aroma coming from the canteen or taste the ache in your legs. Or due to a brain injury as a child, you can only process objects visually if they are in your left visual field (the left side of what each of your eyes can see) or you can only feel sensation coming from one side of your body, so one of your legs aches and the other isn't perceived at all. This is what it is like to experience the kinds of perceptual distortions caused by synaesthesia and spatial neglect.

In this section, you will learn about synaesthesia, introduced in the Engage section, and the neurological disorder of spatial neglect, in which individuals lose the ability to perceive stimuli occurring on one side of their body. By investigating these conditions, you will see how **perceptual distortions** can occur when sensory data is processed in a way that differs from the neurotypical experience.

Figure 10C–2 Perception is subject to individual differences.

Synaesthesia

Synaesthesia was first described in the late nineteenth century and has been an active research area ever since. Current estimates place the number of people with synaesthesia at up to 1 in 200 people. While synaesthesia is associated with perceptual distortion, it is not classified as a perceptual disorder because there is no loss of ability. In fact, there may be some benefit, as synaesthesia and creativity are closely associated.

Perceptual distortions when an individual's perceptual interpretation of a stimulus varies from how it is commonly perceived

Synaesthesia a rare condition in which certain sensations are perceived using another system

The exact number of different types of synaesthesia remains uncertain; however, there may be upwards of 80 types, including:

- ordinal linguistic personification – when an individual views ordered sequences (e.g. days, weeks, numbers, letters) as having personalities. For example, each day of the week might be associated with a different personality trait.
- chromaesthesia – when an individual simultaneously senses sounds and colours. For example, lighter colours might be heard as higher octaves, while darker colours are perceived as lower octaves.
- grapheme–colour synaesthesia – when the individual perceives graphemes (letters and numbers) as being different colours.
- lexical–gustatory synaesthesia – when an individual perceives words as having tastes. For example, the name of a certain road might taste like a hearty fried breakfast.

Let's look more closely at two specific kinds of synaesthesia – grapheme–colour synaesthesia and lexical–gustatory synaesthesia – including how they affect perception and what causes the condition.

ISBN 978-1-009-25401-4 Gallagher et al

Grapheme–colour synaesthesia

Grapheme–colour synaesthesia the association of written letters and numbers with colours

In **grapheme–colour synaesthesia**, written letters and numbers (i.e. graphemes) are associated with colours. This association is consistent and predictable, and experiments have shown it is a genuine immediate perception, rather than a memory or learned association. As demonstrated by Figure 10C–3, a person with grapheme–colour synaesthesia might see a certain colour when they read an 's' or '9'. This may also happen at a higher level, with whole words in sentences perceived as a certain colour (rather than every letter). Interestingly, grapheme–colour synaesthesia is associated with cognitive benefits, including in reading comprehension and memory.

Figure 10C–3 Grapheme–colour synaesthesia is characterised by written letters and numbers being associated with colours.

Lexical–gustatory synaesthesia

Lexical–gustatory synaesthesia the association of certain words with sensations of taste

A person with **lexical–gustatory synaesthesia** experiences sensations of taste when they perceive certain words. For example, someone hearing, reading, saying or even just thinking the word 'Monday' might simultaneously taste onions. These word–taste combinations differ between individuals; however, as with grapheme–colour synaesthesia, the experience is consistent and predictable for each individual. They will always experience the same taste perception in the presence of a certain word (e.g. onions on hearing 'Monday'). For some individuals, only a few lexical items may trigger a gustatory perception. But for others, thousands of words may have an associated taste.

Causes

A person can be born with synaesthesia or develop it. They can inherit the condition in their genes or acquire it due to injury or drug use later in life. In addition, if a person has one form of synaesthesia, they are likely to have others. It is also possible that people with synaesthesia have excess neural connections compared to their neurotypical counterparts due to less synaptic pruning during their early years.

6A NEURO-PLASTICITY LINK

ACTIVITY 10C–1 DO YOU THINK IT COULD BE YOU?

Although the number of individuals who have synaesthesia is difficult to determine, there is evidence to suggest that we may all have a preference to categorise sensory information in a particular way. Let's try some exercises to test this idea.

Exercise 1

These two shapes have names; one is named Bouba and one is named Kiki. Which is which?

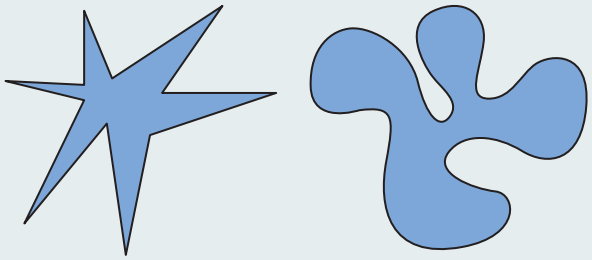


Figure A Figure B

ISBN 978-1-009-25401-4 Gallagher et al

Did you label Figure A as Kiki and Figure B as Bouba? If you did, you answered in the same way as 95–98% of the people who participated in Ramachandran and Hubbard's 2001 experiment. The kiki/bouba effect, as it is now known, was first observed in 1929 by psychologist Wolfgang Köhler (although he used the names 'takete' and 'malumba'), and indicates that these names are not arbitrary (random): 'Bouba' is said with the mouth rounded, like Figure B; while the sound of 'Kiki' is sharper, corresponding to the more angular Figure A.

Exercise 2

Glance at the image on the right. What do you see?

Are there multiple letters? Letters and numbers? Just numbers?

There are letters and numbers, but how many of each?

If you had grapheme–colour synaesthesia, you would most likely have immediately perceived the letters (S) and the numbers (5) as having distinct colours, like on the left. You would have had no trouble at all quickly counting the number of 5s – there are four of them.

ACTIVITY 10C–2 FAMOUS CASES

Choose one of the following famous people to research. What kind of synaesthesia do they have? How have they used their condition to their advantage?

- Billie Eilish
- Beyoncé
- Marilyn Monroe
- Kanye West
- Billy Joel
- Lorde
- Pharrell Williams
- Stephanie Morgenstern
- Nikola Tesla

Check-in questions – Set 1

1 Define synaesthesia with reference to an example.
2 Compare and contrast colour–grapheme and lexical–gustatory synaesthesia. Include supporting examples.
3 How prevalent is synaesthesia?
4 What causes synaesthesia?

Spatial neglect

As you learned in Chapter 6, in the case of a stroke, a temporary lack of blood flow to the brain or bleeding from blood vessels in the brain can damage brain tissue, leading to an acquired brain injury and associated impairment. One common consequence of stroke, especially when it affects the right hemisphere of the brain, is the development of a (typically temporary) neurological condition known as **spatial neglect** (also called hemispatial neglect, unilateral neglect or neglect syndrome). It is estimated that spatial neglect may follow stroke affecting the right hemisphere in 50–80% of cases.

LINK 6B ACQUIRED BRAIN INJURIES

Spatial neglect a condition involving an inability to attend to sensory stimuli on one side of the body

ISBN 978-1-009-25401-4 Gallagher et al

Individuals with this condition are unable to attend to one side of their body or perceive visual stimuli in one side of their visual field. The most common type of this condition – unilateral neglect – involves a loss of attention or vision on one side, usually the left. To understand why the left side of the body is typically affected, recall the concept of **hemispheric specialisation**.

5B THE HINDBRAIN, MIDBRAIN, FOREBRAIN AND CEREBRAL CORTEX LINK

As you learned in Chapter 5, some specialised functions of the body are primarily controlled by certain regions of the brain. Those specialised functions are considered to have hemispheric specialisation. For example, you may remember that the production of speech is largely controlled by **Broca's area**, located in the frontal lobe. Damage to that area of the brain can cause significant problems in speech production.

Hemispheric specialisation when one cerebral hemisphere has a specialised function that is not possessed, or is controlled to a lesser extent, by the other

Broca's area an area of the frontal lobe that is responsible for clear and fluent speech

In the case of the specialised function of distributing spatial attention (i.e. prioritising certain areas within the visual field to selectively process visual information), this is largely controlled by the right hemisphere of the brain. When damage is sustained to this part of the brain, spatial neglect can result. Specifically, the person loses the ability to attend to (and thus process stimuli from) certain areas of the body. The most common causes of brain injury leading to spatial neglect are stroke, disease and accidents.

Interestingly, research has found that while some people do experience neglect of taste sensation due to spatial neglect, the damage has to be significant to have a functional impact. This is because olfaction (smell) and taste are not dominated by any particular region of the brain, or by either hemisphere. That is, these functions do not have hemispheric specialisation. Therefore, even if only one nostril or part of the tongue is attending to the sensory stimuli, the sensory information can still be processed, and the taste can be perceived as normal.

Effect on perception

Experiencing spatial neglect can significantly affect one's quality of life due to the impairment of functioning. The inability to perceive part of their world means that people with this condition can be more prone to accidents (e.g. they may walk into things), and a noise coming from the affected side, or someone appearing from that side, may startle them. They may also overlook dressing part of their body (e.g. putting on their left sock and shoe), not perceive part of a meal and thus not eat it, or not understand a movie because they have only been able to perceive part of the screen. In some cases, the person may not be able to move or use the affected part or side of their body and may even deny that region exists. Figure 10C–4 shows how a person with unilateral spatial neglect affecting their left field of vision performed on a test that asked them to copy some images. Notice how they do not perceive, and thus do not draw, the left side of the images.

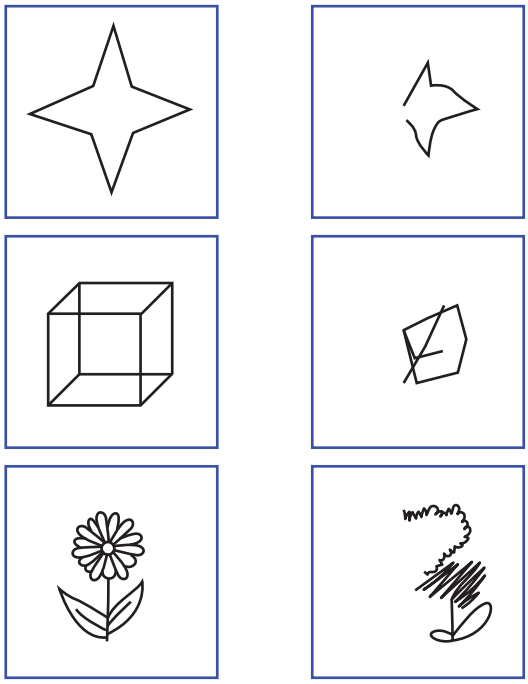


Figure 10C–4 A person with spatial neglect due to right hemisphere damage cannot perceive the left side of these images in the first column, and so cannot copy them, as shown by their attempts on the right.

ISBN 978-1-009-25401-4 Gallagher et al

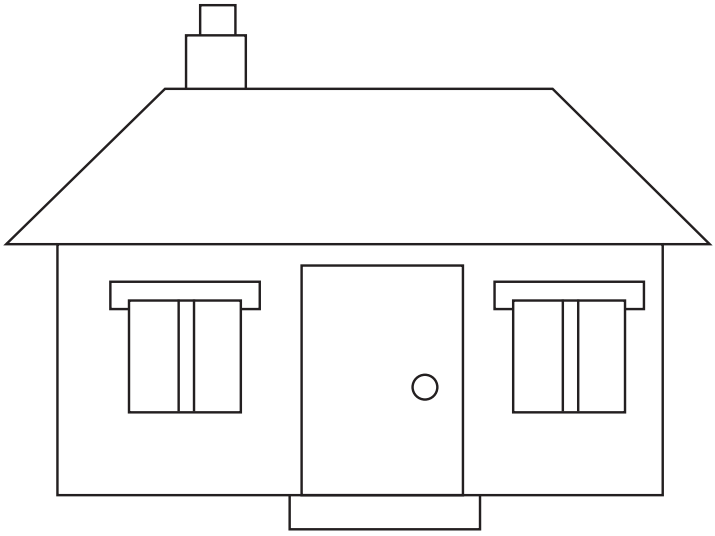
Treatment

LINK 6A NEURO-PLASTICITY

Spatial neglect, although disabling, is often temporary. As you learned in Chapter 6, neuroplasticity means that, with treatment, it is possible to reroute neural connections, to recover functioning. Available treatments focus on developing the person's ability to attend to the neglected region, although there is no recognised best way for achieving this. For example, a therapist might play a game with the person that involves them using their neglected limb, or in the case of a neglected arm, the good arm might be restricted in some way, encouraging the use of the neglected arm. To correct visual neglect, there is a treatment that involves the use of a prism lens on the right eye, which forces the wearer to look to the left, increasing attention to the neglected field of vision. Medicinal treatments, which usually involve the neurotransmitter dopamine, have returned mixed results. Overall, there is no universal approach to therapy.

Check-in questions – Set 2

1 A patient with visual spatial neglect affecting their left field of vision was given this picture of a house to copy. Sketch the drawing they are likely to make.



WORKSHEET 10C–1 SPATIAL NEGLECT

2 Give two examples of how visual spatial neglect can affect functioning.
3 What is the overall aim of treatment for spatial neglect?
4 Describe one of the treatment options available for spatial neglect.

10C SKILLS

VIDEO 10C–1 SKILLS: VCE ANNOTATING AND TIMING RESPONSES

VCE annotating and timing responses

When you first read a question, it is important to use your time efficiently by identifying the command term, the context, the key psychological context and the number of marks allocated. It is recommended that you highlight or underline these key elements on the physical question. This prompts you to address each one. You should also make some notes on what you plan to address in your question and perhaps also on how you will structure the question.

In general, you should plan to spend approximately one minute per mark allocated to a question. So, if a question has been allocated 2 marks, you should aim to spend no more than 2 minutes responding to that question.

ISBN 978-1-009-25401-4 Gallagher et al

Consider the following example question from a previous exam.

1 Josie was diagnosed with spatial neglect syndrome after suffering a stroke.

Which part of Josie's brain (lobe and hemisphere) was most likely to be damaged? (2 marks)

Key elements of the question

1 Josie was diagnosed with spatial neglect syndrome after suffering a stroke.

Which part of Josie's brain (lobe and hemisphere) was most likely to be damaged? (2 marks)

Command term: 'which part' (identify). You will need to identify the lobe and hemisphere most likely to have been damaged.

Context: Josie suffered a stroke. Now she has spatial neglect.

Key psychological terminology: spatial neglect syndrome and parts of the brain

Marks allocated: 2 marks (roughly two minutes to respond)

Marking guide

- One mark was awarded for identifying the parietal lobe or the frontal lobe.
- One mark was awarded for the right hemisphere.

Let's look at another question:

2 An occupational therapist placed Josie's right arm in a sling.

Why might the occupational therapist use a sling to treat Josie's spatial neglect syndrome? (2 marks)

Key elements of the question

2 An occupational therapist placed Josie's right arm in a sling.

Why might the occupational therapist use a sling to treat Josie's spatial neglect syndrome? (2 marks)

Command term: 'why' (explain). You will need to explain using a sling as a treatment for spatial neglect.

Context: Josie is seeking treatment from an occupational therapist.

Key psychological terminology: spatial neglect syndrome and treatment

Marks allocated: 2 marks (roughly two minutes to respond)

Marking guide

- One mark was awarded for identifying that Josie's spatial neglect most likely affected the left region of space.
- One mark was awarded for explaining that restricting the right arm in a sling would force Josie to attend to and use her left arm, increasing her attention to the neglected side of her body.

ISBN 978-1-009-25401-4 Gallagher et al

10C KEY SCIENCE SKILLS

VIDEO 10C–2 KEY SCIENCE SKILLS: APPLYING ETHICS TO RESEARCH SCENARIOS

Applying ethics to research scenarios

In VCE Psychology, you may be asked to analyse and evaluate a piece of research or an experiment in terms of the application of ethical principles and/or guidelines. Let's consider a typical example.

Question

A researcher is interested in studying the effects of being a supertaster on the ability to enjoy food. She advertises for participants from the psychology department at the university at which she lectures. Participants are paid a small fee and given a credit towards their psychology coursework. The researcher informs them that the experimental group will be given food with intense flavours, and that it is vital that participants stay until the end of the experiment. She is pleased to obtain a sufficient number of participants for her experiment. She carries out her experiment and conducts a debriefing session.

Name one ethical guideline the researcher has broken in the conduct of her experiment and explain how she has broken this guideline.

Key points to remember

The question asks you to identify one ethical guideline and explain how it was broken with reference to the scenario.

Suggested response

Voluntary participation was broken, as the participants were pressured to take part in the experiment because of the incentive offered (money and credit towards coursework). For participation to be voluntary, the participant must be able to freely agree to participate in a study, with no pressure or coercion.

OR

Withdrawal rights were broken, as the participants were told that they could not withdraw from the experiment. To maintain ethics, participants must be free to discontinue their involvement in a study at any point during or after the conclusion of the study, without receiving any penalty.

Section 10C questions

1 Name and describe two types of synaesthesia.
2 Why is synaesthesia considered a perceptual distortion rather than a perceptual disorder?
3 Describe grapheme–colour synaesthesia, including its possible cognitive benefits.
4 Define spatial neglect.
5 What are the most common causes of spatial neglect?
6 How does spatial neglect affect an individual's perception?

ISBN 978-1-009-25401-4 Gallagher et al

Chapter 10 review

Summary

Create your own set of summary notes for this chapter on paper or in a digital document. A model summary is provided in the Teacher Resources which can be used to compare with yours.

Checklist

In the Interactive Textbook, the success criteria are linked from the review questions and will be automatically ticked when answers are correct. Alternatively, print or photocopy this page and tick the boxes when you have answered the corresponding questions correctly.

Success criteria – I am now able to:		Linked questions
10A.1	Understand that the visual perceptual system is fallible	1☐
10A.2	Explain what is meant by visual illusion and provide examples that illustrate the fallibility of the visual perceptual system	2☐, 3☐, 4☐, 12☐
10A.3	Explain the term agnosia, with examples	5☐, 6☐
10A.4	Explain how visual agnosia demonstrates that the visual perceptual system is fallible	7☐, 14☐
10B.1	Understand that gustatory perception is fallible	11☐
10B.2	Explain what is meant by a supertaster and how it illustrates the fallibility of gustatory perception	10☐, 17☐
10B.3	Describe what miraculin is and how it illustrates the fallibility of gustatory perception	11☐
10B.4	Describe how judgement of flavours is influenced by the fallibility of gustatory perception	18a☐, b☐
10C.1	Understand that healthy individuals can have distortions of their perception of taste and vision	13☐, 16b☐, 17☐
10C.2	Describe synaesthesia and explain how it can distort perception of taste and vision	8☐, 16a☐, 19☐
10C.3	Describe spatial neglect and explain how it can distort perception	9☐, 15☐

Key Science Skills

Skills	Questions and Skills boxes
Use appropriate psychological terminology, representations and conventions, including standard abbreviations, graphing conventions and units of measurement	Activity 10B–1
Discuss relevant psychological information, ideas, concepts, theories and models and the connections between them	Activity 10A–1, 10A–2 10C Skills
Analyse and explain how models and theories are used to organise and understand observed phenomena and concepts related to psychology, identifying limitations of selected models/theories	Chapter review – 12

ISBN 978-1-009-25401-4 Gallagher et al

Skills	Questions and Skills boxes
Critically evaluate and interpret a range of scientific and media texts (including journal articles, mass media communications and opinions in the public domain), processes, claims and conclusions related to psychology by considering the quality of available evidence	Activity 10A–2 10B Skills
Analyse and evaluate psychological issues using relevant ethical concepts and guidelines, including the influence of social, economic, legal and political factors relevant to the selected issue	10C Key Science Skills
Use clear, coherent and concise expression to communicate to specific audiences and for specific purposes in appropriate scientific genres, including scientific reports and posters	Activity 10A–2, 10B–1 10A Skills
Acknowledge sources of information and assistance, and use standard scientific referencing conventions	Activity 10A–2

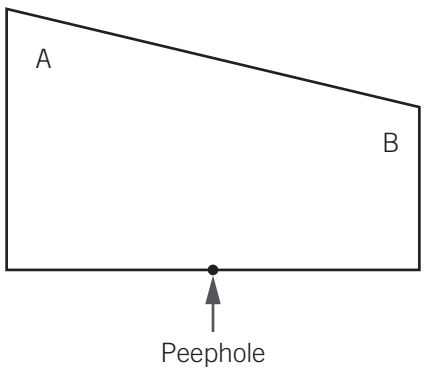
Multiple-choice questions

1 Visual illusions demonstrate that our perceptions
- **A** are produced by stimuli.
- **B** are never reliable.
- **C** are perfect.
- **D** are fallible.

2 A visual illusion is
- **A** created by a misinterpretation (distortion or mistake) of the reality of a visual stimulus.
- **B** the result of a malfunctioning brain.
- **C** caused by the influence of other senses on visual sensory input.
- **D** a symptom of a mental disorder.

Use the following information to answer Questions 3–4.

The following diagram represents the floor plan of an Ames room.



An observer views the Ames room through the peephole. Yuta walks from position A to position B in the Ames room.

3 According to the Ames room illusion, when Yuta is at position A, he is perceived as being _____ than when at position B.
- **A** further away
- **B** closer
- **C** smaller
- **D** bigger

ISBN 978-1-009-25401-4 Gallagher et al

4 Yuta _____ when at position A compared to position B.
- **A** casts a larger retinal image
- **B** casts a smaller retinal image
- **C** casts the same sized retinal image
- **D** does not cast a retinal image

5 Which perceptual system can agnosia affect?
- **A** visual perceptual system
- **B** auditory perceptual system
- **C** olfactory perceptual system
- **D** all of the above

6 Which of the following is an example of agnosia?
- **A** Oni dislikes coffee because she finds bitter tastes overwhelming.
- **B** Since suffering a head injury, Lucas cannot attend to anything on his left side.
- **C** Finn knows what his favourite jumper feels like, but he cannot identify it by sight.
- **D** Megan loves music and experiences her favourite songs as swirling rainbow colours.

7 Apperceptive visual agnosia is
- **A** a fallibility in visual perception due to a physiological problem with the eyes.
- **B** a fallibility in visual perception despite no visual impairment or problem with memory, attention or language.
- **C** not being able to perceive part of the visual field.
- **D** the process by which visual stimuli are perceived.

8 Which of the following is not an example of synaesthesia?
- **A** hearing a day of the week and perceiving it to have a personality
- **B** seeing the number 4 and perceiving it as green
- **C** hearing a sound and perceiving it in the same way as the majority of people
- **D** hearing a sound and perceiving it as having a distinct taste

9 Spatial neglect refers to
- **A** partial blindness due to brain damage.
- **B** being unable to see or sense objects or parts of the body, usually on the left side of the body.
- **C** a permanent loss of ability to move parts of the left side of the body after a stroke.
- **D** the two hemispheres of the brain not communicating with each other.

10 The existence of supertasters demonstrates
- **A** that gustatory perception is fallible because the majority of people are not supertasters.
- **B** that people can be tricked into wrongly identifying a taste.
- **C** that gustatory perception is fallible because supertasters do not always perceive flavours the same as the majority of people.
- **D** that gustatory perception can be changed by the appearance of food.

11 Miraculin is a protein that
- **A** enhances flavour by chemically changing the foods we eat.
- **B** adds sweet and sour flavours to food.
- **C** is tasteless but causes salty stimuli to be perceived as sweet.
- **D** is tasteless but causes sour stimuli to be perceived as sweet.

ISBN 978-1-009-25401-4 Gallagher et al

Short-answer questions

12 Name one theory that has been used to explain the Müller-Lyer illusion and describe what it proposes. (2 marks)

13 What is the spinning dancer illusion, and what does it tell us about the fallibility of perception? (2 marks)

14 How does apperceptive visual agnosia impact visual perception? Give an example not found in the text. (2 marks)

15 Johann has been diagnosed with spatial neglect affecting the left side of his body and his left visual field. What problems may Johann experience when eating and getting ready in the morning? (2 marks)

16 For as long as she can remember, whenever Rita hears certain words, she experiences a taste sensation.

a What condition does Rita have? What sensory systems are affected and how? (2 marks)

b Is Rita's condition considered a perceptual disorder? Why or why not? (1 mark)

17 What is a supertaster, and what is a biological explanation of their ability? (2 marks)

18 Read this abstract from an academic paper that describes a laboratory exercise that uses miracle fruit to educate students about the sensation and perception of taste. Then answer the following questions.

'Miracle Fruit' is a taste-altering berry that causes sour foods to be perceived as sweet. ... Here we provide a step-by-step explanation of the methodology, and an example of data collected and analysed by one group of students who participated in this laboratory exercise. The origins of the miracle fruit, the structure and the physiological function of miraculin (the glycoprotein responsible for the taste-modifying effect found in the pulp of the miracle fruit) were discussed before the laboratory exercise. Students then sampled foods known to target different types of tastes (i.e. sweet, sour, bitter and salty) and rated their perception of taste intensity for each food item. Next, students each consumed miracle fruit berries, then resampled each original food item and again recorded their perception of taste intensity ratings for these foods. The data confirmed that the bitter food items were perceived as less intense after the miracle fruit was consumed. The students also completed a written assignment to assess what they learned about the origins, structure and physiological function of miracle fruit. This hands-on laboratory exercise received positive feedback from students. The exercise can be used by other neuroscience educators to teach concepts related to the sensory system of taste.

a Using your understanding of miraculin and its effects on gustation, explain how the fallibility of the gustatory perceptual system was observed in the above study. (2 marks)

b Identify the limitations of using miraculin to distort taste perception. (1 mark)

19 Define synaesthesia, name a type of synaesthesia and give an example of how an individual's visual perception may be affected. (3 marks)

ISBN 978-1-009-25401-4 Gallagher et al

Unit 2 Revision exercise

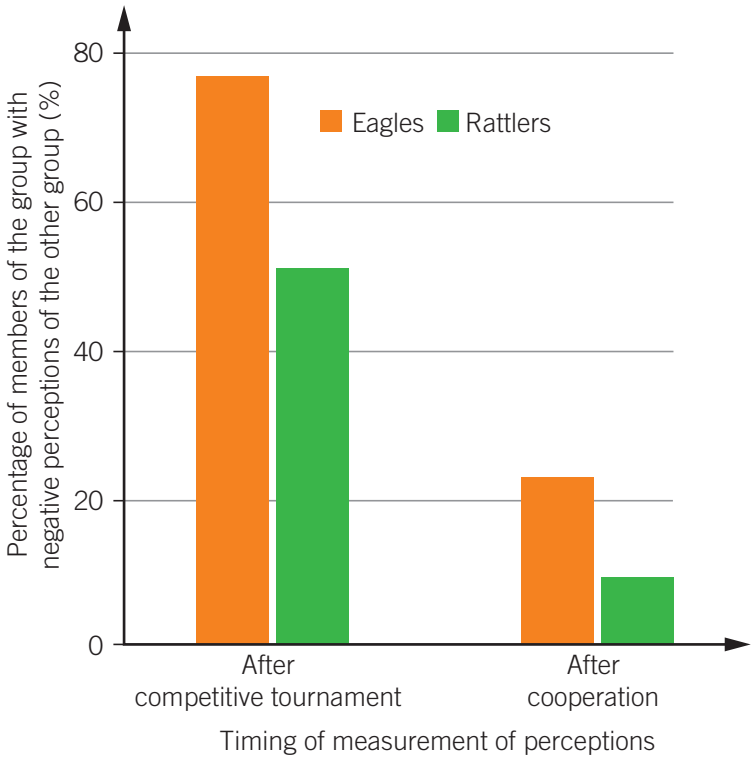
Multiple-choice questions

1 Discrimination is best described as
- **A** a complex form of an attitude.
- **B** an action that assists us to understand what our attitude is.
- **C** an action that reflects our attitude.
- **D** a behaviour that is directed towards a particular group or individual.

2 Factors that contribute to attitude formation include
- **A** direct experience, parents and exposure to media.
- **B** parents, level of education and family size.
- **C** the types of exercise you do, parents and media.
- **D** media, parents and positive feedback on certain behaviours.

3 Superordinate goals are
- **A** goals that are very difficult to achieve.
- **B** shared goals that people cannot achieve alone or without another person or a group.
- **C** shared goals that one group tends to solve while the other group provides support.
- **D** goals that are long term but achievable.

4 The Robber's Cave experiment was conducted by social psychologist Muzafer Sherif in the 1950s. Sherif conducted a field experiment at Robber's Cave State Park in Oklahoma, using 22 adolescent males split into two groups, the Eagles and the Rattlers. Once the participants had become attached to their own groups, Sherif arranged for a competitive tournament between them, then measured the percentage of members of each group that had a negative perception of the other group. He then arranged for cooperative activities between the groups, and again measured the percentage of members of each group that had a negative perception of the other group. Sherif graphed the results of his experiment below. The title of the graph is not shown. Which of the following best describes what this graph shows?



- **A** The Eagles displayed a lower percentage of negative perceptions of the outgroup after the cooperative activity compared to the Rattlers.
- **B** After both groups engaged in cooperative activities, the percentage of negative perceptions of the outgroup was reduced in comparison to after both groups engaged in competitive activities.
- **C** The Rattlers displayed a higher percentage of negative perceptions of the outgroup after competitive activities compared to the Eagles.
- **D** After both groups engaged in cooperative activities, the percentage of negative perceptions of the outgroup was increased in comparison to after both groups engaged in competitive activities.

ISBN 978-1-009-25401-4 Gallagher et al

5 Soo-jin takes her son to the hairdresser and tells the stylist to give him a 'Harry Styles' haircut. In this scenario, Soo-jin is being influenced by _____ power.
- **A** coercive
- **B** legitimate
- **C** referent
- **D** reward

6 Which of the following statements about status and power in the Stanford Prison Experiment is most correct?
- **A** To help create feelings of lower status, the prisoners were stripped naked and sprayed for lice when they entered the prison.
- **B** The prison guards did not hold coercive or reward power.
- **C** The prisoners quickly established a higher status than the guards.
- **D** The individuals who had a higher status at the university were assigned the role of prison guards.

Use the following information to answer Questions 7–8.

Sarah decided to conduct an experiment to test whether the presence of an authority figure influenced levels of obedience in 18–20-year-olds. One of the rules at her university is that no graffiti is allowed on desks. Sarah asked her university professor to be a confederate in her study. At the beginning of the next lecture, the university professor instructed all students to graffiti their desks. Sarah then discreetly recorded how many students broke the university rules and drew on their desks. The results showed that 112 desks out of the 200 that were used had been graffitied by the end of the lecture.

7 The independent variable in this study was
- **A** breaking the rules.
- **B** the number of students who had graffiti on their desk.
- **C** the presence of an authority figure.
- **D** the class members.

8 Which of the statements regarding external validity in this study is correct?
- **A** There is high external validity because Sarah had a large sample size.
- **B** There is low external validity because Sarah used a convenience sample.
- **C** There is high external validity because Sarah controlled for demand characteristics.
- **D** There is low external validity because Sarah used a repeated measures design.

9 Sophie was at VicRoads doing her hazard perception driving test. Nearby in the same room, a woman waiting in line was trying to calm her crying baby. Despite the noise, Sophie was able to focus and concentrate on doing the driving test without being distracted. In terms of awareness, which of the following was Sophie using to focus on the driving test?
- **A** sustained attention
- **B** divided attention
- **C** selective attention
- **D** awareness

10 Which of the following factors would not be identified as a biological influence on an individual's taste perception?
- **A** older age
- **B** having COVID-19 or another illness
- **C** being pregnant
- **D** family upbringing

ISBN 978-1-009-25401-4 Gallagher et al

11 When Gerald looks at his daughter dancing around the house, he perceives her as remaining the same size and having the same body shape, despite the images sent to his brain changing as she moves behind walls, through doors and around furniture. This can be explained by
- **A** perceptual constancy.
- **B** Gestalt principles.
- **C** songlines.
- **D** convergence.

12 Marten would like to carry out an experiment that tests the effect of context on perceptual set. He plans to test a sample of students and then generalise the results to all the VCE students at his school. Which of the following methods for selecting participants is most likely to produce a sample that is representative of the population?
- **A** Use the first 50 VCE students who respond to a post on the school's Facebook page.
- **B** Select the first 50 VCE students who walk into the library during lunchtime.
- **C** Test all 20 students in his VCE Psychology class.
- **D** Generate a random list of 25 names from a list of all VCE students in the school.

13 Which statement best describes the effect of miraculin on the sense of taste?
- **A** When a sour stimulus is tasted, it is perceived as sweet.
- **B** When a sweet stimulus is tasted, it is perceived as sour.
- **C** When a sour stimulus is tasted, it is not perceived.
- **D** When a sweet stimulus is tasted, it is not perceived.

14 Which of the following is not a possible treatment option for Hadassah, who has spatial neglect?
- **A** Hadassah's therapist might play a game with her that involves Hadassah using her neglected limb.
- **B** Hadassah's good arm might be restricted in some way, encouraging the use of her neglected arm.
- **C** Hadassah will use specially coloured glasses to help focus images on her retina.
- **D** Hadassah will use a prism lens on her right eye, forcing her to look to her left to increase her attention to the neglected field of vision.

15 Marco is a supertaster and Maria is a non-taster. They both decide to try beer for the first time. They order the same kind of beer, and it has quite a bitter flavour. How might their perceptions of the taste of the beer differ?
- **A** Marco would like the beer and Maria would not.
- **B** Marco would perceive the beer as quite bitter and may not enjoy the taste. Maria would be less sensitive to the bitter taste, so she is less likely to dislike the taste of the beer.
- **C** Marco would perceive the beer as quite sweet and may enjoy the taste. Maria would be less sensitive to the sweet taste, so she wouldn't enjoy the taste as much.
- **D** Marco would be less sensitive to the bitter taste, so he is less likely to dislike the taste of the beer. Maria would perceive the beer as quite bitter and may not enjoy the taste.

ISBN 978-1-009-25401-4 Gallagher et al

16 Agnosia can be explained as a disorder in which an individual
- **A** can recognise or identify an object, person or sound, but has impairments of their sensory system.
- **B** is not able to recognise or identify an object, person or sound, despite no impairments of their sensory system.
- **C** can recognise or identify an object, person or sound, and has no impairments of their sensory system.
- **D** is not able to recognise or identify an object, person or sound due to impairments of their sensory system.

Short-answer questions

17 Danial is visiting a new dentist, Dr Liam, for the first time. Danial forms the impression that he really likes Dr Liam. Dr Liam is friendly, well dressed and has a soothing voice. Therefore, Danial interprets Dr Liam as being likeable.
- **a** Explain how Danial has formed an impression of Liam, with reference to saliency. (2 marks)
- **b** Identify and explain the cognitive bias that has resulted in Danial interpreting Dr Liam as being likeable. (3 marks)
- **c** A friend of Danial is looking for a new dentist and Danial recommends Dr Liam. With reference to the availability heuristic, explain why Danial was likely to recommend Dr Liam. (2 marks)

18 Pavan is an 85-year-old man who lives in a retirement village next door to a high school. He has long considered the students at the school to be rude and selfish. But then, the Year 10 students from the school start to help out around the retirement village as a form of community service. Pavan is surprised to find that the students are polite and well-behaved and, after several weeks of spending time with them, he changes his previously negative view.
- **a** With reference to the tri-component model of attitudes, outline the affective, behavioural and cognitive components of Pavan's new attitude of the Year 10 students. (3 marks)
- **b** Identify one limitation of the tri-component model. (1 mark)
- **c** Initially, when he started spending time with the Year 10 students, Pavan felt uncomfortable due to his conflicting beliefs about them. Identify the psychological concept that Pavan was experiencing. (1 mark)
- **d** Explain how confirmation bias may have supported Pavan's previously negative beliefs about Year 10 students. (2 marks)

19 Tiffany is researching the effect of group pressure on conformity in social situations. She designs an experiment in which five members of her Psychology class stand outside, point up into the sky and claim they can see a bright moving light, which is clearly not there. The participant then enters the group and Tiffany records whether group pressure changes their response. The results showed that out of ten participants, seven of them reported seeing a bright light.
- **a** Define the term conformity. (1 mark)
- **b** Comment on Tiffany's results in relation to Asch's experiment. (2 marks)
- **c** Explain Tiffany's results with reference to group size. (2 marks)
- **d** Three participants in Tiffany's study did not change their response due to group pressure. Explain why this may have occurred, with reference to independence and anti-conformity. (4 marks)

ISBN 978-1-009-25401-4 Gallagher et al

20 Ava is normally very well behaved. She recently went to a multi-day festival with a big group of friends. On the first day of the festival, her friends decided to play a joke on a group of boys camped near them; they would start throwing things at the boys, which the boys didn't seem to enjoy. Ava was reluctant to join in at first. She thought throwing things at the boys was wrong. But eventually, she started joining in with her friends. By the second day of the festival, she was an active participant in throwing things at the boys.

a With reference to psychological concepts, provide two explanations for why Ava joined in on throwing things at the group of boys on the second day. (4 marks)

b Ava's friend Joanna was unable to attend the festival. When she saw the photos Ava had posted on social media, she felt quite sad. With reference to social comparison, outline two reasons Joanna might have experienced negative feelings when seeing Ava's photos. (2 marks)

21 Late one night, Fen and Jordan are heading home from a party. Suddenly, there is a flash of light in the sky. Fen instantly recognises the light as a shooting star. She has seen them before when camping with her father. Jordan, on the other hand, marvels at the strange phenomenon of the bright moving light standing out against the stillness of the night sky.

a Identify and describe the type of processing Fen used to perceive a shooting star in the sky. (2 marks)

b Jordan has never seen a shooting star before. Explain how he used bottom-up processing to form an interpretation of what he saw. (2 marks)

c If a researcher wanted to conduct an experiment testing the effects of top-down processing on how a bright light moving across the image of a night sky is perceived, what would be an appropriate hypothesis? (2 marks)

ISBN 978-1-009-25401-4 Gallagher et al

Glossary

Ablation
the surgical removal or destruction of tissue (e.g. brain tissue) by lesioning or using electrodes

Abnormality
behaviours that are unusual, bizarre, atypical or out of the ordinary

Abstract
a section of a scientific report that is a concise summary of the whole investigation

Abstract thinking
a way of thinking that is not reliant on directly observing, visualising, experiencing or manipulating something to understand it

Accommodation (in learning)
a cognitive process that involves changing or adjusting existing ideas to deal with new situations

Accommodation (in science)
the ability of the eye to change focus from near to distant objects and back again

Accuracy
how close a measurement is to the true value of the quantity being measured

Acquired brain injury (ABI)
an injury resulting from damage to the brain occurring after birth, at any time during life

Actor–observer bias
the tendency to attribute our own behaviour to situational (external) causes, but to attribute the behaviour of others to their internal factors

Adaptive
a term used by psychologists to describe emotions, behaviours and cognitions that enable us to adjust to our environment appropriately and cope most effectively

Adaptive cognitions
ways of thinking that are of benefit to our survival and wellbeing

Addiction
the state in which a person feels an uncontrolled motivation to perform certain behaviours (e.g. online behaviours) and devotes so much time and effort to these behaviours that it impairs their other important life areas

Advertising
the activity and industry of creating messages and using different psychological techniques to promote or sell a product, service or idea

Affect
an emotional response (in the field of psychology)

Affect heuristic
a mental shortcut based on a person's current emotional state

Affective component
the emotional component of attitudes, involving how you feel about people, objects, places, events or ideas

Ageism
a type of prejudice or discrimination based on a person's age

Agnosia
a brain disorder that interferes with one's ability to recognise or identify objects, people or sounds using one or more of the senses, despite the affected sensory system being otherwise fully functioning

Alertness
the ability to be vigilant and to sustain focus

Allocation
dividing a sample into groups in an investigation

Ames room
a specially constructed, trapezoid-shaped room, designed to create the visual illusion that it is rectangular, for an observer viewing the room through a peephole

Anchoring bias
the tendency to rely too heavily on the first piece of information that we learn when we make decisions

Anecdote
a short personal account of an event

Animism
the belief that inanimate objects have feelings and intentions

Anti-conformity
deliberate behaviour that acts against the position of one or more people

ISBN 978-1-009-25401-4

Aphasia
an acquired language disorder resulting from damage to the language-processing centres of the brain

Apparent distance theory
the theory that, if two objects cast the same-sized retinal image, but one is perceived to be further away, our brain interprets the more distant object as being larger

Apperceptive visual agnosia
an inability to recognise familiar visual stimuli due to problems with processing perceptions

Assimilation
a cognitive process that involves taking a new concept and fitting it into or making it part of a pre-existing mental idea or structure

Associative visual agnosia
an inability to recognise familiar visual stimuli, despite having no problems with perception

Attachment
a close, social and emotional bond between an infant and their caregivers

Attention
the level of awareness directed towards certain stimuli to the exclusion of others

Attentional bias
our tendency to pay attention to some things and ignore others, thereby limiting our options

Attitude
an evaluation that a person makes about other people, objects, issues or any other thing

Attributions
inferences that we make about the causes of events and behaviours (both our own and those of others)

Atypical behaviours
patterns of behaviour that are not expected for an individual or that deviate from the norm and can be harmful or distressing for the individual and those around them

Atypical development
when behaviours, skills or abilities fall outside the expected range of development or progress at a different pace compared to similar-aged peers

Automatic cognitive process
a task that requires a low level of conscious awareness or mental effort

Autonomic nervous system
connects the CNS to the organs and glands of the body

Availability heuristic
a mental shortcut that uses the first thoughts that come to a person's mind when they are evaluating an issue or deciding what to do

Axon
a fibre that transmits nerve signals

Axon terminals
structures at the end of the axon that store and release neurotransmitters

Bar chart
a way to display data with discrete categories

Behavioural component
the action component of attitudes, involving what you do (or do not do) as an expression of your attitude

Beneficence
an ethical concept involving the commitment to maximising benefits and minimising risks and harms

Between subjects design
an investigation design in which participants are randomly allocated to either the control or the experimental condition

Bias
a disproportionate weight in favour of or against an idea or thing, usually in a way that is closed-minded, prejudicial or unfair often leading to error

Binocular depth cues
depth cues that require both eyes to send information to the brain to perceive depth

Biological depth cues
a physiological signal or piece of information that helps us to determine how near or far an object is from another object or ourselves

Biological factors
a range of factors that relate to the physiological functioning of the body

Biopsychosocial approach
considers a person's development and mental wellbeing as influenced by the interactions between biological, psychological and social factors

ISBN 978-1-009-25401-4

Biopsychosocial model
an interdisciplinary model that looks at the interconnection between biology, psychology and social factors

Bistable perception
the ability to spontaneously switch between different interpretations of the same ambiguous visual stimulus

Body language
non-verbal communication in which physical behaviour and movement rather than words are used to express or deliver a certain message

Bottom-up processing
the processing of sensory information beginning with salient sensory data, which is then integrated to form a bigger picture

Brain–heart debate
the question of whether our thoughts, feelings and behaviours originate from our brain or our heart

Broca's aphasia
an acquired language disorder characterised by difficulty producing fluent speech

Broca's area
an area of the frontal lobe that is responsible for clear and fluent speech

Camouflage
when a figure appears to mix with the background

Carpentered-world hypothesis
the theory that the two figures in the Müller-Lyer illusion represent three-dimensional objects viewed in our environment, for example, a Western rectangular house

Case study
an investigation of a particular activity, behaviour, event or problem that contains a real or hypothetical situation and includes real-world complexities

Central coherence
the ability to derive overall meaning from a mass of details

Central nervous system (CNS)
the brain and spinal cord; transmits information to, and receives information from, the peripheral nervous system

Cerebellum
an area of the hindbrain involved in coordinating movements and in learning and memory

Cerebral cortex
the thin layer of neurons covering the outer region of the cerebrum, characterised by extensive folding

Cerebral hemispheres
located on the left and right sides of the brain, these areas control motor and sensory functions on opposite sides of the body

Cerebrum
an area of the forebrain that directs conscious motor activity and receives and processes sensory information

Chronic traumatic encephalopathy (CTE)
a neurodegenerative disease linked to repeated impacts to the head

Classification
the ability to sort objects into groups based on their features

Classification and identification
an investigation that involves arranging phenomena, objects or events into manageable sets, and recognising phenomena as belonging to a particular set or part of a new or unique set

Closure
our ability to fill in or ignore gaps in visual stimuli and perceive objects as a meaningful whole

Cognitions
cognitive processes or mental actions that involve acquiring, processing and understanding information or knowledge

Cognitive behavioural therapy
psychological treatment that targets the relationship between maladaptive thoughts, feelings and behaviours

Cognitive bias
a systematic error in thinking generally due to oversimplifying the information available

Cognitive component
the mental component of attitudes, involving the beliefs or thoughts that you have about people, objects, places, events or ideas

Cognitive development
changes in an individual's mental abilities

Cognitive dissonance
the discomfort that people experience when they have conflicting beliefs or when their behaviours contradict their beliefs

ISBN 978-1-009-25401-4

Cognitive load
the amount of information that our working memory can hold at any given time

Collective
a collection of people who exert minimal influence on each other and don't interact with every other person in the collection

Collectivist cultures
cultures that emphasise the needs and goals of the group as a whole over the needs and desires of each individual

Computerised tomography (CT)
an imaging technique that combines a series of x-ray images taken from different angles to create cross-sectional images of the body

Conclusion
a statement about the findings of a study, which addresses the aim and hypothesis

Concussion
a mild form of traumatic brain injury, resulting from an external force to the head or body that causes the brain to bounce inside the skull

Confederate
in an experiment, someone who is part of the team of experimenters but pretends to be the subject of the experiment (or neutral)

Confidentiality
an ethical guideline that ensures participants remain anonymous, and their personal information is kept private, protected and secure throughout the study

Confirmation bias
the tendency to seek, favour or remember information that supports an existing belief rather than contrary information

Conformity
the process by which people modify their ideas, attitudes, behaviours or perceptions to more closely reflect those held by groups to which they belong or aspire to belong

Confounding variable
an unwanted variable that has affected the results of an investigation

Conservation
the understanding that certain qualities of an object remain the same even when its appearance changes

Contact hypothesis
a hypothesis stating that social contact between social groups is enough to reduce inter-group prejudice

Context
the situation or conditions in which something occurs

Contradictory data
data that appears incorrect

Control group
the group that forms a baseline level to compare the experimental group with

Controlled cognitive process
a cognitive task that requires a high level of conscious awareness and mental effort

Controlled experiment
an experimental investigation of the relationship between one or more independent variables and a dependent variable, in which all other variables are controlled

Controlled variable
a variable that is held constant to ensure that the only influence on the dependent variable is the independent variable

Convergence
a biological depth cue that involves the brain interpreting tension changes in the muscles around the eyes

Correlational study
an investigation that involves planned observation and recording of events and behaviours that have not been manipulated or controlled to understand the relationships or associations existing between variables, to identify which factors may be of greater importance, and to make predictions

Critical period
a specific period in development during which the individual is most vulnerable to the absence of certain environmental stimuli or experiences

Cultural perspectives
a criterion for determining whether a behaviour is typical or atypical, by accounting for cultural norms or societal standards

Cultural responsiveness
respect for, and relevance to, the health beliefs, health practices, culture and linguistic needs of diverse populations and communities

Culture
the many characteristics of a group of people, including their attitudes, behaviours, customs and values, that are transmitted from one generation to the next

ISBN 978-1-009-25401-4

Debriefing
an ethical guideline involving provision of information to participants at the end of the study, including the true aims, results and conclusions, and answering any questions, clarifying misunderstandings or deception, and providing support to ensure no lasting harm

Deception in research
an ethical guideline involving withholding the true nature of the study from participants, when their knowledge of the true purpose may affect their behaviour and subsequent validity of the investigation

Deindividuation
when people act a certain way because of the anonymity (loss of identity) that a group provides

Dendrite
a projection of a neuron that typically branches from the cell body and is able to receive information from other neurons

Dependent variable
the variable that is being measured by the researcher

Depth perception
the ability to judge distances and see the world in three dimensions

Deviate
in Schachter's 1951 experiment, a group member who took the opposing view to the group's general opinion

Direct discrimination
the unfavourable treatment of a person due to a personal characteristic protected by law (e.g. age, sex, marital status or sexual orientation)

Discrimination
a negative behaviour directed towards a specific group or individual of the group based only on their membership of the group

Discussion section
a section of a scientific report that analyses the findings and concludes the research

Divided attention
distributing attention to allow the processing of two or more stimuli at the same time

Dopamine
a naturally occurring 'feel-good' chemical that motivates us to do what we think will bring us pleasure

Downward social comparison
a behaviour in which we compare ourselves to someone we perceive to be worse than we are

Dunning–Kruger effect
a cognitive bias in which people with low skills or ability in a specific area overestimate their abilities and performance, while people with high skills or ability underestimate their abilities and performance

Egocentrism
a limited ability to share or appreciate someone else's point of view

Electrodes
small wires used to electrically stimulate biological tissues or measure electrical activity in these tissues

Emotional development
changes in how a person experiences, interprets and expresses the full range of emotions, and their ability to cope with them appropriately

Emotional wellbeing
the ability to feel a range of emotions and express these in a positive way

Emotions
feelings that arise from our circumstances, mood or relationships with others

Environmental factors
different external influences within a person's environment that can affect their development

Epilepsy
a neurological disorder that causes sudden, intense bursts of brain activity, resulting in seizures

Equality
the state of being on the same level as one another, with neither group having more or less status or power than the other

Equipotentiality
the ability of healthy areas of the cortex to take over the functions of injured parts

Ethical concept
general ethical considerations that are used to analyse the ethical and moral conduct surrounding psychological issues and psychological investigations

ISBN 978-1-009-25401-4

Ethical guidelines
guidelines that ensure the protection and welfare of all participants in research

Ethical principle
a general principle used to analyse the ethical and moral conduct surrounding psychological issues and psychological investigations

Evidence
a verified fact

Executive function
a cognitive process that helps us to set goals, organise and plan, focus our attention and ultimately get things done

Experience-dependent plasticity
a type of plasticity that involves the unique and personal brain changes that take place when different situations occur

Experience-expectant plasticity
a type of plasticity that involves brain development triggered by specific environmental cues that the brain expects to encounter at certain times

Experience-independent plasticity
a type of plasticity that involves brain changes that occur regardless of experience

Experimental group
the group that is exposed to the independent variable and receives the experimental treatment

Extended-contact hypothesis
the idea that when members of an ingroup see that one of their own has a close relationship with an outgroup member, it can lead to more positive attitudes towards that outgroup

External validity
whether the results of research can be applied to similar individuals in a different setting

Extraneous variable
a variable other than the independent variable that may have an unwanted effect on the dependent variable and results of an investigation

False-consensus bias
the tendency to overestimate how much others share our opinions or beliefs

Fear of missing out (FOMO)
the extreme fear of not being included in or missing a social event

Fieldwork
a type of investigation that involves collecting information through observing and interacting with a selected environment

Figure–ground
the tendency to perceive part of a visual stimulus as more relevant (the figure) and standing out against its less relevant surroundings (the ground)

Food culture
the attitudes, behaviours, customs and values around food with which we were raised

Forebrain
the area of the brain that includes the cerebrum, thalamus, hypothalamus, pineal gland and limbic system, and which is involved in coordinating brain activity

Frontal lobe
an area of the brain that plays an important role in planning, sequencing and executing voluntary movement

Functional fixedness
a cognitive bias involving the tendency to regard objects as only having one function or as working in a specific way

Functional magnetic resonance imaging (fMRI)
a type of MRI that shows brain activity by measuring oxygen consumption in the brain, with the assumption that active areas consume more oxygen

Fundamental attribution error
the tendency to overemphasise personal characteristics and ignore situational factors when judging the behaviour of other people

Genes
the basic units of heredity or inheritance that contain genetic information and form a section of DNA

Genetic vulnerability
an increased likelihood that an individual will develop atypically or experience a mental disorder due to the DNA that they carry

Genotype
all the genes that a person has inherited from their biological parents

ISBN 978-1-009-25401-4

Gestalt principles
a set of principles that explain how we interpret visual information most efficiently by grouping individual elements together to perceive a whole object

Goal-directed behaviour
a planned series of actions with a purpose

Grapheme–colour synaesthesia
the association of written letters and numbers with colours

Group
two or more people who interact with and influence one another and work towards a common goal

Group pressure
an occurrence in which other members reveal whether they are obedient to the authority figure or not

Group shift
when discussion leads a group to adopt attitudes or actions that are more extreme than the initial attitudes or actions of the individual group members

Group size
the number of individuals within a group; increase in group size can correspond to a rise in conformity (but only up to a point)

Groupthink
when group members' desire to maintain group loyalty becomes more important than making the best choices

Gustation
the sense of taste

Halo effect
a cognitive bias in which one impression of a person influences our belief about their other qualities

Hemispheric specialisation
when one cerebral hemisphere has a specialised function that is not possessed, or is controlled to a lesser extent, by the other

Hereditary factors
biological influences on development that result from the genetic information passed from biological parents to their offspring

Heredity
the passing on of genes or genetic information from parents to their offspring

Heuristics
mental shortcuts that allow us to make quick decisions on limited information

High levels of functioning
the ability to carry out a wide range of daily activities, attend to self-care, maintain interpersonal relationships and demonstrate resilience in the face of everyday challenges

Hindbrain
a region of the brain composed of the cerebellum, medulla oblongata and pons and which is involved in supporting vital bodily processes, such as breathing and sleep

Homeostasis
the condition of maintaining a stable internal environment of the body that is necessary for survival

Homophobia
a type of prejudice or discrimination based on a person's sexual orientation

Hypothalamus
an area of the forebrain that connects the hormonal and nervous systems and helps the body to maintain homeostasis

Hypothesis
an idea or explanation for something that is based on known facts but has not yet been proven

Hypothetical-deductive reasoning
a way of thinking that involves developing a hypothesis based on what might logically occur

Immediacy
the physical, temporal and social closeness between the influencing group members and the individual being influenced

Implications
the impact a study might have on the population, relevant theory and future research

Imprinting
a newly born animal forms an attachment to the first thing it sees

Incomplete data
data that has elements missing

Independence
a situation in which a person perceives group pressure but doesn't respond to it at either the public or private level

ISBN 978-1-009-25401-4

Independent variable
the variable that is being manipulated (controlled, selected or changed) by the researcher

Indirect discrimination
when the same treatment is applied to everyone, but it disadvantages someone due to a personal characteristic

Individualist cultures
cultures that stress the needs of the individual over the needs of the group as a whole

Information access
the ability to identify, retrieve and use information effectively

Informational influence
an occurrence in which a person conforms because they want to be right, so they look to others they believe might have more information

Informed consent procedures
an ethical guideline conducted before a study begins – participants agree to participate after they have received all the details of the study, including the purpose, procedures and potential risks

Ingroup
any group that a person belongs to or identifies with

Insecure-avoidant attachment
a distant attachment that develops in children who do not experience sensitive responses to their needs from a caregiver. The child appears very independent, both physically and emotionally.

Insecure-disorganised attachment
inconsistent behaviour towards a caregiver, typically arising due to a lack of consistent care or emotional support from a primary caregiver early in life

Insecure-resistant attachment
an anxious attachment that forms because of inconsistent responses to their needs from a caregiver. The child may be clingy around their caregiver, and insecure in themselves or in their interactions with others.

Integrity
an ethical concept involving the commitment to searching for knowledge and understanding and the honest reporting of all sources of information and results

Inter-group contact
a concept proposing that for prejudice between groups to be reduced, there must be more direct contact between the groups' members (i.e., the groups must spend more time together)

Internal validity
whether a study investigates what it sets out or claims to investigate

Intersectional discrimination
when several forms of discrimination combine to leave a certain group or groups at an even greater disadvantage

Introduction section
a section of a scientific report or poster that provides an overview of what the investigation is trying to achieve and why it is important

Investigation aim
the purpose of a study

Investigation design
a framework that determines how participants experience the experimental and control conditions

Investigation methodology
the particular type of research study

Investigation question
the question that is to be solved by a study

Justice
an ethical concept involving fair consideration of competing claims, no unfair burden on a particular group, and fair access to benefits of an action

Just-world hypothesis
a cognitive bias in which people believe that the world is fair or just, and that everyone gets what they deserve

Legitimacy of the authority figure
a concept referring to an authority figure who has a higher position or status in a social hierarchy

Lesioning
the creation of small areas of damage (lesions) in the brain

Lexical–gustatory synaesthesia
the association of certain words with sensations of taste

ISBN 978-1-009-25401-4

Life stressor
an everyday or conceivable event, such as a relationship breakdown, work challenges or failing a test

Limbic system
interconnected brain structures in the centre of the forebrain, next to the midbrain, that play a role in emotions, behaviour control and the formation of long-term memories

Limitations of conclusions
the faults or flaws in the design of an investigation that may limit the conclusions of that investigation

Line graph
a way to display numerical and continuous data

Literature review
a type of investigation that involves collating and analysing secondary data findings and viewpoints

Long-term depression
the relatively permanent weakening of synaptic connections as a result of repeated low level activation

Long-term potentiation
the relatively permanent strengthening of synaptic connections as a result of repeated activation

Magnetic resonance imaging (MRI)
an imaging technique that uses magnetic fields to activate atoms in the brain, which then allows a computer to generate an image of the brain

Maladaptive
a term used by psychologists to describe emotions, behaviours and cognitions that interfere with our ability to adjust to our environment appropriately and effectively

Maladaptive behaviour
behaviour that is unhelpful, dysfunctional and non-productive, and that interferes with a person's ability to adjust to their environment appropriately and effectively

Maladaptive cognitions
cognitive distortions or irrational, inflated thoughts or beliefs that distort a person's perception of reality, usually in a negative way

Maladaptive emotions
very intense or overwhelming emotions that occur frequently, persist for extended periods of time without interruption or are inappropriate for the situation

Mass action
the involvement of large areas of the brain in functioning as a whole in order to carry out complex functions

Mean
a statistic that is the average value of a set of data

Measures of central tendency
a category of statistics that describes the central value of a set of data

Measurement error
the difference between the measured value and the true value

Measures of variability
a category of statistics that describe the distribution of data

Media
the various broadcasting mediums, such as the internet, newspapers, magazines, TV, radio, billboards and smartphones

Median
the middle value in an ordered set of data

Medulla oblongata
an area of the hindbrain involved in the autonomic functions of the body, such as heart rate and breathing

Memory
an information processing system that actively receives, organises, stores and recovers information

Mental disorder
one of a wide range of usually long-lasting conditions that affect mood, thinking and behaviour

Mental health problems
relatively short-term disruptions that affect the everyday functioning of an individual

Mentally healthy
someone who does not have difficulty with activities of everyday living, and displaying resilience

Mental wellbeing
a state of emotional and social wellbeing in which individuals realise their own abilities, can cope with the normal stresses of life, can work productively and can contribute to their community

ISBN 978-1-009-25401-4

Methodology section
a section of a scientific report or poster that describes the participants, materials and procedures used in the study

Midbrain
an area of the brain at the topmost part of the brainstem, involved in auditory and visual processing, motor control, pain inhibition and reward-based learning patterns

Mind–body problem
the extent to which the mind and the body are the same or separate things

Miraculin
a protein found in the pulp of the miracle berry that makes sour tastes seem sweet

Misinformation effect
a cognitive bias in which information that is received after an event interferes with a person's original memory of the event

Mixed design
an investigation design that combines a between subjects design and a within subjects design

Modal
in Schachter's 1951 experiment, a group member who took the view that conformed to the average of the real participants

Mode
the value that occurs most frequently within a set of data

Modelling (in learning)
a form of learning whereby we observe a behaviour of others and then replicate it

Modelling (in science)
a type of investigation in which a physical or conceptual model is constructed and/or manipulated to simulate a system

Modern prejudice
a more subtle form of prejudice that insinuates rejection while displaying acceptance

Monocular depth cues
depth cues that only require one eye to send information to the brain to perceive depth

Moral development
changes in moral behaviour over time, including in the values, attitudes and behaviours we adopt towards people in society, based on social and cultural norms, rules and laws

Morality
the ability to distinguish right from wrong and to behave accordingly

More knowledgeable other
a caregiver, teacher or more experienced peer

Motivation
our desires, which cause us to perceive stimuli that align with our goals as more salient

Motor information
information that is transmitted along sensory neural pathways from the CNS to the relevant organs, glands and muscles to bring about bodily actions

Müller-Lyer illusion
the misinterpretation of two lines of equal length, each with different-shaped ends

Mutual interdependence
when two groups must depend somehow on one another to meet a goal

Myelin
a fatty substance that acts as an insulator to stop nerve signals leaking out, and which also helps speed up the flow of information

Nerve impulse
an electrical message that travels along the axon of a neuron

Neurodegenerative disease
an incurable condition that involves the progressive death of neurons

Neurodivergent
a term that is sometimes used to refer to people whose brains function differently to others'

Neurodiverse
not neurotypical; functioning outside the typical range of neurological development

Neurodiversity
the idea that every human has a unique nervous system with a different combination of abilities and needs

Neurological disorder
any disorder of the nervous system, including of the brain, spinal cord or nerves

Neurons
cells that make up the brain and the nervous system and which receive and transmit information

ISBN 978-1-009-25401-4

Neuroplasticity
the ability of neural networks in the brain to change as a result of experience

Neurotransmitter
a chemical produced by a neuron that carries a message across the synapse to another neuron; produced within the nervous system, including muscles, organs and glands

Neurotypical
an individual whose neurological development or functioning is within the typical (average) range

Neurotypicality
standard or typical brain functioning, processing and behaviours

News
information about current events

Non-conformity
any behaviour that is not conformity

Non-maleficence
an ethical concept involving the avoidance of causing harm

Non-taster
someone who has a lower number of papillae than the average, giving them a decreased sensitivity to taste

Normality
patterns of behaviour that are typical and expected, or that conform to standards of what is acceptable

Normative influence
the occurrence in which we conform with others because we want to be liked by them – and we assume that our conformity will make them like us more

Obedience
the act of people changing their behaviour in response to direct commands from an authority figure

Object permanence
an understanding that objects continue to exist even if they can't be touched, seen or heard

Observational learning
the acquisition of new behaviours as a result of observing the actions of others and the consequences of those actions

Occipital lobe
an area of the brain involved in receiving and processing information related to vision

Occupational health and safety (OHS)
issues of health, safety and welfare that must be protected in a workplace

Old-fashioned prejudice
deliberate and overt prejudice

Opinion
a judgement that is not necessarily based on proof

Optimism bias
our tendency to underestimate the chances of negative events happening and overestimate the chances of positive events happening

Orientation constancy
the ability to perceive an object's actual orientation, despite changes in our retinal image of the object

Outgroup
any group that a person does not belong to or identify with

Outlier
a value that lies a long way from other results

Papillae
raised structures on the tongue containing taste buds

Parasympathetic nervous system
activates the rest and digest response after a dangerous or stressful situation has passed

Parietal lobe
an area of the brain involved in attention, spatial awareness and reasoning, and receiving and processing somatosensory information

Past experience
the situations and events we have encountered throughout our life prior to the present

Percentage
a part of a whole, a proportion out of 100

Percentage change
a calculation of the degree of change in a value over time

ISBN 978-1-009-25401-4

Perception
the mental process of recognising, interpreting and giving meaning to the information received by the sense organs

Perceptual constancy
the mind's ability to perceive a visual stimulus as remaining constant even though the visual information sent to the brain about the object shows changes in shape, size, brightness and orientation

Perceptual distortions
when an individual's perceptual interpretation of a stimulus varies from how it is commonly perceived

Perceptual set
the tendency to view things in a certain way due to a readiness to receive certain stimuli

Peripheral nervous system (PNS)
carries messages to and from the central nervous system

Person perception
the mental processes we use to form our impressions of other people

Personal attributions
explanations of a person's behaviour based on their characteristics, such as their ability, personality or energy

Personal distress
a state in which a person experiences unpleasant or upsetting emotions, such as sadness, anxiety or feeling overwhelmed

Personal error
a mistake, miscalculation or observer error made when conducting research

Phenotype
how a person's genes are expressed

Phrenology
the study of the shape of the skull as an indicator of the extent of one's mental faculties and character traits

Physical cues
the physical characteristics and behaviours of people that influence our impressions of them

Pons
an area of the hindbrain that acts as a bridge between the cerebellum and the cerebral cortex

Population
the wider group of people that a study is investigating

Positron emission tomography (PET)
an imaging technique that provides information not only about brain structure but also activity and function by recording the use of glucose by cells in the brain

Power
an individual's ability to control or strongly influence the thoughts, feelings and behaviour of another person or group

Precision
how close a set of measurement values are to each other

Prejudice
the negative attitude people possess towards individuals based only on their membership of a group

Primary data
data collected through first-hand research for an intended purpose

Product, process and system development
a type of investigation in which a product, a process or a system is designed to meet a human need

Prosopagnosia
a type of visual agnosia involving an inability to recognise the faces of familiar people. Can be apperceptive or associative.

Protective factors
a range of factors that may prevent or decrease the chances of developing atypically or having a mental disorder

Prototype
what we think is the most relevant or typical example of a specific event or object

Proximity
the tendency to perceive the parts of a visual stimulus that are close together as belonging to a group

Psychological development
the changes in an individual's social, emotional and cognitive abilities from infancy through to old age

Psychological factors
a range of factors that relate to the functioning of the brain and the mind, including cognitive and affective processes such as thought patterns and memory

Psychological reactance
an unpleasant motivational arousal that emerges when people experience a threat to or loss of their free behaviours

ISBN 978-1-009-25401-4

Qualitative data
data that describes characteristics and qualities

Quantitative data
data that includes measurable values and quantities and can be compared on a numerical scale

Racism
a type of prejudice or discrimination based on a person's race or ethnicity

Random allocation
dividing a sample into groups in such a way that each participant has an equal chance of being placed into the experimental group or the control group

Random error
an error that creates unpredictable variations in the measurement process and results in a spread of readings

Random sampling
involves selecting participants from the population in a way that means each member of the population has an equal chance of being selected to participate in the study

References section
a list of all the sources used in a scientific report

Repeatability
the closeness of the agreement between successive measurements of the same quantity, carried out under the same conditions

Replicability
giving the same answer to a scientific question when a different method is used and different data is obtained

Representativeness heuristic
a mental shortcut that estimates the probability of an event occurring by comparing its similarity to a prototype that we know

Reproducibility
the closeness of the agreement between measurements of the same quantity, carried out under different conditions

Rerouting
when healthy nearby neurons create alternative neural pathways when existing connections are lost through injury

Resilience
the ability to 'bounce back' to previous normal levels of functioning when faced with adversity

Respect
an ethical concept involving the consideration of the value of living things, giving due regard, and consideration of the capacity of living things to make their own decisions

Results section
a section of a scientific report or poster that outlines the evidence and findings of the study

Reticular activating system (RAS)
an area in the midbrain that is responsible for alertness and awakening

Reticular formation
an area of the midbrain that plays a role in maintaining arousal, consciousness and motor control

Retinal disparity
the brain detecting similarities and differences between the information being sent from each eye, due to the eyes being 6–7 cm apart

Retinal image
the image of an object formed on the retina of the eye

Reversibility
the understanding that actions can be undone or reversed

Risk assessment
a process involving the consideration, identification and reduction of physical and psychological risk

Risk factors
a range of factors that may increase one's chances of developing atypically or having a mental disorder

Role
the behaviour adopted by an individual or assigned to them that influences how they function or act in different situations

Safety data sheet (SDS)
a document that provides all the important information about a substance, such as its ingredients, precautionary statements and first aid measures

Salient
a descriptor for anything that is prominent, conspicuous or otherwise noticeable when compared to its surroundings

ISBN 978-1-009-25401-4

Sample
the smaller group of people selected from the population who will be participants in the study

Sampling technique
involves procedures for selecting participants from the population

Scaffolding
supports of various kinds that help a child to operate within their ZPD

Schema
our pre-existing mental ideas relating to a given concept that help us organise and interpret new information

Scientific poster
a way to present the main sections of a scientific report in a brief and visual way

Scientific report
a report outlining why and how some research was conducted, with an analysis of the findings

Secondary data
data obtained second hand through research conducted by another person for another purpose

Secure attachment
a positive relationship between caregiver and child, in which the child displays confidence when the parent is present, mild distress when they leave and quickly seeks contact when the parent returns

Seizure
an uncontrolled rapid movement or shaking of body parts, also called convulsions, usually accompanied by loss of awareness or unconsciousness

Selective attention
focusing on a single activity and disregarding other environmental stimuli

Self-serving bias
the tendency to attribute our successes to internal factors, and our failures to external factors

Sensations
the information from the environment detected by the sensory organs and transmitted to the brain

Sensitive period
a period during development in which the effects of experience on development are particularly strong

Sensory information
information that is detected by sensory receptors from the internal and external environment and transmitted along sensory neural pathways to the CNS

Sexism
a type of prejudice or discrimination based on a person's sex or gender

Shape constancy
the ability to perceive an object's actual shape, despite changes in the retinal image of the object

Similarity
the tendency to group together as a whole any stimuli that are alike in size, shape or colour

Simulation
a type of investigation that uses a model to replicate and study the behaviour of a system

Situational attributions
explanations of a person's behaviour based on factors outside the person involved, such as luck or something in the environment, in the task or in the actions of another person

Situational strength
roles that group members play that give them a higher level of status and power

Size constancy
the ability to perceive an object's actual size, despite changes in our retinal images of the object

Slider
in Schachter's 1951 experiment, a group member who initially took the same view as the deviate but then changed to the view of the modal participant

Social categorisation
a mental shortcut used in person perception to categorise people into groups based on their shared characteristics

Social cognition
how we judge others in social situations by interpreting and analysing information

Social comparison
a behaviour in which we compare certain aspects of ourselves – such as our behaviour, opinions, status and success – to other people to assess ourselves better

Social connections
the relationships that individuals have with the people around them

ISBN 978-1-009-25401-4

Social development
changes in a person's ability to interact with other people and function as a member of society

Social factors
a range of factors that relate to the conditions in which people live and grow

Social impact theory
a theory suggesting that the degree of influence that a person experiences in group settings depends on three factors: the group's strength, the group's immediacy and the number of people in the group who are exerting the social influence

Social influence
how people change their behaviour or attitudes due to the direct or indirect influence of others

Social loafing
a person's tendency to reduce their effort when working in a group, as opposed to when working alone

Social media
internet-based technology, including smartphones, smartwatches, tablets and computers, that facilitates the sharing of ideas, thoughts and information through virtual networks and communities

Social norms
shared standards or social beliefs about what is normal, acceptable or typical behaviour

Social proximity
in the field of psychology, how physically close one or more people are to each other

Social wellbeing
relates to the connections you make with other people and their ability to get along with others in a community

Somatic nervous system
carries messages from sensory neurons to the CNS and then transmits information from the CNS along motor neurons

Spatial neglect
a condition involving an inability to attend to sensory stimuli on one side of the body

Spinning dancer illusion
an illusion in which a dancer can be perceived as spinning clockwise or anticlockwise, and the same viewer can alternate between perceiving a clockwise or anticlockwise spin

Sprouting
when existing neurons form new axon terminals and dendrites to allow new connections to be made

Standard deviation
a statistic that shows the spread of the data around the mean

Statistical rarity
a criterion that views abnormal or atypical behaviours as deviating significantly from the statistical average or mean

Status
the level of importance (real or imagined) that group members perceive regarding another group member's position in that group

Stereotype
a collection of fixed ideas about members of a certain group in which their individual differences are ignored

Stereotyping
the process of creating stereotypes and matching people to them

Stigma
negative attitudes about someone based on a distinguishing characteristic (e.g. mental illness, disability, gender, sexuality, ethnicity, religion or culture)

Stratified sampling
first dividing the population into subgroups, and then randomly selecting participants from each subgroup in the proportion that they appear in the population

Stroke
an acquired brain injury involving an interruption to the blood supply in the brain or bleeding in the brain, resulting in deterioration of brain tissue

Substantia nigra
one of the largest collections of dopamine-producing neurons in the brain

Superordinate goals
the top-level, ultimate goals shared between groups or individuals that cannot be achieved alone or without the other person or group

Supertaster
someone who has a higher number of papillae than the average, giving them a heightened sensitivity to taste

ISBN 978-1-009-25401-4

Sustained attention
the maintenance of a high degree of attention over a prolonged period

Sustained contact
prolonged and cooperative interaction between two groups who are prejudiced against each other

Symbolic thinking
a type of thinking that uses symbols, such as words or images, to solve simple problems and to talk about things that are not physically present

Sympathetic nervous system
activates the fight-or-flight-or-freeze response in dangerous or stressful situations

Synaesthesia
a rare condition in which certain sensations are perceived using another system

Synapse
the point of communication between two neurons or between a neuron and a target cell, such as a muscle or gland cell

Synaptic pruning
the elimination of unused synapses

Synaptogenesis
the process of forming new synapses

Systematic error
an error that causes readings to differ from the true value by a consistent amount each time a measurement is made

Table
a way to display data and/or summary statistics clearly

Taste buds
cells in the mouth and throat that send sensory information to the brain for taste perception

Tau protein
a protein required by cells for stability that can malfunction and build up within neurons disrupting important processes and disrupting communication with adjacent neurons

Television (TV)
a telecommunication medium used to transmit moving images in black and white or in colour, with sound

Temporal lobe
an area of the brain that plays a significant role in receiving and processing sounds from the ears

Thalamus
an area of the forebrain that processes and relays sensory information

The need for uniqueness
a psychological state in which individuals feel indistinguishable from others, which motivates compensatory acts to restore a sense of uniqueness

Theory of mind
a cognitive ability that allows us to make judgements about other people's mental states

Top-down processing
the processing of sensory information by applying prior knowledge and expectations

Transformation
the understanding that something can change from one state, form or structure to another

Trans-situational strength
characteristics that group members hold that give them a higher level of status and power

Traumatic brain injury (TBI)
an injury that occurs when there is a sudden, physical trauma to the brain from an external force

Tri-component model of attitudes
a model proposing that attitudes must have three related components – affective, behavioural and cognitive

True value
the value, or range of values, that would be found if the quantity could be measured perfectly

Typical behaviours
patterns of behaviour that are expected of an individual or that conform to standards of what is acceptable for a given situation

Typical development
when behaviours, skills or abilities fall within the expected range of development or progress at a similar pace compared to peers of the same age

ISBN 978-1-009-25401-4

Unanimity
the complete agreement that group members experience in terms of knowing the answer

Uncertainty
a lack of exact knowledge of the value being measured

Uniqueness
a person's distinctiveness in relation to other people

Upward social comparison
a behaviour in which we compare ourselves to someone we perceive to be better than we are

Validity
whether a measurement measures what it is supposed to measure

Video game
an electronic game that involves a person interacting with a user interface or input device (e.g. a joystick, controller, keyboard or motion-sensing device) to generate visual and auditory feedback

Vigilance
another name for sustained attention

Visual illusion
an illusion created by a misinterpretation (distortion or mistake) of the reality of a visual stimulus

Visual perceptual principles
a set of consistent instructions that enable us to organise and interpret visual information in a reliable and meaningful way

Voluntary participation
an ethical guideline ensuring that each participant freely agrees to participate in a study, with no pressure or coercion

Wellbeing
the complex combination of a person's physical, social, emotional, mental and spiritual health that is linked to happiness and life satisfaction

Wernicke's aphasia
an acquired language disorder characterised by difficulty comprehending speech and producing meaningful sentences

Wernicke's area
an area of the temporal lobe that plays a critical role in understanding the sounds involved in speech

Withdrawal rights
an ethical guideline that ensures the participants are free to discontinue their involvement in a study at any point during or after the conclusion of the study, without receiving any penalty

Within subjects design
an investigation design in which all participants in the sample are involved in both the experimental and control conditions

Working memory
memory that allows us to process incoming sensory information

Zone of proximal development (ZPD)
the distance between one's actual developmental level as determined by independent problem-solving and one's level of potential development as determined through problem-solving under adult guidance or in collaboration with more capable peers

ISBN 978-1-009-25401-4

Index

ISBN 978-1-009-25401-4

D

e

ISBN 978-1-009-25401-4

ISBN 978-1-009-25401-4

ISBN 978-1-009-25401-4 Gallagher et al

ISBN 978-1-009-25401-4

ISBN 978-1-009-25401-4

Permissions acknowledgments

The author and publisher wish to thank the following sources for permission to reproduce material:

Cover: © Getty Images / Baac3nes

Images: © Getty Images / ozgurdonmaz, p.235 / Anyaberkut, 1A, 1A-1 / Monty Rakusen, 1A-2 / Marilyn Nieves, 1A-4 (1) / J Dettrick, 1A-4 (2) / Dimitri Otis, 1A-8 / JohnnyGreig, 1B-3 / Scott Barbour, 1B-1 / Yuoak, 1B, 1B-2, 1B-6, 1B-4, 1B-5, 1B-7-8 / Prasert Krainukul, 1B-2 / BSIP, 1B-9 right / Plume Creative, 1B-10 / Maria Casinos, 1B-11 / Dusan Stankovic, 1B-13 / Sturti, 1B-14 / Thomas Barwick, 1B-15 / Lechatnoir, 1B-16 / SDI Productions, 1B-16 (1) / Coneyl Jay, 1B-16 (2) / Bernhard Lang, 1B-17 (1) / Aydinmutlu, 1B-17 (2) / I-Am-Helen, 1B-17 (3) / Erhui1979, 1C-3 (1) / Zero Creatives, 1C-3 (2) / Jacob Wackerhausen, 1C-4 / Westend61, 1C-5, 2A-2, 3C-1, 5B-1, 6B-12 (4), 6D-3 (1), 7A-3 (2), 9B-5, 8A-7, p.377 (2,3), 10B-11, 2A-21, 3C-4, 4A Engage, 3C-4, 4A Engage, 6B-12 (1) / Klaus Vedfelt, 1C-6 / Janiecbros, 1C-8 (1) / FroggyFrogg, 1C-8 (2) / TravelCouples, p.54 / A Pasieka/Science PL, p.296 / J Gaertner /Science PL, p.304 / M Barraud, p.422 / A Onufriyenko, Ch2 Opener / Piranka, 2A-2 (2) / Monty Rakusen, 2A-2 (1) / Mevans, 2A-5 / G Mieth, 2A-12 / J Merdan, 2A-17 (1) / Calysta Images, 2A-17 (2) / Cmcderm1, 2A-19 (1) / Jacoblund, 2A-19 (2) / Prykhodov, 2A-20 / K Seisa, 2A-23 / Howard Kingsnorth, 2B-2 (1) / urbazon, 2B-2 (2) / Jennifer A Smith, 2B-3 / AzmanL, 2B-4 / M Rakusen, 2B-5 / Johner Images, 2B-11 / Yaroslav Kushta, Ch3 Opener / Dustin Finkelstein, 3A Engage / A-Digit, 3A-1 / JGI/Jamie Grill, 3A-3 / MARK GARLICK/SPL, 3A (1), 3A-4 / d3sign, 3A (2) / Peter Dazeley, 3D-1 / gargantiopa, 3A-6 (1) / Maskot, 3A-6 (2) / Rob Kim, 3A-5 / Olga Rolenko, 3A-1 (1) / Nadeem Khawar, 3A-1 (2) / d3sign, 3A-1 (3) / Maskot, 3A-1 (4) / Sven Hansche, 3A-1 (5) / Jose Luis Pelaez Inc, 3A-8 (1) / Klaus Vedfelt, 3A-8 (2) / Javier Zayas Photography, 3A-8 (3) / Thanasis Zovoilis, 3A-9 (1) / Alistair Berg, 3A-9 (2) / mrs, 3B Engage / PhotoAlto/ Frederic Cirou, 3B-3 / Maskot, 3B-4 / FG Trade, 3B-5 / Eric Audras, 3B-6 / vorDa, 3B-7 / Sarah Mason, 3B-8 / John White Photos, 3B-9 / Oliver Strewe, 3B-10 / xavierarnau, 3B-11 / Paul Souders, 3B-12 / Grant Faint, 3B-13 / JGI/Jamie Grill, 3B-14 / Andriy Onufriyenko, 3B-15 (1,2) / YinYang, 3B-16 / Catherine Falls Commercial, 3B-17 / Thurtell, 3B-18 / Jessie Casson, 3B-19 / Ekaterina Goncharova, 3C-2 / Catherine Falls Commercial, Table 3C-1 (1) / Dobrila Vignjevic, Table 3C-1 (2) / Maskot, Table 3C-1 (3) / Kelvin Murray, Table 3C-1 (4) / Cecilie_Arcurs, Table 3C-1 (5) / General Photographic Agency, 3C-5 / damircudic, 3C-6 / Blend Images-Stretch Photography, 3C-10 / Blend Images-JGI/Jamie Grill, Table 3C-3 (1) / Morsa Images, Table 3C-3 (2) / Thomas Barwick, Table 3C-3 (3) / Luis Alvarez, Table 3C-3 (4) / Mint Images, Table 3C-3 (5) / Eternity in an Instant, 3C-16 / Jon Brenneis, 3C-17 / South_agency, Table 3C-5 (1) / Peter Dazeley, Table 3C-5 (2) / Klaus Vedfelt, Table 3C-5 (3) / Fly View Productions, Table 3C-5 (4) / Jacobs Stock Photography, Table 3C-5 (5) / Bettmann, 3C-20 / kate_ sept2004, 3C-22 / greg801, 3C-24 (1) / real444, 3C-24 (2) / Jose Luis Pelaez Inc, 3C-24 (3) / Nikola Stojadinovic, 3C-25 / Os Tartarouchos, 3C-26 / MIXA, 3C-27 / Dominic Bugatto, 3C-28 / HRAUN, 3C-24 / Yoann JEZEQUEL Photography, 3C-25 / Heritage Images, 3C-36 / Zave Smith, 3C-38 / skynesher, 3C-39 / Lee Lockwood, 3C-41 / Anna Kraynova/EyeEm, 3D-1 / Klaus Vedfelt, 3D-2 / Bettmann, 3D-3 / koto_feja, Ch4 Opener / Andres Rodriguez, 4B / Sladic, 4D / M VATSYAYANA, Activity 4A-1 (1) / Getty, Activity 4A-1 (2) / Paul Taylor, Activity 4A-1 (3) / Stephen Zeigler, Activity 4A-1 (4) / P Giardino, Activity 4A-1 (5) / mrs, 4A-1 / mixetto, 4A-2 / KT images, 4A-4 / Pep Karsten, 4A-5 / Peter Dazeley, 4A-7 / A Nakic, 4A-8 / MoMo Productions, 4A-9 / Andres Rodriguez, 4B-1 / Serge, 4B-2 / mikkelwilliam, 4B-3 / Gary John Norman, 4B-4 / Jan Hakan Dahlstrom, 4B-5 / Anna Valieva, 4C, 4C-1 / Thomas Imo, 4C-3 (1) / Steve Liss, 4C-3 (2) / Sladic, 4D-1 / SDI Productions, 4D-2 / Fiordaliso, 4D-3 / Callista Images, Ch5 Opener / De Agnostini Picture Library, 5A-1 /BSIP, 5A-2 / ilbusca, 5A-4 / Malte Mueller, 5A-6 / Grafissimo, 5A-7 / VintageMedStock, 5A-8 / ChaNaWiT, 5A-9 / Jonathan Kitchen, 5A-10 / Solarseven, 5A-11 / MIGUEL MEDINA, 5A-12 / Science PL-ZEPHYR, 5A-13 / Memento Image, 5A-14 / FRED TANNEAU, 5A-15 / TefiM, 5B-2 / BSIP, 5B-3, 5B-19, 6A-4, 6A-10 / magicmine, 5B-5 / Graphic_BKK1979, 5B-6 / Matt Wimsatt, 5B-7 / Hank Grebe/Stocktrek Images, 5B-8 / Luis Alvarez, 5B-9 / Dorling Kindersley, 5B-10, p.267 (1), 6B-7 / 10'000 Hours, 5B-11 / Hank Grebe, 5B-12 / hidesy, 5B-13 / ChrisGorgio, 5B-14 / Vladimir Bulgar, 6A-5 (2) / Russell Monk, p.267 (2) / Catherine Falls Commercial, p.267 (3) / magicmine, 6A-8 / SolStock, 6A-11 (1, 8B-10 (1) / Artranq, 6AFatCamera, 6A-14 (2,3) / Wildpixel, 6B, 6B-2 / Henfaes, 6B-3 (1) / Povozniuk, 6B-3 (2) / kali9, 6B-4 (1) / FredFroese, 6B-4 (2) / Getty Images, 6B-5 (1) / S Cohen, 6B-5 (2) / MichaelSvoboda, 6B-5 (3) / VectorMine, 6B-8, 9 / Jose Luis Pelaez Inc, 6B-10 (1) / RapidEye, 6B-10 (2) / matsabe, 6B-11 / SDI Productions, 6B-12 (2) / V Zakharova/Science PL, Table 6C-1 / leremy, 6C-4 / Latsalomao, 6C-5 / ttsz, 6C-6 / undefined undefined, 6C-7 / Bernhard Lang, 6C-8 (1) / DiMaggio/Kalis, 6C-8 (2) / P Kane, 6C-8 (3) / serjopak, 6C-8 (4) / Kateryna Kon, Science PL, 6C-9 / gpflman, 6C-14 / Future Publishing, 6C, 6C-15 (1) / Bloomberg, 6C-15 (2) / d3sign, Ch7 Opener / Photo 12, 7A-2 (1) / Morsa Images, 7A-2 (2), 7A (1), Activity 7A-1 (1-6), Activity 7A-9 (3) / Ezra Bailey, 7A-3 (1) / Digital Vision, 7A-3 (2) / fStop Images, 7A-4 / RubberBall Productions, 7A-5 (1) / T Barwick, 7A-5 (2) / Steve Hammid, 7A-6 (1) / filadendron, 7A-6 (2) / Tim Robberts, 7A-7 (1) / Cavan Images, 7A-7 (2) / Ulrik Tofte, 7A-8 (1) / Peter Cade, 7A-8 (2) / fizkes, 7A-9 / Tara Moore, 7A-10 / Artem Varnitsin, 7A-11 / kwanchai chaiudom, 7A-12 / Thomas Barwick, Activity 7A-5 (1) / Yellow Dog Productions, Activity 7A-5 (2) / Fabio Formaggio, Activity 7A-5 (3) / s sitthikongsak, 7A-14 / A Bret Wallis, 7A-15 / Yuri_Arcurs, 7A-17 / John Downing, 7A-18 (1) / Scott Olson, 7A-18 (2) / Image Source, 7A-18 (4), 7A-22 / OJO Images, 7A-19 (1) / fstop123, 7A-19 (2) / Thana Prasongsin, 7A-23 (1) / L BEAUMONT, 7A-23 (2) / Hill Street Studios, Activity 7A-9 (1), 7A-24 / T Moore, Activity 7A-9 (4) / Flashpop, 7A-25 / Sol Stock, 7A-26 (1,2) / Maskot, 7A-27 / R Baker, p.346 / A Powdrill, 7B Engage / EyeWolf, 7B-2 (1) / Marcos del Mazo, 7B-2 (2) / Abid Katib, 7B-3 / Michael Blann, 7B-4 / T Barwick, 7B-5 / JUSTIN TALLIS, 7B-6 / SolStock, 7B-7, 7C-10 (2) / Ilona Nagy, 7B-8 (1) / E Gromova, 7B-8 (2) / P Cade, 7B-9 / Luis Alvarez, 7B-10 / Creativ Studio Heinemann, p.362 / Education Images, 7C-2 (1) / iridi, 7C-4 / Newsday LLC, 7C-2 (2) WSL, 7C-5 / Justin Paget, 7C-6 (1) / Mike Powell, 7C-6 (2) / Marko Geber, 7C-6 (3) / Scott Barbour, 7C-7 / N McComas, 7C-8 (1) / Klaus Vedfelt, 7C-8 (2) / Tom Werner, 7C-8 (3) / Hirurg, 7C-10 (1) / Compassionate Eye Foundation/Rob Daly/OJO Images Ltd, 7D-2 / Juanmonino, 7D-3 (1) / ljubaphoto, 7D-3 (2) / Hinterhaus Productions, 7D-3 (3) / kickstand, 7D-4 (1) / E BARADAT, 7D-4 (3) / M Tama, 7D-5 (1) / mediaphotos, 7D-5 (2) / Halfpoint Images, 7D-6 / Aurelie and Morgan David de Lossy, 7D-9 (1) / Gradyreese, 7D-9 (3) /Andrew Sheargold, 7D-10 / Bill Tompkins, 7D-12 / MoMo Productions, 7D-13 / Bettmann, 7D-14 / Klaus Vedfelt, 7D-15 / Indeed, 7D-16 / Attila Csaszar, 7D-19 / Orbon Alija, Ch8 Opener / Image Source, 8A (1), 8A-2 (1) / Tom Werner, 8A (2), 8A-2 (2) / Clerkenwell, 8A-3 (1) / Flashpop, 8A-3 (2) /

ISBN 978-1-009-25401-4