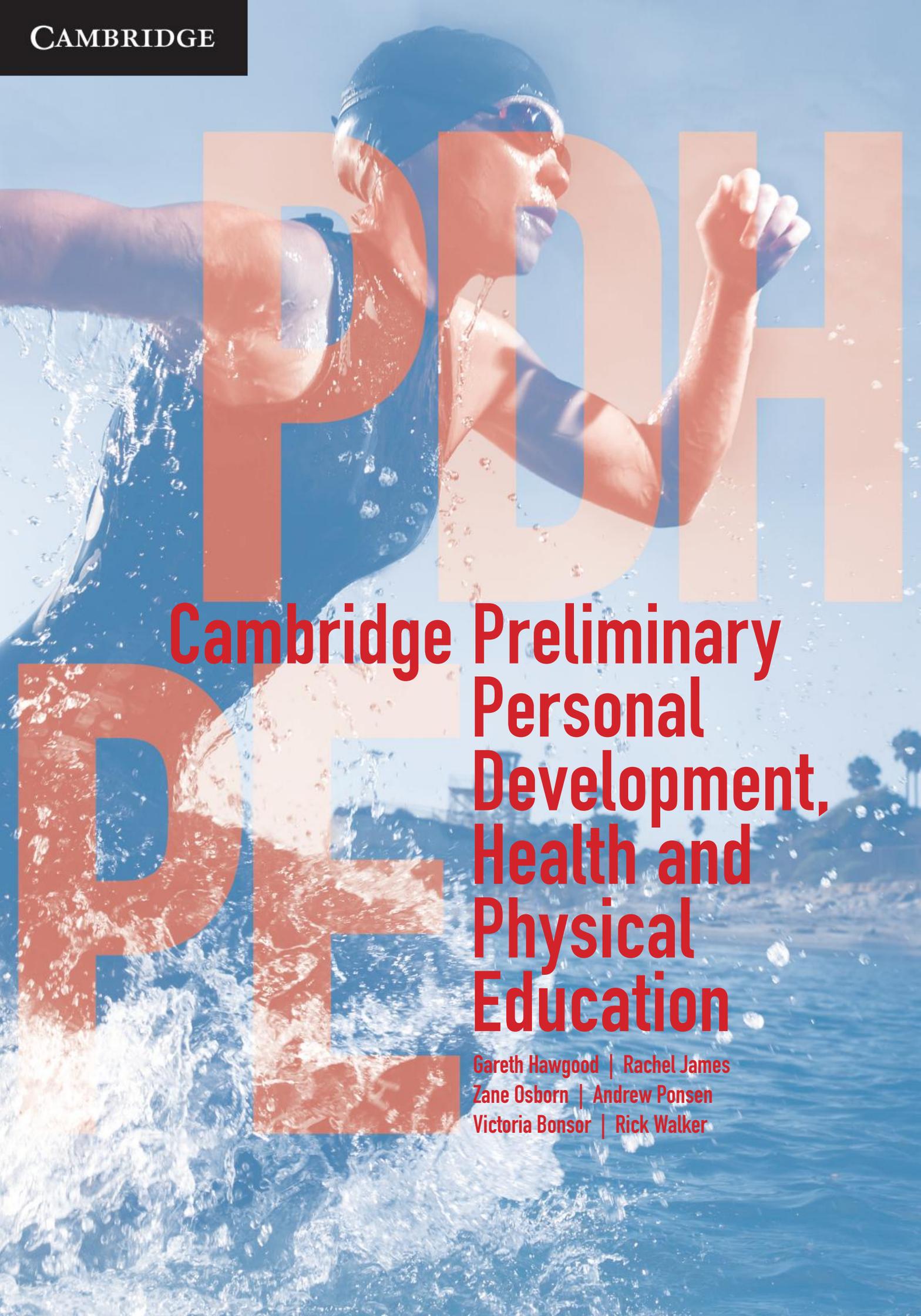


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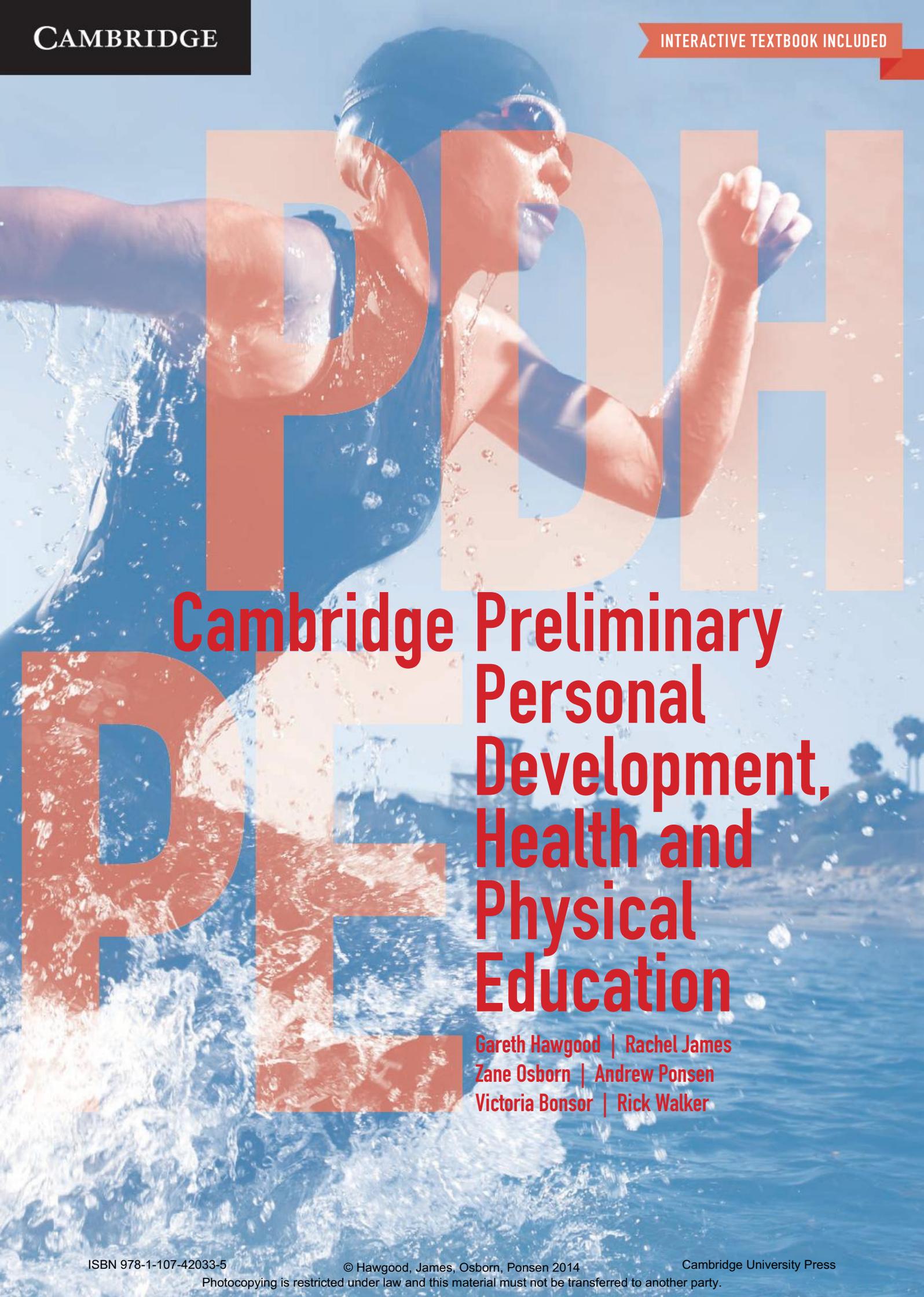


# Cambridge Preliminary Personal Development, Health and Physical Education

Gareth Hawgood | Rachel James  
Zane Osborn | Andrew Ponsen  
Victoria Bonsor | Rick Walker

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# Cambridge Preliminary Personal Development, Health and Physical Education

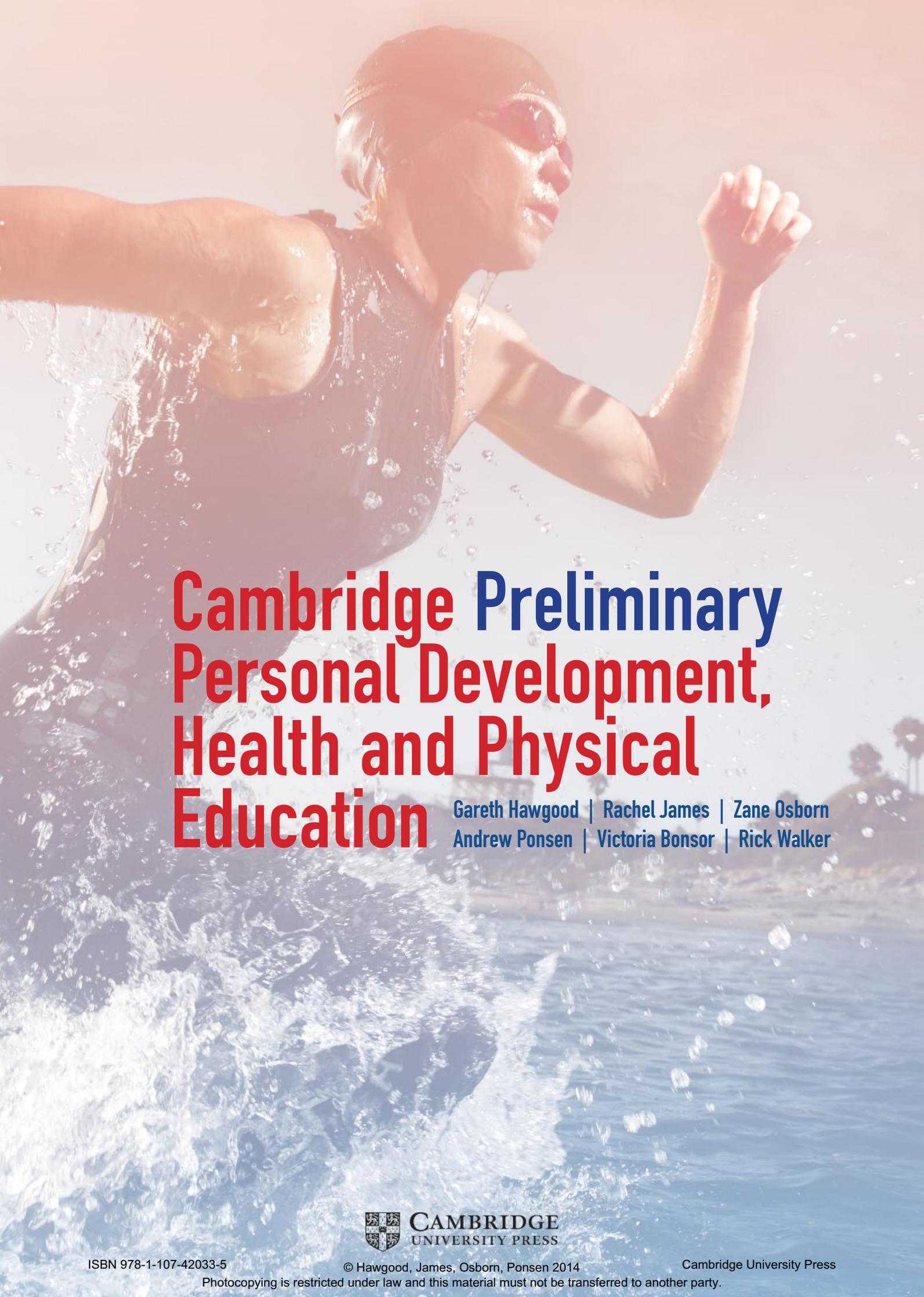
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# Contents

<i>Introduction</i>	v
<i>About the authors</i>	vi
<i>Acknowledgements</i>	x
<b>Chapter 1 Better Health for Individuals</b>	<b>1</b>
1.1 The meaning of health to individuals	2
1.2 Influences on the health of individuals	26
1.3 Strategies that help promote the health of individuals	46
<b>Chapter 2 The Body in Motion</b>	<b>65</b>
2.1 How the body's musculoskeletal and cardiorespiratory systems influence and respond to movement	66
2.2 The relationship between physical fitness, training and movement efficiency	83
2.3 The way in which biomechanical principles influence movement	104
<b>Chapter 3 First Aid</b>	<b>121</b>
3.1 The main priorities for assessment and management of first aid patients	122
3.2 Managing the major types of injuries and medical conditions in first aid situations	128
3.3 Factors the individual needs to consider in administering first aid	144
<b>Chapter 4 Composition and Performance</b>	<b>151</b>
4.1 The elements of composition and how they apply to different movement mediums	152
4.2 Understanding how the elements are used to compose movement	165
4.3 Examining the role of appraisal in the process of composing and performing	171

<b>Chapter 5</b>	<b>Fitness Choices</b>	<b>179</b>
5.1	The meaning of exercise to different people	180
5.2	The ways in which people choose to exercise for fitness	185
5.3	The influences on people's choices of fitness activities	196
<b>Chapter 6</b>	<b>Outdoor Recreation</b>	<b>203</b>
6.1	Examining the value of outdoor recreation	204
6.2	Understanding the technical skills required to safely participate in outdoor recreation	208
6.3	The impact that group dynamics has on the outdoor experience	222
	<i>Glossary</i>	229
	<i>Index</i>	233

# Introduction

## To the student

Congratulations on choosing the *Cambridge Preliminary Personal Development, Health and Physical Education* textbook. This textbook has been written to meet the requirements of the current Stage 6 PDHPE Syllabus in New South Wales. It also aims to make your life easier, by following the syllabus and providing relevant activities that will prepare you for the actual HSC examination.

PDHPE has become one of the most popular subjects undertaken by HSC students, experiencing growth each and every year. Students who study PDHPE enjoy a challenging yet rewarding subject and gain knowledge that will benefit them as athletes, professionals and people, now and into the future.

PDHPE allows you to explore your own health and the health of Australians and to develop an understanding of social justice. It explores the issues that can contribute to improved performance, for you personally or within a guiding role such as coach, personal trainer, PDHPE teacher or health professional.

This book is a comprehensive resource that extends on the knowledge and skills introduced in the compulsory Stage 4 and 5 course. It covers all content areas of the Preliminary course.

You will discover a wealth of engaging material that critically examines the core areas of Better Health for Individuals and The Body in Motion, as well as all available options. You will gain an insight into various issues with relevant and engaging activities that also provide the opportunity for practical application. The checklists and summary questions will give you the best opportunity to succeed in your exam.

Good luck in your studies and we hope you enjoy Preliminary PDHPE!

Gareth Hawgood

## About the authors



### Gareth Hawgood

Gareth is currently Head of PDHPE at Hunter Valley Grammar School in Maitland. He has been a specialist PDHPE teacher for 18 years, working in both primary and secondary schools. He has co-authored an HSC Study Guide for PDHPE, has presented at various HSC study days and is the Hunter Region representative for the NSW PDHPE Teachers' Association.



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Zane Osborn gained his double degree in Education and Physical Education/Health at the University of Newcastle, New South Wales. He has taught in secondary schools in both the Hunter and Central Queensland regions of Australia. As well as school-based teaching, Zane has worked extensively in the not-for-profit sector, outdoor education and with primary school children as part of extracurricular programs focused on improving movement and health. More recently, he has specialised in working with corporate clients to enhance leadership, teamwork and fun. Zane also works closely with communities in the Hunter Region to implement health-based programs aimed at improving and sustaining the good health of families.



### **Andrew Ponsen**

Andrew Ponsen, BA Teaching (BA HPE) (Hons) is currently PDHPE Team Leader at St Philip's Christian College (Waratah Campus) in Newcastle. He has many years' experience as a specialist PDHPE teacher across both middle and senior years. He is passionate about helping students achieve their potential in the senior HSC PDHPE course, the integration of ICT in PDHPE and delivering PE lessons that lead to holistic and individualised development. He has coached across a range of team sports, particularly Rugby League and football. He also has experience as an HSC marker, and co-authored the Cambridge Checkpoints PDHPE study guide.



### **Victoria Bonsor**

Victoria Bonsor, BA Ed (Hons) is a PDHPE teacher with over 10 years' experience in teaching. She has taught in public and private education sectors across all areas of PDHPE, including CAFS and Stage 5 & 6 Dance. Victoria is passionate about teenagers developing and adopting active and healthy life habits.



### **Rick Walker**

Rick Walker has been a teacher for the past 30 years. For the past 20 years he has been a trainer/assessor/facilitator for both the RLSSA and the Surf Life Saving movement and he was the inaugural Director of Education for Central Coast Surf Lifesaving. He has been recognised for his work, winning awards within both organisations.

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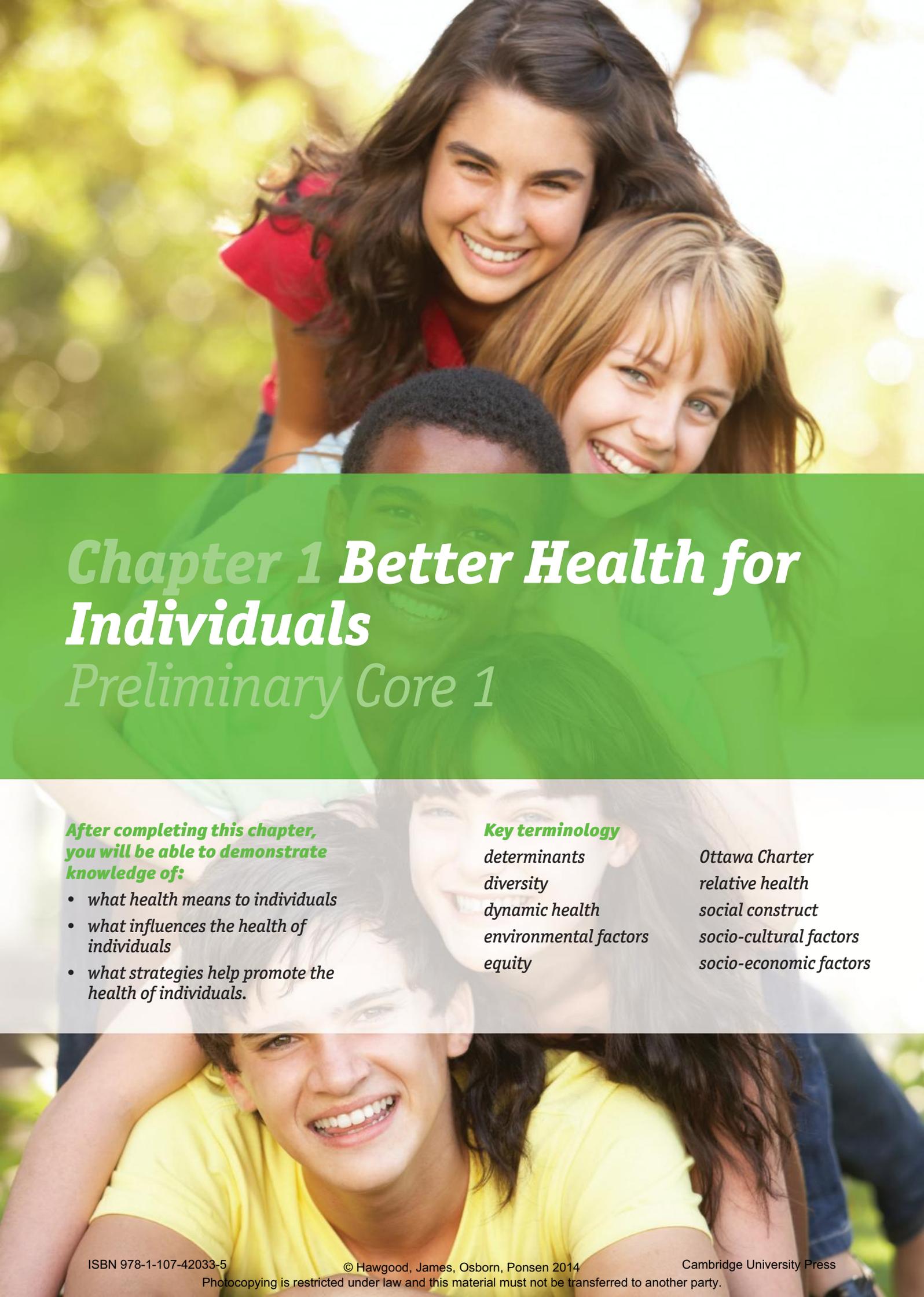
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# *Chapter 1 Better Health for Individuals*

## *Preliminary Core 1*

**After completing this chapter,  
you will be able to demonstrate  
knowledge of:**

- *what health means to individuals*
- *what influences the health of individuals*
- *what strategies help promote the health of individuals.*

**Key terminology**

*determinants  
diversity  
dynamic health  
environmental factors  
equity*

*Ottawa Charter  
relative health  
social construct  
socio-cultural factors  
socio-economic factors*

# 1.1 The meaning of health to individuals

## Meanings of health

### Driving questions 1.1

- 1 What does the word 'health' mean to you?
- 2 Who is the healthiest person you know? Why do you say this?

### Definitions of health

**health** a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity

The meaning that people and organisations have attributed to the word **health** has changed significantly over time. Prior to the twentieth century, health was viewed as the body's normal state of function; that is, the opposite of illness. This simple, one-dimensional view of health reflected the experience of health

at the time as a somewhat fragile physical state, easily disrupted by infectious disease, injury and inadequate nutrition.

While some understanding existed about anatomy, little was understood about the

transmission of disease and environmental hygiene. In the 1800s, infectious diseases such as cholera, smallpox, influenza and scarlet fever were major causes of death and disease, and the transmission of disease was largely understood as a matter of inherited susceptibility, 'bad air', anger or abrupt changes of temperature.

Limited medication was available and treatments relied heavily on a 'change of air' and various methods, such as bleeding by cup or the use of leeches to clear 'impurities' from the body.

Major breakthroughs in the understanding of environmental hygiene in the mid-1800s and scientific and technological advancements in the early 1900s led to an increase in the knowledge of biomedical science and significantly greater control of infectious diseases. With greater control of infectious diseases and a greater understanding of their cause and treatment, life expectancy began to increase.

With continued developments in the health sciences, especially in the area of mental health, there came increased recognition that the current definition of health as the absence of disease was inadequate. This narrow definition failed to take into account an individual's social, mental or spiritual well-being.



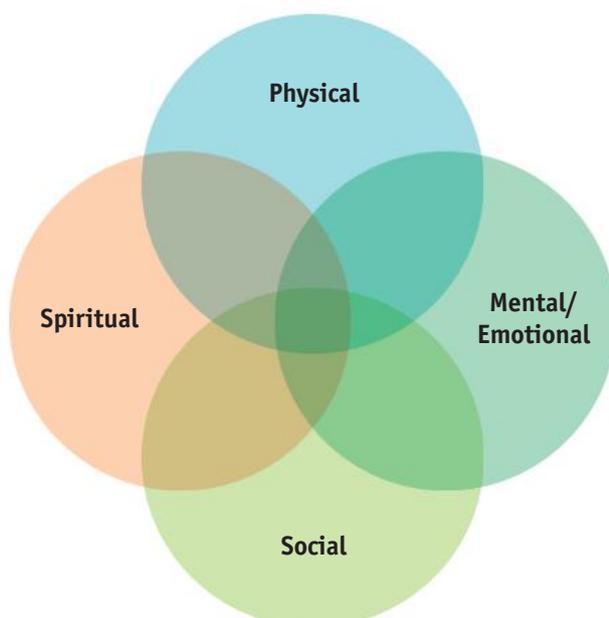
Figure 1.1 Nurse conducting an MRI scan of a patient in a hospital



**Figure 1.2** Health is a major determinant in our quality of life

In 1946 this changing perception of health was encapsulated in the World Health Organization's (WHO) definition of health as: 'A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'. This innovative view of health acknowledged that health was more than just a physical state, but also incorporated a person's mind, their social interactions and emotional and spiritual well-being.

From this point, the understanding of health continued to evolve. It is now widely accepted that health is multidimensional, dynamic and relative, and is influenced by a broad range of factors. Health is considered a valuable resource and a major determinant in our quality of life.



**Figure 1.3** The dimensions of health

## Health as a holistic concept

To the individual, good health means improved quality of life: less sickness and disability, a happier family and social existence, and the opportunity to make choices in work and recreation.

To the community, good health means a higher standard of living, greater participation in making and implementing community health policies, and reducing health-care costs (Better Health Commission 1986).

## Dimensions of health

One of the major aspects of WHO's definition of health that sets it apart from previous definitions of health was that it presented health as a holistic concept, encapsulating all aspects of an individual. It is now widely recognised that health is multi-dimensional and that those dimensions interrelate to produce a level of health that is both relative and dynamic.

The dimensions of health are identified in Figure 1.3.

### Physical health

Physical health refers to the biological functioning of our body. From a base level it includes the normal functioning of organs such as the heart, liver and lungs, and the absence of disease. It is the product of factors such as nutrition, physical activity, fitness and physical capabilities.

### Social health

Social health is the ability to interact with others in a manner deemed acceptable by society. It incorporates our relationships with others on all levels. This includes our ability to communicate



**Figure 1.4** Physical activity is one part of physical health

our thoughts, feelings and emotions with others and our capacity to develop and maintain quality relationships, while retaining our own identity and individuality. As people have such varied personalities, what this will look like for each person may differ substantially.

### Mental and emotional health

Mental and emotional health are often indistinguishable and relate to an individual's ability to understand their emotions, cope with everyday problems and handle stress in a non-destructive way. A person with good mental and emotional health will have a strong sense of self-identity and the ability to cope well with changes and challenges.

### Spiritual health

Spiritual health is closely linked with the sense that someone has of their place within the world. This varies significantly from person to person. For some it may mean having a deeper sense of purpose and direction in life, while for others it may mean having a strong connection with a higher order. Religious beliefs, social conscience and a sense of morality are all encompassed in this dimension of health.

The dimensions of health are very closely connected and a change in one dimension will almost certainly lead to changes in other dimensions. For example, consider a Year 11 student who plays representative soccer breaking their leg in an awkward tackle and having to wear a cast for six weeks. Aside from the physical pain associated with the break, the student will feel the impact of the injury in many other areas of their life. For example, due to the lack of mobility, they may find it difficult to participate in many social events, leading to a sense of isolation from their peers. They may find it more difficult to move around school and to concentrate in class due to pain and the awkwardness of the cast, resulting in lower grades at school. They may feel frustration at missing out on a significant portion of the soccer season and begin to feel excluded from their team-mates. However, their self-identity may be challenged as they evaluate who they are as someone without soccer. Or their religious views may be strengthened as they have more time for reflection and contemplation on their place in life.

## Relative and dynamic nature of health

An individual's level of health is not something that is easily measured; it is subjective and can fluctuate regularly. It is for these reasons that health is considered both relative and dynamic.

## Going further 1.2

### Inquire

- 1 What does good health mean to you? Rank the following dimensions of health in order of importance for quality of life and justify your rankings:
  - social health
  - emotional health
  - physical health
  - spiritual health
  - mental health.
- 2 Compare your rankings with other members of your class. Discuss any differences.
- 3 Do you think there would be a difference with how the following people ranked the dimensions and, if so, explain why:
  - a a church minister
  - b a paraplegic
  - c an elderly person
  - d a person in their 20s.

The concept of **relative health** refers to the idea that a person evaluates their level of health in reference to others or to their own level of health at another time. Individuals' experiences of life are varied and these varied experiences are what shape their understanding and idea of what it means to be healthy. Personality, past experiences of illness and injury, interactions with others and religious views all play a role in a person's perception of health.

**relative health**  
comparison to  
another's health

For example, a young man diagnosed with schizophrenia may describe his level of health as good because with the help of medication and physical activity, his psychotic episodes are under control. Yet, another person who has never experienced a mental illness may not consider this a good level of health.

An 80-year-old man who gets around with the use of a walking frame may consider himself to have a high level of health as he still has an active mind and a degree of physical independence compared to those who are of a similar age but confined to a nursing home or suffering dementia.

A young woman with cystic fibrosis may consider herself to have a good level of health as she is able to manage her illness with the use of a home nebuliser, allowing her to maintain full-time work and play netball. However, others may see the

## Going further 1.3

### Inquire

- 1 Where would you place the following people on the continuum of health? Justify your answers.
  - a Jane is a 45-year-old female who was diagnosed with breast cancer one year ago. Since her diagnosis she has undergone a mastectomy and is currently undergoing chemotherapy. She has lost all of her hair but seems to be responding well to the treatment. She is a strong Christian and has a positive outlook on life. Her family and friends are supportive of her in her situation.
  - b Emily is a 23-year-old university student. She is very athletic and active. She has a large group of friends and is quite close to her family. Emily is bulimic and is quite preoccupied with her body weight and shape and controlling her food intake. Emily does not consider her bulimia to be a problem as her episodes of bingeing and purging are only a couple of times a week.
  - c Anthony is a 48-year-old computer consultant. He gave up smoking seven years ago. He is a jovial man and has many friends. Anthony is overweight and enjoys good food and wine when out socialising with friends. He is committed to his family and makes spending time with his kids a priority. He tries to exercise regularly.
  - d Jason is lean and appears quite muscular. He is 29 and has smoked since he was 17. He works in an office and does very little exercise apart from the odd handyman job around the house. He played football every season until he was 23 and still looks fit. He has two children with whom he has little to do and a wife with whom he frequently argues.
  - e Rebecca is 27 and was made a quadriplegic in a car accident six years ago. She has no movement or sensation from the neck down and is bound to a wheelchair for life. She relies on her husband to do most things for her. After a period of severe depression and a lot of work with a counsellor, Rebecca has accepted her situation and is working on being content. She has learnt to paint and write with her mouth and is currently writing and illustrating a children's book.
- 2 Using one of the above characters as an example, explain the relative and dynamic nature of health.
- 3 Draw a timeline that represents your life. On the timeline plot your level of health, identifying any major health setbacks that may have impacted your health (e.g. broken leg, death in the family).
- 4 Using a specific example from your life, describe the interaction between the dimensions of health.

fact that she must spend up to 1.5 hours every day on the nebuliser and take up to 20 tablets a day as a sign of a low level of health.

As well as being relative, our health is **dynamic**; that is, it is in a constant state of fluctuation. We may experience changes to our level of health from minute to minute, day to day or year to year. Changes to our level of health can occur suddenly, such as an injury, or slowly, such as the gradual development of a disease.

The idea of viewing our health on a continuum, with optimum health at one end and poor health at the other, can help us to understand its relative

and dynamic nature. Judging where we fit on the continuum at any one point in time is highly subjective and is the product of many varying factors.

## Summary 1.4

- 1 What is health?
- 2 What are the dimensions of health?
- 3 What is meant by relative health?
- 4 What is meant by dynamic health?

## Checklist 1.5

- 1 Examine the dynamic nature of health by exploring:
  - a the interactions between the dimensions
  - b the concept of good health
  - c the health continuum
  - d how health changes over time
  - e how an individual's circumstances affect their health.

## Perceptions of health

People's perceptions of health are very subjective. Our perceptions of health have an impact on the choices that we make as individuals, the priorities that we place on healthy behaviours and the decisions that are made by policy-makers.

### Perceptions of their health

Every person is an individual and has a unique experience of life. These varying experiences, combined with our personality, attitudes and genetics, shape our perceptions of health. It is in this sense that health is a highly subjective concept. For example, the way that a health professional may judge a person's level of health may be very different to the way a teenager or an elderly person does. A health professional will have a view of health that is based on formal training and professional experience; whereas a teenager's perception of health will be based more on personal experience and their families' attitudes and behaviours towards health.

There are many influencing factors that shape and form our perceptions of health. These include:

- our families and peers' attitudes and behaviours towards health
- the media's portrayal of what it means to be healthy
- our past experiences of personal injury and illness
- the environment that we live in – geographical, social and political
- our level of education
- our personal beliefs and attitudes
- the meaning that we attribute to the word health.

These perceptions are not static and will vary over the course of our lives. As we age, what it means to be healthy will change, as will our belief about the capacity we have to achieve a good level of health.

## Going further 1.6

### Inquire

Complete this table to explain how an individual's perception of health may vary throughout life.

Age	Perceptions of health
0–11	Health as a concept is not really considered
12–16	
17–25	
25–40	
40–60	
60+	

Table 1.1 Perception of health throughout life

### Perceptions of the health of others

The perceptions that we have of what health means not only influence how we view our own level of health but also the way that we view other people's level of health. In the same way that our personal experiences shape our perceptions of our own **health status**, our experiences of other groups in society shape the way that we view their health status. For example, a person who has a sibling with a physical disability who is still an active member of society, is involved in the Paralympics and does not view their disability as a disadvantage, may have a more positive perception of the health of disabled people than someone who has had limited exposure to people with disabilities or whose only exposure has been an older person who has very limited mobility (housebound, for instance).

**health status**  
the health of an individual or population measured against an identifiable standard

## Implications of different perceptions of health

There are many implications that arise from people possessing different perceptions of health. These implications exist on both an individual and societal level.

On an individual level, a person's perception of their health and their potential to achieve optimal health will have a substantial impact on their health-related behaviours and choices. For example, an overweight person who recognises that a high-fat diet combined with limited exercise is contributing to their increasing weight may seek to change their diet patterns and start exercising. In addition, the recognition that overweight and obesity can lead to other significant health problems, such as sleep apnoea, cardiovascular disease, type 2 diabetes and heart disease, may provide additional incentive to adopt more healthy lifestyle practices. On the other hand, someone who is overweight but sees that as a part of their identity that should be accepted by others, and does not consider the health risks associated with being overweight as something to be concerned about, is much less likely to change their behaviours.

Being able to realistically assess our level of health enables us to take more control over our health and adopt behaviours that address our health issues, such as an overweight person seeking to lose weight. Conversely, if we have an unrealistic perception of our health, then this could lead to behaviours that may have a negative impact on our health. For example, a person who suffers from anorexia has a distorted perception of themselves and may consider themselves to be overweight when, in fact, they are underweight. This distorted perception may result in severely restricted eating and large amounts of exercise – behaviour that will be dangerous to their health.

On a societal level, government policy, allocation of funding and the priority placed on health issues will be dictated by the perceptions of health held by the various levels of government, health professionals and non-government organisations.

## Perceptions of health as social constructs

We have already established that the meaning that we attribute to the word health varies significantly

### Going further 1.7

#### Inquire

- 1 Complete the Healthy Kids Quiz (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)).
- 2 Consider the following people:
  - a your parents
  - b your best friend
  - c a teacher at school.

If they were to complete the same quiz on your behalf, do you think they would get the same result? Why/Why not?
- 3 Consider the following groups of people:
  - a elderly people
  - b people with a physical disability
  - c people with a mental disability
  - d homeless people
  - e Aboriginal and Torres Strait Islander peoples
  - f elite sports players
  - g supermodels
  - h asylum seekers.

Rate each group out of 10 according to the level of health that you think they experience (1 being a very low level of health and 10 being a very high level of health).

- 4 Consider the following questions:
  - a On what factors do you base your ratings of each group?
  - b After discussion with the rest of your class, do you think you would change any of the rankings? Why/why not?
  - c Do you think the perceptions of health that you hold for each group are accurate and fair?
  - d How have your perceptions been influenced by your own experiences?
  - e If you had to rate your own health status by the same scale, what would you rate yourself?
  - f How does your rating compare to those that you gave other groups? Why?
  - g Do you believe that some population groups have a worse health status than your own?
  - h Do you believe that some population groups have a better health status than your own?
- 5 How could the way someone perceives their level of health affect their well-being?

from person to person. This meaning is the product of individual experience and circumstance and is largely influenced by the social, cultural and economic environment in which we live. This idea that how you see health is not just determined by

**social construct**  
a concept that has meaning and shared understandings based on people's ways of seeing, interpreting, interrelating and interacting

you, but is chiefly shaped by society is referred to as a **social construct**.

There are many factors that contribute to our social construct of health. These include:

- economic status
- education
- employment
- cultural background
- religious views
- family and peers
- geographical, social and political environment in which we live

- individual experience and personality.

The idea of viewing perceptions of health as something that is socially constructed means that we can recognise that its meaning will vary:

- over time
- from individual to individual
- from context to context
- from culture to culture.

## Impact of the media, peers and family

The media, peers and our families all play a key role in shaping our ideas about health.

### Media

We live in a media-saturated society. With developments in technology over the last decade, the amount of contact we have with various forms of media has increased substantially. Mobile technology has meant that we can now have access to television, magazines, news, movies, radio and the internet from our mobile device wherever we are.

The media is constantly disseminating messages about health. Some of these messages are explicit and clear, and address specific issues. For example, stories about teenage drug use and road safety on news programs aim to increase awareness about these issues and bring about positive behaviour change. Media attention on relevant health-related issues can perform a valuable role in drawing attention to important issues and in shaping people's attitudes and behaviours towards those issues.

However, many of the messages that the media disseminates about health are more subtle and are implicit in the content of movies, television shows and the many various forms of advertising that we



**Figure 1.5** The geographical environment we live in can shape the meaning we attribute to the idea of health



**Figure 1.6** Our families play a key role in the development of our thinking about health

view. Although the content may not be directly related to health, the messages being sent can be just as strong. For instance, the constant use of thin, tanned, flawless men and women in television and print media conveys a strong message that in order to be successful, healthy and happy you must look like this. These images can then have a significant impact on people's perception of their own level of health and the behaviours they adopt in an attempt to achieve this ideal look.

### Family

Families are a key contributor in the development of attitudes, beliefs and values about health. They are the earliest influence on an individual and provide role models of health-related behaviours. During childhood and adolescence many habits relating to nutrition and physical activity are formed, and in many cases the family are key contributors to the formation of these habits, whether they are positive or negative. For example, attitudes towards drinking can be established from an early age. If a child grows up in a family where alcohol is a significant part of every celebration, where parents and other members of the family regularly drink to excess, then they may be

## Going further 1.8

### Collaborate

- 1 The tobacco industry has changed over time due to social change. With a partner, investigate the changes that have occurred over time with regard to tobacco and health.
- 2 Identify two other areas of health that have changed in line with social change.

influenced to think that this is acceptable and appropriate behaviour. On the other hand, regularly witnessing the abuse of alcohol or having to continually care for an intoxicated parent may lead to an avoidance of alcohol.

### Peers

Peers have a strong influence in the development of health-related attitudes and behaviours. The desire for approval and acceptance from peers can be a very strong motivating force behind making certain health-related decisions. If a group possesses similar values and attitudes towards health then group members are going to be encouraged to align themselves with those values and attitudes. This can have either a positive or a negative impact on health. For instance, if a young person hangs out with a group who are physically active and conscious of good nutrition then it will be easier for the individual to make positive health choices in those areas and they may be encouraged to do so.

Another example is a group who has a strong culture of binge drinking and drug use. An individual who is a part of this group may experience strong pressures to fit in and join in such behaviours.

## Going further 1.9

### Inquire

- 1 Referring to the photographs on the following page (Figures 1.7, 1.8, 1.9, 1.10 and 1.11), explain how healthy body images of women have changed over time.
- 2 How might pressures for women to look a certain way lead to negative health behaviours? Use examples to help explain.



**Figure 1.7** Women in the 1920s 'flapper' era



**Figure 1.8** Marilyn Monroe, the archetypal 1950s woman



**Figure 1.9** Elle Macpherson, the archetypal 1990s woman



**Figure 1.10** A 2000s catwalk model



**Figure 1.11** Physical fitness is one of the contemporary beauty ideals

## Summary 1.10

- 1 How do our perceptions affect health?
- 2 What impact do the media, peers and family have on health?

## Checklist 1.11

- 1 How healthy am I?
- 2 How healthy do other people think I am?
- 3 Why would my perceptions be the same or different to someone else?
- 4 How might one's perception of health affect their behaviour and well-being?

## Health behaviours of young people

Compared to a significant proportion of the world's population, young people in Australia generally experience an excellent level of health. With a government-supported health-care system, free primary and high-school education and a political environment of peace and stability, young people within Australia are provided with many opportunities to achieve good health. So what is the level of health experienced by young people in Australian society? Do most young Australians experience a high level of health? In what areas are young Australians experiencing poor levels of health and why? Why do some young people experience lower levels of health than others?

Government agencies, such as the Australian Institute of Health and Welfare (AIHW), play a key role in answering these questions. AIHW is a major national agency set up by the Australian government to 'provide reliable, regular and relevant information and statistics on Australia's health and welfare'. The aim of the agency is to improve the health and well-being of Australians through better health and welfare information and statistics. They do this by collecting, interpreting and reporting statistical information on a wide range of topics and issues, ranging from health and welfare expenditure, hospitals, disease, injury and mental health to ageing, homelessness, disability and child protection. Governments and the community then use the reports and data created by the AIHW in discussing, debating, and making

policy decisions on health, housing and community-service matters. This ensures that money and resources are spent where the need is greatest.

One of the key reports on the health and well-being of young people in Australia is the AIHW's report 'Young Australians: their health and well-being'. This report, released in 2011, is the latest review of current statistics on how people aged 12–24 within Australia are faring according to the national indicators of health and well-being. So what does it have to say?

## The positive health status of young people

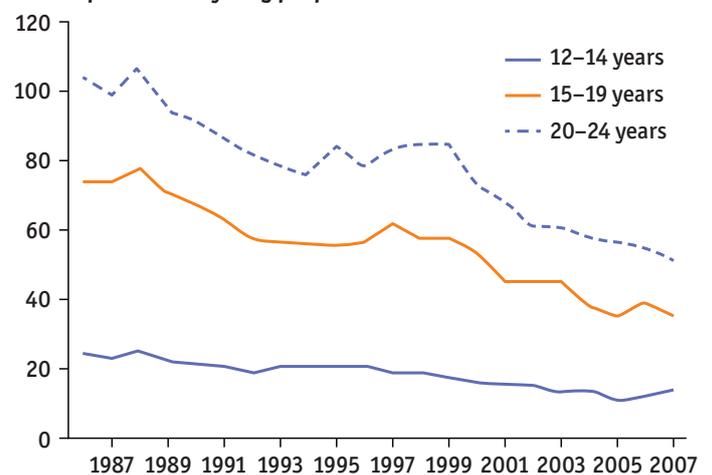
The AIHW reported that many young people within Australia are experiencing a positive level of health. This is indicated both by the statistical data on illness and injury and by the self-reported status of young people.

Due to the multidimensional nature of health, it can be difficult to obtain an accurate indication of physical and mental well-being using only objective measures, like mortality, morbidity and disability. While these measures provide a reliable picture of the presence of physical disability and illness, they are limited in the extent that they acknowledge the relative nature of health and the influence of the **determinants of health** on health status. In order to capture a more holistic depiction of health status, self-assessment tools play a valuable role.

One of the most encouraging findings of the report is that 93 per cent of young people, using self-assessment tools, rated their health as 'good', 'very

**determinants of health** the range of personal, social, economic and environmental factors that determine the health status of individuals and populations

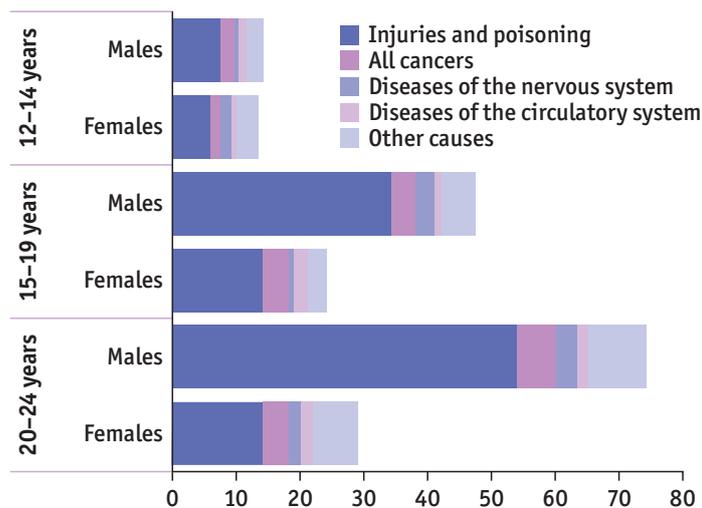
Deaths per 100 000 young people



Source: AIHW report 'Young Australians: their health and wellbeing'.

**Figure 1.12** Death rates for young people aged 12–24 years, 1986–2007

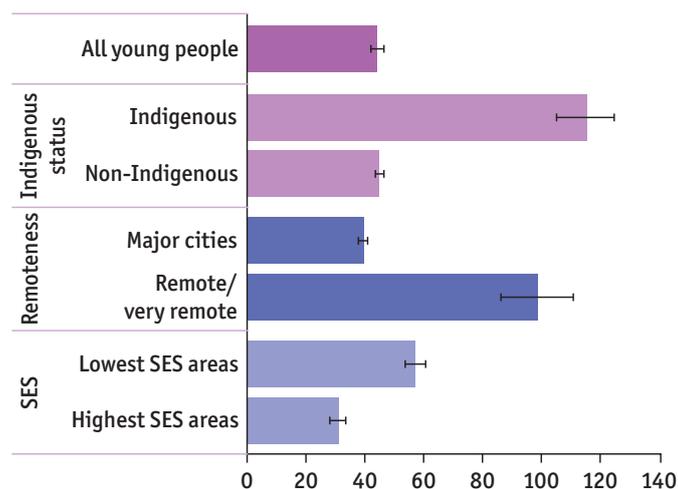
## Deaths per 100 000 young people



Source: AIHW report 'Young Australians: their health and wellbeing'.

**Figure 1.13** Leading causes of death among young people aged 12–24 years, 2007

## Deaths per 100 000 young people



Source: AIHW report 'Young Australians: their health and wellbeing'.

**Figure 1.14** Deaths among young people aged 15–24 years, by selected population groups

good' or 'excellent'. These ratings were higher in the 15–24 year age group than in any other age group within the Australian population and are considered high upon international comparison by the Organisation for Economic Co-operation and Development (OECD). These positive perceptions provide a good insight into perceived health status and when combined with epidemiological data present a holistic picture of health.

Other reported trends include the continued decrease in the mortality rate of young Australians. Over the past two decades the death rate of 12–24-year-olds has halved. This decrease in death rates has been predominantly due to a decrease in the injury and poisoning death rates, which have

more than halved during this same timeframe. Of the decrease in death due to injury, the most significant contributing factor was a decrease in deaths from land transport accidents and suicide.

The report showed positive trends relating to education with the majority of young people achieving national minimal standards for reading, writing and numeracy. In terms of emotional health and the support available to young people, the majority of young Australians also reported the presence of strong support networks and could identify places to seek support from in a crisis.

Asthma is an inflammatory condition of the airways. People with asthma are sensitive to certain factors such as dust, exercise, chemicals and environmental conditions, which may trigger the narrowing of the airways and an increase in mucus production, making it difficult to breathe. Asthma is the third-most commonly reported chronic condition in young Australians with 11 per cent of young people aged 12–24 years affected by asthma in 2007–08. This shows a decrease in the prevalence of asthma from early 2001. Hospitalisations due to asthma have also shown a decrease over the past five years, suggesting that education about asthma, self-monitoring, and treatment and management plans have been effective in reducing severe episodes.

## Going further 1.12

### Inquire

- 1 Referring to the text and the graphs at left and on the previous page, as well as Table 1.2 on the opposite page, propose reasons for the decrease in death rates of young people over the past 20 years.
- 2 Referring to the graphs, outline reasons for the significant difference in death rates between the 12–14, 15–19 and 20–24 year age groups.
- 3 Discuss strategies relating to road accidents and mental health that have been implemented during this time period that may have contributed to the decrease.
- 4 Males account for almost three-quarters of all deaths in the 12–24-year age group. Discuss reasons for the significant difference between males and females.

Health status and well-being		Year of data	Value	Trend
Physical and mental well-being	Proportion of young people aged 15–24 years rating their health as 'excellent', 'very good' or 'good'	2007–08	93%	~
Deaths	Death rates for young people aged 12–24 years	2007	37 per 100 000	✓
Mental health	Proportion of young people aged 16–24 years having high or very high levels of psychological distress as measured by the Kessler 10 (K10) scale	2007	9%	~
	Prevalence of mental disorders among young people aged 16–24 years	2007	26%	..
Injury and poisoning	Injury and poisoning death rate for young people aged 12–24 years	2007	25 per 100 000	✓
	Road transport accident death rate for young people aged 12–24 years	2009	9 per 100 000	✓
	Assault death rate for young people aged 12–24 years	2007–08	1.3 per 100 000	✓
	Suicide rate for young people aged 15–24 years	2007	10 per 100 000	✓
	Accidental poisoning death rate for young people aged 12–24 years	2007	1.1 per 100 000	~
	Injury and poisoning hospitalisation rate for young people aged 12–24 years	2008–09	2199 per 100 000	✗
Chronic conditions	Prevalence of long-term conditions among young people aged 12–24 years	2007–08	60%	✓
	Proportion of young people aged 12–24 years with asthma as a long-term condition	2007–08	11%	✓
	Incidence of diabetes among young people aged 15–24 years	2007	31 per 100 000	✗
	Incidence of cancer per 100 000 young people aged 12–24 years	2007	26 per 100 000	~
Communicable diseases	Incidence of vaccine-preventable diseases among young people aged 12–24 years	2008	73 per 100 000	~
	Pertussis	2008	64 per 100 000	~
	Hepatitis A, B and C notification rates for young people aged 12–24 years	2008	67 per 100 000	✓
	Hepatitis A	2008	1.8 per 100 000	✓
	Hepatitis B	2008	29 per 100 000	✓
	Hepatitis C	2008	36 per 100 000	✓
	HIV infection notification rate for young people aged 12–24 years	2008	3.1 per 100 000	✗
	Incidence of notifiable sexually transmissible infections among young people aged 12–24 years	2008	1045 per 100 000	✗
	Chlamydia	2008	945 per 100 000	✗
Oral health	Proportion of young people aged 12 and 15 years decay-free	2003–04	12 years 58% 15 years 43%	✗ ~
	Mean number of decayed, missing or filled teeth (DMFT) at 12 and 15 years	2003–04	12 years 1.03 15 years 2.01	~ ~

Key: ✓ = favourable trend ✗ = unfavourable trend ~ = no change or clear trend .. = no trend data available or presented

**Table 1.2** National indicators of youth health and well-being: quick reference guide

## Going further 1.13

### Inquire

Chlamydia is hard to spell but easy to catch. Listen to the MP3 article 'Health experts sound warning on spread of Chlamydia' (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)).

- 1 What is chlamydia?
- 2 What are the facts from the interview that you found interesting?
- 3 The highest rates of chlamydia among those tested were found to be 16–17-year-old girls, and 18–20-year-old males. Outline some reasons you think may contribute to the higher rates of chlamydia among these groups.
- 4 What is it about chlamydia that makes it a more difficult infection to detect and control?
- 5 What are some of the suggestions from the interview that they believe may assist in the prevention of the spread of this particular STI?

Favourable trends in some communicable diseases have been seen, with declines in notifications for hepatitis A, B and C. Unfortunately, these positive trends have not been seen in STI incidence rates. Between 1998 and 2008, the number of reported cases of STIs among 12–24-year-olds has quadrupled. While some proportion of this increase is due to increases in testing, these alarming figures also represent a true increase in STI transmission. Of the reported cases of STIs chlamydia was the most common STI, accounting for 90 per cent of all STIs. This is a fivefold increase from 1998.

While the incidence of cancer in adolescents and young adults has remained steady since the mid-1990s, survival rates have shown an improvement. Over the past four decades a gradual but consistent decline in cancer mortality rates has been seen, with survival rates in this age group remaining relatively high. Melanoma is the most reported cancer, with brain cancer the largest killer.

Unfortunately, not all areas of chronic disease have shown positive trends. Over the past decade the rate of diabetes among young Australians has almost doubled. While a significant proportion of this increase was an increase in type 1 diabetes, over half was due to an increase in the rate of type 2 diabetes – the result of poor diet and lack of physical activity. Further to this, an increase was also seen in the number of hospitalisations for ketoacidosis – a serious condition associated with illness or very high blood glucose levels in people with type 1 diabetes. Furthermore, these hospitalisations were frequently the result of non-compliance with medical treatment, especially among people aged 12–24, suggesting an attitude of complacency or a lack of understanding of the seriousness of diabetes.

Despite the generally positive health status reported by young people, it is evident throughout the report there are still some population groups within the youth of Australia that experience lower levels of health.

In terms of youth mortality, a significant variation was found in relation to Indigenous status, geographical location and socio-economic status. As seen in Figure 1.14 (on page 12), young Australians who were Indigenous, of a low socio-economic status or living in a remote or very remote location all had higher mortality rates than the rest of the youth population.

In many cases these three factors are not present in isolation but overlap, with those living in very remote areas more likely to be Indigenous and those living in rural and remote areas more likely to experience some socio-economic disadvantage.



**Figure 1.15** The rate of diabetes among young Australians has almost doubled over the past decade

## Going further 1.14

### Inquire

- 1 Visit the LIFE: Living is for everyone website (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)) to read the article: 'The Yiriman Project – assisting at risk youth in the Kimberleys'.
  - a What is the Yiriman project?
  - b Analyse how several factors work together to increase the risk of suicide among at-risk youth.
  - c Evaluate the ways that the Yiriman project is attempting to assist in the prevention of suicide, specifically in Aboriginal and Torres Strait Islander Youth.
- 2 Access the fact sheet 'Suicide in rural and remote communities' (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)).
  - a What are some of the reasons given for higher rates of suicide in rural and remote populations?
  - b Which of these reasons do you think particularly apply to young people? Why?

## Protective behaviours and risk behaviours

Adolescence is a time of increasing independence where parental and family influence give way to an increased desire for individual control. During this time young people will start to make decisions about health behaviours that may have a lasting effect on their health. These health behaviours can be seen as either protective behaviours (i.e. behaviours that enhance a person's level of health, such as being physically active and eating a balanced diet) or as risk behaviours (i.e. behaviours that can lead to health problems such as smoking and binge drinking). Many of the habits and attitudes towards health that are formed during this time will carry through into adulthood.

### Physical activity

Regular physical activity has many benefits for health and well-being at all ages. The National Physical Activity Guidelines by the Australian government's Department of Health (formerly the Department of Health and Ageing) outlines

recommendations for 12–18-year-olds for the minimum level of physical activity required for good health in adolescents.

It is recommended that for good health, 12–18-year-olds:

- should participate in at least 60 minutes (and up to several hours) of moderate to vigorous-intensity physical activity every day.
- should not spend more than two hours a day using electronic media for entertainment (e.g. computer games, internet, TV), particularly during daylight hours.

These recommendations were developed in acknowledgement of the fact that many of the leisure activities that are currently popular with young people, such as watching television, playing video games and using social media, involve very little physical activity. Many children and young people are now also driven to school or other places rather than walking or cycling. Following the guidelines and participating in regular physical activity produces many health benefits. As well as physical benefits such as weight management, increased bone strength, improved muscle development, increased cardiovascular fitness and mobility there are also many social and emotional benefits. Physical activity can assist in the management of stress, help to improve self-confidence and provide opportunities for social interaction. Physical inactivity is a modifiable risk factor for overweight and obesity and numerous other illnesses such as type 2 diabetes, cardiovascular disease and osteoporosis.

The most recent data on the physical activity levels of young Australians was analysed in the AIHW report: 'Young Australians: their health and well-being'. The report found that only 44 per cent of young Australians aged 15–24 years met the National Physical Activity Guidelines for moderate to intense physical activity and that 27 per cent were **sedentary**. In relation to the guidelines on screen-time use, 71 per cent were found to exceed the recommendations for screen time during the week and 83 per cent on weekends. This is a concerning statistic as research suggests that those who spend two or more hours a day on non-educational screen time are more likely to be overweight, be less active, consume more foods high in sugar, fat and salt and have fewer social interactions, all of which are risk behaviours associated with overweight and obesity.

With one in every five children now overweight or obese in Australia, the importance of physical activity is now even greater. These children often experience a range of health problems as a result and are at a significantly greater risk of being obese

**sedentary** not engaged in physical activity; inactive

as adults, as childhood obesity is known to be a good predictor of obesity in adulthood.

### Obesity/overweight

In 2008 the Australian Minister of Health made obesity a National Health Priority Area due to the rising number of Australians who are overweight or obese. In 2007–08 over one-third of young Australians aged 12–24 years were estimated to be overweight or obese.

Overweight and obesity is indirectly measured using the body mass index (BMI). BMI is a ratio of height to weight and is measured by dividing weight in kilograms by height in metres squared. The BMI is a useful measurement tool for most people over 18; however, there are some limitations. For instance, adults with an athletic build and a high level of muscle mass could show as overweight according to the scale. This is because muscle weighs more than fat and the BMI doesn't take this into account. Therefore, in adults the BMI is frequently used in conjunction with other measurements such as waist measurement. In children and adolescents a separate BMI scale is used to account for the accepted fluctuation of BMI that occurs during normal growth and development. Overweight and obesity in young people is of major concern as a risk behaviour as, not only does it significantly increase the likelihood of being overweight or obese as an adult, it also increases the risk of developing cardiovascular disease, high blood pressure and/or type 2 diabetes later in life. Overweight and obesity is very closely linked with poor diet and exercise and, in many cases, is the result of modifiable lifestyle choices.

## Going further 1.15

### Inquire

Refer to the Heart Foundation's BMI calculator and weight measurement website (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)). What are the limitations with BMI?

### Sexual health

Adolescence is a time when young people develop a heightened sexual awareness and begin to establish an individual and sexual identity. Many start to experience attraction towards others and may start to engage in sexual activity. When young people choose to enter into a close, intimate relationship and begin participating in sexual activity they open

themselves up to a broad range of short-term and long-term consequences.

One potential consequence of participating in sexual activity is the contraction of an STI. The severity of the consequences vary depending on the STI and while some can be cured with medication, others can have a lifelong impact. Having a good knowledge and understanding of the transmission of STIs is a protective behaviour in relation to sexual health. The National Survey of Australian Secondary Students, HIV/AIDS and sexual health, reported that although there has been a marked improvement in student knowledge of STIs in some areas, it still remains relatively poor.

One area in which knowledge was reported as poor is chlamydia (as discussed in Going further 1.13). This lack of knowledge is perhaps reflected in the fact that over the past 10 years, rates of chlamydia have quadrupled, with the highest rates among 15–29-year-olds.

Another consequence of engaging in unsafe sex is unplanned or unwanted pregnancy. From the 1970s there has been a steady decline in the number of teenage births up to 2003. From 2003 the rate seems to have stabilised, with teen mothers accounting for four per cent of all babies born. While this rate can give us an accurate picture of the live birth rate, it does not provide a true representation of teen pregnancy, as abortion, miscarriage and stillbirths are not included. If these factors are taken into account then it can be estimated that the rates of teen pregnancy are in fact much higher.

Teenage motherhood frequently has a negative impact on the health not only of the mother but also the child. Teenage mothers often delay confirmation of their pregnancy and are more likely to engage in risky behaviours such as smoking



**Figure 1.16** Unprotected sex can lead to an unplanned or unwanted pregnancy

and drinking during pregnancy. These behaviours can hinder the development of the foetus and may contribute to the higher levels of complications during birth and pregnancy and the lower birth weights experienced by teenage mothers. As well as physical complications, teenage mothers are also more likely to experience an interruption to their schooling and some level of poverty throughout their life, which may result in poorer educational and economic futures for children born to teenage mothers.

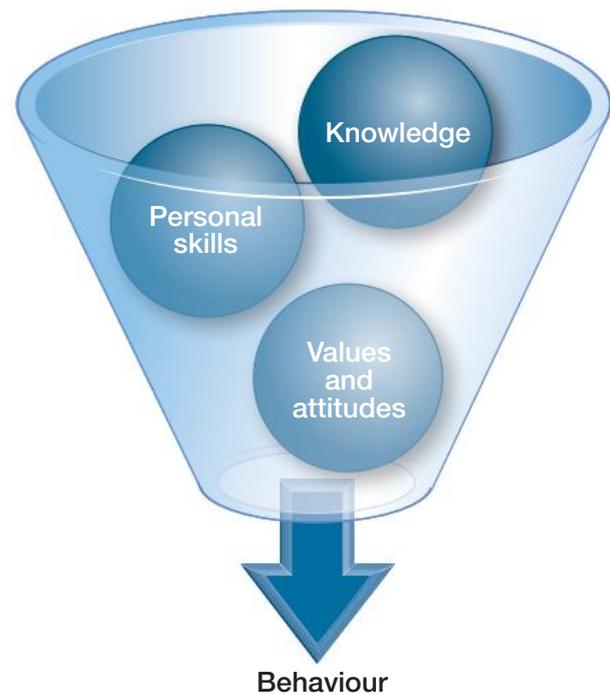
In another alarming statistic, young women's experiences of unwanted sex have increased significantly from 2002. Of these unwanted experiences, the two most commonly reported reasons for unwanted sex was being too drunk or pressure from their partner. The consequences of unwanted sex can be severe and long lasting. In addition to physical consequences such as pregnancy, injury or contraction of an STI, sexual assault can have a severe emotional impact on an individual. Victims of sexual assault are frequently left with feelings of powerlessness, shame, guilt, fear, anger, anxiety, depression and low self-esteem. If these feelings are not resolved they can have a lasting negative impact on an individual's mental and social health.

Safe sexual practices reduce many of the risks associated with sexual activity and are paramount in protecting the physical and emotional health of young people. Safe sexual practices involve more than just preventing pregnancy and are important for protection against STIs. Safe sexual behaviours start with values and attitudes towards sex, knowledge of the associated risks and the personal skills to implement. Safe sexual practices include:

- limiting sexual partners and discussing sexual history and STI protection before engaging in sexual activity with a new partner
- getting tested for an STI every time you have a new partner
- participating in activities such as deep kissing and cuddling instead of penetrative sexual activity
- using a condom every time during any form of penetrative sex.

While behaviours relating to contraceptive use have shown improvement between 2002 and 2008, it is concerning that 1 in 10 sexually active Year 10 and 12 students report the withdrawal method as their main form of contraception. The withdrawal method is an unreliable form of contraception, provides no protection from STIs and relies on a significant amount of control by the male and trust from the female.

One of the most effective methods for STI protection is condom use. Of sexually active



**Figure 1.17** A number of factors influence a person's behaviour

students, only half reported the use of condoms every time they had sex. Disturbingly, there was also a negative association between condom use and the number of sexual partners. Students who were more sexually active, in terms of numbers of partners (three or more), were significantly less likely to always use a condom when they had sex, meaning that those engaging in already risky behaviour are placing themselves, and others, at an even greater risk. The main reason provided for not using a condom was that 'it just happened', suggesting a lack of forethought and planning in relation to sexual activity. Furthermore, almost a quarter of sexually active students reported that the last time they had sex they were either drunk or high on drugs.

### Sun protection

Australia has the highest rates of skin cancer incidence in the world with two in three Australians being diagnosed with skin cancer by the time they are 70. Skin cancer rates have been increasing over the past three decades and now account for around 80 per cent of all newly diagnosed cancer. In Australia, non-melanoma skin cancer is the most common type of skin cancer, and melanoma is the most common cancer in Australians aged 15–44.

Skin cancer is caused when skin cells are damaged; for example, by overexposure to ultraviolet (UV) radiation from the sun. Sun exposure is the cause in 95–99 per cent of all skin cancers, with sun exposure during childhood and adolescence considered to be the most significant risk factor for developing skin cancer.



**Figure 1.18** Melanoma is the most deadly form of skin cancer

**health promotion** the process of enabling people to increase control over and to improve their health

Over the past few decades, **health promotion** campaigns in Australia have been working to change attitudes and behaviours in relation to sun protection. However, despite the knowledge of the harmful effects of sun exposure, many Australians remain complacent about sun protection.

Melanoma is the most deadly form of skin cancer and in 95 per cent of cases is caused by sunburn. On an average summer weekend, 24 per cent of Australian teenagers and eight per cent of children are sunburned. Many are sunburned while participating in water sports and activities at the beach or a pool, or on cooler or overcast days due to the mistaken belief that UV radiation is not as strong on these days. The most common reasons provided for getting sunburned were ‘forgetting’ to protect and poor application of sunscreen.

Attitudes towards tanning have a large impact on adolescents’ behaviours in relation to sun

protection. Tanning is a sign that a person’s skin has been exposed to enough UV radiation (from the sun or solarium) to cause damage. This will eventually cause loss of elasticity (wrinkles), sagging, yellowish discolouration and even brown patches to appear on the skin. Many Australians, however, still hold the misguided belief that a tan appears healthy. Thanks to continued education about sun protection and tanning, this belief is slowly changing. The Cancer Council’s latest National Sun Protection Survey, conducted in summer 2011–12, showed a decrease in the preference for a suntan among 12–17-year-olds from 51 per cent in 2006–07 and 60 per cent in 2003–04 to 45 per cent in 2011–12. Although there is still a large proportion of teens that desire a tan, these statistics show a positive trend.

### Substance use

The use and misuse of licit and illicit drugs is widely recognised in Australia as a major health concern. Causing significant financial and social costs to the wider Australian community each year, drug abuse is a risk behaviour that many young people engage in.

Adolescence is a time where many teenagers begin to experiment with the use of substances such as tobacco, alcohol, illicit drugs and the misuse of prescription drugs. This experimentation can pose health risks, both in the immediate and distant future, and has wider social and economic costs. The *2010 National Drug Strategy Household Survey Report* is the fifth survey tracking the patterns and behaviours of Australians relating to drug use.

### Tobacco use

Tobacco smoking remains the largest preventable cause of death and disease in Australia. It is the largest contributor to the burden of disease in Australia, costing \$32.5 billion in 2004/05. It causes one in nine cancers, and at least one in five cancer deaths each year. Tobacco smoking has also been linked to cardiovascular disease, emphysema, bronchitis, peripheral vascular disease, difficulties in pregnancy and the development of the foetus, stroke and numerous other health problems. While tobacco smoking produces some short-term consequences, such as shortness of breath, persistent coughing and other respiratory problems, tobacco smoking in adolescence is considered a major health risk because of the long-term consequences it produces. Taking up smoking during teen years increases the likelihood that a person will continue to smoke as an adult. Approximately one-third of all adult smokers began regular smoking as a teenager. The most recent

## Going further 1.16

### Collaborate

Read the media release ‘Solariums to be banned in NSW’ (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)). In groups, discuss:

- 1 What risks are associated with the use of solariums?
- 2 Why are solariums misguidedly considered a safe choice when it comes to tanning?
- 3 Explain why there is no safe way to tan with the use of UV radiation.
- 4 Analyse the possible reasons a young person may feel pressured to seek a tan.

	Alcohol (\$m)	Tobacco (\$m)	Illicit drugs (\$m)	Alcohol and illicit together (\$m)	All drugs (\$m)	All drugs adjusted for health interaction (\$m)
<b>Tangible</b>	10 829.5	12 026.2	6 915.4	10 577.8	30 828.9	30 489.8
<b>Intangible</b>	4 488.7	19 459.7	1 274.5		25 222.9	24 683.0
<b>Total</b>	15 318.2	31 485.9	8 189.8	10 577.8	56 051.8	55 172.8
<b>Proportion of unadjusted total</b>	27.3%	56.2%	14.6%	1.9%	100.0%	

Note: Health-related cost components in final column have been adjusted by 2.18% to take account of drugs interaction. As a result of rounding, totals may not correspond exactly with the sums of their individual components.

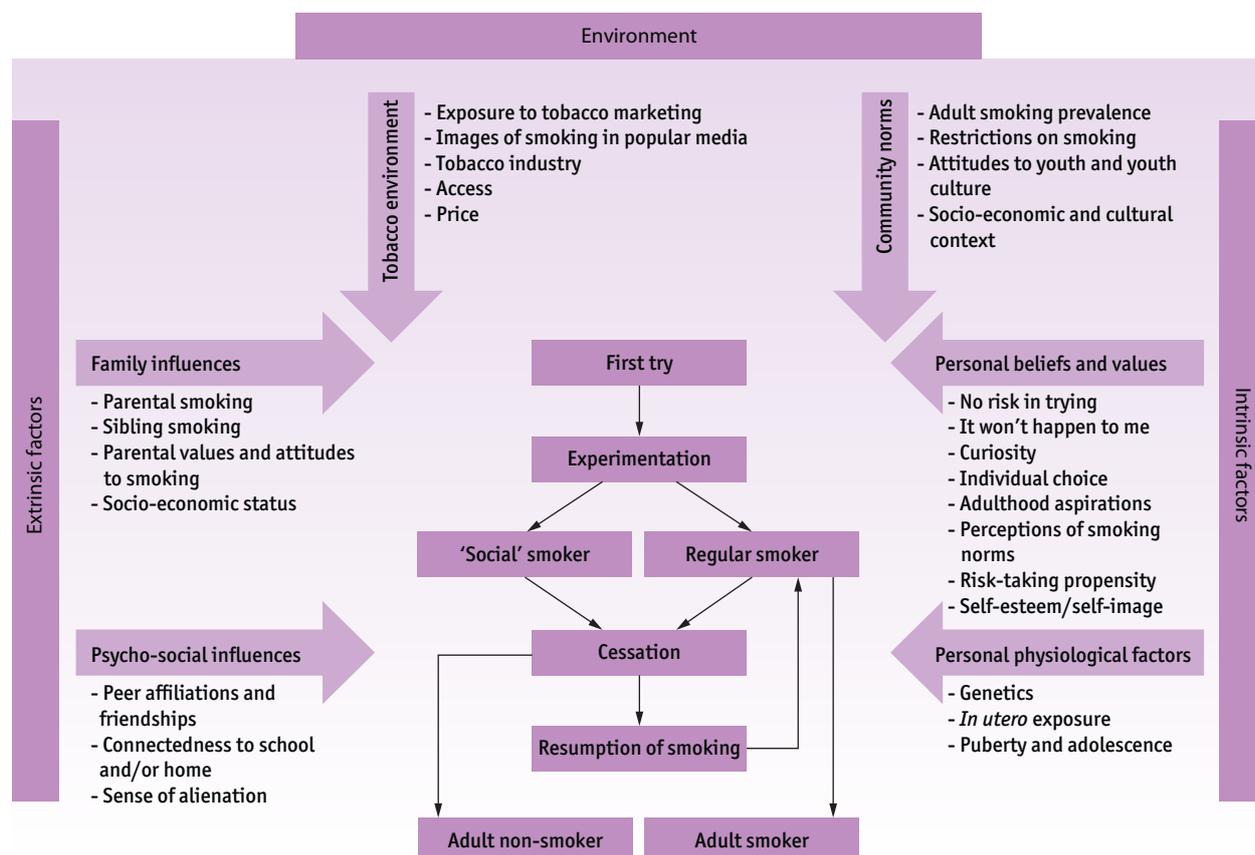
Source: Tobacco in Australia.

**Table 1.3** The costs of tobacco, alcohol and illicit drug abuse to Australian society in 2004/05

statistics report the average age for initiation of smoking as 16, an increase from 1995.

Tobacco can have a long lasting impact on brain health. During adolescence the teenage brain is still in a state of significant structural development. Due to this state of ongoing development, the adolescent brain is extremely vulnerable. Initiating substance use during this time of vulnerability increases the risk of developing an addiction later in life. In relation to tobacco use, evidence

also suggests that during this time adolescents have an increased sensitivity to the stimulatory and reinforcing properties of nicotine, meaning that young smokers are more likely to become addicted to nicotine and more quickly than adults, even while smoking at a lower rate. There is also evidence to suggest that exposure to nicotine during adolescence can alter brain function. These changes in brain function can produce a long-term vulnerability to nicotine addiction and may also



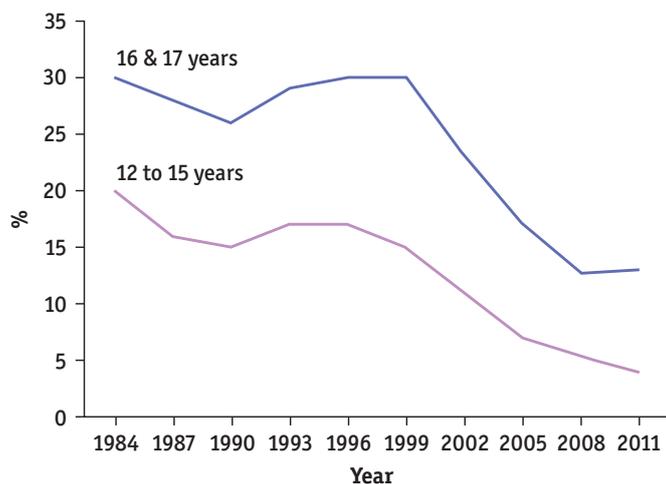
**Figure 1.19** Factors influencing uptake of smoking by young people



**Figure 1.20** Smoking rates among young people are in decline

predispose the individual towards use of other addictive substances and to mental illness.

Over the past 10 years, statistics reveal a positive trend, with a decrease in the number of school children progressing from experimental to established smoking behaviour and an increase in the number abstaining from smoking altogether. In the *2010 National Drug Strategy Household Survey Report* it was shown that of 12–17-year-olds, 94.6 per cent reported to have never smoked, 0.8 and 0.5 per cent, respectively, reported as being weekly or less than weekly smokers, and 2.5 per cent reported being daily smokers. The 18–19 year age group showed much higher rates of smoking, with 13 per cent smoking daily, 2.2 per cent weekly and 1.1 per cent less than weekly. The 20–29 year age group showed higher rates still, with 64.6 per cent reporting to have never smoked, 18 per cent reporting daily use and 2.9 and 2.8 per cent smoking weekly and less than weekly, respectively.



**Figure 1.21** Trends of smoking rates in 12–17-year-olds

### Alcohol use

Teenage alcohol use in any amount poses a health risk, not only due to the developmental harm that can result but also because of the potential for short-term harm. As the amount of alcohol consumed increases, so does the potential for harm. Drinking excessive amounts in a short period of time (binge drinking) can cause nausea and vomiting, headaches and alcohol poisoning, as well as adversely affect behaviour and decision-making capabilities. Reduced inhibitions coupled with impaired decision-making can lead to an increase in risk-taking behaviour such as drink-driving, violence, engaging in unsafe sexual activity or illicit drug use, resulting in injury, illness and regret. The National Drug Strategy (NDS) shows that most teens who are engaging in drinking are doing so at an excessive level, with 17.8 per cent of younger people aged 14–19 years engaging in high-risk drinking. This rate of binge drinking behaviour has remained relatively stable in the 12–15 and 16–17 year age groups but has increased in the 18–19 year age bracket since 2000.

This risky drinking behaviour, as well as resulting in individual consequences, has a wider social and economic impact, costing the Australian taxpayer approximately \$15.3 billion in 2004/05.

## Going further 1.17

### Create

- Read the article opposite, 'Binge drinking a hard habit to break', and then answer the following questions:
  - What were the major findings of the study in Victoria?
  - Why do you think teenagers who binge drink are highly likely to continue this behaviour into their 20s?
  - What are the possible consequences of binge drinking in (i) the short term and in (ii) the long term?
- Consider the section: 'Plan to curb drinking fails'. Clearly, the current strategies being used to address the issue of binge drinking in Australia are not working as well as hoped. Propose a strategy that could be implemented in your school that may actually have a positive impact on young people's attitudes towards binge drinking.

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## Binge drinking a hard habit to break

By LUCY CARROLL

*The Sydney Morning Herald* (online), 25 August 2013

Australians who binge drink as teenagers continue to drink at dangerous levels in adulthood, a study has found.

More than 90 per cent of men who drink alcohol to excess as teens keep doing so throughout their 20s, said lead author Professor Louisa Degenhardt, from the National Drug and Alcohol Research Centre at the University of NSW.

'This shows that binge drinking in adolescence isn't just an experimental or passing phase,' she said.

The research, published in the *British Medical Journal Open*, is based on a study of nearly 2000 Victorian teenagers aged between 14 to 17. They were followed and assessed nine times over 15 years, starting in 1992.

As teenagers, 52 per cent of boys and 34 per cent of girls reported consuming five or more drinks on a single occasion within the past week.

The overwhelming majority – more than 90 per cent of boys and 70 per cent of girls – were highly likely to binge at the same levels, or more, as young adults.

'Even more than tobacco and cannabis use, alcohol is the teenage health-risk behaviour that persists,' said co-author Professor George Patton, of Melbourne's Murdoch Children's Research Institute.

Researchers found that extremely risky binge drinking – defined as more than 20 drinks for males and 11 for females – was also more common than thought.

'This definition of heavy bingeing is the equivalent of a bottle of whisky for boys or bottle and half of wine for girls. This is drinking which is going to cause a whole host of problems in later life, including liver disease and brain damage,' Professor Patton said.

Almost half of the boys and one third of girls reported extreme binge drinking in either adolescence or in their 20s. Of these, more than 40 per cent first started heavy binge drinking when they were teenagers.

'Those kids who drink to the point of becoming unconscious or vomiting have an ever higher risk of continuing bingeing,' he said. 'They are not learning from their experiences.'

But the study found that those who didn't binge drink as teenagers weren't protected from starting in later life.

Seven out of 10 males who had not reported bingeing as teenagers did so as adults.

The director of the Public Health Advocacy Institute at Curtin University, Professor Mike Daube, said the research confirms 'frightening' levels of binge drinking that 'no one is doing much about'.

He said easy access, lack of education and exposure to alcohol promotion are the key drivers that lead to excessive alcohol consumption.

### Plan to curb drinking fails

An ambitious federal government plan to curb alcohol misuse has failed to achieve almost 90 per cent of its goals, an evaluation by the Foundation for Alcohol Research and Education has found.

The 2009 National Preventative Health Taskforce Strategy identified 32 alcohol-specific goals but only four have been achieved in the past four years.

There has been no progress at all on 10 goals and only partial progress on 18 others.

The foundation's chief executive, Michael Thorn, said the assessment found very little had been done to tackle the incidence of risky drinking. 'It reflects a lack of effort and a falling away of leadership,' he said. Some of the goals which have not been addressed related to children and drinking, including embedding the preventative health message in schools and universities.



**Figure 1.22** Alcohol is the teenage health-risk behaviour that persists

In an average week, four Australians under the age of 25 die due to alcohol-related injuries and 70 are hospitalised due to alcohol-related assault. Fifty per cent of 15–19-year-olds who binge drink also reported doing something that they regretted.

Drinking heavily on a regular basis increases the potential for harm in the short term and greatly increases the risk of harm from alcohol-related disease or injury over a lifetime.

During adolescence the brain is in a state of intense development that continues into the early 20s. Drinking throughout this stage can interrupt brain development, preventing full potential being reached.

Regular excessive use of alcohol in early years is also considered a risk factor for the establishment of negative patterns relating to alcohol use. Long-term excessive use of alcohol can result in numerous social, emotional and physical consequences such as alcohol dependence, relationship breakdown, cirrhosis of the liver, decreased memory, depression, increased risk of some cancers and increased risk of heart disease and other chronic diseases.

#### *Illicit drug use*

The use of illicit drugs and the misuse of prescription drugs is another risk behaviour with many potential consequences.

In the *2010 National Drug Strategy Household Survey Report* (see Figure 1.24), the age groups who were the most likely to report illicit substance were

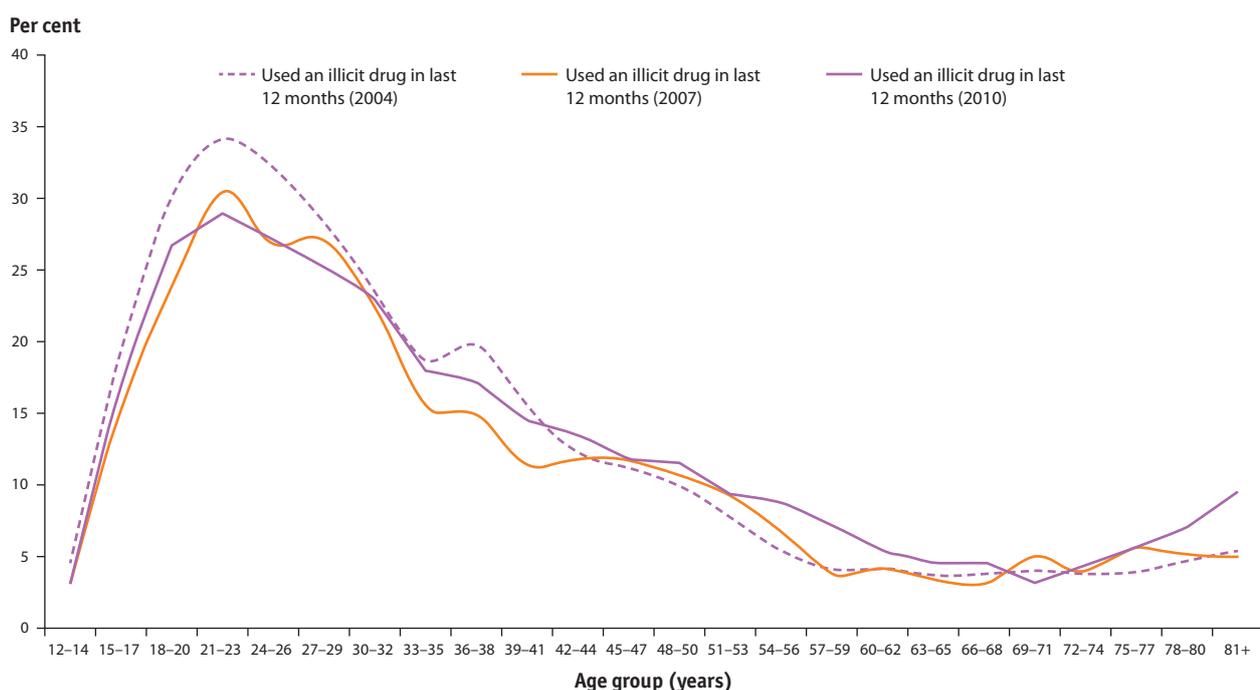
the 20–29 year age group (27.5 per cent) and the 18–19 year age group (25.1 per cent) with just over one in four people in each age group reporting use of an illicit substance in the past 12 months. Although still relatively high, when compared to data from previous years, a somewhat positive trend is evident.

In young people the most commonly reported illicit drug used was marijuana, followed by ecstasy and then cocaine in the 20–29 year age group, and ecstasy and methamphetamines in the 18–19 year age group. Rates of illicit drug use in the 12–17 year age group were significantly lower, reporting very low rates of use of most illicit drugs, apart from marijuana. In 2007, the average age among 15–24-year-olds for first use of alcohol was 16 years, and for marijuana/cannabis it was around 19 years. The average age of first use of meth/amphetamines was around 21 years, and for ecstasy was around

### Going further 1.18

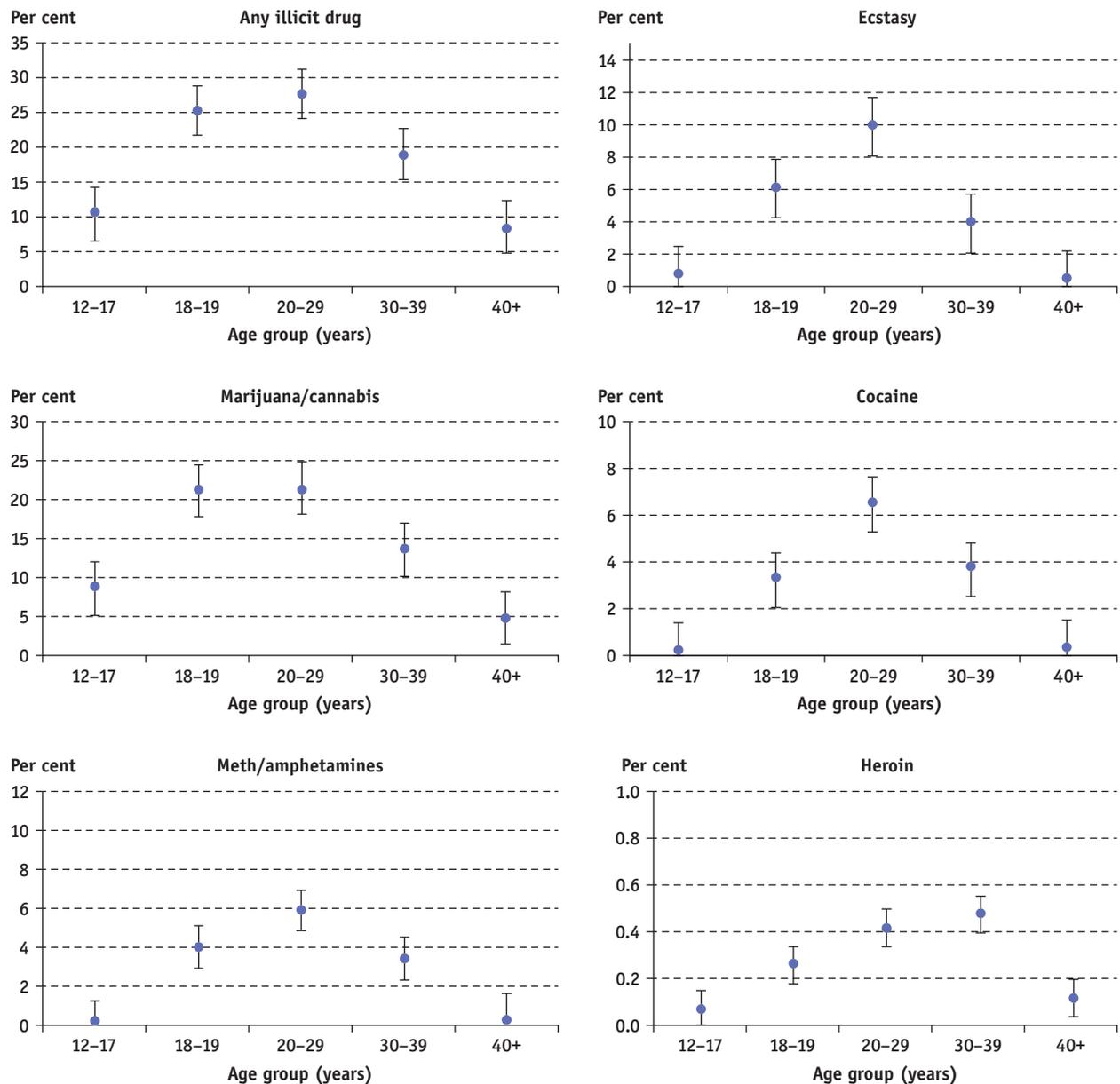
#### Inquire

- 1 Looking at Figure 1.23 below, analyse reasons for the increased use of illicit drugs in these age groups.
- 2 What are some protective factors relating to drug use that may decrease the likelihood of a young person trying drugs?



Source: 2010 National Drug Strategy Household Survey Report.

**Figure 1.23** Recent use of illicit drugs by people aged 12 years or older



Source: 2010 National Drug Strategy Household Survey Report.

**Figure 1.24** Prevalence of selected illicit drug use by people aged 12 years or older

23 years. In many cases illicit drug use is the result of a progression from 'softer' drugs, such as alcohol and marijuana. It has been suggested that experimentation with alcohol and marijuana in the younger years may lead to the use of harder drugs such as meth/amphetamines in later years.

### Nutrition

Adolescence is a key period of growth and development where good nutrition is critical. During adolescence the need for most nutrients increases as a result of the many developmental processes occurring in the body. This includes an increase in energy needs to sustain the increases in height, weight and lean body mass, increased need for calcium for the growth of the skeletal system, increased requirement for protein for the accrual of lean body mass and an increased need

for other minerals and vitamins for the normal functioning and growth of organs. As appetite is also likely to increase during this stage of growth, it is even more important that wise food choices are made.

Not only is nutrition during adolescence important for sustaining normal growth but it is also a key period for the establishment of good nutritional habits. Many habits acquired during teen years will shape behaviours throughout the rest of the lifespan. With increasing age comes increasing independence from the family unit and teens will start to implement more control over their nutritional choices, deciding what they will eat, when and where. Having a good understanding of the impact that nutrition can have on their body will allow teens to make informed decisions about what they are putting in their bodies.

## Going further 1.19

### Inquire

Use the Healthy Eating Self-Assessment tool on the Dieticians Association of Australia website (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)) to evaluate a typical intake of food for three days.

- 1 Overall, did your diet receive a positive evaluation or a negative evaluation?
- 2 In what areas do you meet the recommendations for your age group outlined in the Dietary Guidelines for Children and Adolescents?
- 3 In what areas do you need improvement?
- 4 Outline some realistic ways that you could alter your diet to ensure that you have a nutritionally balanced diet.
- 5 Think about the amount of physical activity you did over the three days.
- 6 Did the amount you ate vary with your level of activity? If not, why not?
- 7 Did you eat breakfast on every one of the three days? If not, why not?
- 8 Outline why breakfast is considered the most important meal of the day.
- 9 Describe why some people skip breakfast.
- 10 Discuss the potential influences on young people's food choices, giving examples of both positive and negative influences.

The National Health and Medical Research Council (NHMRC) developed the Dietary Guidelines for Children and Adolescents in Australia to provide advice on meeting the nutritional requirements of children and adolescents. The guidelines are easy to read and focus on general principles relating to food groups and the creation of healthy lifestyle patterns rather than specific quantities of foods and nutrients.

One of the national indicators of well-being used by the AIHW is the proportion of young people meeting the Australian Dietary Guidelines. In 2007–08 it was found that only five per cent of young people aged 12–24 years were meeting the daily requirements of both fruit and vegetables, a decrease from 2005. Most young people consumed some fruits and vegetables each day but in levels lower than those recommended by the NHMRC.

## Checklist 1.21

- 1 What are the trends in relation to the health behaviours of young people?
- 2 Discuss society's perceptions of young people in terms of their behaviour. Do you think these perceptions are accurate?
- 3 Identify a range of risk and protective factors for three key youth-health issues.
- 4 Would risk increase or decrease if a young person had multiple risky behaviours as a part of their life?

## Summary 1.20

Complete this table summarising the risk behaviours, potential consequences and protective strategies for young people.

Risky behaviours	Consequences	Protective strategies
<b>Reasons why young people take risks – influencing factors</b>		

**Table 1.4** Risk behaviours, potential consequences and protective strategies



Australian Government  
National Health and Medical Research Council  
Department of Health and Ageing

www.eatforhealth.gov.au

# Australian Guide to Healthy Eating

Enjoy a wide variety of nutritious foods from these five food groups every day.  
Drink plenty of water.



**Use small amounts**



**Only sometimes and in small amounts**



Figure 1.25 Australian Guide to Healthy Eating

## 1.2 Influences on the health of individuals

### The determinants of health

#### Driving questions 1.22

- 1 Brainstorm a range of factors that influence your health-related attitudes and behaviours.
- 2 From this list, identify the most powerful factors or determinants.

There are many influencing factors on a person's health. Elements such as the environment in which people live, level of education and income, genetics and social influences all interact to determine the level of health that people experience. These influencing factors are referred to as determinants of health.

They include:

- individual factors
- socio-cultural factors
- socio-economic factors
- environmental factors.

The determinants act in varying degrees and can have either a positive or a negative influence on a person's health. The things that increase our likelihood of experiencing poor health are referred to as **risk factors** and include things such as a high-fat diet, unemployment and physical inactivity. Eating a balanced diet, having a family that supports a healthy lifestyle, having vaccinations and regular medical check-ups are all examples of protective factors that are likely to increase the level of health a person experiences.

**risk factors**  
physical, social and emotional risks that have a negative impact on health

Having an awareness of the impact that the determinants have on a person's level of health can assist in understanding trends in health. It can also help explain why some people experience poorer levels of health than others and assist in creating effective health-promotion strategies.

It is important to note that the determinants do not act in isolation but rather interact to determine an individual's health. Often determinants are closely linked and changes in one area may impact on others. For example, having a high level of education means that you are more likely to have a



**Figure 1.26** A balanced diet can influence individual human development and health

better-paying job – resulting in a higher income and therefore more freedom to choose where you live and greater access to private health insurance.

The impact that a particular determinant will have on an individual's health will also vary depending on the time and intensity of exposure. For instance, an individual who takes a job working in the mines where they are surrounded by heavy machinery and toxic chemicals increases the risk of illness or injury the longer that they work there.

Determinants also differ in the degree to which they are modifiable. That is, how easily they can be altered by the individual. Some determinants such as knowledge and individual attitude can be modified in a much more straightforward way than can factors such as employment and income, which are very closely linked to other factors, such as education and broader aspects of society, including job availability.

Other factors, such as age, gender and genetic makeup, are things people have no control over.

## Individual factors

### Knowledge, attitudes and skills

Knowledge and attitudes, as well as beliefs, about health play a significant role in shaping the decisions we make about health every day. Having an understanding of the way that different things impact our health and the importance of good health can encourage someone to establish protective health behaviours. These include eating a nutritionally balanced diet and participating in regular physical activity, rather than risky behaviours such as binge drinking and unsafe sexual activity.

From medical professionals to peers, family, the internet, books, magazines and television programs, Australians seek health knowledge from a broad range of sources. Due to the large amount of information available it is important that a person possesses a certain degree of **health literacy** – meaning that they are able to evaluate the reliability of a source, determine what constitutes trustworthy advice, how and where to seek information when required and how to apply that information to their life.

There is an assumption that possessing a good level of health literacy and having a knowledge of health and consequences of risk behaviours will lead to better health choices, but this is not always the case. Choices are not the product of knowledge alone but are influenced by many other

factors, including a person's underlying attitudes, beliefs, social environment and socio-economic status (SES). For example, the AIHW reports that there is a discrepancy between knowledge and behaviour in relation to smoking. It is a well-known fact that tobacco smoking is harmful to health.

Numerous health-promotion campaigns have targeted tobacco in efforts to reduce the number of smokers in Australia. Information about short-term and long-term consequences of smoking have been presented on television and in print materials, as well as graphic and written health warnings placed on cigarette packets. Overall these campaigns have been reasonably successful in increasing the amount of knowledge about the effects of smoking.

In a survey conducted in 2007, it was found that three-quarters of smokers believed that they would either definitely or probably become seriously ill if they continued to smoke (Cotter et al. 2008). Furthermore, 83 per cent of smokers agreed that smoking-related deaths are likely to be slow and painful. However, less than half of all smokers (45 per cent) felt that they were seriously thinking about quitting in the next six months (AIHW, Australia's health 2010).

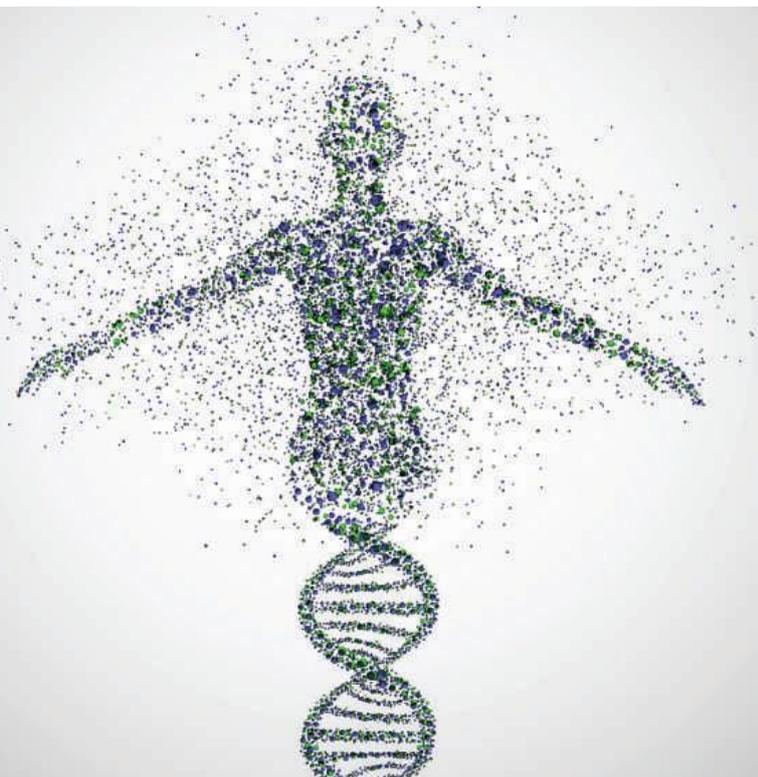
Decision-making, communication, problem-solving and movement skills can all contribute to a higher level of health. For example, having the communication skills to be able to express your emotions and feelings in a productive and assertive way means that you are more likely to experience a higher level of emotional health, stand up for yourself in times of peer pressure and maintain positive relationships. Similarly, possessing movement skills means that you may be more likely to involve yourself in sport and physical activity, thus improving your physical health. As with knowledge, possessing a good level of personal skills does not mean that a person will always make good health decisions but it does empower you to be able to do so.

### Genetics

From the moment of conception there are certain elements of a person's health that are determined. With the contribution of 23 random chromosomes from each parent, a genetically unique individual (of inherited characteristics) is formed. This set of inherited characteristics is what determines physical traits such as hair colour, eye colour and height, behavioural traits and a predisposition to certain medical conditions such as cystic fibrosis, cancer and some mental illnesses.

These traits can have a significant impact on health. For example, people with fair skin and fair hair are more susceptible to skin cancer due to a lower level of pigmentation of the skin.

**health literacy**  
the ability to understand and interpret health information and services and utilise this information in ways that promote and maintain good health



**Figure 1.27** Genetic traits, or biological factors, can also have a significant impact on health

Pigmentation offers more natural protection from the sun and therefore those with less pigmentation burn more easily and more quickly.

The risk of developing some diseases is also increased by genetic predisposition. This means that an individual may possess a number of genes that each act in a small but significant way to contribute to the development of the disease. In rare cases, altering one gene is enough to cause disease. As our genes are inherited from our parents – who inherited them from their parents – we are likely to share similar health problems.

Features of a family history that increase the risk of disease include:

- having one or more close relatives with a medical condition
- having a relative diagnosed with a condition at an early age (typically before age 55)
- having a relative with a disease that is more rare in a certain gender (for example, a male with breast cancer)
- having a combination of diseases that run in your family (for example, both diabetes and heart disease).

The degree to which our genetics influence health is largely shaped by the environment. Even if an individual is predisposed to a certain condition, living in a healthy, supportive environment where positive health choices are made and encouraged can reduce an individual's risk of poor health. In the same way, poor lifestyle choices and an

environment that is detrimental to health can have the opposite effect and greatly increase the risk of the development of a disease.

## Socio-cultural factors

The social environment in which a person lives and plays is an example of a **socio-cultural factor** and it plays a significant role in shaping an individual's beliefs, values and habits. Family, peers, media, religion

and culture all influence the health practices that an individual adopts. As with many other determinants, these influences may be subtle and indirect and have either a positive or a negative impact on a person's health-related behaviours.

Most people have a need for social interaction and therefore seek companionship and acceptance from people that they have commonalities with.

As we develop from children to adults, our peers play an increasing role in our life, our decision-making and our formation of self-identity. This can be largely due to our need for acceptance and approval. Peers can have a considerable impact on health-related decisions and behaviours. Often peers are the social group by which we gauge what is acceptable behaviour. They can also have a large degree of power in influencing a person's level of self-worth. A person who feels they are not accepted by their peer group may go to great lengths to fit in, negatively impacting their emotional and physical health. For example, a young girl who feels ostracised by her peers because of her weight may diet excessively in an attempt to be accepted. This, as well as being potentially harmful to her physical health, can also be detrimental to her sense of self-worth and her emotional health and could lead to more serious mental-health issues, such as an eating disorder in future years. In comparison, a girl who has a group of friends who are very supportive and encouraging of one another and place clear value on personality and relationships rather than physical attributes is more likely to develop a healthy self-confidence and have a strong sense of emotional connectedness and support.

The need for acceptance from peers can also influence risk-taking behaviours, such as smoking, drinking and reckless behaviour, with young people engaging in risky behaviours in an attempt to seek approval from peers.

Family are the earliest influence on an individual and in many cases have a considerable impact on the development of a person's values and beliefs. Aspects of an individual such as their self-esteem, intrinsic ethics and attitudes are largely shaped during childhood and adolescent years. Family

**socio-cultural factor** cause of disease or illness based on family, friends, etc.

attitudes and practices towards physical activity, health and food can result in the formation of either positive or negative habits in these areas. For example, a child from a family who has active parents, who include physical activities such as bike-riding or bushwalking in their lives, who are emotionally connected, and place a clear value on eating a balanced diet and leading a healthy lifestyle, is much more likely to adopt at least some of these behaviours. On the other hand, another child whose parents are obese and sedentary, who see physical activity as a chore and have a diet high in salt, fat and sugar is more likely to develop negative habits in these areas as well.

Culture and religion are other areas that are often closely linked with family. In many cases, cultural heritage is passed down from parents, grandparents and the wider extended family and can have a large influence in the formation of an individual's identity. Different cultures have different values and beliefs about health, and different practices that may influence health in either a positive or a negative way. Having a sense of cultural identity and connectedness to a cultural group can enhance an individual's health as it provides a sense of belonging, a connection to a wider community and social support.

But for some, cultural identity can produce some negative outcomes on their health with some people experiencing bullying, marginalisation and discrimination due to their cultural background. As a result they may experience feelings of shame towards their cultural heritage and a sense of isolation and exclusion from the wider community.

Cultural beliefs can influence the health-related decisions that a person makes, or the decisions

that are made on behalf of them by their parents. Culture can affect perceptions of health, illness and death. Beliefs about the causes of illness, methods of treatment, how pain and illness should be expressed, the degree of control that someone has over their level of health and when to seek help can all significantly influence health.

For example, in some cultures being overweight is seen as a sign of strength, as it shows a store against possible famine, and so overweight women are seen as strong, healthy and desirable. This is in stark comparison to most Western cultures that view women with thin, slender frames as desirable. They may also be described as strong but because they show discipline in terms of diet and exercise.

Traditional diets associated with culture can also affect a person's health. The Japanese traditionally have a diet that is low in fat, and high in fresh vegetables and fish. This may be very different to a traditional diet from other parts of Asia such as India, where diet is dominated by foods that are prepared with large amounts of fats and oils.

Diagnosis and treatment of illness and disease can also be largely affected by culture and religion. For example, India and Sri Lanka place a high value on the practice of Ayurveda or Ayurvedic medicine. Ayurveda is a system of traditional medicine that uses a range of treatments, including panchakarma ('five actions'), yoga, massage, acupuncture and herbal medicine, to encourage health and well-being.

Traditional Chinese medicine takes a very holistic approach to health, and incorporates a range of methods, including acupuncture, herbal remedies, remedial massage (anmo tuina), exercise and breathing therapy (such as qigong), and diet and lifestyle advice. Therefore, a Chinese person may turn to herbal and traditional remedies before consulting a doctor. They may also be more likely to participate in traditional health-promoting activities, such as tai chi, which can have a positive impact on physical, emotional and spiritual health.

Cultural expectations can either deter or encourage healthy practices; for example, the influence of culture on the level of physical activity of an individual. In some cultures sport and activities are seen as more male-appropriate activities with women taking more passive roles. Muslim women face restrictions on the type of activities that they can be involved in, and need to take care to avoid exposing skin. Women-only gyms and women-only swimming sessions at pools provided some options for these women.

Religion as a socio-cultural determinant can provide a positive impact on health. Encouraging abstinence from alcohol, drugs or sexual activity



**Figure 1.28** Cultural identity can have a positive impact on health

**social justice** a value that favours measures that aim at decreasing or eliminating inequity; promoting inclusiveness of diversity; and establishing environments that are supportive of all people

before marriage can have health benefits. Religions that also advocate respect, relationships, **social justice** and the importance of family can positively impact on an individual's emotional and social health. On the other hand, some religions may have a negative impact, with things like female circumcision and accepted abuse towards women, or not allowing the use of medicine and procedures such as blood transfusions as treatment for serious illness and injury.

Media is another socio-cultural factor that can play a role in determining the health of an individual. Our society is saturated by media, which means it can be a powerful influence on shaping our behaviours and beliefs. Media comments on all aspects of our lives, providing strong and sometimes conflicting messages on what we need to do, buy, wear and be in order to be happy. It sends messages that illustrate how people of differing age, genders and cultures should behave. These messages are generally not explicit but ingrained in television shows, movies, advertising and other forms of media. For example, very strong messages about the characteristics of the ideal woman are implicit in the majority of Australian media. Repeated attention is given to thin, flawless women and a consistent and strong focus is given to physical

attributes over other elements of character. This strong message can not only shape the beliefs that a person develops over what is healthy but can also shape the behaviours that they adopt themselves.

For example, media pressures to achieve a thin, tanned body can lead women to excessive dieting and exercise, disordered eating and poor self-esteem as they attempt to achieve the 'ideal' body.

Media, however, can also play an important role in the dissemination of positive health messages. Many health-promotion campaigns are delivered to the Australian population through the use of various forms of media such as television and radio advertisements, magazine and newspaper articles, online advertising and support websites and print media. These health messages educate the population about current health-related issues and seek to educate about risk factors and positive health behaviours. For instance, the changes in road rules in 2012 were reported heavily in all forms of media in Australia. The NSW government released a brochure and online resources that clarified the changes and some commonly misunderstood road rules. This brochure, titled 'Top 10 misunderstood road rules in NSW', was the subject of numerous news programs, news articles and radio shows and received a much greater audience than if it had been a standalone brochure.

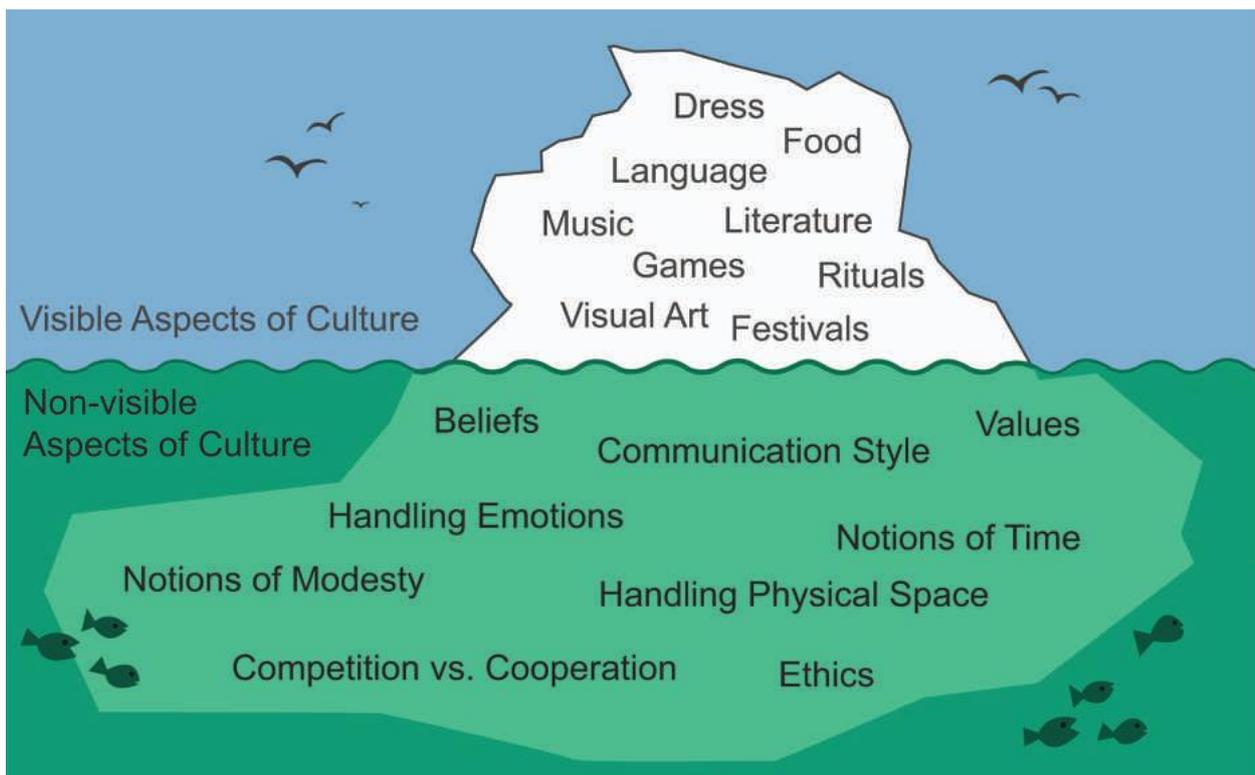


Figure 1.29 Visible and non-visible aspects of culture

## Socio-economic factors

**socio-economic factor** cause of disease or illness based on education, employment or income

**Socio-economic factors** such as income, employment, education and housing are all intricately linked to health. In many circumstances the link to health may be indirect, with the involvement of other influencing factors such as decision-making skills, peer influence and heredity also having

an impact. Therefore, it can be very difficult to determine the influence that a single factor can have on health due to the complex and interwoven nature of some of the determinants.

Many studies have shown that people of lower socio-economic status generally experience lower levels of health. Those with lower levels of socio-economic status (SES) have markedly higher rates of diabetes, injuries and mental disorders than those with the highest SES. These particular ailments are all contributed to by lifestyle-related risk factors such as smoking, drinking, drug use and a high-fat diet, which have also been found to be more common among lower SES groups.

### Education

Research has shown a direct link between an individual's level of education and literacy and their level of health. The higher a person's level of education and literacy, as previously discussed, the better their health is likely to be. This is because having a greater level of education carries better prospects of employment, occupation and income.

People with higher levels of education are more likely to be employed in higher paying, white-collar jobs. A higher level of education also helps to develop skills, confidence and knowledge that can benefit health. Education provides people with a knowledge and understanding of disease and the associated risk behaviours. People with an understanding of the potential harm to their health presented by certain behaviours (e.g. smoking and a high-fat diet) may be more likely to make health-enhancing choices.

Education also develops the skills required to access and analyse available health-related information and services and increases the confidence to access them.

### Income

The level of income and wealth an individual has is linked to health in a number of ways. A lower level of income means that an individual may have fewer options available to them in terms of housing, food, leisure pursuits and health care. Financial limitations can place a great restriction on the areas and type of housing in which a person or family can live. A family experiencing poverty may not even have access to adequate housing and may be forced to live in an environment that is overcrowded, unsafe and insecure. As well as the direct influence that living in an unsafe environment can have on health, having limited options can also contribute to a sense of powerlessness and stress.

	Condition							
Risk factor	Arthritis	Asthma	Chronic obstructive pulmonary disease	Coronary heart disease	Depression	Type 2 diabetes	Osteoporosis	Stroke
<b>Behavioural</b>								
Tobacco smoking	✓	✓	✓	✓			✓	✓
Physical inactivity	✓			✓	✓	✓	✓	✓
Alcohol misuse				✓	✓	✓	✓	✓
Poor nutrition				✓		✓	✓	✓
<b>Biomedical</b>								
Obesity	✓			✓	✓	✓		✓
High blood pressure				✓				✓
High blood cholesterol				✓				✓

**Table 1.5** Relationship between selected chronic diseases (conditions) and risk factors (determinants)

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## Should the private health insurance rebate be means tested?

*The Sydney Morning Herald (online), 11 February 2012*

### The advocate Cassandra Goldie

LAST year private health insurance providers made a \$1.2 billion profit, before tax. Yet the private insurance rebate is the fastest-growing component of Australian government health expenditure. While government funding for health must prioritise improving access to services and reducing inequalities in both access and outcomes, the private health insurance rebate does neither. On the contrary, there is overwhelming evidence that the rebate drives such inequities.

Affordability is one of the strongest predictors of taking out private health insurance. Not surprisingly, this leads to significantly higher rates of private health insurance for those on middle and higher incomes. Private health insurance is also significantly more common for residents of capital cities. Beyond affordability, the rebate does nothing to alleviate the structural barrier to affordable and timely health care in rural and regional areas with no or little access to GPs, specialists and after-hours care.

At the same time, and contrary to popular wisdom, the rebate has failed in its aims to relieve pressure on the public health system. Evidence shows that when people with private insurance have an acute injury or illness, they will attend a publicly funded hospital for care. While this is their right and is an entitlement that is built into our health system, it demonstrates the fallacy of the rebate as a mechanism for relieving pressure on the public health system. It has long been argued that if all government subsidies to the private health sector were redirected to public hospitals, millions of additional people would be able to be treated in these hospitals.

The extension of the rebate to ancillary services (beyond hospital care) is particularly hard to justify as this subsidy is even less likely to reduce the costs of providing public health care. It is also unfair that high-income earners are subsidised by the rebate arrangements for services such as dental care, when public oral health services for people on low incomes are in such a parlous state. This cost to revenue could be better spent with improved health outcomes, for instance, by expanding capacity in public services or by better integrating the primary care sector to improve early detection of preventable conditions.

Means testing the rebate is part of a package that could save the government \$2.4 billion over three years. Redistributing these savings, to those missing out on standards of health that others take for granted, is a key step towards reducing inequities and improving health outcomes in Australia.

*Dr Cassandra Goldie is CEO of the Australian Council of Social Service.*

### The insurer Dr Michael Armitage

MEANS TESTING the 30 per cent rebate would affect everyone requiring health care and would be bad for the public and the private health systems. The rebate makes cover affordable for many people. Means testing will force people out of the private health care system and into the public sector, increase pressure on the public hospital waiting lists, and force premiums to increase, disadvantaging lower-income earners who remain in private health insurance.

The government argues that only the wealthy will be affected. This is a false claim. Of the 12 million privately insured Australians, government figures show 5.6 million have an annual household income of less than \$50 000 and, of those, 3.4 million have an annual household income of less than \$35 000.

As people drop their health cover as a result of the means test, those who remain in private cover will have to pay more, no matter what their income. For many who are privately insured, the rebate is the only form of government assistance they receive.



**Figure 1.30** Affordability is one of the strongest predictors of taking out private health insurance

*(Continued)*

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An independent report by Deloitte on the impact of means testing the 30 per cent rebate, based on ANOP/Newspoll research into consumer behaviour early last year, found that:

- up to 1.6 million people would drop their hospital cover over five years (compared with Treasury's estimate of 25 000)
- up to 4.3 million would downgrade their cover over five years
- premiums would increase 10 per cent above what they otherwise would have
- an extra 845 000 people would be admitted to public hospitals.

The government claims it has to wind back the 30 per cent rebate because it is the fastest growing area of health expenditure, and that means testing will save it \$100 billion over 40 years. Both assertions are incorrect.

The rebate is a small component of total health care spending (8.1 per cent) and has only increased 0.2 per cent as a proportion over 10 years. In previous budgets, Treasury forecasts have varied by more than 25 per cent from the actual outcome when estimating two to three years out, so nobody should have any confidence in that prediction.

The government has failed to consider the impact of people downgrading their private health cover and has not taken into account the flow-on effects into the public hospital system of those who will drop or downgrade their cover.

The policy is flawed. It will not deliver better outcomes to the public, nor will it deliver a pot of gold to the government.

*Michael Armitage is CEO of Private Healthcare Australia.*

### The Medicare pioneer John Deeble

THESE reforms need to succeed. They are small adjustments and will affect only the highest-earning Australians. The rebate program costs more than \$4 billion a year – about a third of private insurance revenue – and it is growing faster than any other health expenditure.

Medicare and public hospitals are funded by taxpayers, based on people's capacity to pay. Private insurance premiums are a flat rate.

Fairness would therefore require that government subsidies follow the same principles as other government assistance – lower-income people should get more than richer ones. At the least, subsidies should be uniform. But the private health insurance rebate doesn't work that way. The more you spend, the bigger the public subsidy you get.

Higher-income earners are more likely to have private insurance and a higher level of cover than those on low incomes, so their share of the rebate is disproportionately large. The rebate also covers 'extras'. Almost \$750 million a year of public money goes to services not covered for the 55 per cent of Australians not privately insured.

The changes will not threaten the private health industry or public hospitals. The 30 per cent rebate was introduced in January 1999. Nothing else changed. Private insurance then covered 30.2 per cent of the population. In March 2000, it had risen to 32.2 per cent. A 2 per cent rise in membership for every 10 per cent reduction in price. So the system was changed again by penalising those who joined after age 30, with a large, government-funded publicity campaign to show private insurance was the only secure way to access hospital care. Within six months, that combination raised coverage to 45.8 per cent, almost exactly what it is now. But this was mainly due to the April 2000 campaign. The rebate alone had almost no effect.

There is no reason to believe the outcome would be any different now – a 2 per cent drop in membership for every 10 per cent price increase. But only a quarter of insured people would be affected and only 7 per cent (singles earning more than \$140 000 and families more than \$280 000 a year) would lose the rebate altogether. Singles earning more than \$80 000 a year and families on more than \$160 000 would get less than 30 per cent on a sliding scale.

*(Continued)*

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Simple maths shows less than 40 000 people – 0.4 per cent – would leave private insurance. The effects on public hospital use would be equally trivial. About 12 000 extra admissions a year. There were more than five million admissions to public hospitals last year. A storm in a teacup.

*John Deeble was principal adviser to the Whitlam and Hawke governments on the introduction of Medibank and Medicare.*

### The administrator Michael Roff

MEANS testing the private health insurance rebate will affect everyone. If you have health insurance you will pay more, regardless of your income. If you rely on the public system you will wait longer for treatment and the increased cost to taxpayers will outweigh any savings the government makes.

Anyone who tells you that you won't be affected doesn't understand the full impact of the measure. And maybe that is not surprising, as this government does not seem to understand the impact it will have on the health system.

Over the past 10 years, the rebate has seen an additional 8 million patients treated in private hospitals, taking pressure off the public system and saving taxpayers \$26 billion.

Not only do private hospitals take pressure off the public system, but the Productivity Commission found private hospitals deal with more complex cases, costs are 30 per cent lower than public (for decades private hospitals have used activity based funding which is just being developed in the public system), and private hospitals perform better on available safety and quality indicators.

A KPMG report commissioned by the government shows there is rapid growth in insured patients using public hospitals. This follows a big jump in people downgrading to health insurance products with treatment exclusions following other government policy changes in 2008 (when people downgrade they rely on public hospitals for all 'excluded' treatments). This downgrading impact will accelerate under means testing but has not even been modelled by the government so they do not understand, or even acknowledge, its impact.

We know that government-commissioned research indicates up to 2.5 million people will downgrade their cover in the first year of means testing. This would have a devastating impact on public hospital demand, with taxpayers picking up the bill for those lucky enough to get into hospital, with many more likely to be waiting for treatment. No wonder the government does not want to acknowledge it.

Those above the income threshold will face significant premium increases (between 14 per cent and 67 per cent depending on age) instantly. In subsequent years, as healthy members drop their cover, even low-income earners on full rebates will be hit with price rises as the risk pool worsens.

*Michael Roff is CEO of the Australian Private Hospitals Association.*

Inability to afford private health insurance also means a lower level of control over health. Reliance on the public health-care system means limited choice in doctors and hospitals, longer waiting periods for treatment of non-life-threatening illnesses and the limited access to other forms of treatments such as physiotherapy, occupational therapy, speech therapy, eye therapy, chiropractic services, podiatry, psychology services, glasses and contact lenses, and hearing aids.

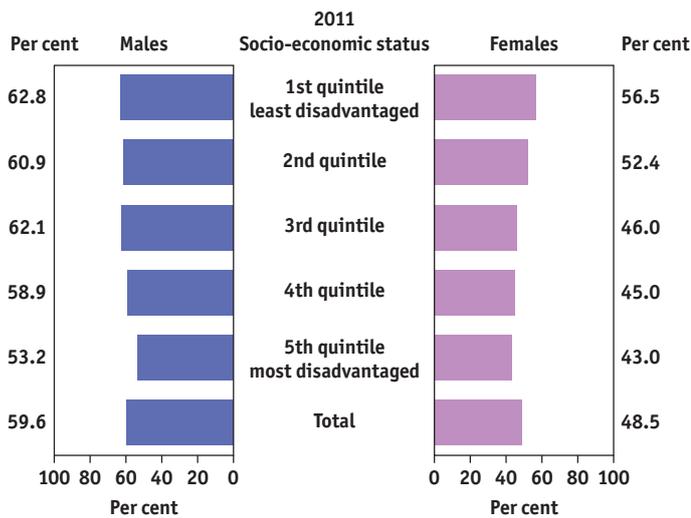
The Health Statistics NSW website reports a strong correlation between SES and rates of physical activity. As can be seen in Figure 1.31, as SES decreases so does the level of activity.

This may be due to a number of different factors including limited options for leisure and physical activity and lower levels of education about the risk factors associated with inactivity.

### Environmental factors

**Environmental factors** refer to the natural and manmade environments in which we live. They are directly linked to climate, air quality and water quality. By world standards Australia possesses well-developed infrastructure and is modern and clean. We have access to clean running water, high-

**environmental factor** cause of disease or illness based on location and surroundings



**Figure 1.31** Adequate physical activity by socio-economic status and sex, persons aged 16 years and over, NSW

quality waste disposal systems, a climate of peace and relatively clean air; however, there is still a large variation in the living environments that people experience throughout the country.

People living in rural and remote areas are one group that has been found to experience lower levels of health than those who live in urban areas. The remoteness of location means that rural Australians may experience limited access to health services and technology and also limited options in relation to food and leisure. The remoteness of location may also contribute to a greater risk of death through injury as the response time of emergency services is so much greater. The sense of isolation has also been found

to contribute to mental health issues, with people in rural and remote areas experiencing higher rates of depression and suicide. Rates of drug use and alcohol abuse have also been found to be higher in rural and remote areas. This may be due, once again, to the sense of isolation or the limited options available for leisure and recreation.

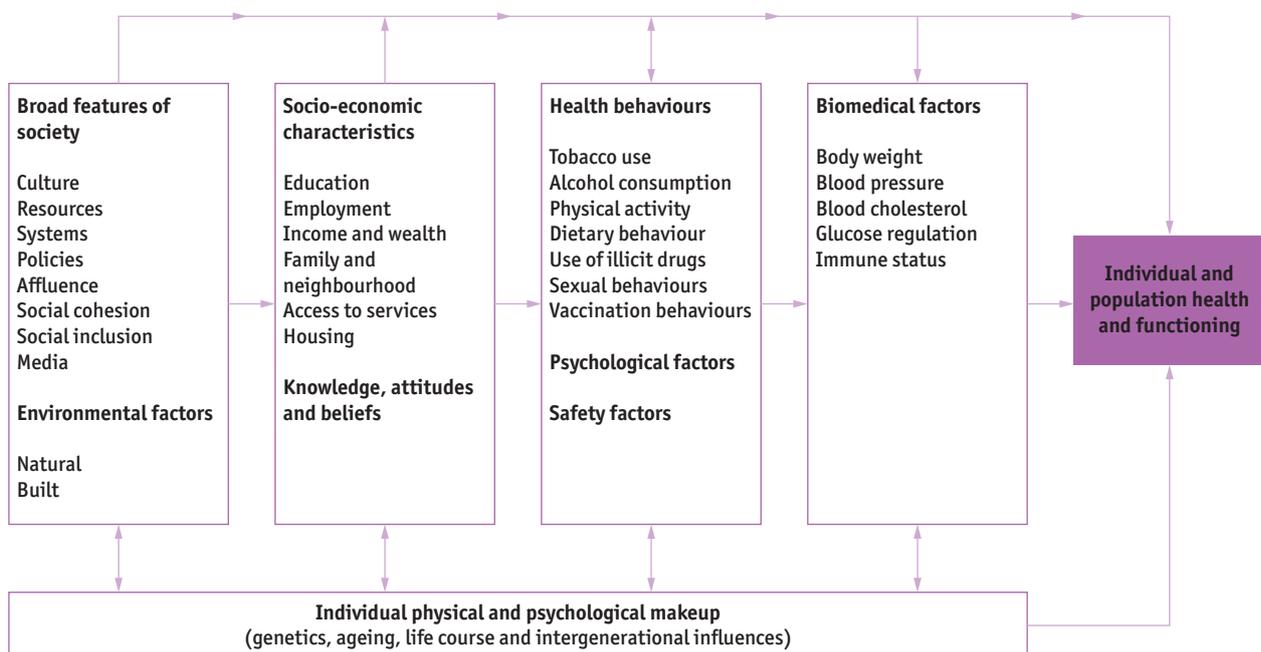
Rural and remote areas are also closely linked with other determinants, with the proportion of Indigenous Australians increasing linearly with remoteness. Low socio-economic status, as well,

### Summary 1.23

- 1 What individual factors determine health?
- 2 What socio-cultural factors determine health?
- 3 What socio-economic factors determine health?
- 4 What environmental factors determine health?

### Checklist 1.24

How can an individual's health be determined by a range of different factors?



**Figure 1.32** A conceptual framework for determinants of health

has been linked with geographical location, with a greater proportion of people in rural and remote areas experiencing lower levels of education and incomes.

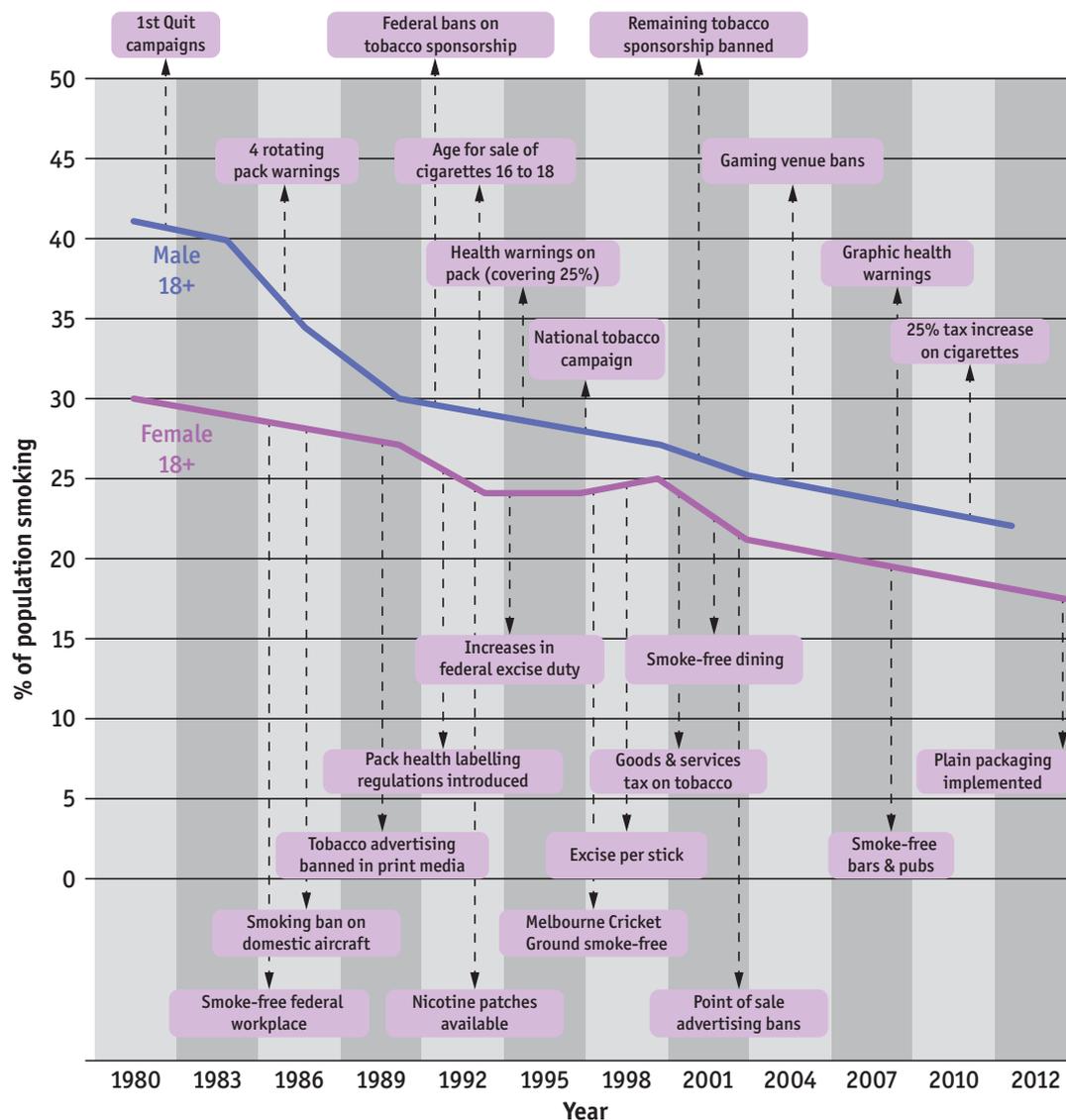
## The degree of control individuals can exert over their health

### Modifiable and non-modifiable health determinants

Individuals have a varying amount of control over the factors that influence their health. Some things may be able to be modified relatively easily – and are called modifiable determinants – whereas others can never be changed – and are called

non-modifiable determinants. The non-modifiable determinants include age, gender, family history and ethnicity. While an individual cannot change these factors, having an awareness of how they may influence health can lead to preventative and protective action being taken.

Our genetic makeup may mean that an individual is either born with an increased risk of developing a certain illness or that they are born with an existing health condition. Advancing technology has meant that the detection of these conditions is a lot more accurate and a lot more accessible. Testing of an unborn child for conditions like Down syndrome is now a regular part of prenatal care. People with a family history of a particular illness can reduce the risk of it developing through preventative actions such as monitoring and screening. For example, new genetic tests mean that women with a particular



Source: *State of Preventive Health 2013*, Australian National Preventive Health Agency.

**Figure 1.33** Preventative health in action to reduce tobacco smoking in Australia, 1980–2012



**Figure 1.34** The quantity of unhealthy foods we eat is a modifiable determinant of health

genetic predisposition to cancer can undergo simple testing to see whether or not they carry the faulty gene.

Advancing age is inevitable and as a person ages their risk of developing an illness or disease increases. This chance can be reduced by living a healthy lifestyle, having regular check-ups and an awareness of any genetic predispositions to certain illnesses.

Some factors, although modifiable, may be extremely difficult for an individual to change. Environmental factors such as geographic location can be largely determined by a person's socio-economic status. A person may live in an area that is surrounded by high industry, or has higher levels of crime, but may not have an adequate income to move to a better area.

A person living in a rural and remote area may experience less access to health services and facilities and higher risk of exposure to things such as occupational hazards. Once again, their ability to modify these factors is extremely limited.

Lobbying to government is one way in which individuals and communities can seek to modify aspects of their environment. For instance, mothers' groups lobbying for improved play

equipment, residents lobbying for noise-reducing glass on their windows when living next to a high road, and lobbying for changes to speed limits in high pedestrian activity areas. However, this relies on a person having knowledge of their options and the correct avenues to pursue them and also the attitude that there is a potential for change.

Modifiable determinants all have the potential to be altered in some way. However, the capacity of an individual to change them can vary greatly. This can be due to the contribution and interaction of a number of different factors including environmental, socio-cultural, socio-economic and individual factors. The relationship between a person's individual characteristics and their social and economic circumstances is very closely linked to the control that they have over their health. Low socio-economic status means that an individual is likely to have fewer options in terms of employment, less access to health-promoting resources such as education and health services, and is more likely to feel that they have less control over their life. This sense of lack of control can mean that it is more difficult for a person to take steps to improve their circumstances and their health.

Health knowledge and skills are key factors in determining an individual's level of health and can be modified. These factors form a key part of most health-promotion campaigns as they lead to empowerment of the individual. The ease with which the improvement of knowledge and skills occurs can vary greatly depending on a number of different factors, such as the provision of reliable and accurate information and the ability of the individual to access and understand the information. However, this is still not enough to produce change and must also be combined with an interest or desire to improve health knowledge and skills. Many health-promotion campaigns focus on this, and provide health-related information in a manner that attempts to make it personal and relevant. For example, the recent Measure Up campaign provided information about the dangers of excess weight gain by presenting the effects that it can have not only on the individual but also on their family. As well as providing education the campaign also provided some tools to assist people in making positive steps towards improving their health, such as exercise plans, healthy meal recipe ideas and food plans.

An individual's attitude to health is another determinant that can be modified but with varying ease. An individual's attitude towards health is the product of a number of different factors including their life experience, knowledge, beliefs and their social environment.

The likelihood that a person will change their attitude increases if a person:

- has support in doing so
- has an understanding of how their health will be improved if they do
- has a sense of control over their health and their life
- does not have attitudes and behaviours that are long fixed.

## The changing influence of determinants through different life stages

The impact that certain determinants have on our health changes with age, as does the degree of control that we have over them. As a baby we are completely dependent on others to fulfil our needs and attend to our health. If a child is sick it is the responsibility of the parent to ensure that they receive adequate care. In this sense, a child's health is very closely related to factors such as the socio-economic status and attitudes of their parents.

Parents not only control elements such as what a child eats and the physical activities that they are

able to participate in but are also a key determinant in their social and emotional development. A stable and emotionally supportive environment can help to develop a child that is emotionally resilient and confident, whereas family break-up and a parent who is emotionally disconnected can contribute to the development of mental-health issues later in life.

As we get older the influence that our family has begins to decrease and the interaction we have with the broader social environment increases. The influence of things like the media and peers on our food habits and choices can be significant, even from a relatively young age. Advertising of junk food has become a contentious issue in Australia with agencies lobbying for changes in the laws to limit the ability of junk food and fast food companies to advertise, especially during children's prime-time viewing on TV. This recognises the power that advertising can have over food choices.

As an adolescent, peers become a much stronger influence on an individual's health-related choices. The desire for social acceptance and a sense of approval from peers can lead a young person to engage in risky behaviours such as binge drinking, reckless driving and sexual activity. This can be compounded by a sense of impunity and the fact that many health issues such as cancer from smoking may seem like a long way off.

During teenage years the media continues to be a significant influence on health with attitudes presented in movies and TV shows and through celebrities subconsciously influencing choices. An example is the pressure that many young girls feel to be thin. Constant presentation of size-zero celebrities and flawless models in advertising leads girls to believe that that is the accepted norm. This, in turn, pressures them to conform to this ideal by restricting eating and dieting. This is further compounded by the frequent focus of many women's magazines and programs on dieting and weight-loss tips.

The direct impact of the media on behaviour may decrease as we get older and our awareness, skills and knowledge increase. Our ability to be critical consumers will, hopefully, strengthen and a sense of individual identity will overtake the desire to conform to peers.

Changes in socio-economic status occur throughout life and vary in their impact on health. As young people get a little older they may also get a part-time job, which means increased income and increased independence. Parents begin to have less control over the decisions that their children make, and an adolescent may start to form their own beliefs and opinions. They may start to question the views held by parents as they seek out an individual identity.

## Summary 1.25

- 1 What are modifiable health determinants?
- 2 What are non-modifiable health determinants?

## Checklist 1.26

- 1 How much control do individuals have over the determinants?
- 2 What can individuals do to modify the determinants they have little control over?
- 3 How does the level of influence of the determinants change over time?

The life stage between 25 and 64 is when most adults enter the workforce in a full-time capacity. During this time they may seek to develop a career, establish a family and then seek retirement. During this stage, socio-economic status is the key determinant in health, with employment dictating income, available leisure time and stress levels. Employment can also impact an individual's social status, their sense of purpose and fulfilment, and general well-being.

During this stage lifestyle habits are formed and become well established, and can have a major impact on health, both in the immediate future and later in life. Changes in metabolism may lead to weight gain if an individual does not participate in adequate physical activity or maintain a nutritionally balanced diet.

This age group tends to have the opportunity to have the most control over health determinants, with the access to information, services and finances to make decisions.

As people get older, the impact of earlier decisions begins to surface. Risk factors such as smoking, overweight and poor nutrition may contribute to the development of chronic illnesses such as cancer, which is much more prevalent in older age groups. On the other hand, protective factors can also result in healthy ageing and increased quality of life.

The influence of genetics also becomes more apparent, with chronic genetic conditions such as Alzheimer's and dementia surfacing.

As people cease work, their income decreases and they become reliant on the pension, superannuation and previous savings. A possible

decline in socio-economic status, combined with declines in health, means a greater dependence on others. With decreased mobility, the impact of things like geographic location may also increase and older people may experience greater difficulty in accessing health services.

## Health as a social construct

The word health carries many different meanings for people, and these meanings are shaped by the people around us, our culture, religious beliefs, medical views, societal attitudes, our gender advancing age and past experiences. In other words, our view of health is socially constructed.

The concept that health is a social construct recognises that there are many external factors that influence health and highlights that because of this, health is not solely the responsibility of the individual. It means that an individual's view of health will vary:

- over time
- from individual to individual
- from context to context
- from culture to culture.

An example of tanning through the ages can be viewed through Prezi (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)).

Appearance and what is considered beautiful and desirable is very much a socially constructed ideal. Skin tanning is an example of a health-related



**Figure 1.35** Many Australians continue to associate a tan with being healthy

behaviour that is strongly linked with society's perceptions of what is acceptable at the time.

Over the past 100 years, society's perception of tanning has changed considerably. In the early 1900s tanning was used as a measure of social standing. Tanned skin was considered an indicator of lower class as it was a sign of physical labour. Ladies of high social standing took care to maintain their pale complexions with the use of parasols, gloves and hats. Some even made use of lightening agents to create a lighter skin tone, indicating a higher social status.

In the 1920s perceptions of tanned skin took a turn when French fashion designer Coco Chanel accidentally got sunburned while sailing aboard a yacht to Cannes. When she returned from the Riviera golden brown, a fad was born. Bronzed skin was a highly sought after accessory and a sign that you were fashionable and wealthy. Products to aid the tanning (and burning) of skin were marketed, wealthy people travelled to sunny destinations in winter or used a sunlamp to create the sun-kissed look and people deliberately 'worked' on their tans by lying in the sun for hours, allowing themselves to burn. In Australian culture, a bronzed body became an iconic image and was considered desirable and healthy.

As the century progressed, an increased understanding of the dangers associated with prolonged exposure to the sun, combined with a large increase in the rate of skin cancer among the Australian population, began to see the start of a change in attitude towards tanning. Sun-tanning lotions began to give way to sunscreen lotions and the use of solariums increased by those who wanted a tan but were worried about the sun.

The understanding of UV radiation continued to increase and doctors began to warn against solarium use. The incidence of skin cancer continued to rise, with melanoma diagnoses increasing by around 50 per cent between 1982 and 2007.

Government-driven health-promotion campaigns such as Slip-Slop-Slap began their ongoing crusade to alter the Australian culture of tanning. Today, perceptions continue to change and there is an acceptance of pale skin as healthy skin, with campaigns using slogans such as 'There's nothing healthy about a tan'. Media and the fashion industry celebrate the pale porcelain skin of celebrities such as Nicole Kidman and Anne Hathaway and the use of protective clothing and sunscreen is an accepted and praised part of our culture.

In the tanning industry there has also been a shift. From 2014 solariums were banned in New

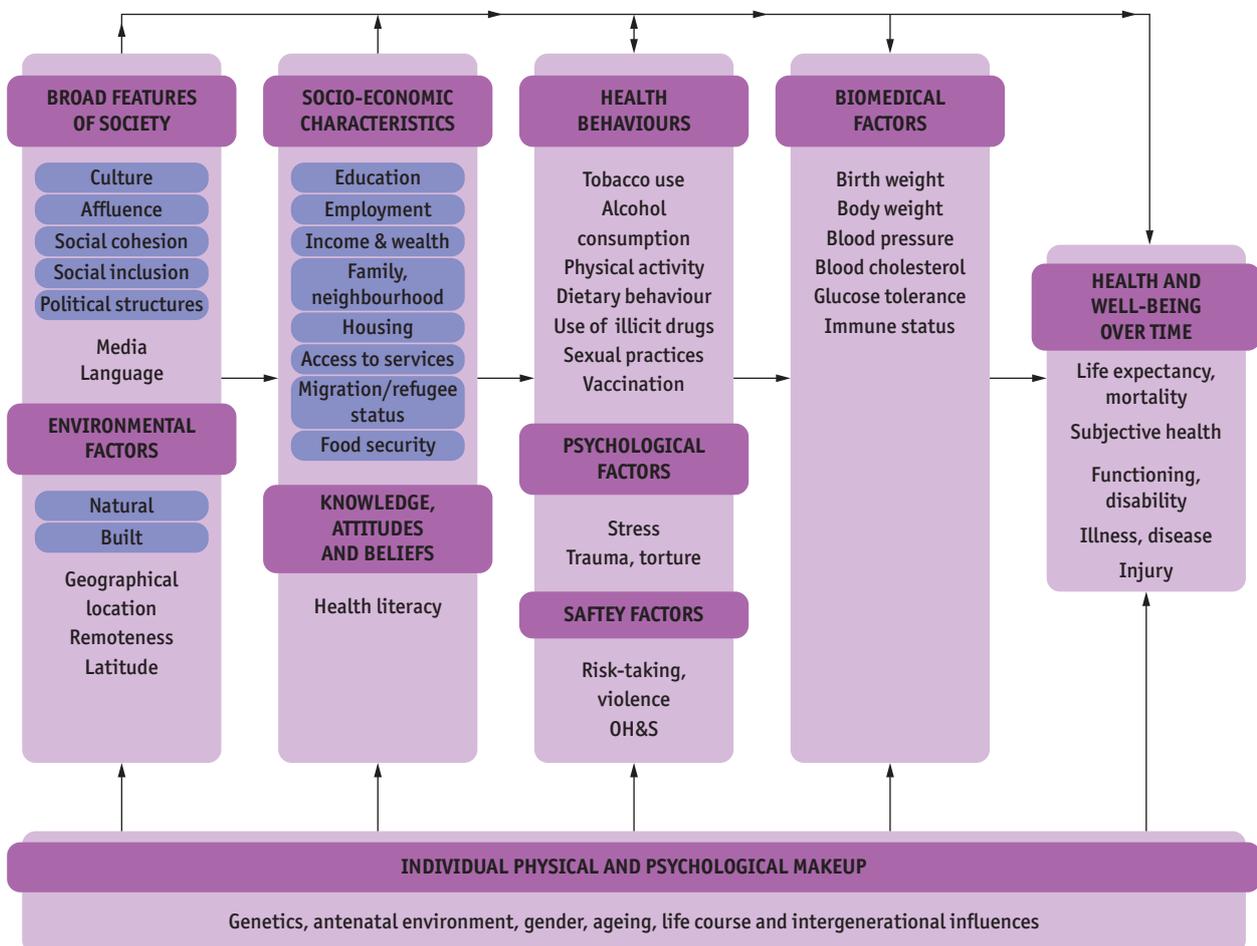


Figure 1.36 Determinants of health

South Wales and South Australia, with other states likely to follow suit. Despite the changing attitudes towards tanning, there remains a significant proportion of the youth that consider a tan to be sexually appealing. However, many of those who still desire a tan are beginning to turn to sunless tanning such as spray tanning to achieve the look without the danger.

By viewing health as a social construct we recognise that an individual's behaviours and health-related decisions are the product of many external influencing factors. This allows us to recognise that an individual is not solely responsible for their health but that there is an element of societal responsibility.

## Recognising the interrelationship of determinants

There are many different factors that influence an individual's level of health. As discussed earlier, these factors are referred to as determinants of health and include social, cultural, economic and environmental factors.

These determinants do not work in isolation to produce an individual's level of health, but rather interact in many different ways and are often intricately linked. For example, an individual's employment opportunities are very closely linked with their level of education and skills, but can also be strongly influenced by other factors such as personal attitude and belief about themselves and their geographic location. Employment determines income and income has been very closely linked with health. This complex interaction can be difficult to measure and to analyse as some determinants are so closely linked that it can be difficult to assess them on their own, whereas other determinants may seem to be so far removed from each other that it would not be expected that they would impact each other. In addition, the degree of impact that each determinant will have can vary throughout an individual's lifetime, even from day to day.

The AIHW describes determinants as 'causal pathways' that affect health. Some of the complexity and degree of influence of the determinants is illustrated in Figure 1.36, which groups the determinants into four main groups with the main direction of influence going from left to right. The broader features of society and environment are considered 'upstream' influences as they are factors that generally have a less direct impact on health but are still very present in the background. These factors include things such as the political stability, air quality, social attitudes and technology. The 'downstream' determinants are factors that influence an individual more directly or

immediately, such as an individual's blood pressure and the strength of their immune system.

The diagram provides a good illustration of the impact that one determinant or group of determinants can have on others and the flow-on effect that this can have into other areas of life. For instance, socio-economic status can have a direct impact on an individual's health behaviours. Unemployment can contribute to feelings of a loss of control and a sense of hopelessness, which can lead to unhealthy behaviours such as high levels of alcohol consumption or illicit drug use in an attempt to escape these feelings. In turn, this can influence physical health, resulting in loss or gain of weight, changes in blood pressure, or injury as the result of increased risk-taking. The broader political and social environments may also contribute to these behaviours. For example, an unemployed person who lives in a social environment where the unemployed are considered useless and that it is their own fault that they can't get a job may be more likely to engage in these unhealthy behaviours compared to someone who is unemployed but receiving government support and training in attempting to get a job.

While the diagram illustrates the influence of the determinants from left to right – upstream to downstream – the direction of influence is not one-directional. The impact of determinants on health can occur in reverse; for example, an individual's level of health affecting their ability to get a job, or participate in physical activity.

## Challenging the notion that health is solely an individual's responsibility

By recognising that health is socially constructed, the many external influences on an individual's health are acknowledged. This acknowledgement challenges the notion that health is solely an individual's responsibility.

The view of health as a social construct is one that has initiated change in the way that health promotion is approached. In the 1970s and 1980s Australia's main attempts to improve the nation's health were based on the assumption that if people were provided with the correct information about issues relating to their health, they would choose better health behaviours. This individual view of health suggests that poor health is the result of ignorance, lack of willpower and laziness, and attributes all the blame to the individual.

This view of health is reflected quite strongly in the following interview with Tony Abbott on the issue of childhood obesity.

However, an individual view of health does not account for the biological, social, economic and environmental factors that may provide

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## Interview – Tony Abbott MP

### On the subject of childhood obesity in Australia

By TICKY FULLERTON

ABC's *Four Corners*, 17 October 2005



Figure 1.37 Tony Abbott

**Q. Minister, do you believe the figures that at least one in four children in Australia are overweight or obese?**

A. That's what the experts tell me and I have no reason to disbelieve that.

**Q. Why do you think kids are getting fatter in Australia?**

A. Because they're eating more and exercising less.

...

**Q. How much do you think parents should take responsibility for the issue of overweight and obesity in children?**

A. I think in the end it is up to parents more than anyone to take this matter in hand.

**Q. But are you making these choices easy for them?**

A. Well, the federal government doesn't say to someone in the supermarket, please take that bottle of Coca-Cola. It is a shopper's choice to take a bottle of Coca-Cola rather than a carton of low-sugar fruit juice or milk.

**Q. But you go to the supermarket presumably, you know that the confectionary is stashed there in almost every aisle at child height?**

A. Mm, mm. But, but, again, there is nothing that makes the parent who is doing the shopping go for the Coke as opposed to the milk.

**Q. What about 'pester power'?**

A. Well, again, if parents are too weak willed to resist, it's going to be very hard for governments to step in.

...

**Q. Do you think there's a connection between marketing and childhood obesity?**

A. Obviously anyone who is marketing a product is determined to try to make the product as attractive as possible, there's nothing inherently wrong with that, but if the product in large quantities is not so good for people, it's up to the people who are out there in the marketplace to exercise appropriate discipline.

**Q. We've spoken to a group of parents who complained about an advert for Kellogg's Coco Pops where Monica Trapaga, a popular children's TV host, sells it as healthy with calcium and yet it's over 30 per cent sugar. Can you see why parents would be so angry?**

A. But if parents don't think Coco Pops are good for their kids, there's a very simple solution – don't buy it.

**Q. Even with all the pester power that parents say kids watch these adverts?**

A. If parents are incapable of resisting their kids, why are they suddenly going to take advice from big sister government?

**Q. Well, just imagine parents who, for example, are split, imagine single parents who are in a position where they have their kids two or three days a week, where they're fighting for the affection of the child. Can you see where pester power would come in and be very, very powerful?**

A. I don't believe that any responsible parent, regardless of his or her family circumstances, would knowingly do things for the kid that are unhealthy for the kid.

**Q. Let me use the example of a McDonald's Happy Meal.**

A. Mm.

*(Continued)*

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**Q. Have your kids ever had a Happy Meal at McDonald's?**  
A. Indeed they have.

**Q. The Happy Meal gives away toys, so does KFC and Red Rooster. Is there anything wrong in companies doing this, do you think?**  
A. No, there's not. What's wrong is giving kids Happy Meals all the time. And to the best of my recollection my kids would only have a Happy Meal about once a week.

**Q. Why do you think these companies give away toys with their food products?**  
A. I imagine that it's because they think it's a good marketing ploy, but there's nothing wrong with marketing, even the ABC markets itself.

**Q. The regulations state that a premium or a toy must be incidental to the product being sold. Parents have complained that in a lot of these ads over 90 per cent of the ad is about the toy and not the junk food.**  
A. Mm.

**Q. Do they have a point?**  
A. Well, you're using, if I may say so, junk terminology in a sense, because there are, sure, all sorts of issues with a constant diet of McDonald's. But there are all sorts of issues with a constant diet of anything, including things that would ordinarily be regarded as healthy, such as salad and bread and so on. So look let's not demonise McDonald's. McDonald's have a perfect right to exist, they have a perfect right to market their products, and it's up to parents and others, um, to sensibly make use of these products.

**Q. But if the rules were saying that if you have a toy or a premium that is supposed to be incidental to the advert, if you've got over 90 per cent of the advert time on the toy, do you think that's incidental?**  
A. Well, if the rules are being broken, let the rules be enforced by whoever the enforcement agency is.

**Q. Well, interestingly the regulator, despite these rules being in place, took the view that this toy was part of a bundled product, that the toy and the food were bundled.**  
A. Well, if the regulator is the appropriate decision-maker and that's the decision that the regulators have made, well, that's that, in a sense.

**Q. I guess that's the question, isn't it? Do you think the regulator is doing a good enough job?**  
A. Well, I'm not responsible for the regulation of advertising, and I don't believe in principle that we should ban the advertising of McDonald's. In the end, McDonald's don't make us eat anything. We decide what we eat, and I think that it's high time that we took more responsibility for what we eat and the amount of exercise we take.

**Q. Larry Anthony, when he was Minister for Children, at a conference in 2003 said that advertisers had to acknowledge that they had tremendous influence over children and if advertisers were not prepared to act responsibly then community pressure would force the government to regulate the industry. Do you agree with that?**  
A. I certainly think that advertisers do have some influence. If advertising had no influence people wouldn't spend millions and millions of dollars on it. But in the end, it's just influence. They have no authority over any of us and, and none of us is so weak willed as to be programmed by an advertisement we see.

**Q. You don't think so?**  
A. Look, I think that it's a pretty sad view of humanity to think that we are in some way programmed by the stuff we see on television.

**Q. What about children under eight?**  
A. Well, children under eight normally eat what their parents give them, and if their parents are foolish enough to feed their kids on a diet of Coca-Cola and lollies, well, they should lift their game and lift it urgently.

...

*(Continued)*

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**Q. Do you think the power of the advertising industry and indeed the media organisations make it quite difficult for people to speak out against them?**

A. Well, I'm perfectly happy to speak out now, Ticky, against over-reliance on fast food. I think it is most unwise for parents to keep more than one bottle of Coke a week in their fridges. I think it is most unwise for parents to give their kids more than one or at most two meals of fast food a week. I think that it's most unwise to allow yourself to become overweight, let alone obese, and I think that all of us should seriously consider exercising more.

**Q. But do you think this is the heart of the problem, of why we have this issue of childhood obesity and overweight, it's actually the parents and the choices that we make?**

A. Absolutely right. No one is in charge of what goes into my mouth except me. No one, no one is in charge of what goes into kids' mouths except their parents.

**Q. Do you think the State has any role on trying to make those decisions easier? You've got enormously powerful companies pushing junk food. You've got urban planning which doesn't allow for parks, enough places for people to exercise. Is the State not responsible for any of this?**

A. Obviously we should have plenty of parks and by every international standard Australia is extremely well endowed with places to exercise.

**Q. Have you been out to the western suburbs?**

A. I jogged through much of south-western Sydney on the weekend, so I have seen these places and, and sure some of these houses are on quite small blocks, but nearly every one of these estates has got a fair degree of parkland, and if there's no parkland there are certainly footpaths and roads that people can run on.

**Q. So you would be against any form of regulation or intervention on behalf of the government in helping this debate?**

A. There are Codes of Conduct, I certainly think that's important. There are the existing regulations which you say aren't being adequately enforced. I'm certainly not advocating their removal. All I'm saying is that in the end government can't and shouldn't determine what goes into people's mouths. In the end people have got to exercise a bit of maturity and a bit of responsibility.

**Q. What is it going to take for the federal government to believe that the situation in health has got to such a bad degree that they will have to intervene?**

A. I just don't believe that the Australian people are so weak willed individually or collectively that it will ever be necessary for the Australian government to try to exercise censorship over ordinary commercial advertising.

considerable barriers to an individual making positive health choices. Viewing health as a social construct assists us in understanding why some people experience lower levels of health than others. It assists us in understanding:

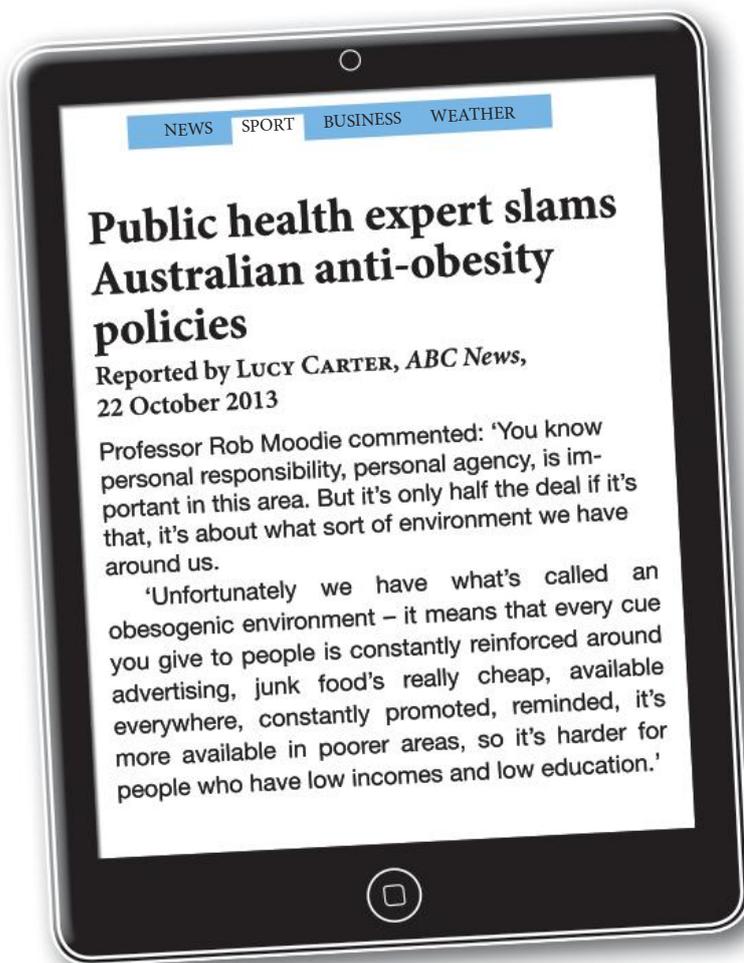
- why certain groups behave in particular ways
- why some people or groups do not have the same chance to achieve a high level of health as others
- how culture and an individual's social environment can influence a person's behaviour
- that some 'upstream' factors are largely unmodifiable by the individual.

Accepting these facts does not remove individual responsibility but brings a better understanding of the role of the government and society in the promotion of health. It is important that a balance is achieved between holding individuals responsible for their choices but also accepting that the government and communities have a responsibility in working to address the determinants to support people in making health choices.

When the responsibility for health is shared in this way then there is a much greater likelihood of positive health outcomes. For example, the reduction in tobacco use over the past 30 years has

been due to a coordinated approach that addresses the contributing determinants. A combination of increased awareness and knowledge about the dangers and effects of smoking, increased community support for those wanting to quit, changes in government legislation and policies relating to smoking and to tobacco sales, involve all levels of society and work to create an environment in which not smoking is a supported behaviour.

The recognition that health decisions are not made in isolation is one of the most important considerations in the attempt to modify a negative health behaviour.



## Going further 1.27

### Inquire

- 1 To whom does Tony Abbott attribute the blame for childhood obesity?
- 2 In what ways is this a very individual view of health?
- 3 How does this view of health and the responsibility of governments in obesity prevention differ from the view presented by Professor Rob Moodie in the quote below left?
- 4 Analyse the impact of the determinants of health on the development of childhood obesity and propose strategies to address it.

## Summary 1.28

- 1 How does viewing health as a social construct recognise the interrelationship of the determinants?
- 2 How does viewing health as a social construct challenge the notion that health is solely an individual's responsibility?

## Checklist 1.29

Using the determinants for the basis of your argument, why do some individuals and groups have better health than others?

# 1.3 Strategies that help promote the health of individuals

## What is health promotion?

### Driving question 1.30

You have just been appointed as the federal minister for health. What immediate actions would you take to improve the health of Australians?

There are many underlying factors that influence the level of health that an individual experiences. Social, economic, behavioural, environmental and lifestyle factors all contribute in varying degrees to determine an individual's health. Health promotion aims to ensure that these factors contribute to health in a positive way, achieving better health for all.

The World Health Organization (WHO) is the leading international organisation for health in the United Nations. It has played a key role in the development of a global health movement and the development of international policies relating to health promotion.

WHO defines health promotion as 'the process of **enabling** people to increase control over their health and its determinants, and thereby improve their health'. This definition recognises the influence of many outside factors on health and the importance of empowerment of the individual in order to improve health.

In 1986 WHO hosted the first international Conference on Health Promotion in Ottawa, Canada. The conference was targeted towards achieving health for all by the year 2000, and the principles and processes that would support this – in other words, the principles and processes of effective health promotion. The conference was attended by representatives from a wide range of countries and was the key movement in a global focus on health promotion.

One of the things that led to this international conference was the establishment of a working party by WHO to discuss 'Concepts and Principles in Health Promotion'. The aim of this group was to identify the most important issues in the development of policy and programs in health

**enabling** action in partnership with individuals and groups, providing resources and support to empower them to promote and protect their health



**Figure 1.38** Health promotion takes in strategies from many different parts of the community

## Summary 1.31

### What is health promotion?

promotion. It described health itself as a resource for everyday life and identified some basic necessities for health and the improvement of health. As stated:

‘Basic resources for health are income, shelter and food. Improvement in health requires a secure foundation in these basics, but also: information and life skills; a supportive environment, providing opportunities for making healthy choices among goods, services and facilities; and conditions in the economic, physical, social and cultural environments (the “total” environment) which enhance health’ (WHO).

Health promotion encompasses a range of different activities as seen in Figure 1.38.

## Responsibility for health promotion

WHO identified that in order for health promotion to be effective it must be reflective of the economic and cultural conditions of the community at the time and should involve the full participation of all people from all sectors of society.

Involvement of individuals, community and school groups, non-government organisations, local, state and federal government and international organisations is important to be able to develop and deliver programs and strategies that will successfully address areas of needs of the community.

### Individuals

Individuals play a significant role in the promotion of their own health. Personal choices about health-related behaviours are a major contributing factor to an individual’s health status. Decisions about diet, physical activity, drug use and sexual practices can all lead to either positive or negative health outcomes. However, in many instances there are a lot of other contributing factors that influence the decisions that are made, or limit the options that a person has available to them. Options may be limited by an individual’s living environment, level of education or level of income. All these factors impact the degree of control that someone has over their health. It is for this reason that one of

the fundamental principles of health promotion is empowerment. Health promotion aims to enable people to achieve their fullest health potential by providing them with the support and resources to do so.

Provision of a supportive environment, access to information, development of skills and the provision of opportunities for healthy choices are all necessary for the achievement of good health.

### Community groups/schools

During childhood and adolescence many health-related habits and attitudes are formed that are maintained for the rest of life. Schools, therefore, have a valuable opportunity to assist students in the creation of positive lifestyle practices.

Information and education provide the necessary base for making informed choices and are a core component of health promotion. Schools play a key role in the dissemination of health-related information to children and adolescents. Knowledge and skills relating to health are taught in the PDHPE classes that are compulsory from kindergarten to Year 10. The PDHPE syllabus approaches health holistically and addresses all dimensions of health. The topics addressed within the syllabus aim to:

- encourage an understanding and value of self and others
- promote the formation of positive habits and attitudes towards physical activity, nutrition and other lifestyle behaviours
- provide students with the information and skills to become critical consumers and make informed decisions relating to their health
- encourage sound physical, social, cognitive and emotional growth and development
- develop positive interpersonal relationships and establish good support networks
- address issues of relevance to young people such as sexual health, drug use and bullying.

School policies also have the potential to reinforce the lessons being taught in the classroom and to further establish healthy habits among students.

For example:

- Most schools adopt a ‘zero tolerance’ policy on bullying. These policies aim to ensure that students feel safe and supported in their school environment and are aware of the support available to them if they do experience bullying.
- Most primary schools have strict policies relating to sun protection. The ‘no hat no play’ policy is common among primary schools and aims to teach the importance of covering up when out in the sun. Further policies relating to sun safety include the provision of shaded areas

and the organisation of outdoor activities for times when the UV radiation is not as strong.

- Policies relating to work health and safety ensure that the work and play environment is safe for staff and students.

Schools are also responsible for the implementation of health-promotion initiatives from government and non-government organisations. These initiatives can be implemented in a variety of ways and focus on a variety of issues. For example:

- Implementation of the school-based national human papillomavirus (HPV) vaccination program, which aims to communicate the facts about HPV and the benefits of vaccination as well as provide the vaccinations during school hours to girls and boys who are of eligible age.
- Fresh Tastes NSW Healthy School Canteen Strategy, which is a NSW government initiative that requires all NSW government schools to provide a healthy, nutritious canteen menu in line with the Australian Dietary Guidelines for Children and Adolescents.
- Many different organisations develop classroom resources and teaching programs to support teachers in addressing issues such as road safety, mental health, binge drinking and smoking. These resources are often free of charge and supported by online activities, DVDs, posters and books.

Health promotion through community-based groups is often one of the most effective forms of health promotion due to the close connection these groups have with the local area. Community groups often have a much clearer idea of the needs of their community, what sorts of strategies and initiatives will be best received and the most effective forms of implementation.

For example, many pools in areas with a large Muslim population offer women-only swimming sessions. This addresses the specific needs of the community and encourages women to be active by providing a comfortable, safe and culturally sensitive environment for women to exercise. Other community-based health promotions may include information evenings on cyber safety run by the local police, community-based support groups for new mothers, recovering alcoholics, cancer patients and a range of other issues, and community-based exercise groups such as the Sydney walkers groups.

## Non-government organisations

Non-government organisations (NGOs) are not-for-profit organisations that run independently of the government. NGOs generally focus on a particular issue, illness or social justice cause and are an important part of health promotion in

Australia. NGOs address health issues in a number of different ways including:

- Research and analysis of the causes, treatments and morbidity rates of illness and disease. This information is then often used by other governmental bodies in the allocation of funding and development of policies.
- Developing and distributing educational resources for use in schools that promote healthy behaviours.
- Raising awareness about various issues in the wider community, educating people about health-promoting behaviours.
- **Advocacy** on issues of health.

Some key NGOs in Australia are:

- **Cancer Council:** A community-funded charity that focuses on the prevention and treatment of cancer, support of those with cancer and is dedicated to finding a cure for cancer.
- **Heart Foundation:** A community-funded organisation that is focused on reducing premature death and for those suffering from heart, stroke and blood vessel disease in Australia. They are instrumental in the development of guidelines for health professionals, research into causes and treatments and preventative action against Australia's biggest killer.
- **Inspire Foundation:** An organisation with a large online presence that focuses on mental-health issues experienced by young people. They are involved in research on technology, young people and well-being, provide support to schools in addressing mental-health issues and fostering **resilience** in their students, and provide clinical services for young people dealing with issues of mental health.

**advocacy** a combination of individual and social actions aimed at gaining support and commitment for a particular goal or program

**resilience** the process and capacity that allows individuals to successfully adapt to challenges in their lives. Resilience is related to the development of personal life skills, such as social problem-solving, assertiveness, negotiation, social support accessing skills and a sense of connectedness

## Government

An element of responsibility for health promotion lies with each level of government. Each tier of government in Australia has different priorities, levels of funding and responsibilities when it comes to health and are therefore involved in health promotion in varying ways.

### Commonwealth

The Commonwealth government's involvement in health promotion is more of a directive and coordinating role. It responds to information analysed and collected by various agencies and



**Figure 1.39** Parliament House, Canberra

bodies and addresses health issues through national strategies. The Commonwealth government's responsibilities include:

- developing national health policies
- identifying priority issues within Australia's health and implementing strategies to ensure that these issues are addressed
- developing and implementing national health-promotion campaigns
- coordinating and supporting state-based health-promotion strategies
- allocating funding to state governments and NGOs for research and health-promotion activities
- providing funding for primary health-care services and services delivered by the private sector
- working with state governments to direct policies relating to health.

### Going further 1.32

#### Collaborate

In groups, brainstorm as many national health-promotion campaigns and strategies as you can.

#### State government

Each state government manages health-related services and delivers most of their health-promotion strategies and programs through their department of health. The NSW Department of

Health (NSW Health) is the biggest public health department within Australia; it oversees the delivery of health services within the public system. The department's organisational structure can be seen in Figure 1.41 and is comprised of 15 local health districts – eight of which are in metropolitan areas and seven of which are in regional NSW. NSW Health allocates funding to each of these local health districts that implement health-promotion initiatives in line with state and local needs.

A key document that provides direction for health at a state level is the NSW State Health Plan 2023. This 10-year plan outlines strategies for addressing national health priority issues within NSW and guidelines for the improvement of health outcomes. It provides direction for long-term funding and budget setting and explores ways of improving collaboration with the Commonwealth government on health issues.

The state is also involved in health promotion through the setting and implementation of policies and legislation. Many of these policies are developed and implemented in partnership with other bodies, such as local governments and councils, schools and NGOs. For example, the NSW government legislates that PHDPE be a compulsory subject in NSW schools and has a significant input into the content that is taught through the development of the syllabus. The NSW Board of Studies then ensures that schools, both public and private, implement the syllabus and are meeting government requirements.

Another strategy implemented at a school level in partnership with schools is, as mentioned on page 48, the Fresh Tastes NSW Healthy School Canteen Strategy, which requires all NSW

government schools to provide a healthy, nutritious canteen menu in line with the Australian Dietary Guidelines for Children and Adolescents.

Implementation of national health strategies also takes place at a state level. This allows for strategies to more effectively target the specific needs of the community. For example, the recent NSW road safety campaign ‘Get your hand off it’ uses humour to effectively address the issue of phone usage while driving.

### Local government

One of the main roles of the local government in health promotion is the regulation and management of local infrastructure and facilities. They play a vital role in the implementation of



**Figure 1.40** Local government is responsible for waste management

## Going further 1.33

### Inquire

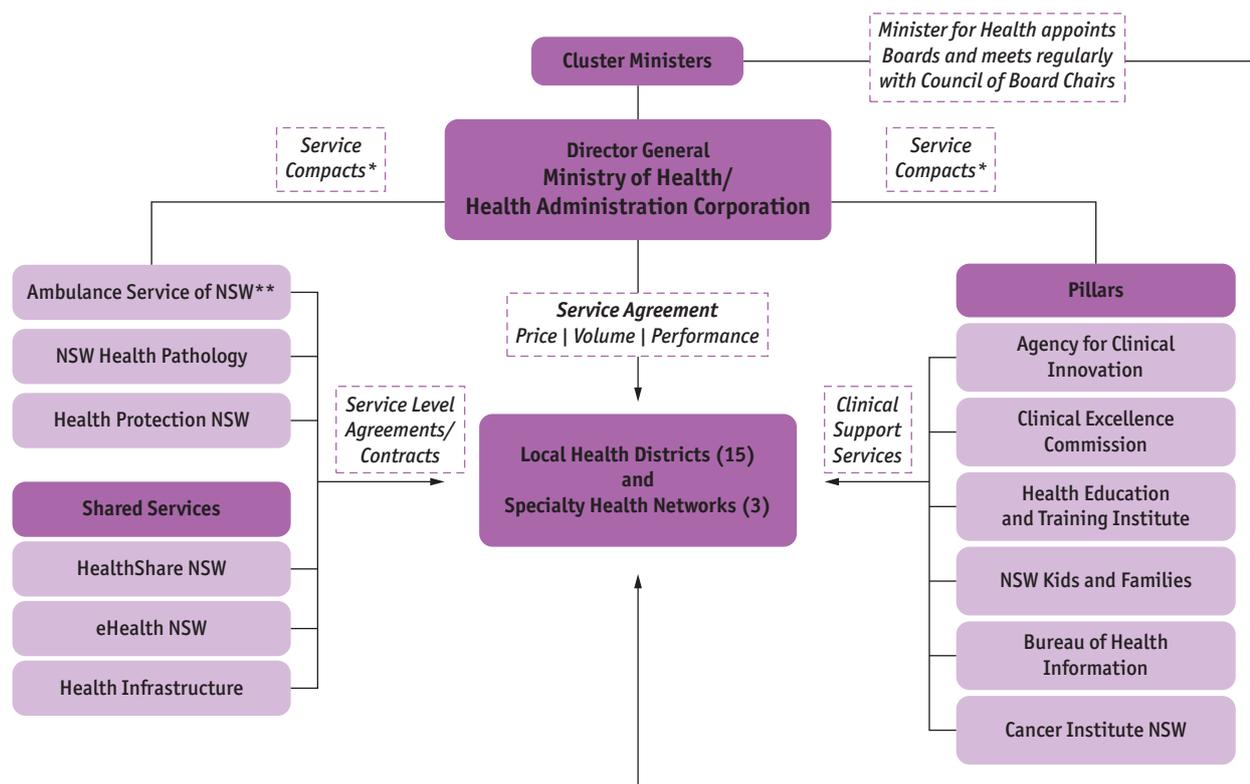
Visit the Bankstown city council website (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)).

- 1 Analyse the community profile. Are there any health-promotion activities organised by the city council?
- 2 Can you think of any health-promotion initiatives run by your local council?

state-based policies and strategies at a local and community level.

Some of the roles of local government include:

- town planning that encourages physical activity through the inclusion of facilities such as parks, play equipment, cycleways and footpaths
- the monitoring and inspection of businesses that sell food to ensure compliance with food-handling standards
- inspection of private and public swimming pools to ensure they meet fencing requirements
- management of sewage facilities and maintenance of water quality



\*Service Compact – Instrument of engagement detailing service responsibilities and accountabilities

\*\*No Service Compact between Ministry of Health and Ambulance Service of NSW

**Figure 1.41** NSW Health organisational chart (as at 9 April 2013)

- management of traffic in areas of high pedestrian activity.

Many local governments are becoming increasingly more involved in explicit health-promotion activities that address issues or target disadvantaged groups specific to their area.

## International organisations

In 1945 at the end of World War II, diplomats met to form the United Nations – an intergovernmental body focused on the creation and upholding of international law, civil rights, world economic and social development, and the achievement of lasting world peace. One of the things they discussed was the need for a global health organisation and, in response, the World Health Organization (WHO) was formally established.

WHO is the directing and coordinating authority on international health within the United Nations. WHO has 193 member countries who, combined with WHO experts, contribute to the development of health guidelines and standards, support and promote health research, address global health issues and work to improve the well-being of all.

### Going further 1.34

#### Inquire

Examine the timeline of key events in the history of WHO (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)).

- 1 Outline the significance of each event in global health.
- 2 Select three of the major events and outline how some of these issues could have impacted life as an Australian if they had not been addressed.

### Going further 1.35

#### Inquire

The OECD: An International Comparison. Visit the website of the OECD (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)).

- 1 Who are the OECD?
- 2 What information do they provide?

## Summary 1.36

- 1 Who has responsibility for health promotion?
- 2 Outline the responsibilities that each has.

WHO headquarters are situated in Geneva in Switzerland, but spread throughout the world are 8000 public health experts at 147 different country offices and six regional offices.

WHO agenda identifies six key goals that direct their programs and operation:

- 1 Promoting development – addressing issues of inequality in relation to health and working to ensure equitable access to life-saving and health-promoting resources and interventions.
- 2 Fostering health security – managing existing outbreaks of disease and illness as well as looking forward to defend against potential outbreaks.
- 3 Strengthening health systems – working to develop health systems in poverty-stricken areas through the provision of financial, technological, educational and resources support.
- 4 Harnessing research, information and evidence – distributing and using the information to monitor global health.
- 5 Enhancing partnerships – collaborating with UN agencies, other international organisations, private companies and governments to encourage practices that promote health.
- 6 Improving performance – reviewing performance at all levels of WHO to ensure utmost efficiency and effective use of resources.

The policies and initiatives developed by WHO, although relevant to all, require governments to apply them in a way that is best suited to their capabilities and needs as a country.

For example, the application of the principles of the **Ottawa Charter** are relevant to all countries but the actual implementation of strategies based on the charter may look very different between a developing African country and Australia as the needs of the population would be extremely different.

**Ottawa Charter** the charter represents the views of the World Health Organization's first international Conference on Health Promotion. It outlines prerequisites of health and the importance of enabling, mediating and advocating for health. It outlines five essential actions for health promotion:

- build healthy public policy
- create supportive environments
- strengthen community action
- develop personal skills
- reorient health services

## Checklist 1.37

- 1 Describe the health promotion roles adopted by individuals.
- 2 Describe the health promotion roles adopted by non-government organisations and community groups.
- 3 Describe the health promotion roles adopted by all levels of government.

## Health promotion approaches and strategies

There have been many changes over the past couple of decades to the way health promotion is approached. Many changes have been due to the increase in understanding of health itself and the recognition of the influence of external factors on an individual's level of health and the decisions they make about health.

As discussed at the beginning of this chapter, in the early part of the twentieth century, health was seen as largely biological. It was viewed as the absence of disease and health promotion was, therefore, characterised by a largely medical approach. Disease prevention was principally based on medical intervention and dealt predominantly with the illness itself and not the behaviours and actions that may have contributed to its development.

In developed countries, lifestyle diseases began to account for a significant amount of the burden of disease. As science, technology and epidemiology progressed, the link between lifestyle behaviours and these diseases began to be understood.

One such important link was published in the historically significant article by Sir Richard Doll and Austin Hill in the *British Medical Journal* in 1950, which confirmed suspicions that lung cancer was caused by cigarette smoking. The importance of this article was huge, as smoking rates were at their peak in the United States and Europe after World War II, smoking was readily endorsed by doctors and the tobacco industry made undisputed claims that smoking was, in fact, safe. That health-promoting article sparked the campaign against smoking that is still ongoing today.

This event also sparked a move towards a lifestyle and behavioural approach to health promotion where governments focused on specific issues and worked to increase understanding and change negative health behaviours that may contribute to poor health.

As more significance was given to the contribution that the determinants of health had

on an individual's ability to achieve good health, the focus of health promotion shifted once again towards a public health approach and the use of a broad range of strategies to address health issues and the determinants behind them.

## Lifestyle/behavioural approaches

This approach to health promotion uses a variety of strategies that target an individual's lifestyle and behaviour in order to empower people to improve their health. This approach uses the premise that people have significant control over their health and if they are provided with the information and skills to make positive health choices, they will do so.

Lifestyle/behavioural approaches aim to:

- develop an understanding of the consequences associated with various lifestyle choices; for example, the link between a high-fat, high-salt diet and the development of cardiovascular disease
- equip people with the skills to make positive health choices
- develop the capacity to cope positively with change and difficult situations
- encourage people to take responsibility for their health and their actions and find personal meaning in behaviour change.

One example of a recent government strategy that used the lifestyle/behavioural approach is the Measure Up campaign (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)).

The Measure Up campaign was part of the Australian Better Health Initiative (ABHI), which aimed to change behaviours that increased the risk of chronic diseases, such as some cancers, heart disease and type 2 diabetes.

While the campaign was for all Australians, it was specifically targeted at 25–50-year-olds, particularly parents. Using television ads, print media, radio ads and a support website, the



**Figure 1.42** The Measure Up health promotion campaign offered a good starting point for individuals to take charge of their own health

campaign aimed to increase understanding of why people need to change their negative lifestyle behaviours and adopt long-term healthy habits relating to diet and physical activity. It aimed to generate positive attitudes towards healthy lifestyles and equip people with the tools to make positive, sustainable lifestyle changes.

While these sorts of programs are a good starting point to change an individual's health behaviours, it is much more effective to combine this approach with other forms of health promotion. Health promotion also needs to address the social and environmental conditions in which a person lives.

## Preventative medical approaches

The preventative medical approach to health promotion is predominantly utilised by the health sector and uses medical interventions – such as vaccinations and health screenings – to protect people from developing certain illnesses through awareness and immunisation and to identify illness early on for more effective treatment.

The preventative medical approach addresses health issues at a biological level and does so effectively. An example of this approach in use on a global scale is the fight to eradicate polio.

### Global health – the eradication of polio

Polio was once a disease feared worldwide, striking suddenly and paralysing mainly children for life. WHO is a partner in the Global Polio Eradication Initiative, the largest private–public partnership for health, which has reduced polio by 99 per cent. Polio now survives only among the world's poorest and most marginalised communities, where it stalks the most vulnerable children. The initiative's goal is to reach every last child with polio vaccine and ensure a polio-free world for future generations.

The preventive medical approach can also be



**Figure 1.43** The National HPV Vaccination Program began in 2007

used to identify those people who may be at risk of developing a certain illness. If the individual is aware of their genetic predisposition then preventative measures can be taken to decrease the likelihood of that disease developing. For example, BreastScreen Australia offers a free screening service to identify breast cancer in women. In support of this service, the National Breast and Ovarian Cancer Centre has developed guidelines entitled 'Do you have breast cancer in your family?' to assist women in working out if they are at an increased risk of developing the disease and steps they can take to reduce that risk.

Another example of the preventative medical approach in action in Australia is the National HPV Vaccination Program. Vaccination has been found to be the best way to prevent human papillomavirus-related cancers and disease and the National Immunisation Program reflects this. The HPV program began in 2007, using schools as a medium for the delivery of the program. When it was introduced, the program was delivered to young women and girls, free of cost, and since its introduction has achieved a significant education in the rate of HPV-related infection among the vaccinated group. In 2013 the program was extended to include males as well.

Preventative medical approaches generally take place on three levels – primary, secondary and tertiary:

- **Primary:** Health-promotion actions that are targeted at the whole population and aim to stop the disease from ever developing. For example, HPV vaccination program, childhood immunisation programs for whooping cough, polio, chicken pox and measles.
- **Secondary:** Targets high-risk groups and is focused on early detection to reduce the risk of the disease developing. For example, breast cancer screening for women over 50, prostate check for men over 50, pap smears, skin cancer clinics.

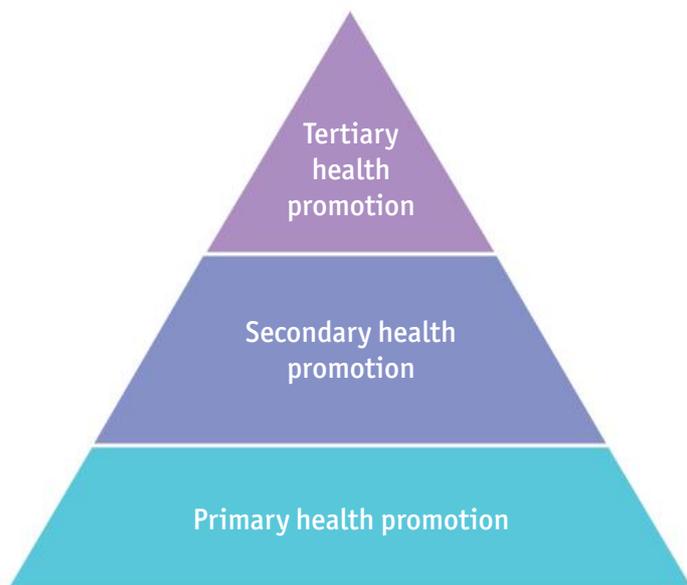
## Going further 1.38

### Inquire

Read WHO's 10 facts on polio eradication (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)).

- 1 What are the main symptoms of polio?
- 2 What are the key strategies that have made the attempts to eradicate polio thus far so successful?
- 3 What is preventing polio from being eradicated entirely?

- **Tertiary:** Aims to prevent the recurrence of a disease in an individual once they have been diagnosed and treated. For example, medications to manage high blood pressure, regular check-ups and monitoring, combined with physical activity and diet change to support someone recovering from a heart attack.



**Figure 1.44** The preventative medical approach has three tiers – primary, secondary and tertiary

## Public-health approaches

The public-health approach to health promotion uses a more holistic approach to health promotion than the behavioural/lifestyle or preventative medical approaches. Adopting the philosophies of WHO, they recognised the complex interaction of determinants on health. This approach advocates a multi-faceted approach to health promotion and the importance of involvement from all levels of society to bring about positive change.

### Health-promoting schools

A school's curriculum, ethos, environment and policies can significantly influence the health of their students. A school environment that uses an integrated and holistic approach to health will have much greater success in influencing the health of their students in a positive and lasting manner than a school that simply provides information and limits health education to what is taught in the classroom.

A health-promoting school sets education and health as interdependent priorities. It engages all members of the school community in fostering a healthy environment and does not limit health promotion simply to its students but also seeks to improve the health of all – staff, families and the wider school community – by creating an environment that supports student development

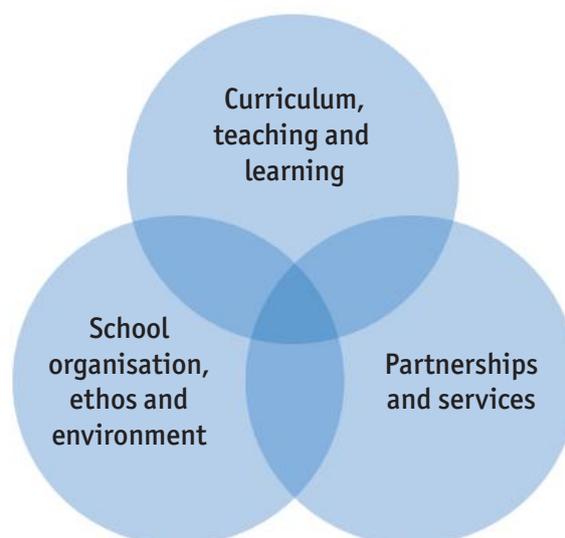
physically, socially, emotionally and mentally, and aims to develop positive attitudes and practices towards positive lifestyle behaviours like nutrition and physical activity.

### Health-promoting workplaces

Just as the school environment can significantly impact the health of a child, the workplace can have a critical influence on the health of an adult. The workplace can have a direct impact on the physical, social, mental and emotional health of its workers and, by association, the wider community of workers' families and friends.

Health promotion within the workplace is different to work health and safety (WHS) and is more ingrained in the environment and culture of the workplace. It recognises that a workplace needs to be more than just safe, it needs to be healthy. There are many benefits to both the employer and employee of having a healthy, positive work environment. Employees that have high morale, low levels of stress, a positive work-life balance and good physical, mental and social health are likely to be more productive and take less sick leave.

Under the National Partnership Agreement on Preventive Health, the Australian government recognised the need for a preventative approach to emerging health issues and saw the workplace as an ideal medium to reach the wider community. As a result, they established the Healthy Workers Initiative, a program that will provide \$294 million over nine years to support workplace health programs. The programs will focus on: decreasing rates of overweight and obesity; increasing levels of physical activity and intake of fruit and vegetables; quit smoking programs; and reducing harmful levels of alcohol consumption.



**Figure 1.45** A framework for healthy schools

Due to enormous diversity of workplaces, the Commonwealth government is allocating the majority of the funding to state governments to design, deliver and monitor programs.

### Healthy workplace awards

As part of the Healthy Workers Initiative, a series of awards were developed to acknowledge leadership in the area of preventive health, and recognise sectors of the Australian community that are working hard to promote the importance of good health and well-being.

In 2013 the large workplace award was presented to Tomago Aluminium – New South Wales:

As one of Australia's leading manufacturers of aluminium products Tomago Aluminium identified the need to improve the health and well-being of its 1000 employees and engaged the University of Newcastle and the Hunter Medical Research Institute to develop a workplace program targeting the predominantly male workforce.

The Workplace POWER (Preventing Obesity without Eating like a Rabbit) program provided education sessions about energy balance, the challenges of shift work relating to diet and exercise, and behaviour change strategies and has seen participants experience improvements in both their health and worksite outcomes.

*Source: Australian National Preventive Health Agency.*

A health and well-being statement from Tomago Aluminium:

Tomago Aluminium is committed to supporting employees in living full, safe and happy lives. As part of this, we always pursue excellence in the provision of the best possible systems and practices to ensure safety at work.

We also offer our employees health programs and educational initiatives to motivate our employees into healthy lifestyles. These include health risk reduction programs, medical screenings and employee assistance programs.

We also offer excellent benefits, including a free on-site gym, subsidised meals in our canteen, leisure days, relocation assistance and highly competitive salary and bonus schemes.

A 'work-life' balance for employees is important to Tomago Aluminium's continued success, which can include 20 per cent annual leave loading, a 12 per cent superannuation contribution and flexible work hours.

Supporting collegial relationships and encouraging social interaction is also important to

us, and that's why each of our departments hold internal social events. Larger-scale social events are also held at different times throughout the year.

*Source: Tomago Aluminium.*

Another example, outlined as follows, is Lend Lease:

### Working hard to ensure our well-being

'Foundation' was established in 1983 when Lend Lease founder Dick Dusseldorp and former chairman Stuart Hornery recognised a direct link between employee well-being and a company's performance. If employees were happy and healthy, more often than not, the company's performance reflected this.

The focus of the Foundation programs is not only on employee well-being, but also the well-being of communities where we live and work. Through a variety of health and well-being, personal development and community engagement initiatives, we make sure we leave a positive and lasting impact on our employees and the communities. Foundation programs are open to all employees, and in some cases, employees' families. Programs are developed based on employee and business needs, and governed by a charter and vision.

Foundation hosts global and regional programs throughout the year, which focus on one or a combination of the following themes:

- **Health and well-being:** These programs offer practical tips for maintaining a healthy work-life balance, enhancing physical, mental and emotional well-being.
- **Personal development:** These programs support personal and interpersonal development, helping employees reach personal and professional goals.
- **Community:** These programs engage with communities in which we live and work. Many programs are focused on creating long-term partnerships and matching employees' skills with community needs.

*Source: Lend Lease.*

In addition to government involvement, the private sector has seen workplace-related health promotion growing as an emerging industry. As awareness about the importance of a healthy workplace grows, many companies are turning to professionals for advice and assistance in the development of health-promoting programs and strategies. Many workplaces are adopting programs that address health issues and promote the well-being of their staff.

## Summary 1.39

Outline the various approaches to health promotion.

## Checklist 1.40

- 1 Investigate the health promotion initiative at Binge drinking. What are you doing to yourself? (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)). How effective do you think it is?
- 2 Investigate the health promotion initiative at Play Safe (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)). How effective do you think it is?
- 3 What other actions may improve the health of young people?

## The Ottawa Charter as an effective health promotion framework

The Ottawa Charter was the product of the first international Conference on Health Promotion, which was held in Ottawa, Canada in 1986. The conference was held in response to the growing recognition of the need for a global health movement. The charter was developed using many different sources of information from around the globe and built on principles that were developed through the Declaration on Primary Health Care at Alma-Ata, the World Health Organization's Targets for Health for All document.

**intersectoral collaboration** different sectors of society work together in a coordinated manner in order to tackle a particular issue or achieve an agreed outcome; the combined effort is more effective and the outcome more sustainable than the health sector working in isolation

The charter clearly identified that in order for good health to be achieved, some prerequisites existed, including peace, a stable ecosystem, social justice and equity, and resources such as education and income. It identified the necessity for an **intersectoral collaboration** to health promotion and called for support from international organisations in setting up strategies and programs for health promotion.

The charter was the first of its kind and identified five key principles of

health promotion that could be applied by countries in a manner that best addressed their needs and population. These five principles are still relevant and active in shaping health promotion in the world today.

### 1 Developing personal skills

Developing personal skills is related to the maintenance of positive health behaviours and altering of negative health behaviours. For example, education about healthy and unhealthy nutrition so you can make informed choices that are conducive to good health.

Health promotion supports personal and social development through providing information, education for health, and enhancing life skills. By so doing, it increases the options available to people to exercise more control over their own health and over their environments, and to make choices conducive to health.

Enabling people to learn, throughout life, to prepare themselves for all of its stages and to cope with chronic illnesses and injuries is essential. This has to be facilitated in school, home, work and community settings. Action is required through educational, professional, commercial and voluntary bodies, and within the institutions themselves.

Source: WHO.

### 2 Creating supportive environments

Creating **supportive environments** involves people taking care of each other, their communities and their natural environment. It is about organising communities, workplaces and families so that they recognise and support healthy lifestyles. For example, altering work conditions so that they are safer for all.

**supportive environments** the places people live, work and play that protect people from threats to health and that increase their ability to make health-promoting choices

Our societies are complex and interrelated. Health cannot be separated from other goals. The inextricable links between people and their environment constitutes the basis for a socioecological approach to health. The overall guiding principle for the world, nations, regions and communities alike, is the need to encourage reciprocal maintenance – to take care of each other, our communities and our natural environment.

The conservation of natural resources throughout the world should be emphasised as a global responsibility.

Changing patterns of life, work and leisure have a significant impact on health. Work and leisure should be a source of health for people. The way society organises work should help create a healthy society. Health promotion generates living and working conditions that are safe, stimulating, satisfying and enjoyable.

Systematic assessment of the health impact of a rapidly changing environment – particularly in areas of technology, work, energy production and urbanisation – is essential and must be followed by action to ensure positive benefit to the health of the public. The protection of the natural and built environments and the conservation of natural resources must be addressed in any health promotion strategy.

Source: WHO.

### 3 Strengthening community action

Strengthening community action involves identifying how communities can improve the health status of their members. By agreeing on community action priorities, making decisions and implementing them for the better, communities are empowered to own and control their own health problems. A good example of this is Clean Up Australia Day.

Health promotion works through concrete and effective community action in setting priorities, making decisions, planning strategies and implementing them to achieve better health. At the heart of this process is the empowerment of communities – their ownership and control of their own endeavours and destinies.

Community development draws on existing human and material resources in the community to enhance self-help and social support, and to develop flexible systems for strengthening public participation in and direction of health matters. This requires full and continuous access to information, learning opportunities for health, as well as funding support.

Source: WHO.

## 4 Reorienting health services

**Reorienting health services** involves going beyond the traditional focus of health care providing curative services, and expanding roles to include promotion of good health and prevention of illness and disease. For example, organisations providing information about positive health methods and behaviours (Cancer Council); disposal sites for needles.

**reorienting health services** moving the focus of the health sector towards health promotion, prevention and supporting the well-being of the whole person to complement traditional roles of diagnosis, treatment and rehabilitation; the health sector is encouraged to also adopt a key role in coordinating other sectors to work for health

The responsibility for health promotion in health services is shared among individuals, community groups, health professionals, health service institutions and governments.

They must work together towards a health care system which contributes to the pursuit of health. The role of the health sector must move increasingly in a health promotion direction, beyond its responsibility for providing clinical and curative services. Health services need to embrace an expanded mandate which is sensitive and respects cultural needs. This mandate should support the needs of individuals and communities for a healthier life, and open channels between the health sector and broader social, political, economic and physical environmental components.

Reorienting health services also requires stronger attention to health research as well as changes in professional education and training. This must lead to a change of attitude and organisation of health services which refocuses on the total needs of the individual as a whole person.

Source: WHO.

## 5 Building healthy public policy

Building healthy public policy requires health to be important to governments at all levels. It means taking account of the importance of health for individuals and communities when laws are made and changed. For example, speeding restrictions and drink-driving laws.

Health promotion goes beyond health care. It puts health on the agenda of policy makers in all sectors and at all levels, directing them to be aware of the health consequences of their decisions and to accept their responsibilities for health.

Health promotion policy combines diverse but complementary approaches including legislation, fiscal measures, taxation and organisational change. It is coordinated action that leads to health, income and social policies that foster greater equity. Joint action contributes to ensuring safer and healthier goods and services, healthier public services, and cleaner, more enjoyable environments.

Health promotion policy requires the identification of obstacles to the adoption of healthy public policies in non-health sectors, and ways of removing them. The aim must be to make the healthier choice the easier choice for policy makers as well.

Source: WHO.

## How has health promotion based on the action areas of the Ottawa Charter contributed to positive health outcomes?

The multi-faceted approach to health promotion that is inherent in the Ottawa Charter is necessary for real and lasting change to be brought about. This approach to health promotion provides a targeted approach that addresses all areas in which poor health decisions may be made. It provides support at all levels, attacks poor health choices and supports positive ones. Health-promotion strategies target the same issue in a variety of different ways, ensuring that no one escapes the message.

For example, the issue of road safety in Australia is one that has seen some vast improvements over the last couple of decades. Health promotion based on each action area of the Ottawa Charter has driven numerous campaigns aimed at different aspects of road safety. Using a coordinated approach that is often government driven but supported by many other agencies and organisations.

### Going further 1.41

#### Inquire

Many of these strategies are aimed at young male drivers. From Table 1.6, outline the influence on young male drivers in rural NSW to drink-driving.

Action area	Strategy	
Developing personal skills	Party safe	
	You're in our sights campaign	
	Paranoia campaign	
Creating supportive environments	Road rules awareness week	
	Designated driver programs	
	Good sports	
Strengthening community action	Free breath testing at pubs and major events	
	A formal liquor accord	
	Catch you later Leeton program	
	R U Over It campaign	
Reorienting health services	Rotary Youth Driver Awareness Program	
	Alcohol Action in Rural Communities Research Program	
Building healthy public policy	Leeton Shire Council's 5 Year Road Safety Strategic Plan 2012–2017	
	<ul style="list-style-type: none"> <li>• Strict laws governing drink-driving</li> <li>• Zero blood alcohol level for L and P plate drivers</li> <li>• Double demerits for drink-driving and other offences over peak times of year such as long weekends and holidays</li> </ul>	

Table 1.6 Influence on young male drivers in rural NSW to drink-driving

How it was implemented/who was involved	Aim
Road safety officers working in conjunction with local schools to provide information on safe alcohol use and the need for planned transport.	To change attitudes and risky behaviours relating to alcohol use among teens. Educate about potential consequences.
Developed by the NSW Centre for Road Safety. Launched in 2009 on digital media and supported by print media on buses, taxis and in licensed venues.	To deter people from making negative choices by encouraging them to consider the potential legal consequences.
Developed by the NSW Centre for Road Safety. Ran 2006–2012. Included television, radio, press and online. There was also supporting merchandise in targeted licensed premises and advertising on the back of buses.	To increase awareness of police mobile RBT operations and the likelihood of getting caught for drink-driving, as well as to reinforce the social unacceptability of drink-driving.
Included the launch of the 'Top 10 misunderstood road rules in NSW'. Hotline for answering questions relating to road rules.	To clarify the changes that were brought about in 2012 to road rules and encourage people to seek a greater understanding of the rules.
Pubs and clubs issue wristbands to those registered as designated drivers. Designated drivers are often supplied with free soft drinks.	Encourages forethought and planning and supports responsible action.
Program run by Leeton sports clubs targeting the negative drinking culture around sport.	To reduce the abuse of alcohol within sporting communities with a focus on drink-driving risks through education and attitude modification.
Leeton Shire council implemented this strategy after identifying drink-driving as a major contributor to accidents in their area.	To encourage people to think about the amount they have consumed and educate about the amount of time it takes for alcohol to be processed in the body.
Formal committee of community members that oversee the running of drink-driving and alcohol-education programs.	Community involvement means programs are more likely to address specific issues within the community. Creates consistent messages and a sense of unity.
Drink-driving prevention poster and brochure, developed by NSW Health, supported by Leeton Shire Council.	Removes the temptation to drink-drive as they are catching a taxi to the venue. Encourages forethought and planning.
People going out take a taxi to the venue. The driver then issues them with a voucher that they hand in at the bar with \$1, which is the cost of the taxi home. The patron also receives a \$5 voucher towards food or drink to be used at a later time. On the way home the patron gives the taxi driver the completed voucher who sends it in to the local Road Safety Officer who pays the remaining fare.	To raise awareness of the likelihood of being 'over the limit' the day after a 'big night out' and encourage drinkers to plan their transport arrangements ahead of time.
Presentation to 600 Year 11 students each year by ambulance officers, highway patrol, NSW Police Community Liaison officers and driving instructors.	To address issues of road safety and promote responsible behaviours through education and awareness.
Leeton Shire Council participated in this state-wide research program conducted by the National Drug and Alcohol Research Centre. This research program was supported and substantially funded by the Foundation for Alcohol Research and Education over a five-year period and is the largest and most rigorous evaluation of a community action approach to reduce risky alcohol consumption and related harms ever undertaken anywhere in the world.	The study aimed to evaluate the impact of community action on excessive alcohol consumption and harms. It was comprised of three evidence-based, community-led interventions over a period of five years in 20 different rural towns.
A strategic plan that addresses the major issues of road safety specific to Leeton. The plan is based on the Australian Transport Council's 'Safe System' approach and the National Road Safety Strategy for 2011 to 2020. The plan takes the key principles from the Australian Government's strategy and applies them to the specific needs of Leeton as identified through community surveys and analysis of crash statistics.	To make the Shire of Leeton a safer place for all road users by creating safer roads, safer vehicles and safer people. The plan outlines a coordinated approach with local government, local media, local schools, fire and ambulance services, local transport authorities, local community clubs and district health services.
Laws created by state and Commonwealth governments and enforced by local and federal police through mobile RBT units.	To provide a deterrent for drink-driving and other risky road behaviours, especially at times when the temptation is higher, such as holidays and long weekends.

Year	Number of alcohol-related fatal and injury crashes	Percentage of total number of fatal and injury crashes
2000	11	19
2001	2	4
2002	5	19
2003	4	11
2004	5	10
2005	4	15
2006	9	29
2007	0	0
2008	2	12.5
2009	0	0

**Table 1.7** Fatal and injury crashes attributed to alcohol – Leeton Shire, 2000–09

The Ottawa Charter in action: a multi-faceted approach to drink-driving in rural NSW

In 2007, Leeton Shire launched a multi-faceted attack on drink-driving within their community. The shire had a significant history of alcohol-related accidents and had the highest percentage of crashes relating to alcohol within the south-west region of the Roads and Traffic Authority (RTA) NSW, with around 12 per cent of injury and fatal crashes attributed directly to alcohol.

### Going further 1.42

#### Inquire

- 1 The statistics in Table 1.7 show that this multi-faceted approach to the issue of drink-driving in Leeton is working. With reference to the Ottawa Charter, analyse reasons for the success of the programs.
- 2 An evaluation of the programs reported that although there was a significant reduction in high and medium PCA infringements, there has been an increase in low-level and morning-after infringements. Propose reasons for the increase.
- 3 Outline a strategy that you think could address the low-level and morning-after infringements.

### Summary 1.43

Outline the five areas of the Ottawa Charter for Health Promotion.

### Checklist 1.44

- 1 Describe the historical significance of the Ottawa Charter.
- 2 How has the Ottawa Charter contributed to positive health outcomes? Provide two examples.

Their community-driven campaign was a great success for a number of reasons:

- it acknowledged the impact that the determinants of health had on decision-making
- it addressed these determinants and provided other options
- it involved all levels of the community and was supported by the campaigns and strategies employed by the Australian and NSW governments.

## Principles of social justice

‘The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition ...’ (WHO Constitution).

The principles of social justice are embodied in WHO’s constitution and are a critical element of effective health promotion. Social justice is the promotion of fundamental and universal human rights. Everyone has the basic human right to health, in addition to the right to security, shelter, clothing, housing, medical care, social services and the resources necessary for health and well-being. But the reality is that for a large proportion of the world’s population these basic rights are not upheld. Health promotion based on the principles of social justice seeks to change that and to ensure that those disadvantaged individuals and groups are provided with the resources and support to take control of and improve their health.

The principles of social justice that support this are equity, diversity and supportive environments.



**Figure 1.46** Public protest is one action that can be taken to reduce inequality

**equity** equity means that resources are allocated in accordance with the needs of individuals and populations with the desired goal of equality of outcomes

## Equity

**Equity** involves taking action to reduce the level of inequality in society. It seeks to ensure that resources are distributed in a way that allows all people the opportunity to achieve optimal health. In some cases this may mean the allocation of more resources and support to a disadvantaged group in order to achieve fairness.

**diversity** covering a range of groups, communities

## Diversity

**Diversity** recognises the many differences that exist between individuals and groups. Differences in culture, religion, age, gender, sexuality, socio-

economic status, history and language are not only acknowledged but direct the development of health-promotion strategies and campaigns. Effective health promotion tailors strategies to the specific needs of the population group and does so in a way that is culturally sensitive and appropriate.

## Supportive environments

This principle recognises the significant impact that the environment in which a person lives, works and socialises can have on an individual's level of health and their ability to make changes to their level of health. Health promotion seeks to create environments that are safe, supportive and encourage people to make positive health choices.

### Summary 1.45

- 1 What are the three principles of social justice?
- 2 Outline each principle.

### Checklist 1.46

Identify a strategy where the principles of social justice have been applied to promote health.

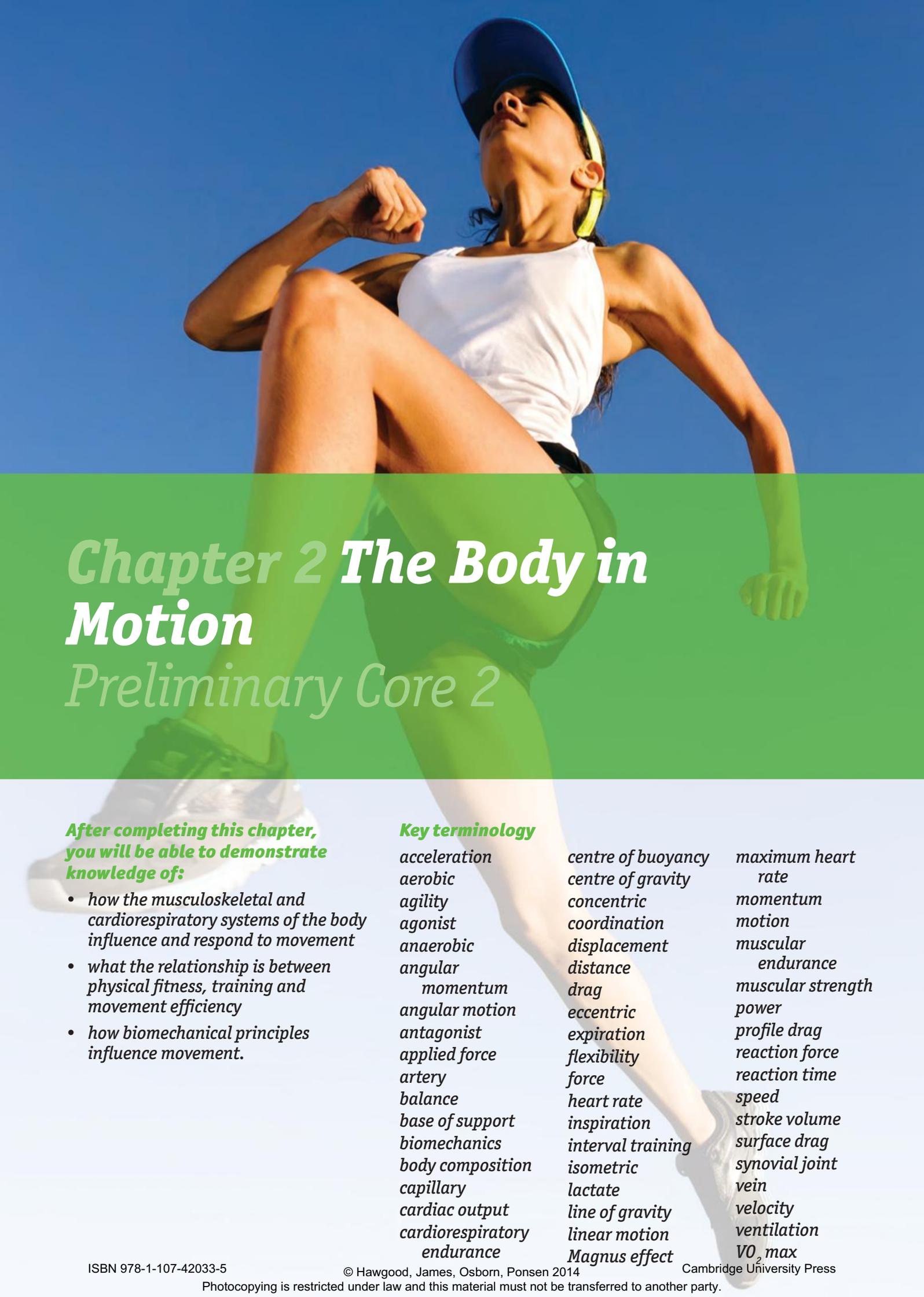
## Chapter summary

- Definitions of good health have changed over time. The current WHO definition of health presents health as a holistic concept, which includes physical, social, spiritual and emotional health.
- Individual health is both relative (understood in relation to other people) and dynamic (constantly changing).
- One's attitude towards health will be based on subjective experience, including level of education, family and peer behaviour towards health, and the views of the society in which one lives (social construct).
- The Australian Institute of Health and Welfare (AIHW) is a major national agency, which aims to 'provide reliable, regular and relevant information and statistics on Australia's health and welfare'.
- The AIHW reported that 93 per cent of young people assessed themselves as having 'good', 'very good' or 'excellent' health – a high figure by OECD standards.
- While many chronic diseases have become less widespread in Australia in recent years, the incidence of diabetes has almost doubled in the past decade.
- Australia has the highest rates of skin cancer incidence in the world, with two in three Australians being diagnosed with skin cancer by the time they are 70.
- Other health concerns affecting youth in Australia include the use and misuse of licit and illicit drugs, smoking, consumption of alcohol, nutrition and unsafe sexual practices.
- The determinants of health include individual, socio-cultural, socio-economic and environmental factors.
- Determinants are interrelated and interact in many different ways to produce an individual's level of health.
- Individual factors include knowledge, attitudes and beliefs about health, as well as a genetic predisposition to disease.
- Socio-cultural factors include cultural beliefs, family attitudes towards physical activity and diet, and media messages about health.
- Socio-economic factors such as income, employment, education and housing are all intricately linked to health.
- Environmental factors, such as remoteness of location, will affect an individual's access to health services and technology, as well as their options in relation to food and leisure.
- Some health determinants are modifiable (environment, health knowledge and skills, attitude) while others are unmodifiable (genetics, advancing age).
- The impact of various determinants will change depending on one's stage of life.
- Health promotion is not only the responsibility of an individual, but is also the domain of schools, community groups, non-government organisations (NGOs) and all levels of government (Commonwealth, state and local).
- The Ottawa Charter identifies five key principles of health promotion: developing personal skills, creating supportive environments, strengthening community action, reorienting health services, and building healthy public policy.
- Principles of social justice are important to health promotion, and include equity between individuals, an awareness of the diversity of those individuals and a recognition of the need for supportive environments.

## Exam-style questions

- 1 How do the dimensions of health interact?
- 2 To what degree are perceptions of health socially constructed?
- 3 Choose a health issue affecting young people. Discuss the risk factors that may contribute to the issues and the protective behaviours that could decrease the risk of the issue occurring.
- 4 How can the determinants of health affect an individual's health?
- 5 How could an individual modify the determinants they have little to no control over?
- 6 What is the value of viewing health as a social construct?
- 7 Discuss how health changes over time.
- 8 To what degree are perceptions of health socially constructed?
- 9 Analyse the perceptions of the health of young people.
- 10 What are the risk factors and protective behaviours for road use for young people?
- 11 Discuss the impact of socio-economic determinants on an individual's health.
- 12 How can an individual modify the control they have over the various health determinants affecting them?
- 13 Outline the various groups that have a responsibility for health promotion.
- 14 How has the Ottawa Charter for Health Promotion contributed to the reduction in tobacco use?





# Chapter 2 *The Body in Motion*

## Preliminary Core 2

**After completing this chapter, you will be able to demonstrate knowledge of:**

- how the musculoskeletal and cardiorespiratory systems of the body influence and respond to movement
- what the relationship is between physical fitness, training and movement efficiency
- how biomechanical principles influence movement.

### **Key terminology**

acceleration

aerobic

agility

agonist

anaerobic

angular

momentum

angular motion

antagonist

applied force

artery

balance

base of support

biomechanics

body composition

capillary

cardiac output

cardiorespiratory

endurance

centre of buoyancy

centre of gravity

concentric

coordination

displacement

distance

drag

eccentric

expiration

flexibility

force

heart rate

inspiration

interval training

isometric

lactate

line of gravity

linear motion

Magnus effect

maximum heart rate

momentum

motion

muscular

endurance

muscular strength

power

profile drag

reaction force

reaction time

speed

stroke volume

surface drag

synovial joint

vein

velocity

ventilation

$VO_2$  max

## 2.1 How the body's musculoskeletal and cardiorespiratory systems influence and respond to movement

### Driving questions 2.1

Can you name the 11 human body systems? Which body systems have the most influence on movement? How do these body systems react during movement?

**anatomy** the study of the structures of the body and their relationships

**Anatomy** is the study of the structures of the body and their relationships. In anatomy, descriptions of the body assume that the body is in a specific position, called the anatomical

position. In this position the person is standing upright, facing forward with their hands down by their sides with their palms facing forward.

The body can also be divided into planes. The three planes of the body are:



Figure 2.1 Anatomical position of the body

- sagittal plane – vertical plane that divides the body into left and right
- frontal plane – vertical plane that divides the body into front and back
- transverse plane – horizontal plane that divides the body into top and bottom.

Directional terms are used to locate various body structures in relation to each other, as outlined in Table 2.1 below.

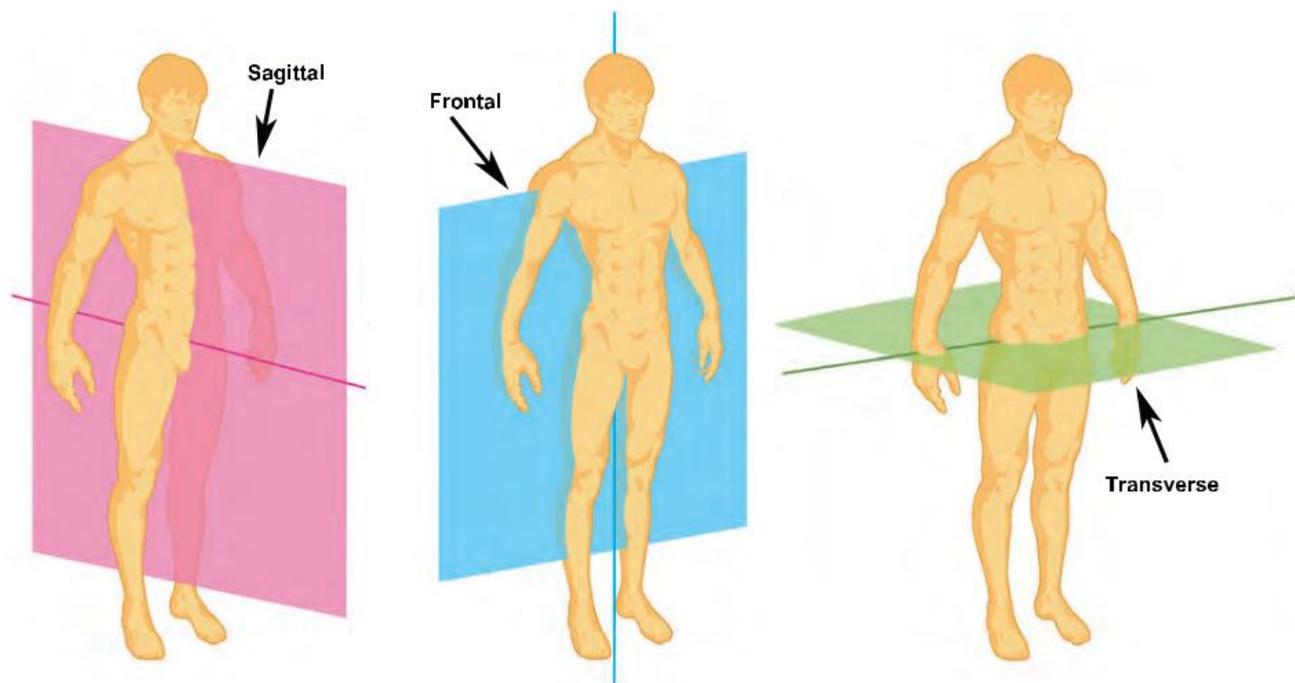
### Skeletal system

The roles of the skeletal system are:

- support – bones provide a framework for the body
- protection – bones protect many internal organs from injury
- movement – skeletal muscles attach to bones; when muscles pull on bones they produce movement
- storage of minerals – bone tissue stores several minerals, particularly calcium and phosphorous
- blood cell production – red blood cells, white blood cells and platelets are formed in the marrow

Term	Definition	Example
Superior	Toward the head	The heart is superior to the liver
Inferior	Away from the head	The stomach is inferior to the lungs
Anterior	Nearer to the front of the body	The sternum is anterior to the heart
Posterior	Nearer to the back of the body	The oesophagus is posterior to the trachea
Medial	Nearer to the midline of the body	The ulna is on the medial side of the arm
Lateral	Further from the midline of the body	The lungs are lateral to the heart
Proximal	Nearer to the attachment of an extremity	The humerus is proximal to the radius
Distal	Further from the attachment of an extremity	The phalanges are distal to the carpals

Table 2.1 Directional terms of the body



**Figure 2.2** The three planes of the body – sagittal, frontal and transverse

- storage of energy – a secondary reserve of chemical energy is stored in the marrow.

Bones are made up of:

- compact bone – contains few spaces and forms the external layer of all bones
- spongy bone – contains marrow, which produces blood cells.

There are four principal types of bones based on shape – long, short, flat and irregular (as seen in Figure 2.3):

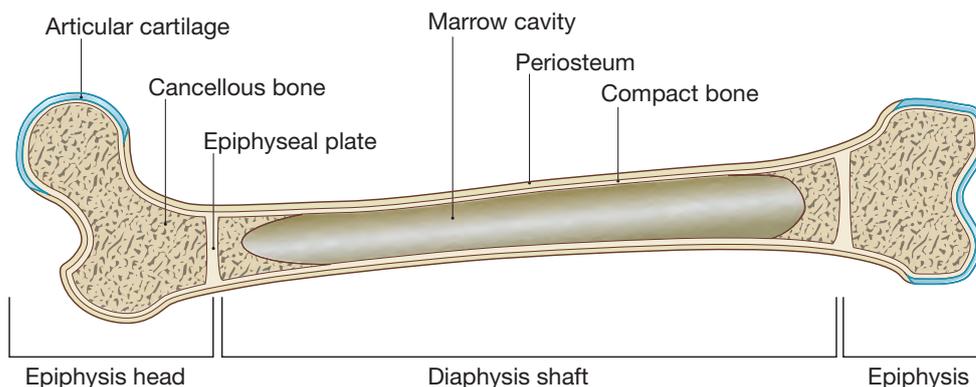
- long bones – have greater length than width and consist of a shaft; they consist mostly of compact bone encasing spongy bone (e.g. femur, tibia, fibula, phalanges, humerus, radius and ulna)
- short bones – are somewhat cube shaped and nearly equal in length and width; they are spongy bone except for the surface, which is a thin layer of compact bone (e.g. carpals and tarsals)
- flat bones – are generally thin and composed of two thin plates of compact bone encasing spongy bone (e.g. cranial bones, sternum, ribs and scapula)
- irregular bones – have complex shapes; they also vary in the amount of spongy and compact bone (e.g. vertebrae and some facial bones).

There are two additional types of bones:

- sutural bones – small bones located between joints
- sesamoid bones – small bones wrapped in tendons where there is considerable pressure exerted; the patella is a sesamoid bone.



**Figure 2.3** The four principal types of bones



**Figure 2.4** Parts of a typical long bone

A typical long bone consists of the following parts (as seen in Figure 2.4):

- diaphysis – shaft or long portion of the bone
- epiphyses – ends of the bone
- articular cartilage – thin layer of cartilage covering the epiphysis
- periosteum – membrane around the surface of the bone
- medullary – space within the diaphysis that contains the marrow.

- 7 cervical vertebrae in the neck region
- 12 thoracic vertebrae in the chest region
- 5 lumbar vertebrae supporting the lower back
- 5 sacral vertebrae fused into one bone (sacrum)
- 4 coccygeal vertebrae fused into one bone (coccyx).

Between the vertebrae from the first vertebrae to the sacrum are intervertebral discs. The discs form strong joints, permit movement and absorb vertical shock.

## Major bones involved in movement

The adult skeleton consists of 206 bones grouped into two divisions: the axial skeleton and the appendicular skeleton. The bones of the axial skeleton are shown in blue (in Figure 2.5 on the following page). The bones of the axial skeleton lie around the axis: skull bones, breastbone, ribs and bones of the backbone. The appendicular skeleton contains the bones of the upper and lower limbs plus the girdles that connect the extremities to the axial skeleton.

### Skull

The skull contains 22 bones. It includes cranial bones (8) which protect the brain and (14) facial bones which form the features of the face.

### Hyoid bone

This single bone is unique as it does not articulate with any other bone. It is suspended by ligaments and muscles in the neck.

### Vertebral column

This, along with the sternum and ribs, form the trunk of the body and consists of 26 vertebrae in five groupings:

### Thorax

This refers to the whole chest. It is formed by the sternum, ribs and thoracic vertebrae. The sternum is a flat bone located in the centre of the chest. There are 12 pairs of ribs. They increase in length from the first to the seventh before decreasing again. The first seven ribs have a direct attachment to the sternum while the remaining five ribs have an indirect attachment or do not attach to the sternum at all. In fact, the 11th and 12th pair are floating ribs because they do not attach to the ribs at all.

### Pectoral girdle (shoulder)

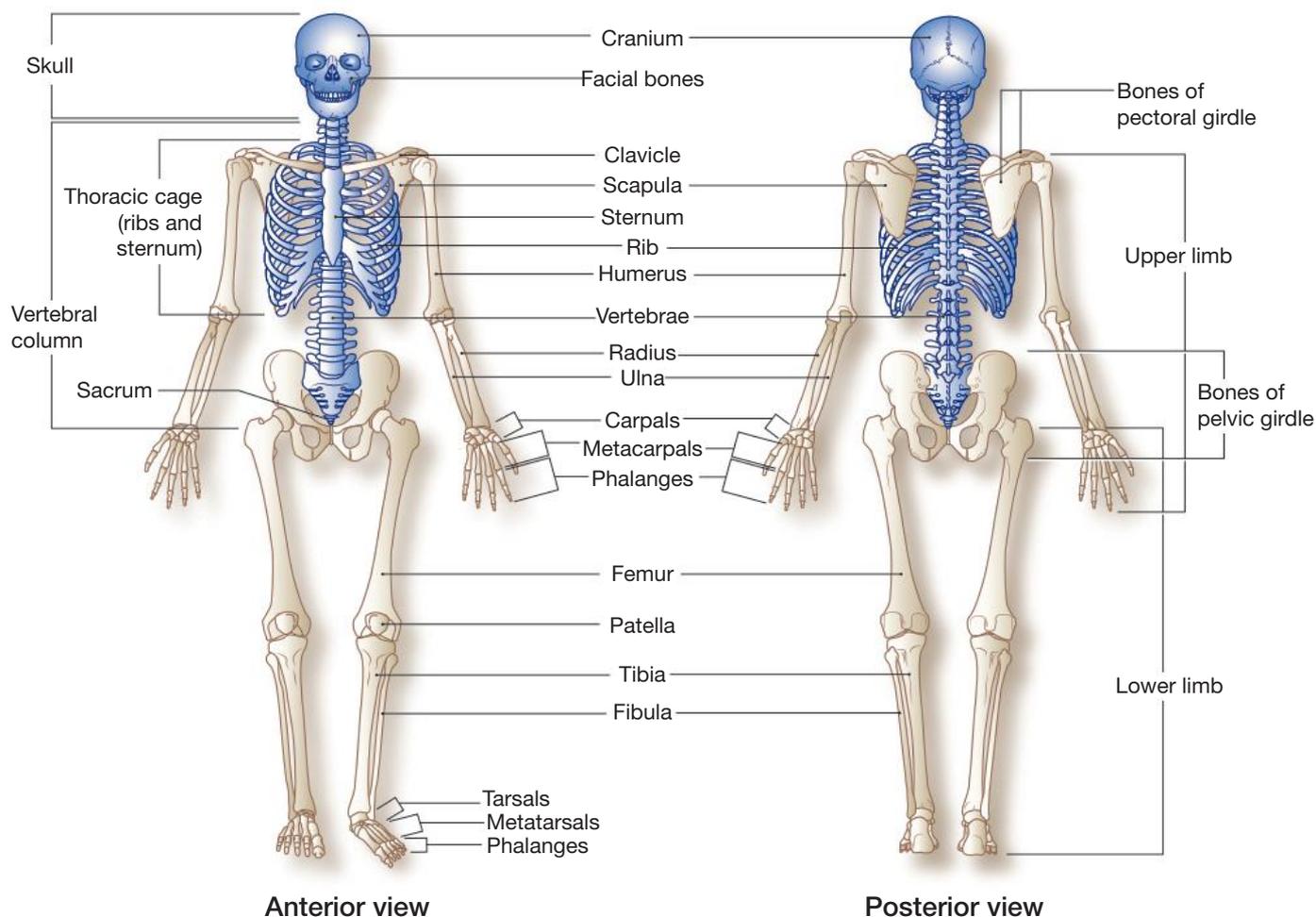
The pectoral girdle attaches the bones of the upper limbs to the axial skeleton. It consists of the clavicle and scapula. The clavicle is a long bone also known as the collarbone. The scapula is a flat bone also known as the shoulder blade.

### Upper extremity

The upper extremities consist of 60 bones. Each upper limb includes a humerus, ulna and radius, carpals (wrist), metacarpals (palm of the hand) and phalanges (fingers).

### Pelvic girdle (hip)

The pelvic girdle consists of the two hipbones. It provides a strong stable support for the lower



**Figure 2.5** The adult skeleton

extremities, which hold the weight of the body. Each hipbone consists of three bones at birth and eventually these bones fuse into one.

### Lower extremity

The lower extremities consist of 60 bones. Each lower limb contains a femur, patella, tibia, fibula, tarsals (ankle), metatarsals and phalanges (toes).

## Checklist 2.2

- 1 Examine the diagram of the skeletal system and familiarise yourself with the bone names.
- 2 Participate in a series of physical activities. Which bones are used in providing movement?

## Structure and function of synovial joints

A joint (articulation) is a point of contact between at least two bones. Joints allow movement to occur.

Joints can be categorised based on structure or by the type of movement they allow. The structural classification is as follows:

- fibrous – there is no joint cavity and the bones are held together by fibrous connective tissue making movement difficult
- cartilaginous – there is no joint cavity and the bones are held together by cartilage allowing some movement
- synovial – there is a joint cavity and the bones are surrounded by an articular capsule and often ligaments allowing for movement.

### Synovial joints (freely movable joint)

Most joints in the body are **synovial joints**. They have common features that allow for movement. These include:

- articular cartilage – covers the end of the bone providing cushioning and reducing friction during movement
- synovial cavity – space that separates the two articulating bones.
- ligaments – join bone to bone
- synovial fluid – acts as a lubricant with the synovial cavity

**synovial joint**  
a joint that can move freely

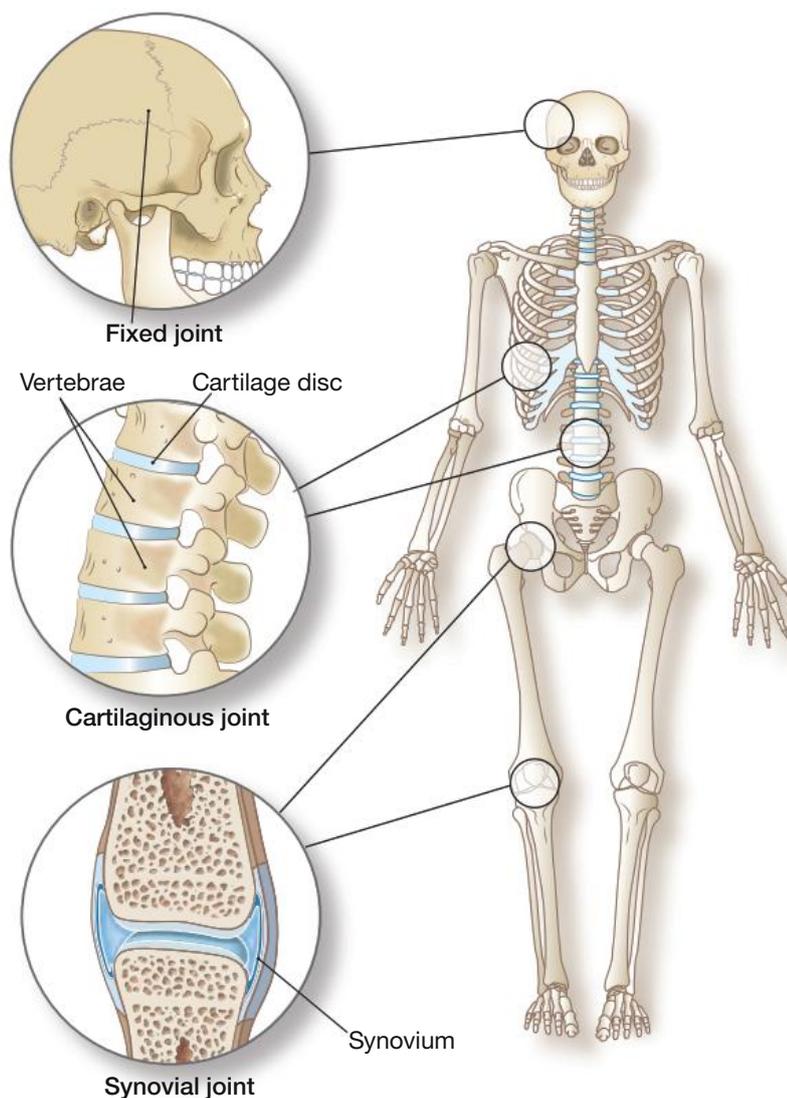


Figure 2.6 Types of joints

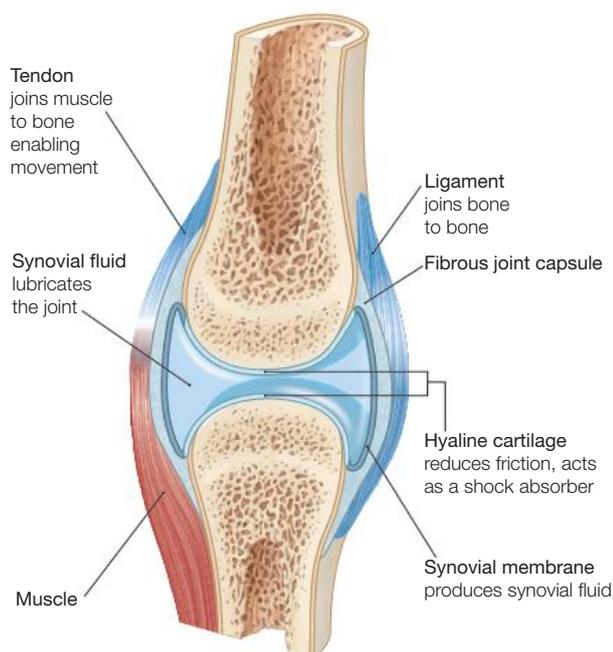
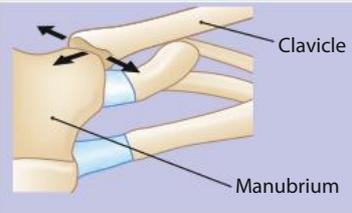
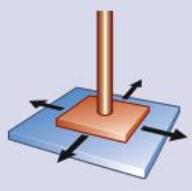
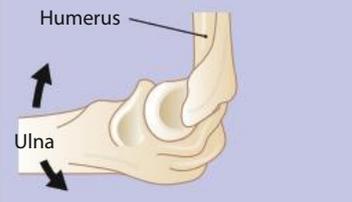
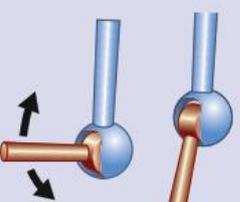
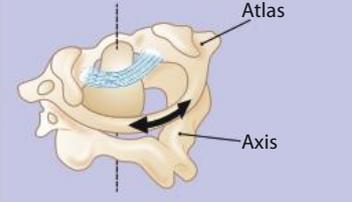
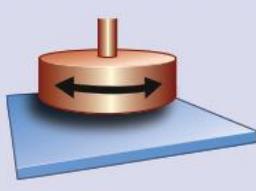
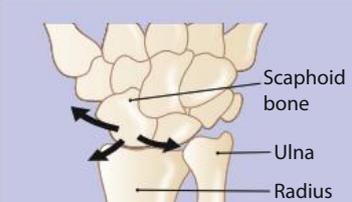
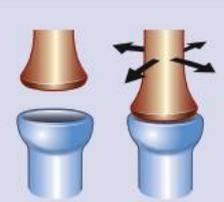
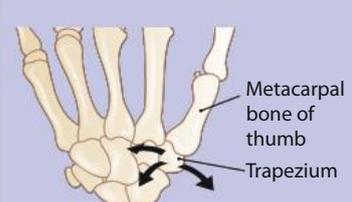
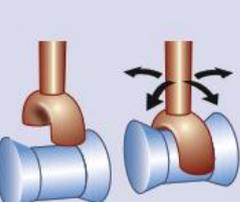
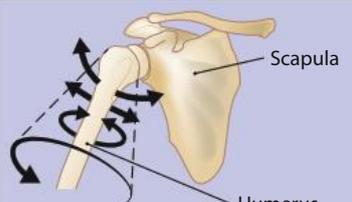
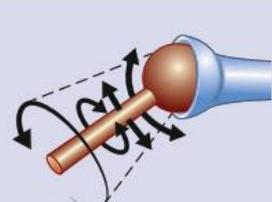


Figure 2.7 Synovial joint

- joint capsule – encloses the cavity and contains the fluid
- fibrous capsule – encloses the bones and synovial cavity
- synovial membrane – secretes fluid into the joint
- meniscus – inward growing cartilage that absorbs shock, pressure and enhances stability
- bursae – saclike structures that are strategically placed to alleviate friction
- tendon – join muscle to bone.

Synovial joints can be classified into six categories:

- 1 Gliding joint: Articulating bones are usually flat. Side to side and back and forth movements are permitted. Gliding joints include the carpals, tarsals and vertebrae.
- 2 Hinge joint: The convex surface of one bone fits into the concave surface of another. Movement is in a single direction allowing flexion and extension. Hinge joints include knee, elbow and ankle.

Types of synovial joints		Models of joint movements	Examples
Gliding joint			<ul style="list-style-type: none"> <li>• Acromioclavicular and sternoclavicular joints</li> <li>• Intercarpal and intertarsal joints</li> <li>• Vertebrocostal joints</li> <li>• Sacro-iliac joints</li> </ul>
Hinge joint			<ul style="list-style-type: none"> <li>• Elbow joints</li> <li>• Knee joints</li> <li>• Ankle joints</li> <li>• Interphalangeal joints</li> </ul>
Pivot joint			<ul style="list-style-type: none"> <li>• Atlas/axis</li> <li>• Proximal radio-ulnar joints</li> </ul>
Ellipsoidal joint			<ul style="list-style-type: none"> <li>• Radiocarpal joints</li> <li>• Metacarpophalangeal joints 2–5</li> <li>• Metatarsophalangeal joints</li> </ul>
Saddle joint			<ul style="list-style-type: none"> <li>• First carpometacarpal joints</li> </ul>
Ball-and-socket joint			<ul style="list-style-type: none"> <li>• Shoulder joints</li> <li>• Hip joints</li> </ul>

**Figure 2.8** The anatomical types of synovial joints

- 3 Pivot joint: A rounded surface of one bone articulates with a ring formed partly by another. Primary movement is rotation. An example is the atlas of the neck rotating.
- 4 Ellipsoidal (condyloid) joint: An oval shaped bone fits into an elliptical cavity of another bone. It allows side-to-side and back-and-forth movement. The joint at the wrist is an ellipsoid joint.
- 5 Saddle joint: One bone is saddle shaped while the other bone is shaped like a rider. Movement is side to side and back and forth. The thumb is a saddle joint.
- 6 Ball-and-socket joint: Consists of a ball-like surface that fits into a cuplike depression of

another. They allow flexion and extension, adduction and abduction and rotation. The shoulder also allows circumduction. The hip and shoulder are the only examples in the body.

## Joint actions

Joint actions are as follows:

- flexion – movement at the joint reduces the angle between the bones
- extension – movement at the joint increases the angle between the bones
- hyperextension and hyper flexion – makes the joint go beyond its normal range of motion

## Checklist 2.3

Complete the following table.

Joint	Type of joint	Joint actions
Elbow		
Wrist		
Shoulder		
Neck		
Knee		
Ankle		
Hip		

**Table 2.2** Joint actions

Complete the following table.

Activity	Bones	Joint actions
Push-up		
Sit-up		
Squat		
Bicep curl		
Star jump		
Cricket bowl		
Calf raise		

**Table 2.3** Joint actions

- 1 Identify the major bones involved in movement.
- 2 Outline the structure of a synovial joint.
- 3 Classify the different types of synovial joints.
- 4 What are the actions that joints can perform?

- circumduction – the distal end of the body moves in a circle
- rotation – the movement of a bone around its axis
- abduction – movement of a bone away from the midline of the body
- adduction – movement of a bone towards the midline of the body
- dorsiflexion – the foot flexes toward the shin
- plantarflexion – the foot points toward the ground
- supination – movement of the forearm in which the palm of the hand is turned anteriorly
- pronation – movement of the forearm in which the palm of the hand is turned posteriorly
- inversion – movement of the sole of the foot inward

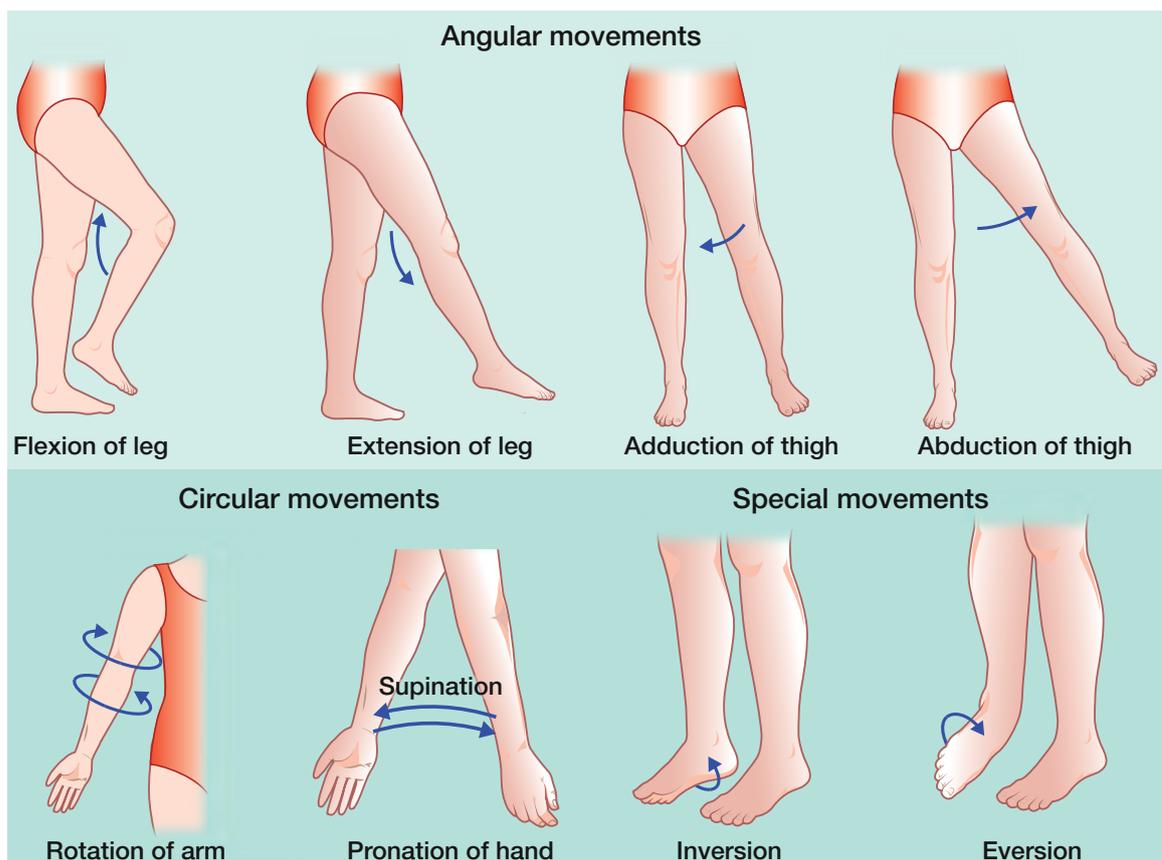


Figure 2.9 Movements permitted by synovial joints

- eversion – movement of the sole of the foot outward
- elevation – upward movement of a body part
- depression – downward movement of a body part.

## Muscular system

**ATP** adenosine triphosphate – the molecule that transfers energy between cells in the body

Motion results from alternating the contraction and relaxation of muscles. The prime function of muscle is to convert chemical energy (**ATP**) into mechanical energy to produce movement.

There are three types of muscle tissue:

- 1 **Skeletal muscle tissue:** These are attached primarily to bones. Skeletal muscle is striated due to its alternating dark and light bands. It is a voluntary muscle.
- 2 **Cardiac muscle tissue:** This forms most of the heart. It is also striated but is involuntary.
- 3 **Smooth muscle tissue:** This is located in the walls of hollow internal structures such as the intestines. It is smooth in appearance and is usually involuntary.

Skeletal muscles produce movement by exerting force on tendons, which in turn pull on bones or

other structures. Most muscles cross at least one joint and are attached to the articulating bones that form the joint. Normally one bone is held in its original position while the other bone moves during a contraction. The attachment of the tendon at the stationary bone is called the origin, while the attachment at the movable bone is the insertion.

## Major muscles involved in movement

### Muscle relationship

Most movement requires several muscles working together. Most skeletal muscles are therefore arranged in opposing pairs. The muscle that causes the desired action is the prime mover or **agonist**. While the agonist is contracting, its opposing partner is relaxing. The relaxing muscle is known as the **antagonist**.

An example is the flexion and extension of the forearm. To flex the forearm the prime mover is the bicep. Therefore, the agonist is the bicep with the tricep being the antagonist. In lowering the forearm back down, the roles are reversed with the tricep becoming the agonist as it is now the prime mover and the bicep becomes the antagonist as it relaxes.

**agonist** the contracting muscle  
**antagonist** the relaxing muscle

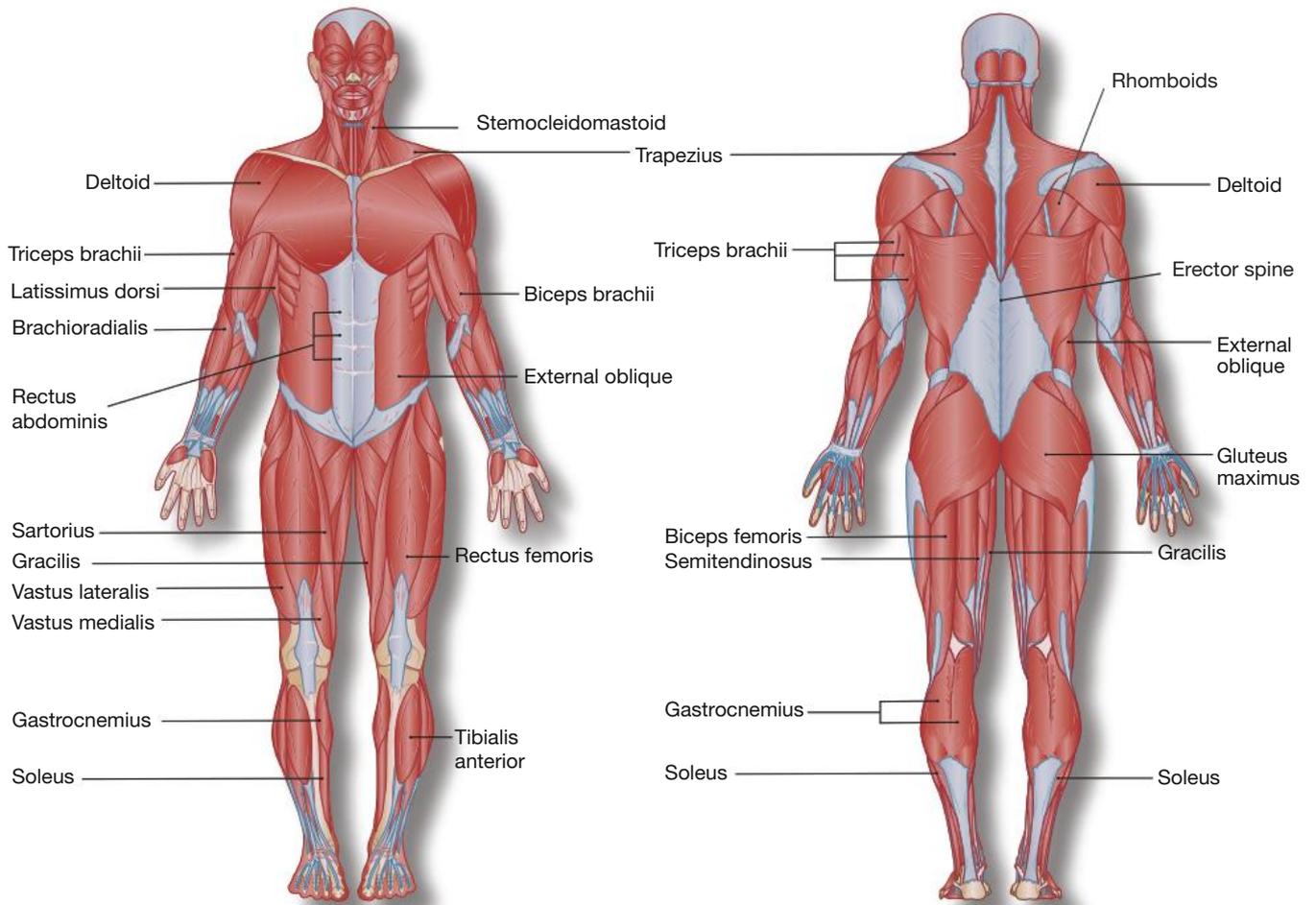


Figure 2.10 Major muscles of the body

## Checklist 2.4

Complete the table below.

Exercise	Agonist	Antagonist	Origin	Insertion
Bicep curl				
Sit-up				
Squat				
Calf raise				
Push-up				

Table 2.4 Agonists and antagonists

## Checklist 2.5

Complete the table below.

Exercise	Agonist	Antagonist	Type of contraction
Dip (down phase)			
Flexed arm hang			
Chin-up (down phase)			
Seated row (pull phase)			
Squat (up phase)			
Plank			

Table 2.5 Agonists and antagonists

In addition to the agonist and the antagonist, most movements also include a synergist, which serves to stabilise the movement. Some synergists act as fixators, which stabilise the origin of the agonist so that the movement can be more efficient.

### Types of muscle contraction

There are different types of contractions that muscles are capable of. The muscles will contract according to the need of the movement required.

There are two main types of contractions:

- 1 Isotonic contractions occur when the muscle contracts (shortens) and lengthens to produce movement. There are two types of isotonic contractions:

**concentric** during an isotonic contraction the muscle shortens

**eccentric** during an isotonic contraction the muscle lengthens

- **Concentric** contraction: The muscle shortens during the contraction and pulls on another structure to produce movement (e.g. the flexion phase of a bicep curl).
- **Eccentric** contraction: The muscle lengthens during the contraction. Eccentric contractions result in

more delayed onset muscle soreness than concentric contractions (e.g. the down phase of a push-up).

- 2 **Isometric** contractions occur when the muscle does not or cannot shorten, but the tension on the muscle increases. No movement is produced and the length of the muscle stays the same (e.g. a wall sit or a plank or hover).

**isometric** the muscle remains the same length while developing tension

### Summary 2.6

- 1 What are the three types of muscle fibres?
- 2 Outline the muscle relationship during movement.
- 3 Describe the three types of muscular contractions and provide an example for each.

## Checklist 2.7

Perform the following movements and complete the table.

Exercise	Bones	Joint action	Muscles	Muscle contraction
Overarm throw				
Underarm throw				
Soccer kick				
Netball pass				
Basketball lay-up				
Tennis serve				
Running				

Table 2.6 Movements

## Respiratory system

Cells continually use oxygen for the reactions that release energy to produce ATP. At the same time, carbon dioxide is released. The respiratory system is one of two systems that supply oxygen and eliminate CO<sub>2</sub>.

### Structure and function

#### Nose

The nose has an external and internal portion. The inside of both the external and internal nose is called the nasal cavity. It carries three functions: incoming air is warmed, moistened and filtered, smell stimulus is received and chambers modify speech sounds.

#### Pharynx

The pharynx or throat is a passageway for both air and food.

#### Larynx

The larynx or voice box is a short passageway that connects the pharynx to the trachea. The epiglottis is responsible for directing food and air into the corresponding tubes. It closes off the larynx ensuring food and liquids go to the oesophagus.

#### Trachea

The trachea or windpipe is a passageway for air.

#### Bronchi

The trachea divides into the right and left bronchus. These bronchi eventually branch into bronchioles. This process resembles a tree trunk with its branches, the bronchial tree.

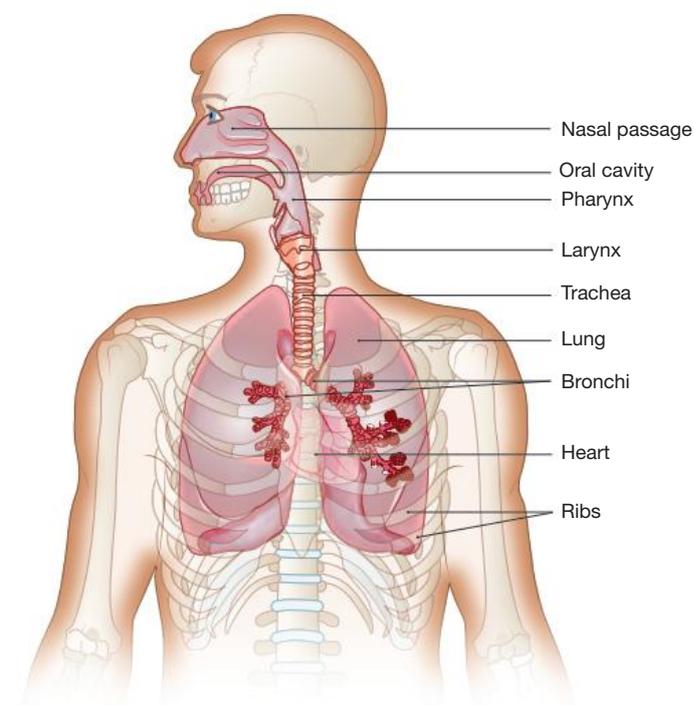
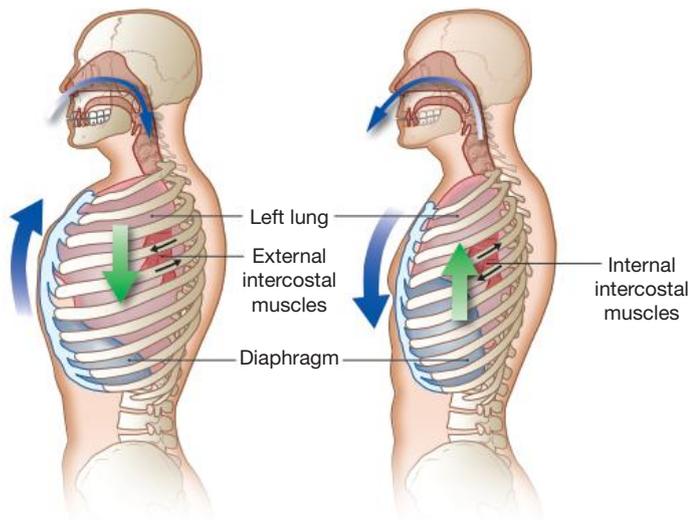


Figure 2.11 The human respiratory system



During inhalation, the diaphragm presses the abdominal organs downward and forward

During exhalation, the diaphragm rises and recoils to the resting position



Action of rib cage in inhalation



Action of rib cage in exhalation

**Figure 2.12** Pulmonary ventilation (more commonly known as breathing)

## Lungs

The lungs are paired organs within the thoracic cavity. Each lung is divided into lobes, which receives the bronchi. These eventually divide into alveoli, which are tiny air sacs. The gas exchange takes place within the alveoli.

## Lung function

The principle purpose of respiration is to supply the cells of the body with oxygen and remove carbon dioxide. The three processes of this are pulmonary ventilation, external respiration and internal respiration.

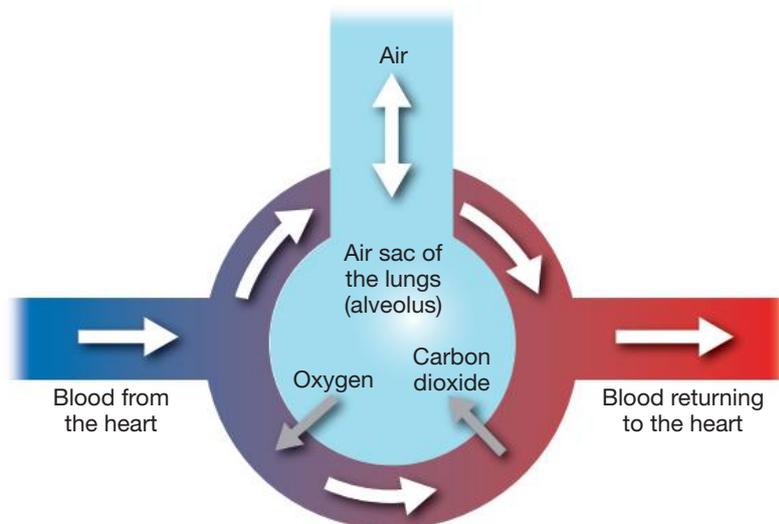
### Pulmonary ventilation

More commonly known as breathing, this is the process by which gases are exchanged between the atmosphere and the human body, mainly the alveoli. This is due to a pressure gradient.

- **Inspiration** (inhalation): For air to flow into the lungs the size of the lungs needs to increase. This occurs when the diaphragm and intercostal muscles contract. This pulls the ribs upward and sternum forward and consequently the walls of the lungs are pulled outwards. This creates a pressure difference and air enters the lungs.
  - **Expiration** (exhalation): Normal expiration is a passive process due
- inspiration** the act of drawing air into the lungs from the external environment
- expiration** the act of releasing air from the lungs into the external environment



**Figure 2.13** Human respiratory system



**Figure 2.14** Gas exchange in the lungs

to muscle recoil and surface tension. When the diaphragm and intercostal muscles relax, the ribs move downwards, the lungs decrease in size and the pressure gradient now causes air to exit the lungs.

## Exchange of gases

Wherever there is a difference in gases, Boyle's Law suggests that these gases will move to achieve equilibrium. The remaining two processes result in the exchange of gases:

- **External (pulmonary) respiration:** This is the exchange of oxygen and carbon dioxide between the alveoli in the lungs and pulmonary blood **capillaries**. It results in deoxygenated blood becoming oxygenated blood. Within the lungs, oxygen is in plentiful supply, while in the blood, carbon dioxide is in plentiful supply. Thus, the exchange of gases occurs as the carbon dioxide moves into the lungs, while oxygen moves into the blood within the pulmonary capillaries.
- **Internal (tissue) respiration:** This is the exchange of oxygen and carbon dioxide between blood capillaries and tissue cells. It results in deoxygenated blood becoming oxygenated blood. Within the blood capillaries, oxygen is now in plentiful supply, while in the tissue cells, carbon dioxide is in plentiful supply. Thus, the exchange of gases occurs as the carbon dioxide moves into the blood capillaries, while oxygen moves into the tissue cells throughout the body. At rest, only about 25 per cent of the oxygen in the blood enters the cells. The deoxygenated blood returns to the heart, where it begins the cycle again.

**capillary** where gases are exchanged within tissues

## Summary 2.8

- 1 What are the main structures of the respiratory system?
- 2 Outline the process of pulmonary ventilation.
- 3 Describe how the process of gas exchange occurs within the body.

## Checklist 2.9

Analyse how lung function works through participation in a range of physical activities.

## Circulatory system

The circulatory system is considered to include the cardiovascular system and lymphatic system. The focus for this section will be the cardiovascular aspects. All cells in the body need oxygen, nutrients and waste removed. The heart, blood and blood vessels are the main structures involved within the system.

### Components of blood

Blood is heavier, thicker and more viscous than water. It makes up approximately 8 per cent of total body weight. The blood volume of an average sized male is 5–6 litres and 4–5 litres of an average sized female.



**Figure 2.15** Blood is one of the major structures involved in the circulatory system

Blood has three functions within the body:

- 1 **Transportation:** It transports oxygen from the lungs to the cells and carbon dioxide from the cells to the lungs. It also carries nutrients, heat, waste products and hormones.
- 2 **Regulation:** It regulates pH levels throughout the body and adjusts body temperature.
- 3 **Protection:** Clotting protects against blood loss and antibodies protect against foreign toxins.

Blood is composed of two portions:

- **Blood plasma (55 per cent):** A straw-coloured liquid that is mostly water. It also contains waste

products, nutrients, vitamins, hormones and enzymes.

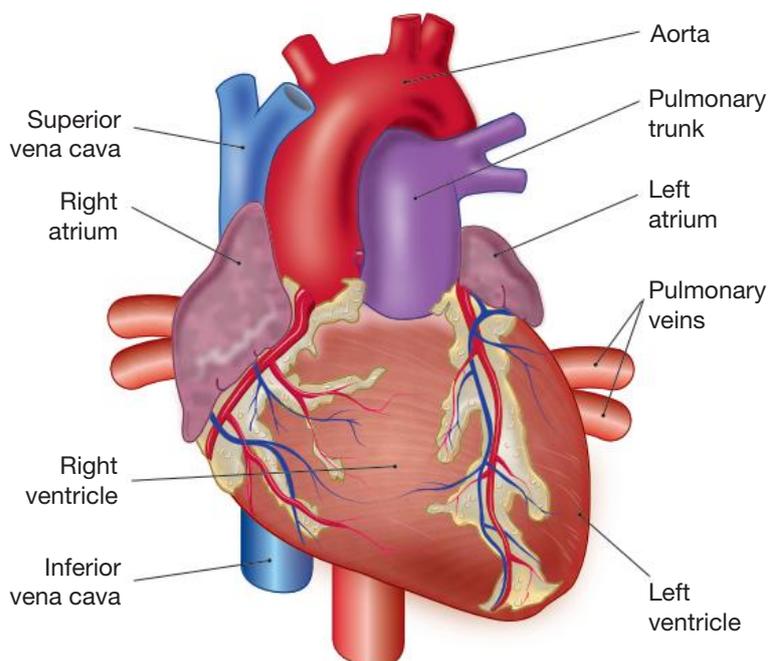
- **Formed elements (45 per cent):** The formed elements of blood are:
  - **Red blood cells (erythrocytes):** Contain oxygen carrying haemoglobin. RBCs are highly specialised for oxygen transport. They live approximately 120 days and 2 million enter circulation per second.
  - **White blood cells (leukocytes):** They are responsible for fighting infections within the body. RBCs outnumber WBCs 700:1.
  - **Platelets:** Help repair damaged blood vessels and promote blood clotting.

## Structure and function of the heart, arteries, veins and capillaries

The heart is about the size of a closed fist and about two-thirds of it lies to the left of the body's midline within the thoracic cavity. The heart contains chambers and valves, which fulfil a role in ensuring the effective functioning of the heart, given that it can pump around 7000 litres of blood per day. Blood vessels form a closed system that transports blood to and from the heart.

### Chambers of the heart

The heart has four chambers. The two superior chambers are called the left and right atrium. The two inferior chambers are called the left and right ventricle. The thickness of the walls varies according to each chamber's function. The atria are thin-walled as they deliver blood to the ventricles.



**Figure 2.16** Chambers of the heart

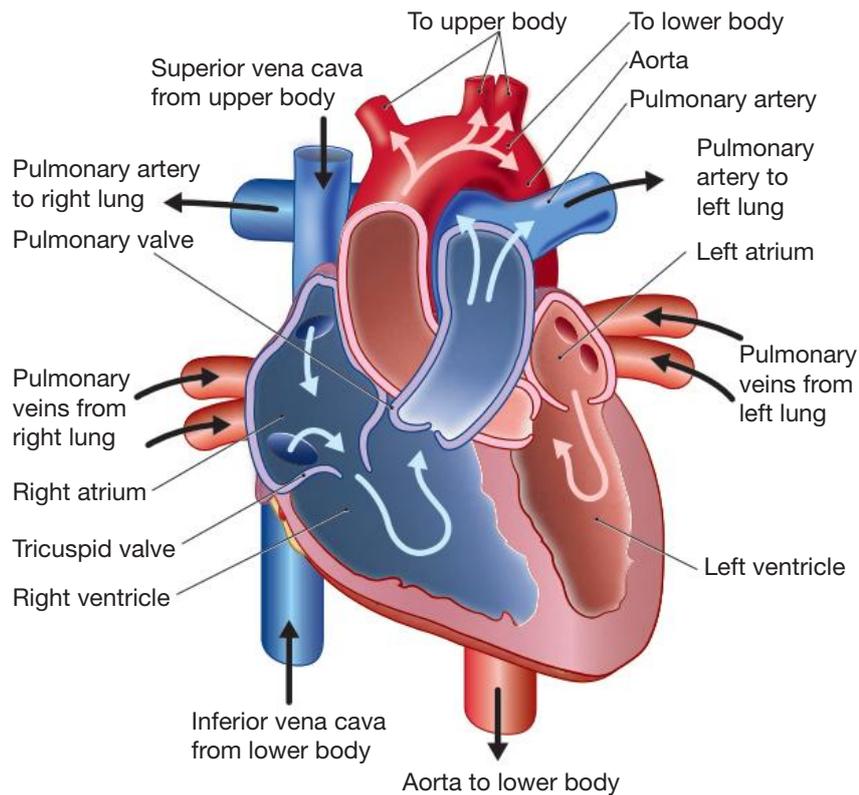


Figure 2.17 Valves of the heart

The right ventricle pumps blood to the lungs while the left ventricle pumps blood around the body. Thus, the wall of the left ventricle is two to four times as thick as the right ventricle.

#### Blood flow within the heart

The right atrium receives deoxygenated blood from various parts of the body via the superior and inferior vena cava. From here the blood travels to the right ventricle where it is pumped via the pulmonary artery to the lungs. The gas exchange occurs within the lungs and the now oxygenated blood

travels back via the pulmonary vein to the left atrium. This oxygenated blood then travels to the left ventricle where it is pumped around the body via the aorta.

vein carries blood to the heart

#### Valves of the heart

The heart has valves to prevent blood flow in the wrong direction (back flow). The valves open and close as the heart contracts and relaxes.

The valve between the right atrium and ventricle is called the tricuspid valve. The valve between the right and left ventricle is called the bicuspid valve.

artery carries blood away from the heart

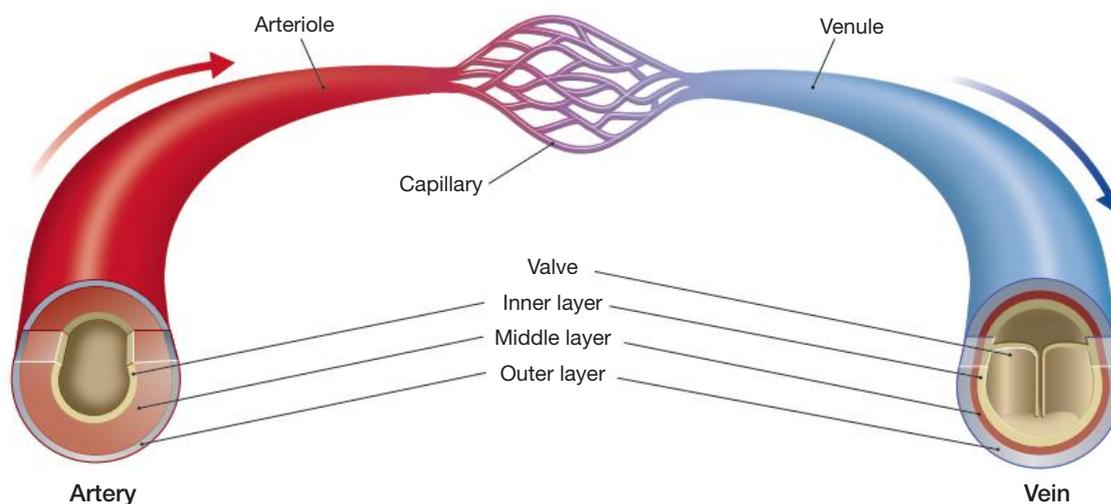
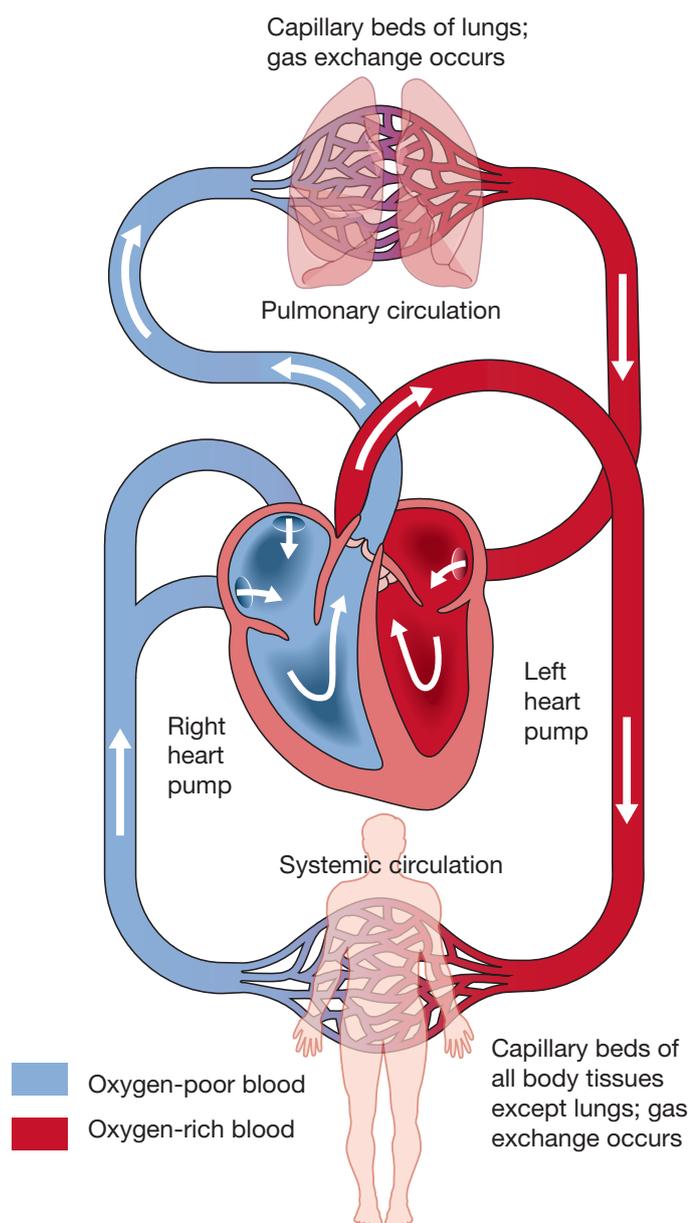


Figure 2.18 Sections of an artery, capillary and vein



**Figure 2.19** Systematic circulation pumps blood through the body

Semilunar (so called because they are half-moon shaped) valves prevent backflow from the veins and arteries of the heart.

### Arteries

Arteries carry blood away from the heart. Arteries have elasticity and contractility, allowing them to be effective in transporting blood around the body. They are thick, muscular vessels. Arteries as they divide become smaller and eventually branch into arterioles.

### Capillaries

These are microscopic vessels that connect to arterioles and venules. They are found near most cells in the body. Their primary function is to permit the exchange of nutrients and waste products.

### Veins

Veins carry blood to the heart. Their anatomy is very similar to that of an artery, only thinner in some instances. Veins gradually become larger and stem from the smaller vessels, called venules.

While it is true that arteries carry oxygenated blood and veins carry deoxygenated blood, this is, in fact, incorrect due to one exception. The pulmonary artery carries deoxygenated blood and the pulmonary vein carries oxygenated blood. Thus, it is best to refer to arteries as carrying blood away and veins carrying blood to the heart.

### Pulmonary and systemic circulation

Pulmonary circulation carries deoxygenated blood from the right ventricle to the lungs and returns oxygenated blood from the lungs to the left atrium. Contractions of the left ventricle then send the blood into the systemic circulation.

Systemic circulation carries oxygen and nutrients to body tissues and removes carbon dioxide, wastes and heat from the tissues. Blood is pumped from the left ventricle into the aorta before it moves around the body. This delivers blood to all tissues except the air sacs within the lungs. The blood returns to the right atrium via the superior and inferior vena cava.

### Blood pressure

This is the pressure exerted by blood on the wall of a blood vessel. It is generated by the contraction of the ventricles. The average blood pressure for a young adult is 120/80 mm Hg. The first reading of 120 mm Hg is the systolic reading. The systole is



**Figure 2.20** The average blood pressure for a young adult is 120/80 mm Hg

when the left ventricle is contracting. The second reading of 80 mm Hg is the diastolic reading. The diastole is when the left ventricle is relaxing. Blood pressure is determined by blood volume and also cardiac output. A sphygmomanometer measures blood pressure. It uses an inflatable cuff and a stethoscope. You are considered to have high blood pressure if you measure 140/90 mm Hg or higher. 180/110 mm Hg is very high blood pressure.

## Going further 2.10

### Collaborate

- 1 With a partner, use a sphygmomanometer to measure your resting blood pressure.
- 2 Participate in an active game of choice and, immediately following, re-measure your blood pressure. What effect did exercise have on your blood pressure?

## Summary 2.11

- 1 What are the components of blood?
- 2 Outline the structures of the heart and their functions.
- 3 Outline the blood vessels and their functions.
- 4 What is blood pressure? How is it measured?

## Checklist 2.12

- 1 How does blood move through the body?
- 2 How do the circulatory and respiratory systems influence movement efficiency and therefore performance?



**Figure 2.21** Modern sphygmomanometers are digital and automatically measure a patient's blood pressure

## 2.2 The relationship between physical fitness, training and movement efficiency

### Driving question 2.13

Evaluate which athletes require the most diverse and varied training programs and why.

To some extent, all sports are based on a comparison of the relative physical fitness levels of different athletes. Some sports are predominantly based on physical fitness, such as weightlifting. Other sports have a higher degree of skill-based assessment, where physical fitness provides a foundation for skill execution, such as archery. While the majority of sports rely heavily on highly refined individual skills as well as good tactical awareness, a level of physical fitness will support all athletes in achieving success. The development of physical fitness through dynamic and well-prepared training programs leads to greater skill execution and movement efficiency. Athletes are always searching for unique and proven methods of developing the specific physical fitness levels required for their sport, in the hope that it may give them an advantage over their competitors.

Broadly speaking, there is a range of components to physical fitness. These can be broken into two distinct categories, as outlined in Table 2.7.

All sports require a different mix of each component to different degrees. Some sports are relatively simple in terms of the required physical fitness, where only two to three components are

necessary to focus on. Other sports, however, are more dynamic and require development across many components for holistic development and preparation for competition.

Yet, people are often surprised to learn that what may seem to be a relatively simple sport in terms of the required physical fitness, such as weightlifting, can actually require several components of physical fitness for elite competition. Obviously **muscular strength** is the primary focus for development in weightlifting; however, power, balance, coordination, flexibility and body-composition are also necessary considerations.

**muscular strength** the amount of force that a contracted muscle or group of muscles can produce against a resistance

### Health-related components of physical fitness

Health-related components of physical fitness are recognised as being necessary for everyday health and well-being, in addition to the benefit they may provide in certain sports. They are not the focus of athletes alone, as every person needs to ensure they have the physical fitness levels required to complete their daily activities, without excessive fatigue. Having well-developed levels of health-related physical fitness can bring about many positive outcomes for individuals, such as:

- maintaining a healthy body weight
- reducing the risk of diseases that have low physical activity levels as a risk factor – these include cardiovascular disease, diabetes and obesity
- positive effects on mental health due to increased self-esteem, endorphin release and lower risk of mental-health issues such as depression
- increased muscle tone, joint flexibility and freedom of movement, allowing a greater range of physical activities to be undertaken
- increased energy levels and general feelings of health and well-being.

The benefits of health-related components of physical fitness for athletes depend upon the sport's

Health-related components of physical fitness	Skill-related components of physical fitness
<ul style="list-style-type: none"> <li>• Cardiorespiratory endurance</li> <li>• Muscular strength</li> <li>• Muscular endurance</li> <li>• Flexibility</li> <li>• Body composition</li> </ul>	<ul style="list-style-type: none"> <li>• Power</li> <li>• Speed</li> <li>• Agility</li> <li>• Coordination</li> <li>• Balance</li> <li>• Reaction time</li> </ul>






Table 2.7 Health and skill-related components

## Going further 2.14

For all components of fitness – health and skill – participate in relevant fitness tests.

unique requirements. The marathon race is a test of which athlete is the fittest on a particular day. However, while the tennis player relies on accurate shot execution to win, it is essential they are fit enough to be able to keep moving in order to be able to hit the ball. Likewise, while a football team that passes and kicks the best should win, without being in excellent physical condition the athlete would not be able to put themselves in a position to execute the required skills and strategies.

To develop each component, physical exercise is necessary to stress various body systems, with the aim of invoking a response or adaptation. This, in turn, leads to improvement and development of that specific component of fitness. For the athlete, this will most likely lead to an improved performance while competing.

## Cardiorespiratory endurance

This can also be described as cardiovascular fitness, **aerobic** endurance or stamina. Primarily, the focus of this component is the delivery of sufficient oxygen to the working muscles to minimise the effects of fatigue from sustained efforts of steady aerobic exercise. The body's cells work most efficiently in the presence of oxygen, which is known as aerobic respiration. When there is a lack of oxygen available, cells can still produce some energy; however, they are less efficient and produce less energy. This is known as **anaerobic** respiration. In addition to this, waste products such as carbon dioxide are eliminated through the exhaled air.

An effective cardiorespiratory system requires:

- a strong heart, capable of continuously pumping large amounts of oxygen-rich blood around all of the body
- healthy blood vessels that are flexible and able to withstand large amounts of pressure, with low build-up of internal fatty plaque

**aerobic** when energy for movement is being created in the presence of oxygen

**anaerobic** when energy for movement is being created in the absence of oxygen

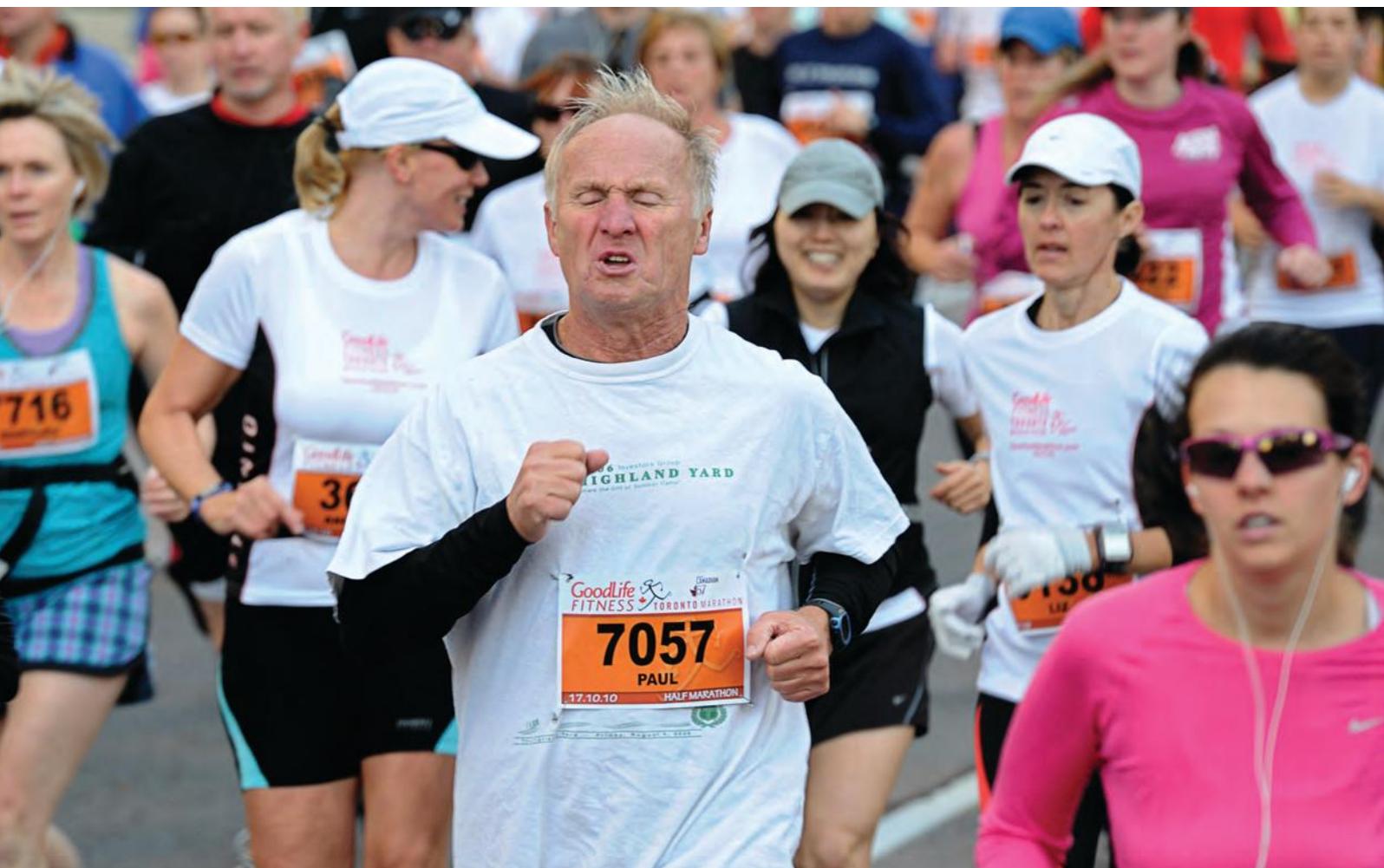


Figure 2.22 Long-distance running develops cardiorespiratory endurance

- healthy and clean lungs, able to draw in large amounts of air and efficiently diffuse oxygen across a semipermeable membrane into the blood (and vice versa for carbon dioxide)
- muscle cells that can efficiently draw large amounts of oxygen from the blood and use it to produce energy.

### cardiorespiratory endurance

the ability of the heart and lungs to deliver sufficient oxygen to the working muscles over a sustained period of continuous and strenuous exercise without excessive fatigue

**Cardiorespiratory endurance** is an essential health-promoting action, as it has many positive outcomes on an individual's physical, mental and social health and well-being.

In sporting contexts, athletes who need to produce sustained movement will be able to perform better with higher levels of cardiorespiratory endurance. In the majority of sports, it provides the foundation for skill execution and helps the athlete maintain a healthy body composition, reduced fatigue levels and achieve

faster rates of recovery from intense efforts.

Training methods to develop cardiorespiratory endurance generally involve sub-maximal exercise for at least 30 minutes. The intensity needs to be great enough to produce a training effect (normally exercising between 70 per cent and 90 per cent of maximal efforts). The type of aerobic training depends upon the sport. Generally, swimmers will

swim, cyclists will ride, rowers will row, and most other team and individual sports rely more so on running activities. Many athletes will incorporate a variety of these into their training program to maintain interest; however, it is essential that the type, intensity and structure of the aerobic training closely mimic the specific requirements of the sport.

Cardiorespiratory endurance can be measured in a number of ways. Monitoring heart rate during exercise is an easily accessible means of measuring the intensity of training. However, testing procedures that measure a person's cardiorespiratory fitness are most valid if they directly measure or provide an estimate of the amount of oxygen a person can absorb or draw into the working cells of the body. This is known as oxygen uptake, expressed as  $VO_2$ , and is measured in the quantity of oxygen that can be absorbed per kilogram of body weight per minute (mLs/kg/min). The greater an athlete's maximum oxygen uptake ( $VO_2$  max), the harder and longer they will be able to exercise aerobically for. In a sport such as triathlon, athletes with the highest  $VO_2$  max are most likely to succeed.

The most common test for cardiorespiratory endurance is the multi-stage fitness test, commonly known as the beep test. View the instructions for the beep test (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)).



**Figure 2.23** The  $VO_2$  max test measures the quantity of oxygen that can be absorbed per kilogram of body weight per minute

For elite athletes who require accurate measurement of their  $VO_2$  max, a treadmill or cycling test can be used, where the intensity of the exercise increases until the athlete has reached their maximal effort. While doing so, the air they exhale and inhale is measured, as well as heart rate, to scientifically determine the cardiorespiratory endurance.

## Muscular strength

**force** refers to a push or pull effect upon an object, resulting from the object's interaction with another object

**power** the ability to exert a maximal force through rapid muscular contraction in as short a time as possible

Daily activities require the ability to produce sufficient **force** to hold and move objects. From something as simple as carrying groceries to climbing a ladder, everyone requires a degree of muscular strength. In sporting contexts, the required amount of muscular strength can vary depending upon the sport itself. Weightlifting is primarily a test of the strongest athlete, whereas table tennis is less dependent on muscular strength. While muscular strength is a foundational area of development for many athletes, it is often the rate at which an athlete can move an object

that becomes more important, which refers more to **power**. However, powerful athletes must also be very strong, which is why muscular strength provides the foundation for muscular development. It is only in sports such as weightlifting where the rate at which the force is moved is less important.

Muscular strength is developed through various types of resistance training. The resistance could be provided by an athlete's own body weight, weight-training machines or the use of free weights and mobile equipment such as kettlebells. To increase muscular strength, the resistance needs to be heavy enough to allow the athlete to move the resistance no more than 15 times or repetitions. In doing so, the muscle responds by becoming stronger

### Going further 2.15

#### Communicate

For the following sports, discuss and rank them in terms of which require the most strength, and identify which muscles should be targeted in training:

- Rugby Union
- shot put
- weightlifting
- diving.



Figure 2.24 A dynamometer tests hand grip strength

and larger in size, otherwise known as muscular hypertrophy. The specific muscles and degree of development should be specific to the sport.

Tests to develop strength are difficult to administer, as the athlete needs to be highly trained and able to move large amounts of weight safely. A proper warm-up should be put in place and the test needs to be supervised with a spotter. A maximum repetition test could be used for a bench press, squat or deadlift. More accessible muscular strength tests could include a hand grip test using a dynamometer (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)).

## Muscular endurance

The key difference between muscular strength and endurance is the number of repetitions that are performed. The resistance is generally light to moderate, which is why a large number of repetitions are possible. **Muscular endurance** can assist with daily activities such as gardening or hanging out washing. It is also necessary in many fitness activities such as cycling and swimming, where muscles are required to perform multiple contractions without rest. Most sports also require movements to be repeated many times over, and the ability of a local muscle to be able to do this without excessive fatigue is very important. It is important for athletes to develop specific muscles to benefit their sport. An example of this would be for a rower to develop muscles in their back and legs, for the power stroke of the movement. If the athlete is training with light

**muscular endurance** the ability of a muscle or group of muscles to repeatedly exert a force against a resistance

resistance, they should execute between 15 and 30 reps to develop local muscular endurance. An example of this could be calf raises or abdominal curl-ups. Static isometric exercises may also be used, such as wall squats or a bridge to develop the core abdominal muscles. These should be held until the athlete is feeling very fatigued. Body weight exercises, such as tricep dips, push-ups and pull-ups are also excellent in developing local muscular endurance.

Testing an athlete's muscular endurance is very easily achieved. Tests should be specific to the sport's requirements. For example, upper body testing will not indicate the muscular endurance of the leg muscles. Using a pull-up test to determine the athlete's muscular endurance in their back and biceps would be ideal for a rower. It is also very important that a strict testing procedure be followed to ensure the test is both valid and reliable. All athletes completing tests should have the exact same form and technique. The example below is for a basic push-up test. If this technique is not strictly adhered to, athletes could cheat and produce inaccurate results.

For the basic push-up test (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)):

- Equipment: Floor mat, push-up cadence sound track (DOWN–HOLD–UP).
- Procedure: Start with hands and toes touching the floor, body and legs in a straight line, feet slightly apart and arms straight at shoulder width apart.
- Lower the upper body until the elbows are at 90 degrees, pause and hold for a second, then return to the starting position.

- The body must be kept straight and flat throughout the movement.
- Continue until no more correct push-ups can be performed.
- Record the number of push-ups.

## Flexibility

**Flexibility** is an essential component of health for both athletes and non-athletes. As people age, muscle length and joint flexibility decrease, resulting in the restriction of movement and possible discomfort when completing daily tasks. Regular strength is essential in minimising the loss of flexibility. In sporting contexts, flexibility can be essential to the performance. Consider the gymnast who must have a high degree of flexibility to be able to produce required movements such as the splits. Swimmers must have excellent range of motion around the shoulder joint to be able to more efficiently move through the water and produce more power through the stroke. In other sports, good flexibility plays more of a role in the prevention of injury from intense physical activity. For example, a footballer must have flexible hamstrings to be able to decrease the chance of strains from sprinting and kicking activities. Stretching activities also play an important role in helping athletes recover following activity.

Different types of stretches should be performed depending upon the sport's requirements and time. Static stretches held for 15–30 seconds are best used during recovery and during a specific

**flexibility** the absolute range of motion that a specific joint or group of joints can produce



Figure 2.25 Basic push-up test



Figure 2.26 Shoulder flex test

flexibility training session. However, gentle dynamic stretches such as leg swings, where a joint is moved through its full range of motion, are most appropriate during a warm-up. The chosen muscles being stretched should also be specific to the sport's requirements and a range of stretches should be used to fully develop the range of motion around a particular joint.

Testing procedures should focus on the needs of the sport. It is critical that correct testing procedures are followed, otherwise the results may be invalid. Slight variations in form can produce largely different results between athletes. This is particularly important during screening of athletes for potential injury risks, such as a fast bowler in cricket who has poor spine flexibility. An issue like this could lead to stress fractures. Some common tests include:

- sit and reach test (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks))
- shoulder flex test
- trunk rotation test
- spinal extension test.

## Body composition

Success in sports is partly determined by an athlete's specific body shape and composition of the various tissues. In most sports, athletes

competing often look similar in terms of height, degree of leanness or muscularity. There are always exceptions to these rules; however, talent scouts often rely on anthropometric measurements as part of the process of identifying potential elite athletes.

A person's body shape and composition is partly determined through their genetic disposition. However, through exercise and healthy nutritional intake, people are able to control and manage their body fat percentages and level of lean muscle mass. For general health, people are advised to focus on developing lean muscle mass through light to moderate resistance training, while also keeping body fat percentages between 15 per cent and 25 per cent (age and sex dependent) through regular exercise and healthy eating. Table 2.8 outlines some recommendations for the average population.

Achieving a specific body composition is also the focus of much of an athlete's training program, as they seek to develop an advantageous body shape, and the desired composition of lean muscle and fat percentage. Consider what a prop in Rugby Union generally looks like, as opposed to a 5000 m runner. In collision sports, greater body mass will provide biomechanical advantage through

increased **momentum**. Likewise, endurance cyclists must achieve a very specific level of lean muscle mass. While needing powerful leg muscles for fast finishing and **acceleration**, excessive weight will require greater power output to maintain a sufficient average speed, which could be a disadvantage over 200 km of a mountain stage. Achieving and maintaining specific body compositions through physical training requires a high degree of professional knowledge to develop, implement and monitor an effective training program.

There are a variety of widely accessible body composition tests; however, these often fail to take into account individual factors that could produce inaccurate results. The popular body mass index (BMI) – which measures height against weight to determine a person's size – is widely used.

**momentum**  
motion determined by mass and velocity

**acceleration**  
refers to the rate of change of the movement speed of a body in motion

Description	Women	Men
Essential fat	10–13%	2–5%
Athletes	14–20%	6–13%
Fitness	21–24%	14–17%
Average	25–31%	18–24%
Obese	32%+	25%+

Table 2.8 ACE body fat percentage chart



**Figure 2.27** A caliper helps measure body fat percentage with a skinfold test

However, having a high degree of muscularity will often indicate that a person could be obese, as muscle tissue weighs much more than stored fat. More scientific measurements should be used when required. These could include:

- skinfold testing on various sites around the body (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks))
- hydrostatic underwater weighing – measure body weight on land and while standing in water; because fat is less dense than water, the difference in weight is the body fat percentage
- dual-energy x-ray absorption (DEXA) imaging – a specialist body scanning system used to accurately measure body composition.

### Summary 2.16

- 1 Outline the five health-related components of physical fitness.
- 2 Why are they classified as health related?

### Checklist 2.17

- 1 What is the relationship between physical fitness and movement efficiency?
- 2 To what degree is fitness a predictor of performance?

Body shape measurements are undertaken by using calipers and rulers to measure the relative lengths and girths of specific limbs, bones and body parts in relation to each other. These are important for sports where a specific body shape will provide an advantage. For example, elite swimmers often have a relatively longer torso and arm span in relation to their total height.

## Skill-related components of physical fitness

Skill-related components of physical fitness are recognised as being less necessary for everyday health and well-being. However, they often provide a distinct advantage in sporting contexts. Developing these skill-based components requires specific and specialised training activities, and they often relate to the skill execution in a particular sport.

Another way to distinguish between health-related and skill-related components of physical fitness is to consider the role of the health-related components as providing a body capable of executing the skills required for success in sport. An elite tennis player may have excellent technique across all shots; however, this will mean little if they do not have the fitness to be able to maintain the required intensity of the sport. Health-related components provide a foundation to sporting success, whereas skill-related components provide the fine details related to accurate skill execution.

## Power

Power relates to the explosive capabilities of a particular muscle or muscle groups. It differs to strength, in that strength is a measurement of the total amount of weight that can be moved, whereas power takes into account the time taken to move the object, or the speed or acceleration that can be generated through the movement. It is an essential component of sports involving sprinting, throwing and jumping. Consider the sport of shot put, where all athletes use the same size shot. The athlete that can propel the shot at the fastest velocity at the correct trajectory will win. The athlete must generate maximal speed in as short a time as possible.

The power requirements of different sports can vary, depending upon the nature of the sport. A single maximal effort, such as weightlifting or shot put, requires more strength-based power. Training for this requires heavier resistance training and fewer repetitions. However, a 100 m

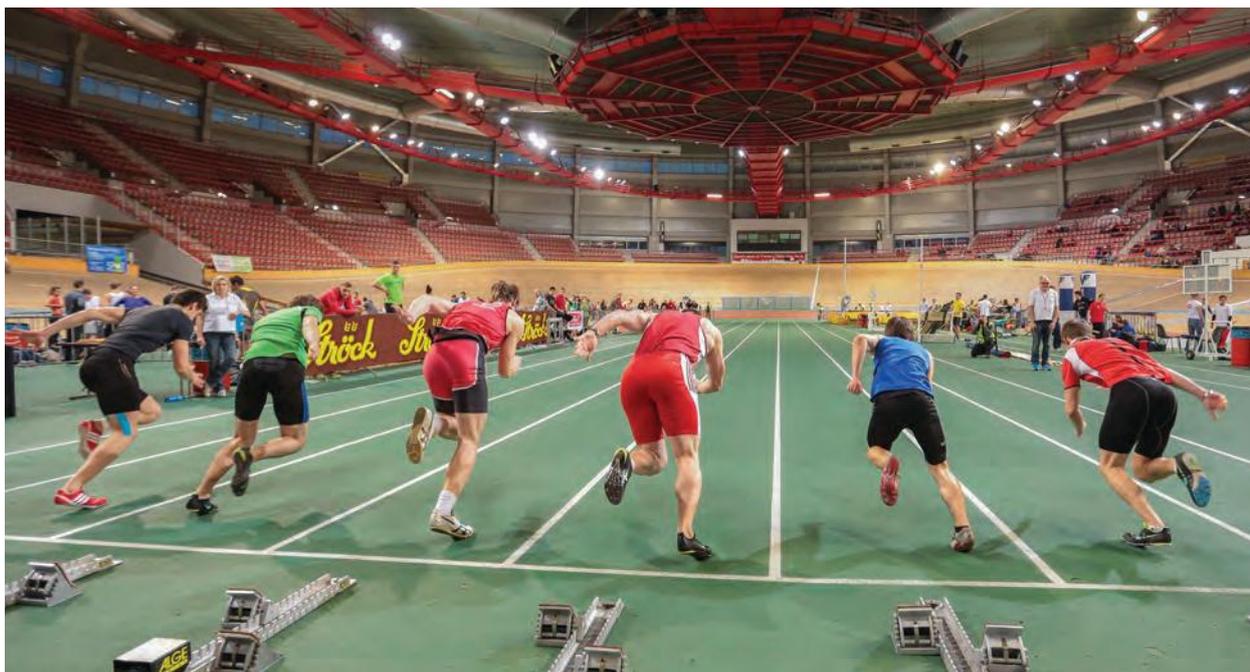


Figure 2.28 Power training

swim or 1 km tracking cycling requires multiple powerful movements, which could be described as speed-based power. Training for this requires a lighter resistance, moved over a greater amount of repetitions. For this reason, power training programs must be tailored to suit the specific requirements of the sport.

Testing procedures should replicate the sports requirements in terms of muscle groups and actual movement. Some common tests and examples include:

- seated basketball throw – useful for shot put or Rugby League
- standing vertical jump – useful for high jump or basketball (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks))
- standing long jump – useful for triple jump or netball
- 10 or 30 second maximal cycle test – track cycling or sprinting.

## Speed

There is some overlap between speed and power, as both require a maximum speed of effort. Speed is largely determined by the ability of the neuromuscular system to fire muscle motor units as quickly as possible in the correct sequence and timing to produce the fastest movement of a limb possible. Speed is also largely determined by the relative amount of fast-twitch muscle fibre types, as opposed to slow-twitch muscle fibres. For both these reasons, training for increase in speed is less responsive than other specific training types. Some improvements can be made; however, greater speed

is often developed through greater biomechanical efficiency and refined technique, increased power and acceleration of movement and development of the required energy systems. These can all be applied to sports such as sprinting or short-distance swimming events.

Speed tests require specialised equipment for the sake of accuracy. Using a stopwatch to test two sprints over 40 metres could produce a small, yet significant difference based on human error. The use of radar and timing gates can increase the accuracy of such tests. These tests should also be self-paced to eliminate the effect of different reaction times on the result (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)).

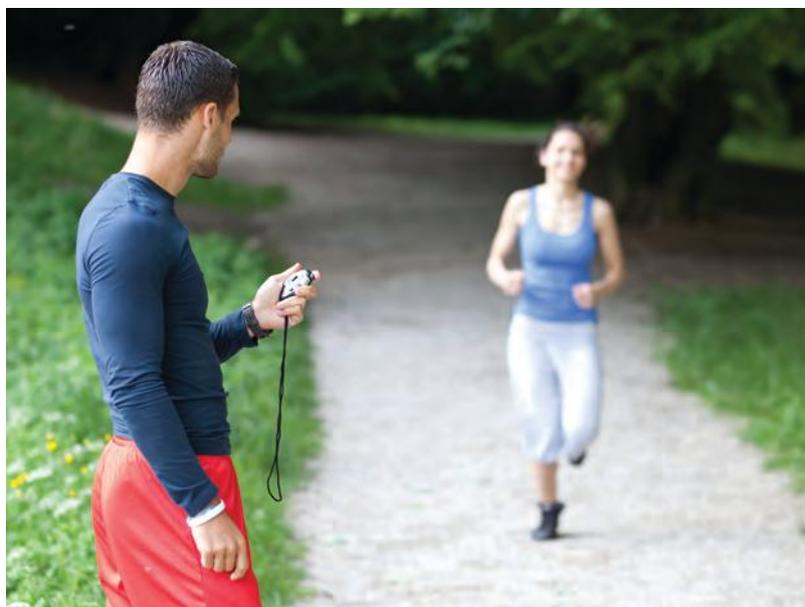


Figure 2.29 Speed testing



## Going further 2.18

### Communicate

Rank the five senses of the human body in order of usefulness for sporting success. Justify your selections.

Consider the various sub-components involved in a tennis serve. The ball toss, backswing, ball strike, follow-through and body movements are all separate components of a successful tennis serve. All components have to be executed accurately in the correct sequence to produce a successful and powerful serve.

Coordination seems to have some hereditary influence. Some athletes find they are able to quickly learn new sporting skills, as they have a high degree of general coordination. Their brain seems to be able to quickly learn and adapt to new skills, equipment and sports.

To develop coordination, sport-specific skills training is required to refine a player's skill and technique. The aim is for an athlete to be able to execute skills accurately and consistently, under the pressure of a competitive situation.

General testing for coordination is not normally used in sporting contexts. Coaches can observe a player's level of coordination or skill level in relation to a specific sport by observing them train and play. Every time they execute a set skill, their degree of accuracy and consistency indicates the players' skill level, and hence their level of coordination.

A variety of tests can be used to assess an athlete's general coordination. Locomotor skills that can be evaluated include hopping, skipping and jumping. Non-locomotor skills include catching, throwing, hitting, rolling, bouncing and kicking. Some examples of common coordination tests are:

- alternate hand wall toss (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks))
- flip-stick test.

size of that one foot only. Keeping an athlete's body consistently above such a small base requires much greater balance.

There are two distinct forms of balance. When a person is in a stationary position and is not moving it is described as static balance. However, when a person is walking or running they are still in a state of balance, even though they are in a constantly changing body position. This is known as dynamic balance.

To maintain balance, the human body has to be able to monitor and detect any changes in a person's equilibrium. This is primarily done in the middle ear, where special sensors detect changes in the body's position, and if the body is in a relative state of unbalance, it will signal to the brain to adjust the body's position to regain its stable position. Eyesight also plays a role in balance, which is obvious when someone tries to stand on one foot and then close their eyes. It is much harder to concentrate and stay steady. Special kinaesthetic

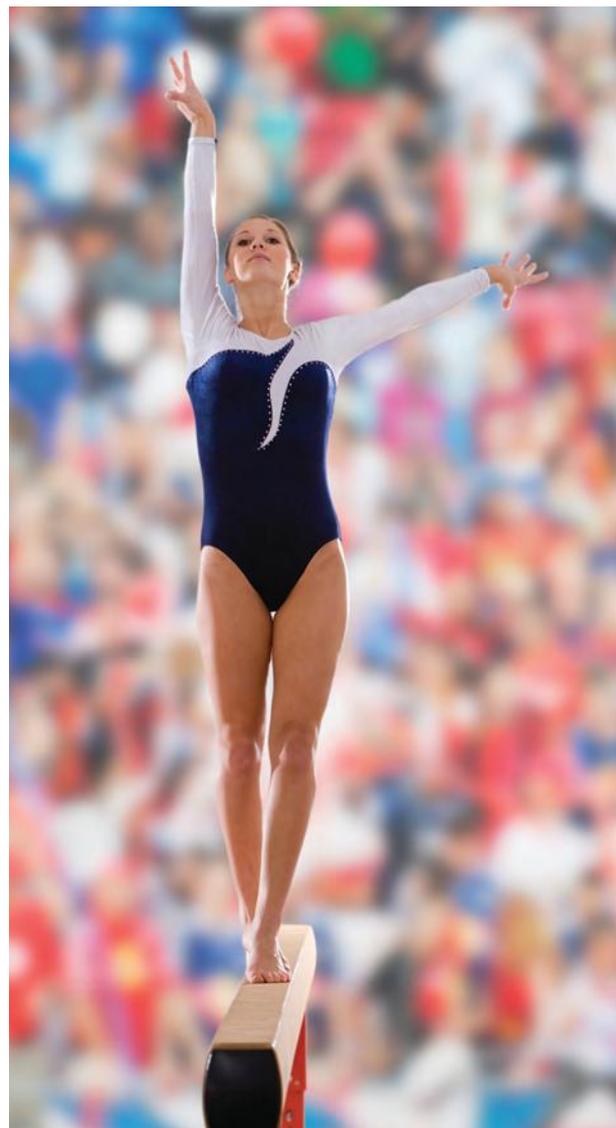


Figure 2.33 The balance beam apparatus in gymnastics requires excellent balance

### centre of gravity

the point at which all the mass of an object is equally concentrated

### base of support

the size and shape of an imaginary line that is drawn around the parts of the body in contact with the ground

## Balance

Balance refers to a state of equilibrium. When the weight of a person is equally distributed, or their **centre of gravity** is kept above their **base of support**, they are said to be in a state of balance. The base of support is determined by the area of an imaginary line drawn around the parts of the body in contact with the ground. On two feet, this shape is a large oval; however, standing on one foot makes the base of support the

neurons in the joint structures also play a role in detecting when the body is in a position that is unstable and potentially dangerous.

**kinaesthetic sense** perception of the body's movements that is gathered through receptors in the tendons, muscles and joints and relayed to the brain

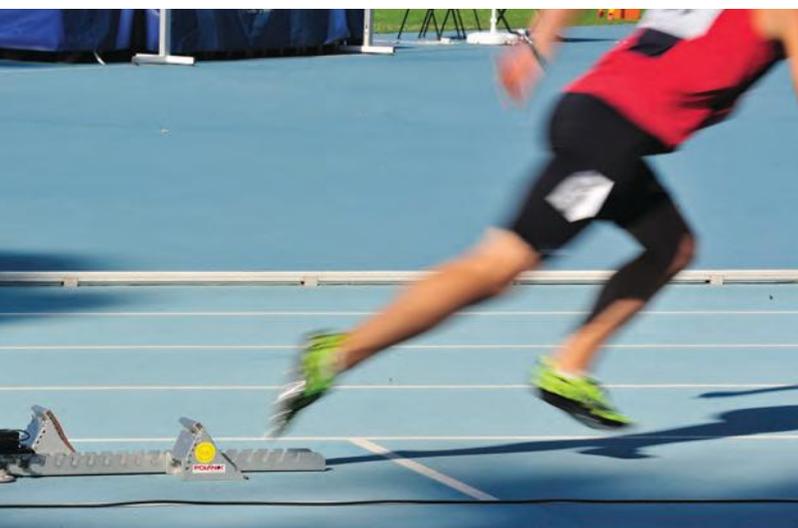
This is known as **kinaesthetic sense**, which is described as the body's awareness of its position in space. When a joint is damaged, these structures can be damaged, making it more likely that a person will re-injure themselves. This is evident for people who regularly roll their ankles and damage the joint structures such as ligaments and tendons.

In sport, balance is as essential as it is for daily living. However, some sports place a greater emphasis on holding extreme balance positions. This is clearly evident in gymnastics events, such as the beam, where the athlete performs tumbling routines on a bar that is 10 cm wide. However, excellent balance will assist in all sports, as it allows the athlete to maintain a stable position from which to execute skills.

Athletes can improve their balance through training activities. This is particularly useful as an injury-prevention measure by doing activities that develop the athlete's kinaesthetic sense, which is generally joint specific. Balancing on a wobble board or exercises on a mini-trampoline will both assist in developing the ankle and the knee, especially following an injury. By specifically training for the skills required in a sport, athletes develop the necessary strength and balance to consistently execute difficult balancing skills.

Tests for balance are easily accessible, and are usually timed. Examples include:

- standing stork stand (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks))
- balance beam test.



**Figure 2.34** Sprint starts are examples of a predictable and expected reaction time



**Figure 2.35** Excellent balance is also required as a swimmer as it sets the athlete up to execute their skills



**Figure 2.36** The goal keeper in soccer has to make a choice about when to react

## Reaction time

**Reaction time** is evident in daily-life activities as well as a number of sports. There are two types of reactions. Where the movement is predictable and expected, such as a sprint start to the starter's gun – it is known as simple reaction time. However, when a decision has to be made prior to skill execution, it is known as choice reaction time. An example of this would be a cricketer facing a fast bowler. Once the necessary information about the speed, trajectory, swing and line of the ball has been detected, an appropriate shot can be decided upon, followed by the execution of the chosen skill. Likewise, a clay target shooter must quickly assess the flight of the target and then make an accurate shot.

**reaction time** the elapsed time between detecting and interpreting a stimulus, making a correct decision and then executing the related movement

## Going further 2.19

### Collaborate

- 1 Analyse and consider the physical fitness requirements of each of the following sports:
  - boxing
  - netball
  - archery
  - high jump
  - downhill skiing
  - football.
- 2 In groups, identify and rank the top five most important components of fitness, as well as any components that have any relevance.

Simple reaction time cannot be developed directly through training, as this characteristic is primarily inherited. However, practice and training can improve the decision-making involved in choice reaction time. By being able to read the subtle cues of an athlete's movements and body positions, they can more accurately predict what is about to follow. For example, when receiving a tennis serve, elite players can often make an approximate estimation of where the ball is likely to be hit towards. When the ball could be moving faster than 200 km/h, this can provide a distinct advantage.

A simple test used to assess the simple reaction time of an athlete is the ruler drop test (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)). The distance taken to catch the ruler is an accurate measure of the athlete's ability to react to a visual stimulus.

## Summary 2.20

- 1 Outline the six skill-related components of physical fitness.
- 2 Can these be developed to the same extent as the health-related components?

## Checklist 2.21

What is the purpose and benefit of testing physical fitness?

## Anaerobic and aerobic training

### The FITT principle

The **FITT principle** refers to the foundational guidelines to follow when performing many forms of fitness training and conditioning. It refers to the Frequency, Intensity, Type and Time of the exercise being performed. The FITT principle is most applicable to individuals who exercise at a low to moderate intensity and provides a useful guideline for both cardiovascular and resistance training (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)).

**FITT principle**  
a framework for developing fitness programs that emphasise the variables Frequency, Intensity, Type of exercise and Time or duration of exercise

### Frequency

Frequency is how often an individual person performs the targeted health-related physical activity. The frequency of exercise is dependent upon the type of physical exercise being performed by the individual. Continuous low to moderate cardiovascular exercises – jogging, cycling, walking, aerobics and swimming – are designed to strengthen the heart and lungs, burn calories,



Figure 2.37 Usain Bolt



Figure 2.38 Cadel Evans

increase general endurance capacity, assist in weight loss and promote general health.

Frequency:

- Low to moderate-intensity exercise can be performed five days per week.
- More intense cardiovascular sessions can be performed three times per week.
- Individuals requiring weight loss may require up to six sessions per week.
- Strength training should be performed two to three times per week with a rest day between each session.

### Intensity

Intensity is how hard a person exercises during a physical-activity period and can be expressed in many ways, depending on the types of exercise performed.

Intensity can be monitored by:

- performance measures (speed, power output, etc.)
- physiological measures (heart rate, oxygen uptake, etc.).

Examples of performance measures include:

- **Heart rate** can be expressed as percentage of maximum (86 per cent max) heart rate or the level of heart rate achieved in beats per minute (168 bpm).
- heart rate the number of times the heart beats in one minute

- Speed (rowing, cycling and sprinting) can be expressed as a percentage of maximum speed per cent max speed), metres per second (m/s) of kilometres per hour (km/h).
- Oxygen uptake can be expressed as (per cent  $VO_2$  max).
- Power output (rowing, cycling) can be expressed as a per cent maximum power (Pmax) or the power level, such as 250 watts.

Usain Bolt (pictured in Figure 2.37) is a world champion 100 m (9.58 s) and 200 m (19.19 s) sprinter. Bolt's average speed for the 100 m equates to 38.18 km/h or 23.72 m/ph. Usain reached a top speed of 44.72 km/h or 12.42 m/s between 60 and 80 metres.

Cadel Evans of Australia (pictured in Figure 2.38) won the 2011 Tour de France.

Cadel laid down the highest ( $VO_2$  max) score (87) the AIS had ever seen – a truly remarkable aerobic capacity. This score is nearly double that of the average individual.

Riders can achieve power outputs of more than 400 watts for time trial specialists, double what a recreational cyclist could produce for long periods. You can find more information about this at *The Conversation* website (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)).

Zone	HR method	Lactate method
5 Max zone	>93% MHR	>8–10 mmol
4 High intensity	85–92% MHR	6–8 mmol
3 Medium intensity	78–84% MHR	4–6 mmol
2 Moderate intensity	70–77% MHR	2–4 mmol
1 Low intensity	<69% MHR	0–2 mmol

**Table 2.9** Heart rate zones

## Type

Type is the specific physical activity chosen to improve a component of health-related fitness. For example, an individual wishing to improve leg strength must perform strength-based exercises like squats and deadlift variations, while an individual wishing to increase aerobic endurance may jog, run, swim or perform some other aerobically challenging activity in order to improve aerobic fitness levels.

Some coaches recognise four to six different HR zones as being applicable to aerobic energy system training (or five lactic acid level zones).

General guidelines for cardiovascular training (FITT):

- Frequency: Three to five times per week.
- Intensity: 55 to 90 per cent of maximum heart rate.
- Type: Aerobic style training (e.g. swimming, cycling, running).
- Time: 20 to 60 minutes.

## Time

Time is the length of the physical activity performed. The appropriate time of exercise varies depending on the fitness component targeted. For example, an Olympic lifter requires only a few seconds to complete the lift. A static stretch may require a 30-second hold for each stretch, while the minimum time recommended for continuous aerobic activity is 20 minutes.

## Heart rate based training

Heart rate based training is particularly effective for closed-loop endurance sports such as cycling, swimming and track and field. Coaches will often use variations on these recommendations based on their personal preferences, collected data and results. Heart-rate recovery is often used to determine rest between efforts in energy system development training. Some coaches will use a return to a heart rate of 120 bpm to determine recovery between intervals. Others will use a recovery of between 30 and 40 beats.

## Interval training guidelines:

- Intensity: Varied, can be sub-maximal, maximal or supra-maximal intensities with sub-maximal recovery periods. Intensity is prescribed based on a performance (e.g. speed) or physiological (heart rate zones) measure.
- Duration: Short, medium and long intervals. The duration will be dictated by the duration of the event being trained. To remain aerobic, recovery is generally 1:1 work to rest ratio or less.
- Frequency: Minimum one session per week if other training activities are taking place. Generally two to three sessions per week.
- Mode: Dictated by the sport. The sport will also determine the ideal length of speed bursts within the session.

**interval training** periods of very intense physical activity, interspersed with periods of rest and recovery; aimed at developing anaerobic energy systems

## Maximum aerobic speed training

Many studies have shown that time spent at or around 100 per cent of maximum aerobic power is a more effective stimulus for developing fitness



**Figure 2.39** Sprint training with a parachute is a tactic to increase strength and speed

## Summary 2.22

### What is the FITT principle?

qualities than lower intensity training in well-trained athletes.

Sub-maximal methods of training may be a less effective factor for improving endurance, although still a necessary part of the overall training process for factors such as recovery, developing a foundation and skill-based training.

As a result of this research, maximum aerobic speed (MAS) training has become a popular, effective and time-efficient method of training

To determine an athlete's MAS, some form of max aerobic power test must be undertaken. This may be in the form of a time trial lasting five to eight minutes, or an actual  $\text{VO}_2$  max test. Field tests such as the multi-stage shuttle test (MSST) can be used.

For a time trial, the distance that is covered is divided by the time (in seconds) to determine the MAS. This is usually expressed as metres/sec. For a  $\text{VO}_2$  max test, the final speed or power that is achieved is used to determine the MAS.

## Checklist 2.23

- 1 Design an aerobic training session based on the FITT principles.
- 2 How important is aerobic and anaerobic training for the following sports?
  - gymnastics
  - soccer
  - Rugby League
  - netball
  - diving
  - archery
  - wrestling
  - tennis.

## Tempo training

Tempo is the name given to a common, lower intensity form of interval training, made famous by Canadian sprint coach Charlie Francis. It follows the premise that effective training needs to be done at either 95 per cent and above (alactic) or 75 per cent and below (tempo) of maximum velocity (as opposed to maximum aerobic speed). Tempo running can be described as sprinting without trying. The speed is approximately 75–80

per cent of maximum velocity over 50–100 m (or 8–15 seconds for non-running sports), but with an emphasis on a relaxed sprinting technique and 1:3–4 recovery. Tempo is a common form of conditioning for contact sports and a great introduction to any form of conditioning training. One of the primary goals of tempo training is to avoid fatigue. The lactic acid system should not be challenged with this form of training.

## Training the anaerobic energy systems

The two alactic and lactic energy systems fatigue quickly, lasting 8–10 seconds (alactic) and 30–60 seconds (lactic). As a result, the volume and intensity of interval training for the anaerobic energy systems need particular care.

The role of **lactate** as a cause of muscle fatigue is under question. It may be that lactate is merely a by-product of strenuous exercise. Fatigue may be caused by a build-up of phosphate, which reduces the flow of oxygen into the muscle cell, thereby causing the production of energy to be severely reduced. Additionally, in larger muscle group actions, there may be an insufficient blood supply to provide oxygen to the working muscles.

**lactate** a naturally occurring by-product of cellular respiration, which is associated with the fatigue related to high-intensity exercise

## Game-based conditioning

This form of training uses modified competitive games to develop all three energy systems in the form they are used in the sport. Another term commonly used is skill-based training. This approach is common in sports such as basketball and soccer where smaller sides and playing areas are used to intensify skill training.



**Figure 2.40** Tempo training aims to avoid fatigue in an athlete

Research has produced mixed results when comparing game-based conditioning with pure conditioning activities.

## Immediate physiological responses to training

### Driving questions 2.24

- 1 Imagine you are to complete a 5 km run at varying paces. What does your body feel like throughout the exercise if you are:
  - a moving at a fast walk/slow jog?
  - b moving at a steady run pace that can be held consistently?
  - c moving at a fast run pace that requires you to intersperse your run with slower recovery sections?
- 2 What are the major changes that your body makes to accommodate the change in activity levels?
- 3 What are the primary reasons for these changes?

During steady and prolonged exercise, a number of key physiological changes occur within the various systems of the body. These changes are to primarily ensure the muscles have the required oxygen and nutrients to sustain the increased level of activity. Further to this, these changes also aid the removal of metabolic waste products such as carbon



**Figure 2.41** Physical activity produces an immediate change in heart rate

dioxide. In the case of extreme sports, the body can sustain such levels for many hours, such as an Ultra Ironman event, which lasts for over eight hours.

## Heart rate

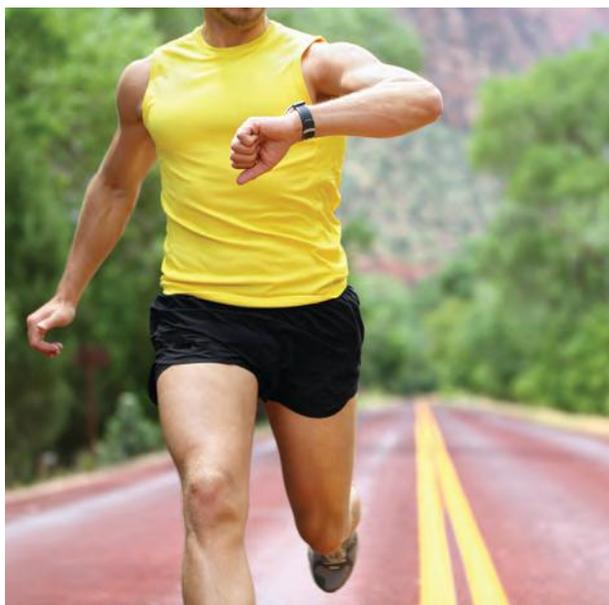
The most obvious change that occurs during an increase in physical activity levels is an increase in heart rate. This can be easily detected and monitored by the participant, and can provide relatively reliable information about the intensity of exercise. For most healthy adults, resting heart rate should be between 60 and 72 beats per minute (bpm). This range is indicative of a healthy and efficient cardiovascular system. As athletes develop their cardiorespiratory endurance, their resting heart rate can be reduced to as low as 30 bpm.



**Figure 2.42** Maximum heart rate is achieved as exercise increases

As exercise increases, so does the working heart rate. This will continue until the heart rate reaches a maximum, which is calculated at approximately 220 minus the age of the athlete. This is known as **maximum heart rate** (MHR). However, if an athlete settles into an intensity of exercise that they are able to sustain for 20 to 30 minutes, the heart rate will level off, and only change if there is an increase or decrease in exercise intensity. Athletes mostly measure the intensity of exercise as a percentage of their MHR. To achieve specific goals, they may aim to work within a set zone for a set amount of time. Table 2.10 outlines basic characteristics of these heart rate target-training zones.

**maximum heart rate** an approximate calculation of the maximum heart rate an individual can work to; measured as 220 minus your age (i.e. the MHR of a 25-year-old would be 195 bpm)



**Figure 2.43** Recovery time is faster in people who are fit

As soon as exercise starts, the heart rate will rise rapidly and level off as the intensity of exercise steadies. Likewise, when exercise stops, the heart rate decreases rapidly initially, and then more slowly as it returns to the resting heart rate level. In unfit people, this recovery time is slower, and the immediate recovery from exercise is a key indicator of cardiovascular fitness.

## Ventilation rate

As exercise starts, the demand for oxygen in the working muscles also causes the rate and depth of breathing to increase to help meet this need. This complements the increase in heart rate and subsequent blood flow, which carries the oxygen to

the working muscles. The two stages of **ventilation** are inspiration (breathing in) and expiration (breathing out). Primarily the inspiration is to draw oxygen-rich air into the lungs and the expiration is to remove the waste product of carbon dioxide. A full cycle of inspiration and expiration is considered a full breath or ventilation cycle.

Generally, an adult's resting ventilation rate and depth is approximately 12 breaths and 6 litres of air per minute. As physical activity increases, both the rate and depth of ventilation rapidly increase, to meet the increased oxygen needs. It continues to rise until exercise steadies, and

**ventilation** refers to the depth and rate of breathing; ventilation rate is measured in breaths per minute and ventilation depth is measured in either millilitres per breath or litres per minute



**Figure 2.44** Ventilation has two stages – inspiration (breathing in) and expiration (breathing out)

% of MHR	Heart rate zone descriptions
50–60%	Basic aerobic training zone: For older or untrained individuals starting an exercise program. For most young healthy adults, a brisk walk would raise their heart rate into this zone. This is also the zone that is optimal for a cool-down. While in this zone, the body is working aerobically, with the oxygen needs of the muscles being easily satisfied.
60–70%	Health-based aerobic training zone: This is a comfortable pace that can be sustained for an extended period. It is still a predominantly aerobic pace, and is suitable for people aiming to increase cardiovascular health or for people new to training, who may be looking to develop a base level of fitness or trying to lose weight.
70–85%	Performance-based aerobic training zone: In this zone, the body is working at a more stressful level where cardiovascular and aerobic development will be most effectively achieved. At the lower end of this zone, calories are optimally burned, using both fat and glycogen stores. As the athlete pushes towards the top end of the zone, fatigue levels will increase and there will be greater reliance on glycogen stores, as oxygen needs become more difficult to meet. Working consistently above 80% MHR for an extended period is very challenging, but leads to the greatest aerobic development.
85%+	Anaerobic training zone: As athletes begin to work above 85% MHR, they will experience a greater degree of fatigue, due to localised neuromuscular fatigue (a feeling of heaviness within the muscles), depletion of ATP and glycogen fuel stores, as well as increases in metabolic by-products such as lactate. Athletes generally have to intersperse this intensity of training with a rest period at a lower intensity, which is known as interval training.

**Table 2.10** Maximum heart rate zone descriptions

ventilation stabilises to ensure sufficient oxygen is being supplied. Likewise, when exercise stops, ventilation decreases rapidly at first and then more slowly until it returns to the resting level.

## Stroke volume

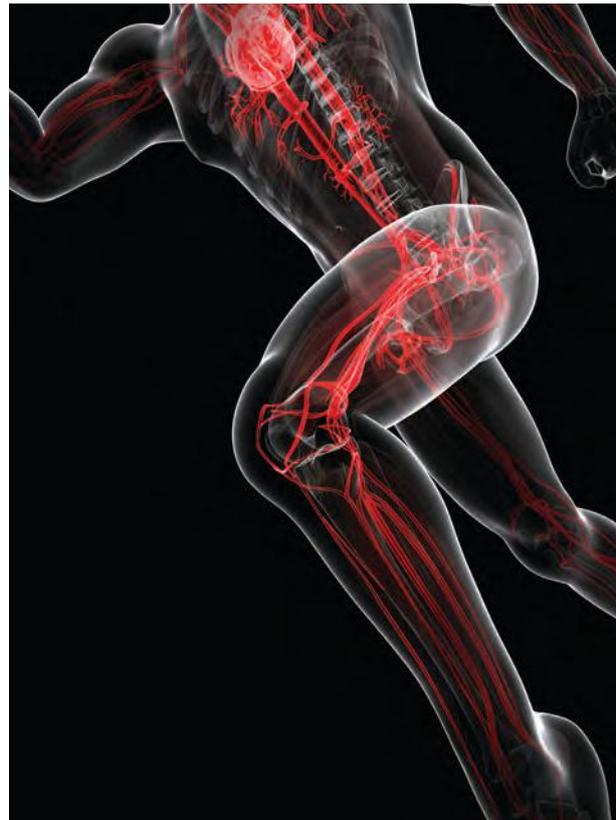
To increase the amount of blood circulating around the body, the heart not only beats faster, but harder as well. By contracting with more force, a greater amount of blood is ejected into the aorta and around all the arteries in the body as the **stroke volume** increases in direct response to the increased amount of blood being returned through the veins. This leads to a greater amount of oxygen being made available to the working muscles. Typically, stroke volume can double before reaching a plateau.

**stroke volume** the volume of blood ejected by the left ventricle of the heart during each systemic contraction; it is measured in millilitres per beat

Stroke volume increases until the athlete is working between 40 per cent and 60 per cent of MHR, at which point it typically plateaus. In non-athletes, it increases from about 60 mL at rest to 120 mL at maximal exercise. In elite endurance athletes, stroke volume can increase from 100 mL at rest to 200 mL at maximal exercise. This stronger contraction in athletes is made possible by an increase in the thickness of the muscular wall of the left ventricle, which is a response to sustained aerobic training. Interestingly, stroke volume is greater when in the supine (or lying) position, as venous return does not have to overcome the increased gravitational force when standing in an upright position. An example of this is while swimming.



**Figure 2.45** Blood circulation increases when the heart beats faster and harder



**Figure 2.46** During exercise cardiac output rises to meet an increased demand for oxygen

## Cardiac output

The combined effects of a heart beating faster and harder is known as increased **cardiac output**. At rest, the oxygen demands of the body are easily met and there is little difference in the relative cardiac outputs between an untrained and trained individual. However, as the individual starts to exercise, cardiac output rises to meet the increased demand for oxygen.

To calculate a person's cardiac output, their heart rate should be multiplied by their stroke volume:

$$\text{Heart rate (HR)} \times \text{stroke volume (SV)} \\ = \text{cardiac output (CO)}$$

To determine the cardiac output of a healthy adult with a resting heart rate of 60 bpm and a stroke volume of 75 mL/beat, the calculation would be:

$$60 \text{ bpm} \times 75 \text{ mL/beat} = 4500 \text{ mL/min}$$

Interestingly, an adult on average has approximately 5000 mL of blood circulating in their body. Therefore, close to this entire quantity of blood circulates around the body each minute.

Exercise has a profound effect upon cardiac output. Table 2.11 outlines this for a trained athlete. This sixfold increase in cardiac output

**cardiac output** the volume of blood ejected by the left ventricle of the heart per minute; it is generally measured in millilitres per minute

Athlete	Heart rate (bpm)	Stroke volume (mL/beat)	Cardiac output (mL/min)
At rest	60	100	6000
High intensity	180	200	36 000

**Table 2.11** Cardiac output

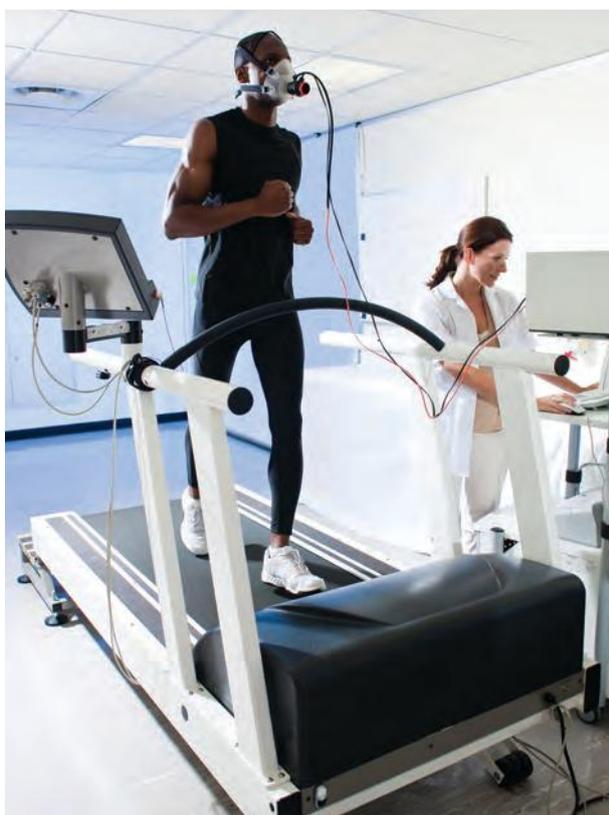
demonstrates the degree to which working muscles require significant amounts of oxygen to enable them to produce energy aerobically.

In addition to the extra-oxygenated blood circulating around the body, a large proportion of the blood in the body is redirected from non-essential organs during exercise such as the liver, kidneys and brain. At rest, muscles generally use up to 25 per

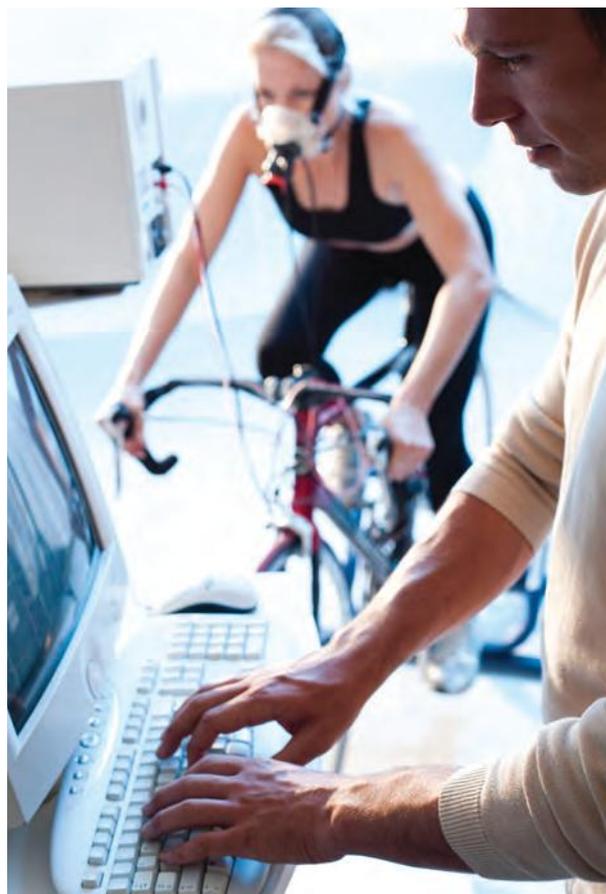
cent of the cardiac output. However, during exercise, this increases to over 80 per cent.

**VO<sub>2</sub> max** the maximum amount of oxygen a person's body can absorb during exercise; it is measured in the millilitres of oxygen absorbed into the muscles per kilogram per minute

Trained athletes are able to deliver the same amount of oxygen at lower heart rates, as the efficiency of their various body systems allow this. As exercise intensity steadily increases, so does the cardiac output, until its maximum output is reached (**VO<sub>2</sub> max**). At maximum output, trained athletes are able to produce significantly



**Figure 2.47** In general, males achieve slightly greater VO<sub>2</sub> max scores



**Figure 2.48** A trained athlete's body system is very efficient

greater amounts of aerobic power output, which translates to faster speeds, an obvious advantage in sports such as triathlons.

Untrained adults will score a VO<sub>2</sub> max of approximately 30 mL/kg/min. Trained athletes are able to achieve scores in excess of 75 mL/kg/min. Generally, males are able to achieve slightly greater scores due to their increased body size and muscle composition. A common test for VO<sub>2</sub> max is the multi-stage fitness test, commonly known as the beep test.

## Lactate levels

As the intensity of physical activity increases, blood lactate levels also increase, which is a clear indication of the intensity of exercise. There is much misunderstanding about the relationship between exercise fatigue and blood lactate levels. First, the term lactic acid is often used interchangeably with lactate; however, this is not correct. Lactic acid is found in milk products and not the human body. Further to this, most people believe that lactic acid is 'the enemy', and the cause of fatigue. This also is not true as lactate acts as a counteractive product against increasing muscle pH and feelings of fatigue. This is explained in greater depth later (in the HSC topic, 'Factors affecting

performance', specifically 'Energy systems'); yet, an understanding of the basic relationship between increasing exercise intensity and blood lactate levels is sufficient at this point.

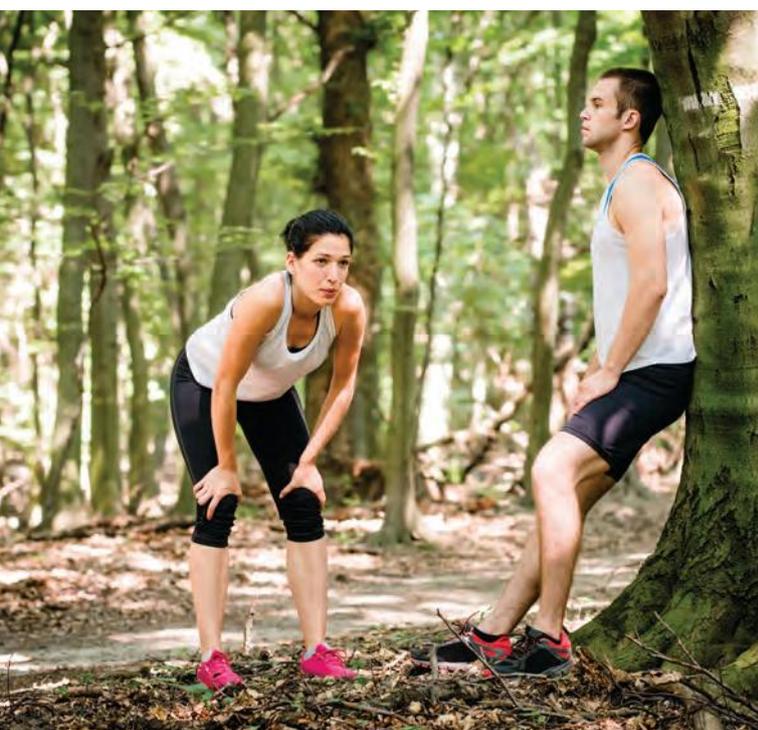
The primary fuel source of the body is adenosine triphosphate (ATP). ATP is broken down, resulting in adenosine diphosphate (ADP), and energy is released for muscular contractions. The body has a limited supply of ATP, and therefore it needs to be resynthesised by way of three energy systems (this is covered in greater detail in 12 PDHPE Core 2). As this occurs, protons (hydrogen ions) are released into the muscle, causing a decrease in the pH or acidosis within the muscle (which people often refer to as a burning sensation). This decreased pH is detected in nerves near the muscle cells.

The two major processes used to resynthesise ATP involve the breaking down of glucose into pyruvate in a process called glycolysis. If energy production occurs aerobically (in the presence of oxygen), pyruvate is processed through a series of chemical reactions, and the body can efficiently maintain balanced pH levels within the working muscles. However, when glycolysis occurs anaerobically (when insufficient oxygen is available to the working muscles), pyruvate rapidly accumulates in the muscle as well as the pH-increasing protons from the rapid breakdown of ATP.

To buffer against this increasing acidosis that occurs during intense physical activity, the protons are absorbed into the pyruvate, resulting in a new substance called lactate. This lactate is then



**Figure 2.50** Lactate levels increase when the intensity of exercise increases



**Figure 2.49** The body has a limited supply of ATP

transported to the liver and other organs of the body to be converted back into glucose and used again for energy within the muscles.

During moderate exercise, lactate levels stay fairly consistent. As the intensity increases to a moderate to high degree of exertion (sometimes described at the point where speaking clearly becomes difficult), lactate levels start to increase exponentially until a maximum effort is reached. The lactate continues to be used as a fuel source as most of it is converted back into glucose.

### Going further 2.25

Participate in a range of physical activities or sports. Upon completion consider the following before, during and after:

- heart rate
- ventilation rate.

A common misconception is that increasing lactate causes increased muscle acidosis and is the primary cause of muscle fatigue and the burning sensation. However, it is clear that increasing lactate levels are a beneficial by-product of anaerobic exercise. This can be measured with a lactate analyser (which involves a finger prick to analyse a drop of the athlete's blood). When this occurs at regular testing intervals, an athlete's endurance and development can be monitored.

### Summary 2.26

How does exercise immediately affect the following?

- heart rate
- ventilation rate
- stroke volume
- cardiac output
- lactate levels.

### Checklist 2.27

Examine the reasons for the changing patterns of respiration and heart rate during and after sub-maximal physical activity.



**Figure 2.51** A lactate analyser test can monitor an athlete's endurance and development



**Figure 2.52** A long jump requires an increase in lactate levels to be completed

## 2.3 The way in which biomechanical principles influence movement

**biomechanics**  
study of  
mechanical laws  
and how they  
relate to the  
movement of  
living organisms

The study of **biomechanics** originates from combining two separate disciplines: *bio* refers to the study of living organisms; *mechanics* refers to the study of motion and forces. Within the sporting context, biomechanical study involves identifying ways of improving performance through the

development and refinement of equipment and sporting technique and skill.

Sports scientists explore the advantages that can be found through biomechanical study. Any incremental increase in efficiency could mean the difference between a gold and silver medal. Athletes, businesses and sports governing bodies invest significant time and money into research to try and find these possible advantages. Generally speaking, biomechanics can provide three distinct advantages:

### Driving questions 2.28

Can you name any sports where fancy equipment or technical skills do not contribute towards success? In what sports would a strong understanding of physics be an advantage?

- Refining an athlete's technique to maximise force production or stability, with the least amount of effort. For example:
  - runners seek to move efficiently by using as little energy as possible
  - high jumpers seek to propel their body as vertically as possible and contort their bodies over the bar
  - weightlifters seek to lift the maximum amount of weight possible, while maintaining excellent stability to ensure they control the weight above their heads
  - tennis players seek to strike the ball in such a way that it increases the chances of winning the point.
- Modifying and developing equipment that has increased strength and power, while being as light as possible. Developing and refining new materials, such as carbon fibre, will often help achieve this. It could also involve modifying

the shape of the equipment, to increase how streamlined and effective it is.

- Decreased risk of injury by improving movement efficiency, such as running technique or improving the safety of collisions and contact during sport, such as the development of lightweight and strong safety apparel like bike helmets.

## Motion

**Motion** refers to the specific path or movement of a body. In sport, this could be the movement of the human body (e.g. the speed an athlete runs during a running race) or an object that is manipulated by the human body and the force it applies to this object. (e.g. a javelin that is to be thrown).

While some of these principles of motion are simply observed in sport, others can be focused upon to maximise efficiency and lead to the development of improved technique or equipment.

**motion** refers to the change in position of an object, with respect to time and its reference point

## The application of linear motion, velocity, speed, acceleration, momentum in movement and performance contexts

### Linear motion

True **linear motion** can be observed when a person skates or skis in a straight line without moving after initial propulsion. Or when a ski jumper slides down the ramp, preparing for

**linear motion**  
motion along a  
straight line

### Going further 2.29

#### Collaborate

Think of a time where you improved in sport. Did this relate to either using improved equipment, or the development of a more refined and effective technique? Share this with a partner and discuss how biomechanics provided an advantage.



**Figure 2.53** A downhill skier displays linear motion

takeoff, they hold a stationary crouched position. A car moving in a straight line is another example (despite the fact the wheels are turning in a rotational path). A swimmer who pushes and glides as far as possible off the wall also displays linear motion. When a sprinter runs from start to finish over 100 m, they run in a straight line to ensure they travel the least distance. Any slight deviations from this linear motion will result in increased distance.

In sports that involve linear motion, athletes aim to minimise any unnecessary lateral, up–down or twisting movements that do not contribute to forward motion.

### Angular motion

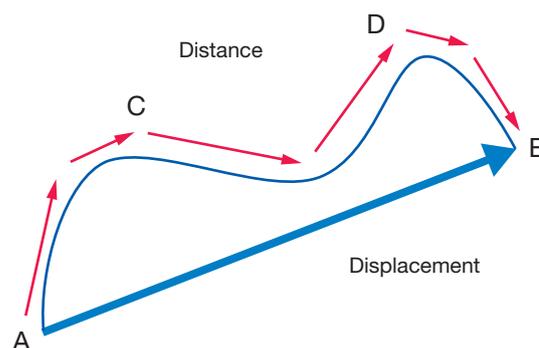
The movement of body around a curved path is very common in sport. Any object manipulated by the body will be projected by either the arms or legs, which have a fixed axis, where the bones rotate at a joint. When a cricket ball is hit back in a straight line, the swinging arms are an example of **angular motion** that produces the movement of the bat. Walking and running requires the leg to swing under the body. Divers spin their body as they somersault, controlling the angular motion, which is essential to ensure a clean entry into the water.

**angular motion** movement of a body along a curved path with a fixed axis

## Going further 2.30

### Inquire

For five separate sports, identify examples of both linear and angular motion that contribute to general motion.



**Figure 2.54** Diagram showing distance and displacement

### General motion

As in everyday life, the majority of sporting skills have an element of both linear motion and angular motion. This is known as general motion. The swimmers' arms represent angular motion, while their hips display linear motion as they glide through the water.

Related to motion is the concept of distance and **displacement**, which are merely observable features of sport.

A marathon run over 42.2 km is only concerned with the distance of the race. However, the length of a javelin throw measures the displacement and not the actual distance of the path travelled by the javelin. Strategies in sports seek to minimise distance, such as running around the inside of a corner, and to maximise displacement by projecting an object such as a ball at the most efficient trajectory.

**displacement** the length of space between the start and end points, if connected in a straight line

## Going further 2.31

### Inquire

For three separate sports, identify examples of both distance and displacement.

### Velocity

**Velocity** is calculated by using a simple formula:

$$v = \frac{\text{displacement}}{\text{time}}$$

Generally, this calculation is for objects that move through a curved path. An example of this is when calculating the velocity of a javelin. The displacement is the **distance** from release point to landing point. The velocity of the javelin can be calculated by dividing this displacement by the time the javelin was in the air. Increasing velocity upon release

**velocity** speed in a given direction

**distance** the length of space between two points

## Going further 2.32

### Inquire

Research the key points of good sprinting technique, then record video footage of different students sprinting. Using slow motion, compare their various sprinting techniques and identify aspects that are either good or in need of development.

will lead to increased displacement, prompting the javelin thrower to develop the power of their throw.

### Speed

Similar to velocity, speed is calculated simply by:

$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

For example, a 400 m race ran in 44 seconds will have an average speed of 9 m/s or 32 km/h.

Calculations of speed are an essential aspect of many sports. In a marathon, the runner with the fastest average speed will win. Where athletes compete against each other in team sports, speed is a great advantage, which can allow one player to escape or catch another. Sprint speed is an excellent example of the role of biomechanics in maximum performance. Athletes must have a highly refined technique to run at their fastest potential speed. Poor technique leads to wasted effort and decreased performance.

### Acceleration

When acceleration is increasing, it is described as positive acceleration. For example, when moving from a run to a jog to a sprint. When the opposite occurs and the body in motion is slowing down, it is called either deceleration or negative acceleration.

Being able to get to top running speed as quickly as possible is a significant advantage, particularly in sports where power is necessary. In sports such as rugby, great acceleration over a short distance increases a player's potential effectiveness in the game. Muscle power and speed, as well as some simple biomechanical techniques, such as leaning forward, can maximise acceleration. Sports such as sprinting rely on rapid acceleration, which is why blocks are used to position the body to better enable this.

## Going further 2.33

### Inquire

Record video footage of different students starting a sprinting race from different body positions (e.g. leaning backwards/standing tall/leaning forward/using blocks). Using slow motion replay, analyse the various techniques and identify the differences of each.



Figure 2.55 A sprint begins with positive acceleration



**Figure 2.56** Momentum is an advantage in surfing

## Momentum

Momentum is most easily understood by considering the outcome of a collision between a truck and a car both travelling at 60 km/h in a head-on crash. Momentum is an advantage in many sports. Some have rules to negate the effects of variable momentum by requiring a specific weight (e.g. in shot put, the shot must be 7.3 kg for men in the Olympics). However, in other sports, increased momentum is a significant advantage, especially during collision sports. When two rugby players collide, the athlete with the greater momentum is more likely to be able to get into an advantageous position by pushing their opponent back. However, having one player weigh 15 kg more than another is only one of many factors that will determine success, including:

**angular momentum**  
the quantity of rotational motion, which is the product of its speed and mass

- the angle of collision
- tackling technique and timing
- the amount of contact with the ground that affects stability.

**Angular momentum** is the final aspect that combines the understanding of angular motion and momentum.

## Summary 2.34

- 1 What is linear motion? How can it affect performance?
- 2 What is velocity? How can it affect performance?
- 3 What is speed? How can it affect performance?
- 4 What is acceleration? How can it affect performance?
- 5 What is momentum? How can it affect performance?

This is very common in sports, where athletes rely on rotational movements to generate power. For example, the longer a lever is or the greater its mass, the greater its angular momentum will be. This is evident in golf, where longer clubs like a driver produce more force than a shorter club such as a 9 iron, if swung with the same force.

## Balance and stability

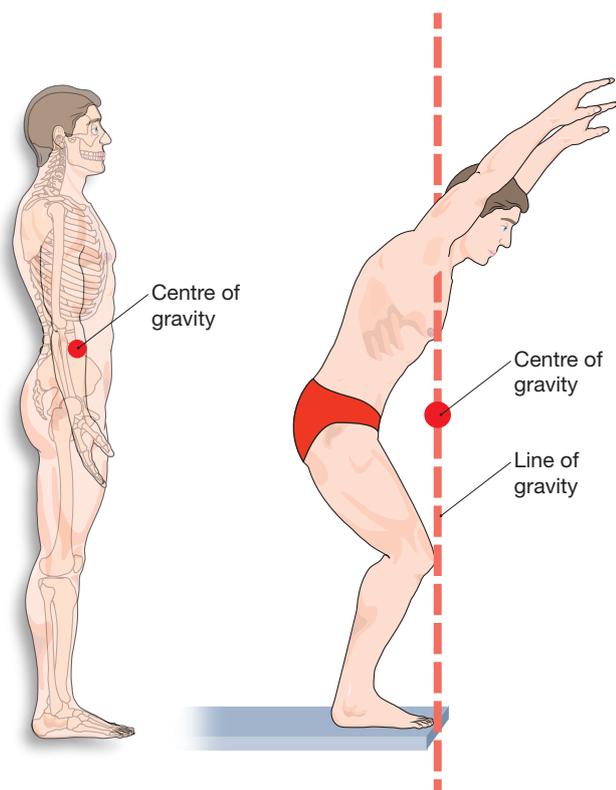
All sports require athletes to maintain a steady balance and equilibrium. Some sports, such as archery, require a stationary and balanced body position. Other sports are judged on the degree of balance and stability demonstrated, such as the beam in gymnastics, while other sports require opponents to disrupt each other's balance, such as in wrestling and rugby. There are two main types of balances that are evident in sport:

- 1 static balance
- 2 dynamic balance.

There are three aspects related to balance and stability that athletes manipulate and are aware of.

### Centre of gravity

All athletes are highly skilled in effectively manipulating either their own body position or that of the equipment being used, thus ensuring the centre of gravity is perfectly positioned throughout the movement. However, this is generally an unconscious and automatic response, refined over years of practice. Where an object has a uniform and consistent shape, such as a tennis ball, the centre of gravity lies directly in the centre of the sphere. Irregular shapes are more difficult to identify; however, an athlete quickly learns to feel the centre of gravity as they use it. The human



**Figure 2.57** Diagram showing changes in centre of gravity

## Summary 2.35

- 1 What is centre of gravity? How can it affect performance?
- 2 What is line of gravity? How can it affect performance?
- 3 What is base of support? How can it affect performance?

body is unique in that its centre of gravity moves as it changes shape. For example, moving from standing upright to leaning over will shift the centre of gravity forward. Simply lifting the arms in front of the body can also shift the centre of gravity forwards. To counteract this and maintain a steady equilibrium, a slight change in posture may be used to reposition the centre of gravity back into the most stable position.

As can be seen in Figure 2.57, the centre of gravity can actually move outside of the physical mass of the body into space. Highly skilled athletes have a carefully refined awareness of their centre of gravity and will make minor adjustments to ensure it is consistently in the most efficient position. This development is evident in two distinct sports:

- 1 **High jump:** While learning the high jump, athletes can generally clear the bar up to torso height by using a powerful scissor kick. Their technique only allows them to propel the body over the height that they can move their entire mass above. However, elite high jumpers can clear heights above their head. By contorting their body in a curved position (where the centre of gravity is below the body), they can



**Figure 2.58** Elite high jumpers use a lower centre of gravity



**Figure 2.59** Kicking practice develops and repositions a player's centre of gravity

'snake' or curl their body over this point. Basic technique development can add over 30 cm to a person's jump, without any actual physical development in power and speed.

- 2 Kicking: Children learning to kick a football off the ground are generally very upright as they strike the ball. This is to ensure their centre of gravity stays in a stable position. However, this limits the movement and angular momentum of the kicking leg. Skill refinement will enable the kicker's ability to lean away from the ball to increase the degree that the leg can swing in a controlled manner. In this position, the centre of gravity moves to outside of the body, allowing for greater power production. Practice increases the kicker's awareness of their centre of gravity and their ability to lean further without losing balance. To counteract the shift in the centre of gravity, the kicker will extend their arm out to the side.



**Figure 2.60** Balance in golf is relatively stationary

In sports that require a position to be held stationary, known as a static balance, the athlete must hold their centre of gravity very still in the correct position. Minor adjustments in body position will enable this. This is evident as a person attempts to do a stork stand or handstand. In other sports, such as golf, while there is movement, the balance required is relatively stationary.

## Going further 2.36

### Inquire

Record and review video of various balance activities in slow motion. Identify the point where equilibrium is lost and describe this in relation to their centre of gravity.

## Line of gravity

An athlete who is in a stable position will have their centre of gravity positioned over the top of their base. This base would be formed with their feet if standing, their hands if doing a handstand or whatever body parts are in contact with the ground. When athletes sense that this **line of gravity** does not align over their base, corrective action must be taken. For example, when leaning too far forward, a quick step must be taken to stop from falling over. In the start of a swimming race, the athlete purposefully loses balance by leaning forward off the blocks, and at the exact correct moment, forcefully jumps. This leads to maximum force production and the most effective dive possible.

**line of gravity**  
an imaginary line passing vertically from the point of centre of gravity of an object down to the ground

## Base of support

All activities require an adequate base of support that allows an athlete to maintain their balance. Generally, this base of support will be made as large as required to successfully execute a skill. A free throw in basketball can be done with feet shoulder width apart or less. It is a skill that is relatively static and simple, in terms of the balance required. However, if the same athlete was to contest and land after catching a rebound, or look to maintain possession of the ball, their feet would ideally be much wider.

Some sports require athletes to execute skills on a very small base of support. This requires exceptional balance and control.

## Going further 2.37

### Create

- 1 Draw the base of support for the following:
  - rugby tackle
  - free throw
  - arabesque
  - skiing.
- 2 Discuss the impact that each will have on the athlete's sense of balance.



Figure 2.61 Diving requires a strong base of support

There is a dynamic relationship between centre of gravity and the base of support that an athlete is constantly adjusting. Where possible, an athlete should widen their base of support by spreading their feet. However, this may not just be out to the side. It may be more beneficial to change the orientation of the feet that are forming the base of support.

Another aspect is the height of the centre of gravity, above the base of support. Shorter athletes, who have a naturally lower centre of gravity are closer to their base of support, which generally means they are more stable. Athletes may lower themselves to a point that increases their stability. Taller athletes can sometimes struggle to be as balanced in contact sports, as a collision can more easily disrupt their equilibrium.



Figure 2.62 Shorter athletes have a naturally lower centre of gravity



Figure 2.63 Taller athletes may struggle to have a stable base of support

## Going further 2.38

### Inquire

Observe (or record video footage of) a defender attempting to tackle someone who is running fast towards them. What does the tackler do to their base of support and centre of gravity to successfully maintain their balance upon the collision?

## Going further 2.39

### Collaborate

Perform various activities where students attempt to disrupt their opponent's balance. Record and review in slow motion for critical moments where this loss of balance occurs, and what the causes of this are. Make reference to their centre of gravity, line of gravity and base of support. For example, pushing each other over with various foot positions. Also, wrestling by starting on your knees is an excellent way to learn the art of maintaining your own balance and seeking to disrupt the balance of another.

## Fluid mechanics

Fluid can be either a liquid or gas, and in most cases this is either done through water or air. Any sport that includes movement, whether of an object or the human body, is subject to the impact of the fluid it moves through. Generally, sports require this movement through the fluid to be as fast and efficient as possible. Even with regards to water and air, there can be subtle differences in the fluid property when comparing different locations around the world. Swimming in salt water is different to swimming in fresh water. The increased salt concentration increases the body's ability to float. Air can change with increasing altitude, as decreased oxygen concentration can change the amount of air resistance to an object flying through it. To enable the most efficient and effective movement possible, both technique development and equipment modification can be used.

## Going further 2.40

### Inquire

Watch video clips of downhill skiing, rowing and cycling. Describe the properties of the fluid involved and the technique and equipment developments that are used to enhance performance in the respective fluid.

## Flotation, centre of buoyancy

If you asked three differently-shaped people to try and hold a stationary flotation position on their backs in the water, you will see that their bodies behave differently within the water. Some people easily float on top of the water; others slowly sink in a flat position; and others will sink quickly with their legs leading down. These differences relate to the principles of buoyancy of that particular individual.



Figure 2.64 Body shape and body composition can affect how an individual floats in the water

When a body attempts to float and is immersed in water, a specific weight or weight of water will be displaced (or forced to change position to accommodate the body):

- > If this volume of displaced water is heavier than the body displacing it, it will float.
- > If this volume of displaced water is lighter than the body displacing it, it will sink.

This displaced volume of water is spread throughout the rest of the entire body of water it is a part of. This relates to Archimedes' principle, which describes the fact that the upward buoyant force that is exerted on a body immersed in water is equal to the weight of the fluid that the body has displaced, whether it was fully or partially submerged. A simple demonstration of this is to observe the water in a bathtub as the body enters it.

Factors that can influence the flotation and buoyant properties of a body in water can relate to its relative body shape and **body composition**. There are also some changing properties of the water itself, which can influence its buoyancy.

The human body is not uniform or consistent in shape and density. The legs, which are predominately comprised of muscle and bone, have a much higher density than the upper torso region, which contains the air-filled sacs of the lungs. Obviously, a

**body composition** the distribution of fat, bone and muscle in the body, as well as the specific measurements of height, length and girth of the various parts of the body

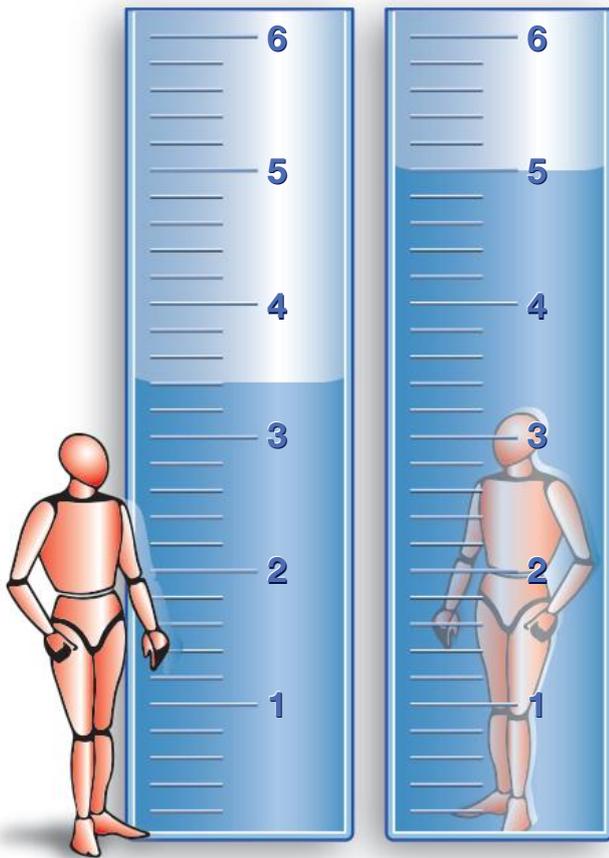


Figure 2.65 Diagram showing water displacement

person's legs will sink faster, potentially dragging the rest of the body down with it. This can be experienced when holding a static float, lying in the supine position (facing up) with arms and legs spread out. Slowly breathe and exhale all of the air out of your lungs and note the manner in which your body sinks (if it sinks). Similarly, the torso has a larger surface area and fat percentage, which also makes it more buoyant than the legs.

Objects with a higher density will tend to sink faster than an object of lower density. The exception to this is for large ships made of steel, where their specific shape adds to their ability to float. For most humans, the density of their body is similar to water. However, salt water, with its higher salt concentration and increased density, promotes greater buoyancy than fresh water. People with increased body fat, which is less dense than water, float more easily. This can be replicated by wearing a low-density personal flotation device, which greatly increases the volume of the body without increasing its actual weight.

When a body is immersed in water, there is a volume of water displaced by it.

The centre of this volume of water is referred to as the **centre of buoyancy**. A body's ability to hold a static float depends on the relative position of its own centre of gravity, in relation to the centre of buoyancy of the water being displaced by it. Various body shapes, where the centre of gravity differs, will have a different capacity to hold this static float, and will also affect the manner in which it sinks if it is unable to float.

**centre of buoyancy** the point at which all the mass of the water displaced by an immersed object in it is concentrated

These properties of flotation and buoyancy significantly affect a person's ability to swim. The higher they are able to float in the water, the easier it is to swim as they encounter less fluid resistance from the water (air is far less viscous or thick than water). Efficient swimming technique aims to ensure the body floats as high as possible in the water. This also affects the development and design of equipment such as rowing boats and the manner in which they float in water. The higher they can float out of the water, with the least amount of volume submerged will enable easier propulsion through it.



Figure 2.66 The centre of buoyancy impacts a body's ability to hold a static float

## Fluid resistance

Whenever an object moves through a liquid or gas (air), various forces impart resistance that impacts on the efficiency of this movement.

This resistance is often referred to as **drag** and any reduction of drag through technique refinement and equipment development will generally increase performance.

**drag** refers to the nature of the resistive force that is exerted on an object trying to move through fluid

Drag is an oppositional force that impedes the movement of an object through fluid. The water opposes this movement, causing the athlete to slow down. Because the water is not moving, it has to flow around the body pushing through it. This flowing water becomes disturbed and turbulent, which adds

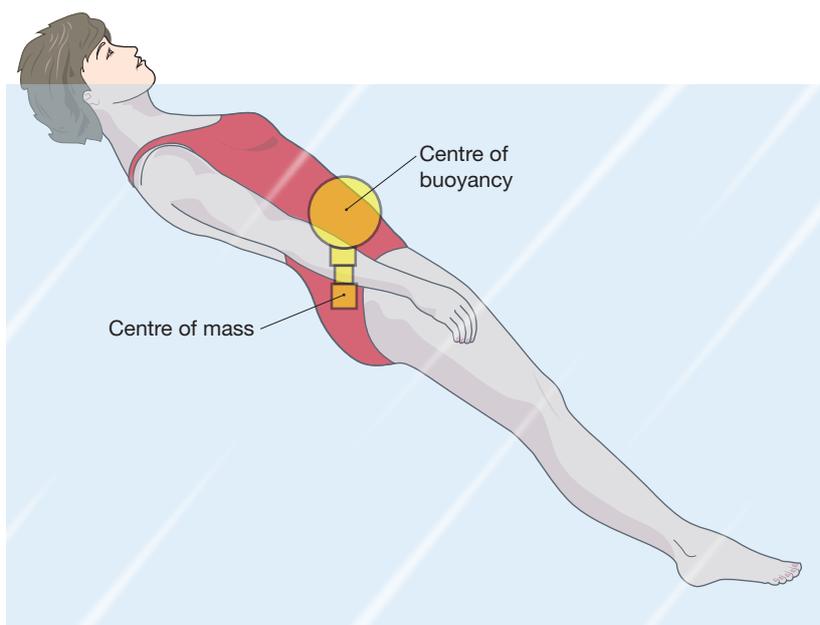


Figure 2.67 Centre of mass and centre of buoyancy

even more drag and resistance. To reduce this drag, the following can be modified:

- Equipment and clothing: Should be minimal and form fitting (e.g. swimming in a tracksuit would be extremely difficult!). Even wearing a swimming cap and shaving down can make a difference.
- Technique: The shape of the body should be as streamlined as possible. The larger the surface

## Going further 2.41

### Inquire

Consider two swimmers who push off a wall and glide in a stationary position for as far as possible. What advice would you give to enable one person to glide further than the other? How does this advice relate to drag?



Figure 2.68 Lightweight bicycles and streamlined helmets can affect both the surface and profile drag

area of an object pushing through water, the greater the drag it will encounter. For example, swimming with your head above water is much slower than when putting your head face-down in the water.

- Surface materials: Other methods of reducing drag and fluid resistance relate to the surface material of the object. Tennis balls are regularly replaced throughout a match, because as they age, they become more 'furry'. The increased fuzziness increases the **surface drag** or friction that the ball encounters. Rough and irregular surfaces also create more turbulence to the fluid passing the object.

The shape of the object is designed to reduce **profile drag**. Profile refers to the shape and surface area that is presented as it cuts through the fluid. Consider a quarterback throwing a

**surface drag** a drag force that is determined by the surface material of an object

**profile drag** a drag force that is determined by the shape of an object



**Figure 2.69** A swimmer moves faster with their head under water

football in NFL. A flat, smooth throw with the object flying through the air with the smallest surface area possible will fly much further than a ball that flies side on or is wobbly. Rowing boats are made as narrow as possible and time trial bikes are shaped to minimise profile drag.

However, some sports demand a trade-off between being streamlined and being stable. Single sculls are extremely narrow with a long nose because they only have to go in a straight line. Yet, a white-water kayak is not so streamlined, as it must be able

to change direction and stay afloat in challenging waters. It is wider and shorter, but more stable.

A unique aspect of fluid mechanics is the manner in which objects, which in this case are mostly balls, can fly through a curved path because of uneven surface drag and friction.

When some balls are struck with rotational movement (spinning action) as they fly through the air, they often deviate from their original path. This is particularly evident in tennis, baseball, soccer, cricket and golf.



**Figure 2.70** Time trial bikes are made to minimise profile drag



Large drag in unstreamlined position



Small drag in streamlined position

**Figure 2.71** Unstreamlined position versus streamlined position

The spinning ball creates a section of high-pressure air flow on the side of the ball that is spinning towards the direction of its flight. This adds increased surface drag over that side of the ball. On the opposite side of the ball, low air pressure results as the ball is spinning in the same direction

as the air flowing past it, where it encounters less drag resistance. As a result of this, the ball will curve towards the side of low pressure. This is known as the **Magnus effect**.

In tennis, players regularly strike the ball in a manner that will produce the Magnus effect. Topspin causes the ball to drop quickly, which is used when hitting a firm groundstroke for a winner (hitting over the top of the ball), whereas backspin tends to make the ball fly slower, but for longer (slicing under the ball). This is used to slow down the play or as a recovery shot. Sidespin can also be applied to curve the ball away from an opponent.

In soccer, players apply spin and topspin when taking free kicks, as they attempt to curve the ball around the wall into the goals.

**Magnus effect** refers to the forces and effects that act upon an object that is spinning as it moves through fluid



**Figure 2.72** The Magnus effect occurs when the ball curves towards the side of low pressure

## Summary 2.42

- 1 What is flotation? How does it affect performance?
- 2 What is centre of buoyancy? How does it affect performance?
- 3 What is fluid resistance? How does it affect performance?



**Figure 2.73** Row boats are made as narrow as possible to minimise profile drag



**Figure 2.74** A white-water kayak is not as streamlined but is more stable

### Checklist 2.43

How have the principles of fluid mechanics influenced movement and performance? Provide examples.

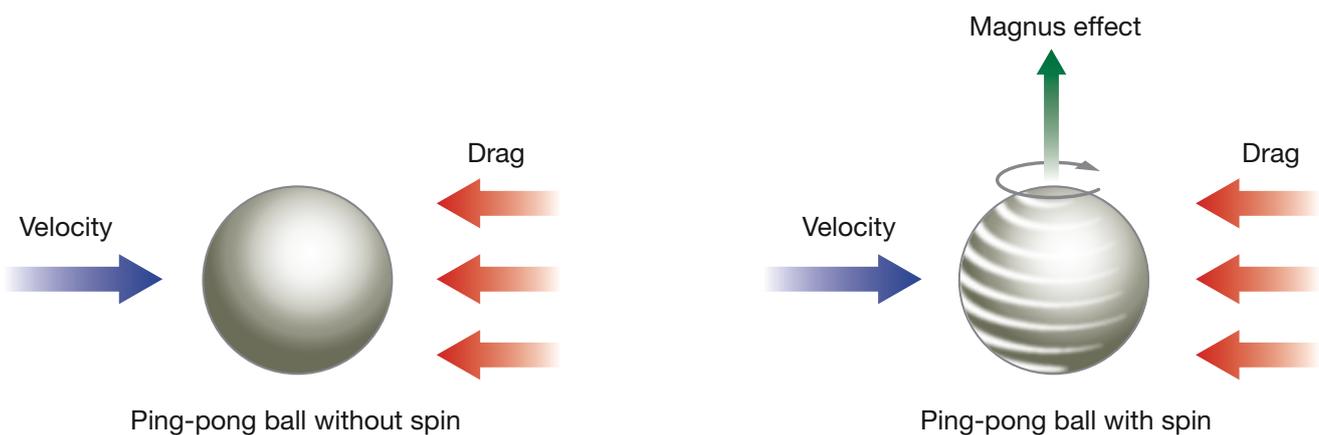
Cricket balls are unique in that the ball over time may become asymmetrical and irregular in its surface properties from one half of the ball to the other. As the bowler shines and rubs one side of the ball, the other side continues to become rough. If the ball is bowled with the seam vertical, the ball will swing towards the rough-side, where the surface friction increases the drag.

## Force

### How the body applies force

The application and resistance of force is evident in all aspects of life. All sports require athletes to apply forces in some form to produce movement and physical action, and to also resist various forces that oppose this movement. Newton's three laws of motion are observable when considering the impact of force in various sporting contexts:

- Newton's first law: An object remains at rest or will move at a constant velocity, unless acted upon by an external force.
- Newton's second law: The acceleration of a body is directly proportional to, and in the same direction as, the force acting on the body.
- Newton's third law: When one body exerts a force on a second body, the second body simultaneously exerts a force that is equal and opposite in direction to that of the first body.



**Figure 2.75** The Magnus effect

The body produces force through the coordinated contraction of skeletal muscle, resulting in movement of the skeleton; for example, jumping, throwing and running. These are known as internal forces. Sport requires the application of these forces against other objects and surfaces in the competitive environment.

Maximising internal forces is achieved through specific training programs, aimed at physical development of the power and strength capabilities of a specific muscle group. In addition to this, efficient movement patterns through technique development will enable an athlete to produce the maximum amount of force possible for their physical capabilities.

### How the body absorbs force

Often in sport, the body encounters an external force that must be absorbed and controlled. It is the role of internal forces, through the action of muscle contraction and joint flexion, to absorb these external **applied forces**. For example, when

**applied force** a force that is acting on another object

landing from a basketball rebound, the athlete will bend and flex through the hip, knee and ankle joints to smoothly absorb the force of gravity and minimise the risk of injury. Other skills where the

body absorbs force include having 'soft' hands that 'give' when catching a cricket ball or tackling an opponent in rugby who has high momentum and runs straight at the defender. These skills require practice and technique development to stay as safe and effective as possible.



**Figure 2.76** In cricket, 'soft' hands help to absorb force



**Figure 2.77** Shot put is an example of applied force

### Going further 2.44

#### Collaborate

With a partner, stand 1 metre apart and throw and catch an egg between each other. Gradually move further apart. How did you have to change your catching style as you moved apart? Why? What does this suggest about how the body absorbs force?

### Applying force to an object

Generally, two types of forces are evident in sport: applied and **reaction forces**. Applied forces occur when the human body comes into contact with an object through movement. In most cases, applied forces are used to manipulate an object. For example, applying a powerful force to a shot in shot put will project it through the air as far as possible. Some other forces are applied to the ground, resulting in a movement that opposes the force of gravity.

Reaction forces are the equal and opposite forces that oppose the applied force of the body (refer to Newton's third law of motion). The shot in the hand is being drawn to the Earth through gravity. Applied forces seek to overcome this reaction force as much as possible. As a person

**reaction force** a force that is acting in the opposite direction to the applied and external force

### Summary 2.45

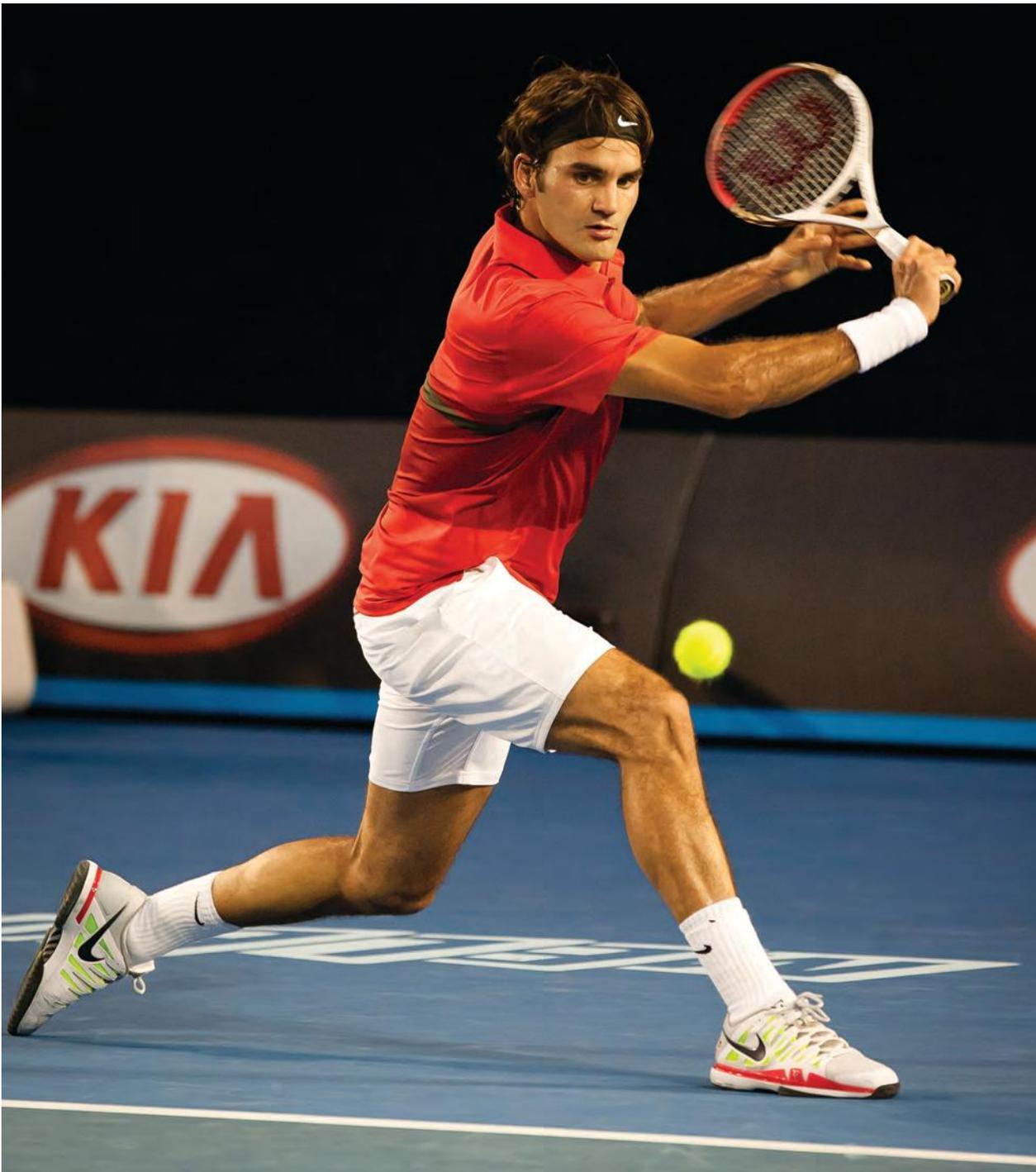
- 1 How does the body apply force?
- 2 How does the body absorb force?
- 3 How is force applied to an object?

runs and applies force through the feet making contact with the ground, the reaction force against the feet enables the runner to push against it, resulting in movement.

### Going further 2.46

#### Inquire

Compare, via slow-motion video analysis, a single sporting skill such as a tennis serve, kicking a ball, or throwing. Identify the factors that contribute to the more powerful skill. What does this suggest about how the body applies force to an object?



**Figure 2.78** All sports require athletes to apply forces in some form to produce movement and physical action, and to also resist against various forces that oppose this movement

## Chapter summary

- The role of the skeletal system is to provide a structural framework for the body, and to protect the body's internal organs from injury. It is also responsible for storing minerals and energy, and the production of red and white blood cells.
- Synovial joints allow for movement of the skeleton via muscle tendons.
- Movement results from alternating the contraction and relaxation of muscles, which either shorten (concentric) or lengthen (eccentric). These are isotonic contractions.
- Isometric contractions occur when muscle tension increases without producing any movement.
- The principle purpose of respiration is to supply the cells of the body with oxygen and remove carbon dioxide. This occurs through pulmonary ventilation (breathing in and out) and the exchange of carbon dioxide and oxygen between the lungs and the capillaries, and between the capillaries and tissue cells throughout the body.
- Blood has three functions in the body: transportation of oxygen; regulation of pH levels/temperature in the body; and protection against foreign toxins through clotting.
- Pulmonary circulation involves the cycle of oxygenated and deoxygenated blood between the lungs and the heart's ventricles.
- Systemic circulation involves the transfer of oxygen and nutrients to body tissues, and the removal of carbon dioxide and waste from the tissues.
- Cardiorespiratory endurance is an important component of physical fitness and determines how effectively the body can deliver oxygen to the working muscles to minimise the effects of fatigue.
- Muscular strength determines the body's ability to produce force to hold and move objects and is developed through resistance training.
- Muscular endurance determines the ability for muscles in the body to perform multiple contractions without rest.
- Flexibility determines the range of motion possible for the body's muscles and joints.
- Skill-related components of fitness include the explosive capabilities of muscles (power), reaction time and agility (the ability to change the direction of movement with speed and efficiency), as well as balance and coordination.
- The FITT principle refers to frequency, intensity, type and time of the exercise being performed.
- Different forms of training will involve the FITT principle in differing proportions, such as heart rate based training or maximum aerobic speed training.
- The body's immediate response to prolonged exercise will include an increase in heart rate, as well as in the amount of oxygen available to working muscles (stroke volume) and a rise in lactate levels.
- Biomechanical study in sport involves identifying ways of improving performance through the development and refinement of equipment and sporting techniques.
- The majority of sporting skills will have an element of both linear motion and angular motion, known as general motion.
- All motion will have a velocity (displacement/time), a speed (distance/time) and an acceleration (positive, negative or 0).
- Balance relies upon an athlete having an adequate base of support and a correct positioning of their centre of gravity.
- Fluid mechanics is the study of the body's motion through different substances, either air or water, and includes such notions as force, fluid resistance (drag) and flotation.
- The Magnus effect refers to the forces and effects that act upon an object that is spinning as it moves through fluid.

## Exam-style questions

- 1 Explain how the skeletal system affects movement.
- 2 Differentiate between the agonist and antagonist muscles.
- 3 Describe the effect the cardiovascular system has on movement.
- 4 Identify a health-related component of fitness and describe a fitness test to assess it.
- 5 Outline the immediate physiological responses to exercises.
- 6 Describe how the centre of gravity can impact on performance.
- 7 How have fluid mechanics affected equipment and clothing design in sport?
- 8 Describe how the body absorbs force.
- 9 Explain the relationship between muscles during movement.
- 10 Outline the three types of muscle contractions and provide an example for each.
- 11 Explain the exchange of gases within the body.
- 12 How does exercise affect the circulatory and respiratory systems?
- 13 Discuss the question: 'To what degree is fitness a predictor of performance?'
- 14 Design a training program for a 5000 m runner.



# Chapter 3 First Aid

## Preliminary Option 1

**After completing this chapter, you will be able to demonstrate knowledge of:**

- what the main priorities for assessment and management of first aid patients are
- how the major types of injuries and medical conditions should be managed in first aid situations
- what the individual needs to consider in administering first aid.

### **Key terminology**

abrasion  
amputation  
avulsion  
dermis  
embedded object  
epidermis  
incision  
laceration  
puncture wounds  
subcutaneous layer  
triage

# 3.1 The main priorities for assessment and management of first aid patients

## Setting priorities for managing a first aid situation and assessing the casualty

### Driving questions 3.1

- 1 What would be your priorities in any first aid situation?
- 2 Share stories of experiences requiring first aid.

### Situational analysis

An individual coming upon the scene of an accident or event needs to remain calm and make measured decisions rather than hasty decisions based upon

**triage** deciding the order and priority of treatment to multiple patients or casualties

emotion. A calculating decision in an accident can decide the priority of treatment or **triage** for an accident scene involving a number of casualties.

This effectively allows for a number of casualties to be supported in the most effective way. Every situation that requires first aid is different and needs

to be treated as such.

### Priority assessment procedures

This priority in any accident event is based upon the vital signs of the patient, including:

- their level of consciousness
- the danger they are in
- the extent of their other injuries.

For example, a patient who is bleeding would come after a patient who is not breathing; a broken arm would be treated after someone suffering internal bleeding. The decision as to who is to be treated may be based on the level of your training and the assistance you can provide.

The analogy of the chain of survival can be used to help with the decision-making. The links in this chain are:

- Early access: This means that the earlier professional medical assistance is provided, the better, so medical assistance should be sought early.

- Early CPR: The sooner effective CPR is commenced, the greater the chance of survival for the patient.
- Early defibrillation: The earlier an AED (automatic external defibrillator) is used to analyse the heart for a shockable rhythm, the greater the chance of recovery.
- Early ACLS: All of these steps should lead to the patient being taken to advanced cardiac life support, and better their chances of recovery.

The assessment of a patient needs to follow a plan and be executed in a calm and calculating manner.

### DRSABCD

The letters DRSABCD enable us to have a structure to follow for a patient who is not responsive. They stand for:

- danger
- response
- send
- airways
- breathing
- CPR
- defibrillation.

#### Danger

The first priority in any accident event is to ensure the safety of all involved. The priority is the safety of the rescuer first, bystanders next and finally the victim.

#### Response

The level of consciousness of a patient is an important consideration. The way this can be assessed is by looking carefully at the patient, talking loudly to them and, if no response, to squeeze their hand. Do not shake the victim, especially a young child, as you may injure them further, increasing the chance of a spinal injury.

#### Send

Call for help from bystanders, or using a telephone call for medical assistance through emergency call centres. When calling for assistance the following could be asked for:

- that the location of the emergency is detailed and known
- the nature of the injuries
- the level of consciousness of the patient
- what first aid is being provided
- how many people were involved.

Never be the first to hang up in an emergency phone call; wait until the emergency personnel have no more questions to ask. Remember, in the chain of survival, the link of early access.

### Airway

The patient may be unconscious but still breathing and for ease of management and assessment a clear airway is required. Placing an unconscious patient carefully in the recovery position (see pages 126–7) will enable a clear airway and ensure any obstructions can be easily cleared. This will ensure an open airway.

### Breathing

The signs of life can be easily assessed now that we have ensured the victim has an open airway. The presence or absence of normal breathing can be reviewed and, if absent, then the mouth can be easily checked for obstructions. The key here is to look, listen and feel for breathing. Look for the rise and fall of the chest, listen for breathing from the mouth and nose and feel for the flow of breath coming from the mouth and nose.

### CPR

If the patient is unresponsive and not breathing normally, CPR should now be commenced. The victim should be placed on a firm flat surface for effective CPR.

### Defibrillation

An automated external defibrillator (AED) is a device that is becoming more and more commonly available and can be used to analyse and detect a person's heart rhythm.

The AED will administer electric shocks to the heart when it has detected a shockable rhythm. The operator is clearly instructed on how to use the AED by the machine itself.

Some key points when operating the AED:

- The AED will not operate if it is not a shockable rhythm.
- The AED should only be used on a non-breathing victim.
- Turn on the AED and follow the instructions.
- Attach the pads to a dry clear chest.
- Press the pads down firmly.
- Follow the prompts and do not touch the patient when the heart rhythm is being analysed or when giving the patient a shock.



**Figure 3.1** An automated external defibrillator (AED)

- Ensure no one else is touching the patient when administering a shock.
- Give CPR while the AED is being attached and afterwards.
- Remain calm.

## STOP

For a victim who is responsive you can use the STOP regime. This involves:

- stop
- talk
- observe
- prevent further damage.

### Stop

Stop the victim from moving and attempt to prevent further damage to allow you to survey the victim and assess the injury or injuries.

### Talk

Ask the victim what has happened and to give you information as to where there is pain, how they feel, if it hurts anywhere else and the history of the injury.

### Observe

Observe the victim and look for anything that is not normal, such as the way the victim is holding themselves, bleeding, movement of limbs, tenderness, deformations and anything else not normal.

### Prevent further damage

This is a time to assess the seriousness of an injury. If minor then begin support; if more severe then look at support through RICER – rest, ice, compression, elevation and referral – if severe then look at further support and help.

In summary, for a non-responsive patient look at DRSABCD; for a responsive patient look at STOP.

### Summary 3.2

- 1 What should be considered when analysing a first aid situation?
- 2 What guidelines should be used when setting priorities in a first aid situation?
- 3 Outline DRSABCD.
- 4 Outline STOP.

### Checklist 3.3

Plan and conduct appropriate assessment and management procedures in response to a range of first aid scenarios suggested by your class teacher.

## Crisis management

For all crisis management, management of injuries and management of medical conditions, fact sheets can be found via the St Johns Ambulance Australia website (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)).

## Cardiopulmonary resuscitation (CPR)

To perform effective CPR there are a few simple steps. To begin, locate the compression point. The compression point of the chest can be easily located as the centre point of the chest. If the compressions are performed too low they may appear to be on the stomach and be ineffective, or if too much pressure is applied they may break a rib. It is important to remember that you should not stop doing CPR or not commence CPR if you have a fear of harming the patient. You are creating the breathing and heartbeat for this victim.

When performing the chest compressions:

- place the heel of your hand at the centre of the victim's chest – one-third the depth of the chest
- press down so you compress the chest – be smooth and rhythmical
- apply pressure directly over the chest, not at an angle
- allow the chest to recoil after the compression.

For an adult, these compressions are performed with two hands; for a child, with one hand; and for a baby, with two fingers.

The compressions should be at the rate of 100 compressions per minute with breaks for the two rescue breaths performed in sets of 30 compressions with two breaths.

The next stage of CPR is rescue breathing. The rescue breaths should be commenced with a face



Figure 3.2 Demonstrating CPR procedures

shield or oxygen mask. The rescue breaths are performed by:

- tilting the head back fully (for adult or child); the neutral position for a baby
- for an adult and child, provide chin lift
- seal the victim's nose using the fingers; for a baby you cover both the mouth and nose
- for a baby, the rescue breaths must be a small puff rather than a full breath.

The most common complications that can occur in rescue breaths are regurgitation and vomiting. Regurgitation is the passive flow of fluids from the stomach and is caused when oxygen enters the stomach. This is not accompanied by a muscular spasm. Vomiting is when the contents of the stomach are ejected with force and is accompanied by a muscular spasm. A person who vomits should be checked for signs of breathing as this is an indication that oxygen is getting to the muscles and the victim may be able to begin to breathe for themselves.

Care must be taken in both cases to clear the mouth and ensure the fluids do not enter the lungs as this can complicate attempts at resuscitation. Place the victim in the recovery position and clear the mouth.

In summary, for resuscitation of a baby:

- keep the head in the neutral position
- rate of 30 compressions and two breaths
- breaths should be a light puff only
- cover the mouth and nose for the breaths
- chest compressions with two fingers
- depth of compression should be one-third the depth of the chest.

For resuscitation of a child or adult:

- tilt the head back fully
- rate of 30 compressions and two breaths
- breathe in for one second and wait for one second between breaths
- cover the mouth and seal the nose

## Summary 3.4

Identify signs and symptoms and primary management for:

- CPR
- bleeding
- shock
- neck and spinal injury.

What are some basic guidelines for:

- moving the casualty?
- medical referral?
- care of the unconscious casualty?



**Figure 3.3** All suspected spinal injuries need to be treated as extremely serious, as these injuries can result in permanent damage

- for compressions of an adult, use two hands; for a child, use one hand
- depth of compression is one-third the depth of the chest.

The number of cycles of 30 compressions and two breaths is five every two minutes and if possible change operators every two minutes.

When doing CPR remember that any attempt at resuscitation is better than no attempt at all.

## Bleeding

Most bleeding is superficial and is easy to stop. Management of body fluids such as blood should begin with personal protection and should include at the least gloves, sterile dressings and disposable equipment being used. Bleeding, while seeming bad, should never take precedence over resuscitation.

Management of a bleeding crisis:

- apply pressure to the wound to restrict the flow of blood
- if blood goes through a bandage, apply a second – do not remove first to allow for blood clotting
- raise the affected limb above the level of the heart
- monitor the patient's vital signs
- seek urgent medical assistance
- monitor closely for signs of shock.

## Shock

If a patient is going into shock, they need to be closely monitored. The reasons for someone going into shock may be many and varied, ranging from a jellyfish sting to a sudden loss of body fluid.

In shock, the heart is not carrying out its role of supplying the body organs with sufficient oxygen.

Signs and symptoms of shock:

- pale, cold clammy skin
- rapid or weak pulse
- rapid shallow breathing
- collapse
- altered state of consciousness
- thirst.

Management of shock:

- call for urgent medical assistance
- elevate the patient's legs so they are above the level of the heart
- treat the cause of the shock if possible (e.g. wounds, burns)
- altered state of consciousness – if breathing and unconscious, place in recovery position
- reassure
- monitor closely
- try and keep body temperature stable; if cold, cover with blankets.

## Neck and spinal injury

All suspected spinal injuries need to be treated as extremely serious, as these injuries can result in permanent damage. The spinal column is a series of vertebrae separated by cartilage, which operates as cushions. The spinal cord and its attached nerves provide the means by which we breathe, move and use our senses. Any organs below the site of a damaged spinal cord will be unable to send or receive signals and therefore will not function.

Immobilisation or minimal movement is the key to any spinal injury. If an event is suspected of involving damage to the spinal cord it must be treated as a worst-case scenario.

Signs and symptoms of a spinal injury:

- pain at the site
- being able to recount the events leading to the injury
- loss of movement
- sensation of tingling in hands or feet
- bump or lump on the backbone
- onset of shock.

Management of spinal injuries:

- immobilisation of patient and placing a possible pad around the neck and back of the patient
- seek urgent medical assistance
- look for signs of shock
- DRSABCD
- support the head at all times
- treat for shock
- maintain body heat.

## Moving the casualty

If a spinal patient has to be moved, then this should only occur because of a life-threatening situation and should only be done once.

## Medical referral

Medical referral is when a patient needs further medical assistance and records need to be kept on the injury; for insurance, WHS records and most importantly to provide a history of the event.

Most industries have a standard form they use, which has similar information that needs to be included, such as:

- brief personal details (name, date of birth, address, allergies, medical history)
- date of incident
- observations and description of injury (this is usually done with the support of a diagram)
- treatment plan
- assessment
- if possible, witness details.

The ambulance services have their own record-keeping requirements for patient referral and movement. An important consideration in any accident event is to ensure the confidentiality of the casualty.

## Care of an unconscious casualty

Any dealings with a patient who is suffering from an altered state of consciousness is a serious medical situation and needs to be dealt with as such – urgent medical assistance needs to be sought.

For an unconscious patient, the first consideration is to ensure that they do not injure themselves any further. Any treatment must take into consideration that there is trauma for the patient to be in this condition, usually to the brain. If they remain on their back or their stomach, there is a chance of an obstructed airway from vomit, fluids or even the tongue.

For the safety of the patient they need to be placed in the recovery position. This is where they are on their side, with the head tilted slightly back

### Checklist 3.5

- 1 Demonstrate CPR procedures using a manikin.
- 2 Identify safe procedures for moving a casualty.

(for a clear airway) and slightly downwards (to ensure any fluids escape from the mouth) with the rescuer behind the patient and placing one hand to support the head and the other on the diaphragm to ensure effective monitoring of the vital signs of the patient.

The patient in the recovery position needs to be protected from danger and monitored closely

for vital signs until medical assistance arrives. These prompt actions and the monitoring can make certain that if further problems arise they can be dealt with. This can make the difference between a quick and effective recovery and a long and protracted one with ongoing problems.



**Figure 3.4** For the safety of an unconscious casualty, the patient must be placed in the recovery position

## 3.2 Managing the major types of injuries and medical conditions in first aid situations

### Management of injuries

#### Driving question 3.6

Briefly discuss the management of injuries or medical conditions that you have experienced.

#### Cuts and lacerations – bleeding

There are many situations where a person with medical knowledge may be called to deal with a 'situation' involving cuts and lacerations. Wounds are caused when the skin tissue is torn or cut. There are many accepted types of wounds and these include abrasions, amputations, incisions, lacerations, punctures, avulsion and embedded objects.

In most cases blood loss is minor but correct management is important to ensure short and effective recuperation.

Management of bleeding:

- These examples of bleeding should be treated first with personal safety in mind, so if available put on disposable gloves and if the wound looks life threatening seek help by ringing 000. Avoid contact with blood and, if possible, use sterile materials on the wound.



Figure 3.5 An abrasion



Figure 3.6 A laceration

- **Abrasion:**
    - General or minor wounds are described as those that are superficial and where bleeding ceases quickly. The wound should be washed in clean running water, dried using sterile gauze and covered with a sterile dressing.
    - Remember that large abrasions can easily become infected and so special care needs to be taken when cleaning and dressing them. If bleeding seeps through the first dressing, apply a second dressing over this. Medical support should be sought if there is any doubt as to the severity of the abrasion.
  - **Incision or laceration:**
    - These wounds can lead to major bleeding and need to be treated as such, with direct pressure applied to the wound, a sterile dressing being applied with a pad, elevation of the wound if possible and reassurance to the patient at all times.
    - Major wounds can lead to the patient going into shock with the signs of pale, cold,
- abrasion** occurs when the outer skin layers are scraped due to being dragged along a hard or rough surface; they tend to bleed less and can be characterised by having small particles embedded in the wound
- incision** a cut caused by a sharp object (e.g. knife or glass); usually a narrow, deep wound that bleeds profusely
- laceration** a jagged-edge wound caused by things such as wire or rough-edged objects

clammy skin, thirst, a rapid weak pulse, rapid shallow breathing and nausea and/or vomiting.

- Medical support should be urgently sought if your patient is displaying these signs and symptoms.

**punctures** these types of wounds are characterised where a sharp object has penetrated the skin (e.g. the end of a piece of wire or an arrow)

**embedded object** this is a wound with an embedded object still in place

**avulsion** this is where a flap of skin or flesh has been totally or partially removed

- **Puncture wounds or embedded objects:**

- With a puncture wound there may be little external bleeding, but the danger to internal organs could be high and can be associated with a high risk of infection.
- The object needs to be left in place as this can cause further bleeding if it is removed. To control the bleeding, if possible elevate the wound, apply pressure around the wound with a ring bandage and dress around the wound without applying pressure to the wound.

- **Avulsion:**

- The treatment here is to try and put the flap back into its normal position and then apply a bandage.

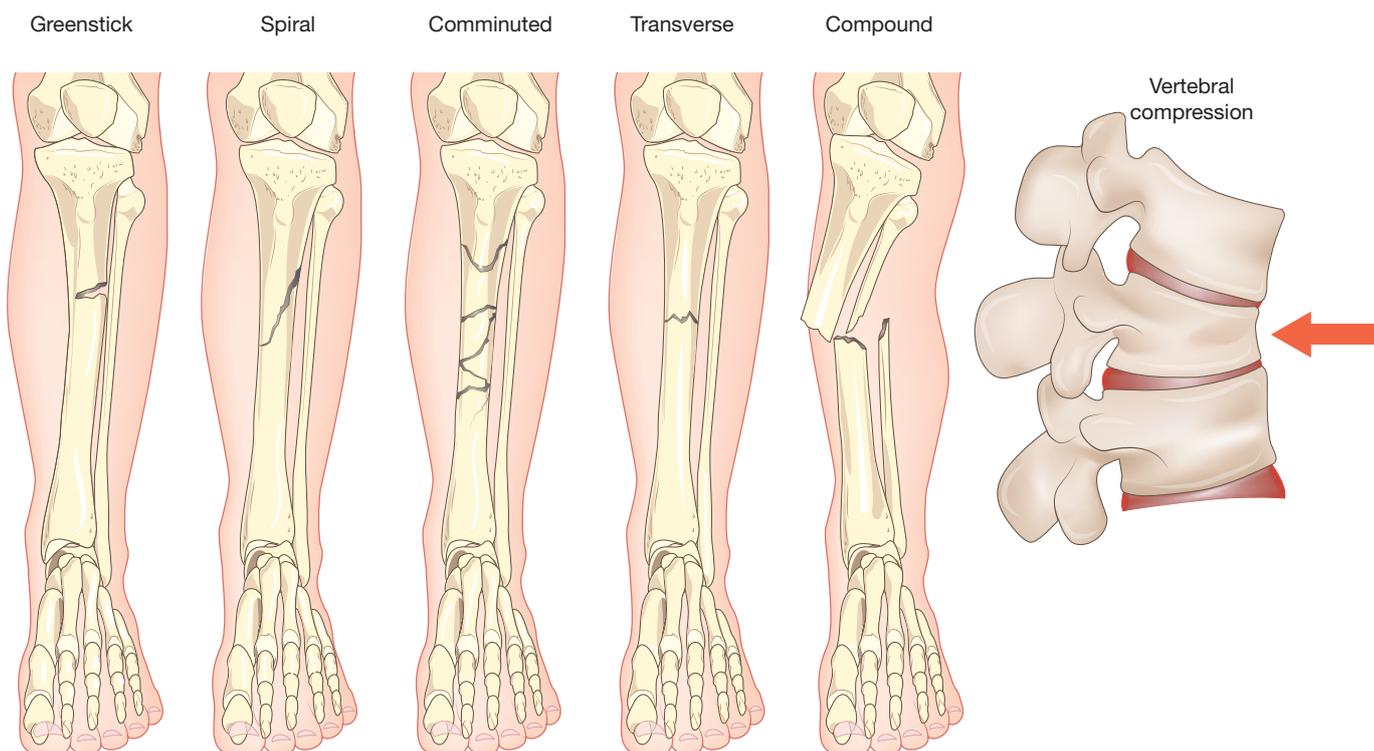
- **Amputation:**

- With the progress that has been made with surgery, especially microsurgery, many amputated limbs can be successfully reattached as long as correct first aid and management of the amputated limb is carried out.
- The first is that the bleeding needs to be controlled with a sterile pressure bandage and the amputated limb needs to be sealed in a plastic bag, like a zip lock bag, and placed in iced water.
- You need to ensure that the limb does not come into contact with either ice or water as this will jeopardise the chances of reattachment. The limb needs to go to the hospital with the casualty.
- Note, in all cases of excessive bleeding the victim needs to be carefully monitored, especially for shock and medical assistance sought as a matter of urgency.

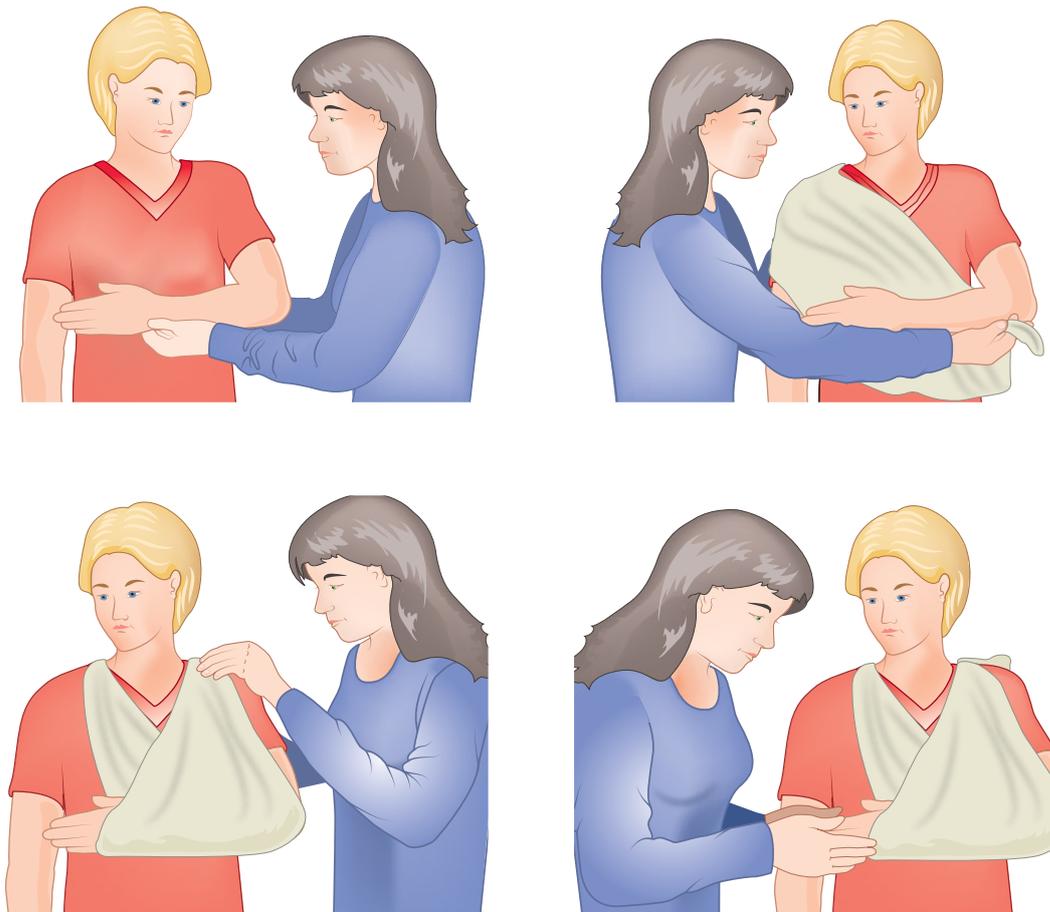
**amputation** the severing of all or part of a body such as a finger or limb

## Fractures

There are over 200 bones in the human body. Their size and shape vary greatly, but the important role of the skeleton bones is: to protect, such as the skull; support, such as the ribs and pelvis; for grasping and movement of the fingers; and the



**Figure 3.7** Typical bone fractures



**Figure 3.8** Applying a St John sling

production of blood cells through the bone marrow.

With ageing, the bones become much easier to break as they lose their strength and become seemingly fragile. It takes much less to break a bone for an older person than it does for a younger one.

Generally, fractures are classified as one of three types: complicated, open and closed.

- complicated – where the fracture can damage other nearby organs or major blood-carrying vessels
- open – where the bone is visible through skin
- closed – where there is no sign as to the extent of the damage to the bones.

It is important to know that fractures can be caused by a number of different types:

- indirect force – where there is an impact on the body but the bone breaks away from the point of impact
- direct force – the bone breaks at the point where the force was applied to the bone
- spasm or muscular contraction – where a muscular spasm exerts that much force that the bone breaks
- old age or disease – the bones become brittle and this can cause the bones to break.

A point of caution here in that any suspected break to the neck or back should be treated as a spinal injury and reference is made to the section on spinal injuries.

Signs and symptoms of a fracture (this is not an exclusive list, nor could all of these be exhibited):

- tenderness
- pain at the site of the fracture
- swelling
- deformity
- the bone grating (do not test for this yourself; rely on the patient)
- difficulty or pain when moving the affected limb
- shock (e.g. pale, cold or clammy skin, rapid weak pulse, nausea).

Management of a fracture:

- Depending upon the type of fracture, the prime care is to splint and immobilise.
- The main aim of a splint is to support and immobilise the limb, and prevent any movement of the fracture. Reassure the patient, making them as comfortable as possible while medical assistance is being called.
- Circulation needs to be carefully monitored in all fracture victims and if medical assistance is readily available and there is no worry of further damage the decision not to splint can be made.

- It is only in the instance of imminent danger or a remote location that decisions to move the patient should be made.

The various bones of the body can be treated in a number of different ways:

- Leg:
  - Immobilise the leg to the other leg bandaging above and below the fracture and ensuring the ankles are tied together to minimise movement of the leg.
- Fractured arm/collar bone:
  - The rule here is to support the fracture in the most comfortable position possible for the patient, whether this is with a sling or support bandage. Use the appropriate sling for the place of the fracture.
- Fractured lower arm:
  - Apply a St John sling. To do this, support the forearm and have it parallel to the ground, with the wrist slightly higher than the elbow (to keep it above the level of the heart).
  - Place a triangular bandage between the arm and the body with the shorter point towards the elbow, and extend this inside corner over the shoulder on the uninjured side.
  - Then, take the lower point and extend it up and over the injured side and tie firmly with a reef knot (but not a bow knot) on the uninjured side.
  - Finally, fold the end of the bandage over the elbow and tuck into the bandage, securing the elbow. This should support the fractured limb. If it is a fractured forearm it may be suitable to apply a splint to the forearm before applying the sling.
  - At all times be mindful to reassure the patient and regularly check the blood flow below the fracture and monitor the patient for shock.
- Fractured upper arm:
  - Apply the collar and cuff sling. Like all slings this should be applied when the patient has supported the arm in the most comfortable position possible.
  - This sling uses a narrow-fold triangular bandage, allowing you to create a clove hitch. You create two circles with the bandage, one pointing towards you and one pointing away; if you were looking down upon the bandage from above, a six and a nine would be formed.
  - Put the loops together by sliding your hands into the loops and bring the loops together. Slide the loops over the wrist of the patient and then tie firmly on the uninjured side with a reef knot.
  - The arm should now hang comfortably with the cuff and collar sling, providing the

needed support. If more support is needed, a narrow-fold bandage can be used to support the arm against the chest. In this case, ensure when you tie it off that the uninjured arm is left free.

- Fractured collar bone:
  - The sling supports the arm and the elbow against the body. The arm is above the level of the heart to reduce pain and swelling.
  - To put the sling in place, open a triangular bandage over the forearm and hand the smallest point towards the elbow, placing one edge over the injured shoulder.
  - Wrap the bandage around the arm then roll the bandage below the elbow so that the elbow does not fall out. Tie off behind the uninjured shoulder with a reef knot.

## Dislocations

The normal position of the joint capsule is what typifies a dislocation. These injuries can be quite significant but can be easily dismissed. If there is a lack of a distal pulse (one further from the heart than the point of dislocation) then urgent medical attention is required.

A dislocation can be caused by a twisting movement, weak ligaments or direct force and if not carefully managed can lead to damage of the nerves and blood vessels.

The management of a dislocation is to splint the dislocated joint in the position most comfortable for the patient. (No attempt to move the dislocated limb back into its normal position should be made, as this can lead to further damage).

The patient should be comforted, reassured and monitored for shock. Some of the signs and symptoms of dislocation are deformity at or around the joint, tenderness, pain in the joint, or loss of movement or power in the limb.

## Head injuries and concussion

Head injuries can be classified as two types:

- 1 open – with bleeding wounds to the face or head
- 2 closed – no visible sign of injury to the face or head.

### Closed head injuries

The brain is soft and protected by the skull, but it does not fit the skull entirely, it floats in a clear liquid called the cerebrospinal fluid. This acts like a shock absorber, but it can only do so much. A hard impact to the head can push the brain against the skull with great force. This can cause a bruise to the brain or even cause bleeding inside

the skull. This pressure inside the skull (called intracranial pressure) can cause permanent damage as the brain can be literally crushed within the confines of the skull.

The signs and symptoms of a closed head injury can be difficult to ascertain as blood is not present in most cases, but other injuries can be present such as:

- Altered consciousness: The patient may be conscious then unconscious, appear drowsy or confused (seemingly drunk), they may also improve then deteriorate.
- Deformities to the skull: In the form of compressions or fractures.
- Clear liquids oozing from the ear or nose.
- Black eyes or bruised skin behind the ears: Evidence of ruptured blood vessels.
- Pupil changes: The pupils of the eyes may be dilated (enlarged) or a person may complain of double or blurred vision.
- Nausea and vomiting: These can be common and if they persist should be treated and noted carefully.

### Concussion

Concussion can also result from a closed head injury. This is where the brain has bounced inside the skull causing concussion or mild traumatic brain injury. With concussion the brain function may be interrupted even though there is no structural damage to the brain. The brain floats in the cerebrospinal fluid and this rapid acceleration/deceleration of the brain can cause concussion even though the patient does not lose consciousness.

The signs and symptoms of concussion may be obvious or very subtle. The effects may not be felt for many hours after the head trauma occurred. Being knocked out or having a seizure after a head injury are not common, but the symptoms may be much more subtle and have the patient showing mild confusion, disorientation or even irritability. The patient could also exhibit nausea, dizziness, slower reaction times, headache, difficulty concentrating, difficulty with bright lights or loud noise and changes in sleep patterns or even insomnia.

Time is the major ally in the management of concussion. The brain will recover at its own rate. It has been suggested that during the curing period it is best to limit multimedia and electronic devices, such as television, computers, smartphones and iPods.

Various sports now have mandatory guidelines as to the return to playing the sport after a concussion, as it is seen that continued concussions lead to permanent brain damage and disabilities.

It has been researched that the majority of concussion patients will recover within 7–10 days but some patients experience symptoms for weeks or months. The rate of recovery is related to the individual and many other historical factors rather than the initial injury.

### Open head wound

These head injuries need to be treated with care as any head wound can be associated with damage to the brain and the spinal cord. After checking the patient's responses and whether there has been any alteration to their consciousness, an open wound can be treated as for any other bleeding occurrence with pad, pressure and bandage.

It is important to remember that even the shallowest of head wounds will bleed profusely, so you should not be surprised at the amount of blood from a wound that requires little or no stitches.

### Eye injuries

Eye injuries can result from a number of causes and each needs to be treated differently.

Some of these causes can be flash burns, chemical contamination, infection, allergies, and trauma from blunt objects such as sporting balls, or even small objects or particles getting under the eyelid and causing irritation. The danger with all eye injuries is the chance of permanent damage so medical support and advice should be sought promptly.

The general rules when dealing with eye injuries, taking into account the type of injury, are:

- Flush any foreign object from the eye with cool, clear water, keeping the affected eye downward.



Figure 3.9 An eye injury

- Place sterile pads over both eyes to avoid tracking.
- Avoid putting any pressure on the affected eye.
- Never place any object into the eye or pick the object from the eye.
- Reassure the patient.
- Encourage the patient not to blink.

For small foreign objects:

- Encourage the patient to blink.
- Flush the affected eye with cool, clear water.
- Seek medical aid if the problem persists.

Embedded object:

- Do not remove the object.
- Try to place a protective cover over the injured eye, don't bandage or anything else, and if possible cover the uninjured eye as well to stop tracking (the movement of the eyes).
- Seek urgent medical support.

Chemical injury:

- Rinse the eye for at least 15 minutes with fresh, cool flowing water.
- Ensure that no fluid enters the uninjured eye as this could cause cross-infection.
- Seek urgent medical aid.

Flash burn:

- This is caused by inadvertently staring at intense light, and this can cause permanent damage. Treatment for this is cool compresses applied to the eyes. The eyes should then be covered with pads and urgent medical attention sought.

## Nasal injuries

Nasal injuries are the most common facial trauma and the nasal bones are the most commonly fractured bones of the face, and this has been attributed to their position and lack of support.

When looking at a nasal injury, close attention must be made for other facial injuries; if these can be discounted then treatment of the nasal injury can occur.

Signs of nasal injury could be:

- bleeding
- deviation of the septum (the bone and cartilage that divides the nasal cavity)
- swelling.

All should be referred to medical aid. You should never try to manipulate the nasal passage to straighten it.

### Nosebleed

Remembering your personal safety, put on disposable gloves, have the person with the nosebleed lean slightly forward and pinch the fleshy part of the nose below the bone. The patient should now breathe through their mouth and maintain the pressure until bleeding ceases – this can take

longer if the nosebleed is caused by exercise or hot weather. Cool cloth can be applied to the nose, neck and/or forehead, and if bleeding persists, medical support should be accessed.

It is important here to remind the patient not to blow their nose for at least a couple of hours, and even then to blow gently.

The swallowing of blood can cause the patient to vomit and this can lead to distress for the patient, thus reassurance should always be given.

## Burn injuries

Burns and scalds are injuries that damage and kill skin cells and there are many different causes of burns, including:

- flames
- hot objects
- hot air of gases
- hot liquids or steam
- chemical burns
- radiation
- electricity
- extreme cold.

The human skin performs a number of functions, including protecting the body, regulating body temperature, holding the sensory organs and helping with the functions of vitamin D.

The skin has two layers: the epidermis and the dermis. The **epidermis** consists of a number of layers and in different parts of the body can be of different thickness. The outer layer is dead skin continually being shed from the body. The thickest layer is on the soles of the feet and hands.

**epidermis** the outer layer of skin

**dermis** the inner layer of skin

The **dermis** is much thicker and contains capillaries, blood vessels, sweat glands and nerve endings.

Burns were once classified with reference to both the surface area and the depth of the burn (i.e. first-degree, second-degree and third-degree burns). The terminology when describing a burn is based now solely upon the depth of the burn.

The three types are:

- superficial
- partial thickness burn
- full thickness burn.

### Superficial

When describing the superficial burn, the top layer of the epidermis is affected.

Signs and symptoms of a superficial burn:

- a reddening (like sunburn)
- pain.

Management of a superficial burn:

- pour cool water on the affected area

- apply lotion (but never without medical direction).

Cool water can help with managing the burns and the burn will disappear in a few days. If the burn has been caused by sunburn then peeling or flaking of the skin may occur. There are a number of lotions available that can alleviate the burn but these should never be applied without medical direction.

### Partial thickness burn

In a partial thickness burn, the epidermis and part of the dermis may have been damaged.

Signs and symptoms of a partial thickness burn:

- the skin is reddened and may be moist, with a clear weeping liquid
- blistering may occur
- severe levels of pain.

Management of a partial thickness burn:

- seek medical aid
- wear gloves for personal protection
- peel off any clothing not sticking to the burn
- if possible, remove rings and watches and other jewellery from the affected area
- cover the burned area with a clean, non-stick sterile dressing or even plastic wrap
- remove the patient to a safe environment
- monitor the burn victim for shock
- if possible, give oxygen.

Do not break any of the blisters and do not apply ointment or lotion without medical direction.

Cooling the area of the burn and eliminating radiant heat remains a priority but be mindful that you only want to lower the temperature of the affected area, not the whole body.

### Full thickness burn

**subcutaneous layer** the tissue beneath the dermis

Full thickness burns go through both the epidermis and the dermis through to the **subcutaneous layer**, and the burn site may be dry.

Signs and symptoms of a full thickness burn:

- the burned area is white or blackened
- loss of feeling or no feeling of pain at the burn site.

Management of a full thickness burn:

- seek urgent medical aid
- cover the burned area with a clean, sterile lint-free dressing
- monitor closely for shock
- elevate the burned limb where feasible
- remove the patient to a safe environment
- cool the affected area with water
- ensure the safety of yourself and bystanders.

Do not peel off any clothing sticking to the burns

and do not use ointments or lotions without medical direction.

### Other forms of burns

#### *Inhalation*

To inhale hot gases or even flames can cause burns along the respiratory tract, resulting in inflammation of the tract.

Signs and symptoms of inhalation:

- breathing difficulty.

Management of inhalation:

- urgent medical aid
- oxygen
- monitor closely for shock and breathing difficulties.

#### *Electrical burns*

Electrical burns can be caused by electrical, industrial power sources and lightning. The human body is a very efficient conductor of electricity and an electrical burn will be characterised by an entry and exit wound. This may seem to be very minor but this type of burn is characterised by damage to internal organs.

The treatment will depend on the voltage of the burn. The first point of management is to ensure that whatever caused the initial injury cannot affect you or any bystanders. The area must be made safe for everyone involved in the rescue situation. Once the area is made safe the patient can be managed



**Figure 3.10** An example of a full thickness burn

for symptoms such as irregular or no heartbeat, not breathing or breathing difficulties, fractures and evidence of burns.

Management of electrical burns:

- seek immediate medical aid, as CPR and compressions may need to be commenced
- cool, non-stick sterile dressings can be applied
- if conscious, the patient should be reassured and treated as appropriately as possible.

### *Chemical burns*

Sources of chemical burns are numerous, including cleaning agents, gardening or pool chemicals, and industrial products.

If possible, reference should be made to a MDS sheet (material data safety sheet), which will give information as to the correct actions to be carried out in case of an accident.

Management of chemical burns:

- seek urgent medical support
- remove affected clothing
- wash the area with cool, clear water for an extended period of time
- ensure the initial accident cannot be repeated and affect bystanders or you
- if inhaled, treat with oxygen and follow the protocol for inhalation burns.

## Teeth injuries

A blow to the mouth or jaw area may cause a tooth to be knocked out. For permanent teeth, it can be possible to save the tooth if prompt action is taken: grasp the tooth by the crown, not the roots, rinse the tooth with saline (sterile) solution or milk. Try not to use tap water as this contains chlorine, which may damage the root.

If possible, attempt to place the tooth back into the open socket. If this is not possible, store it in milk, saline solution or even the victim's own saliva, and seek dental care as soon as possible.

If bleeding continues within the mouth, ensure the patient does not swallow the blood, fold a gauze bandage and place on the site of the bleeding, then instruct the patient to bite down gently. Rinsing out the mouth should be avoided if possible as this may slow the clotting of the blood.

## Electrocution

In any situation involving electricity, care must be immediately taken to ensure that the source of the electrocution is disconnected – this is because even if you do not touch the live wire, electricity can be passed through the human body, so when you touch the victim, you could become the second victim.

Safely remove the patient using any suitable means

without touching them by using any available non-conducting materials.

Electrocution can cause significant burns. It can cause difficult or absent breathing, fractures, affected consciousness or a weak, absent or irregular pulse. Treatment should reflect the type and severity of the injuries.

## Chest injuries

Chest injuries are the most difficult to diagnose and, if identified, medical aid should be sought as a matter of priority. The chest can be defined as the area of the body made up of the top section of the vertebrae of the backbone and the ribs around the sternum. The main role of these bones is to provide protection for the underlying organs, namely the heart and the lungs.

The most common chest injuries encountered:

- fractured ribs
- flail segment chest
- collapsed lung (pneumothorax)
- open or sucking chest wound.

### Fractured ribs

The ribs consist of a series of flat bones, which allow the ribs to have flexibility. When the chest suffers a trauma, these ribs can break and cause pain and distress at the point of the break, and this can increase over the next few days, especially when breathing in. There is also a slight chance of the broken rib causing damage to other internal organs.

The signs of a broken rib can be deformity at the site of the break, pain at the site of the break, bruising and difficulty breathing. The patient could also go into shock (e.g. pale, cold, clammy skin, rapid or weak pulse).

The management of the fractured rib can be to observe the patient, place them in the most comfortable position and seek medical assistance. The fracture site can be stabilised either by using the arm on the injured side as a support or a splint, which can be tied with a broad-fold bandage.

### Flail segment chest

Flail segment chest occurs when the rib has a number of fractures and a section of the rib has a free and floating segment. Often when this occurs there can be an associated collapsed lung and, as such, if a flail chest is identified, it should be considered life threatening and medical assistance should be sought urgently.

The signs for a flail chest are the same as for a fractured rib – the injured section of the ribs moves in the opposite direction to the rest of the chest and it will appear to push in while the rest of the

rib cage expands. This is commonly referred to as paradoxical breathing and the pain that occurs with the breathing usually reduces the patient to shallow breathing.

As mentioned earlier, medical assistance should be sought. If possible, oxygen should be administered, and the patient should be reassured and continuously monitored for shock.

### Collapsed lung (pneumothorax)

A collapsed lung occurs when air enters the chest cavity and causes part of the lung to collapse. It may not be characterised by damage to the rib cage but can be the result of blunt trauma, such as a road accident, or even something as simple as an explosive cough.

The pressure within the chest cavity can continue to rise and any identification of the symptoms of a collapsed lung should be treated as a serious medical situation.

Signs include severe chest pain, breathing difficulty, reduced level of consciousness, bluish skin colour (cyanosis) and reduced chest movement on the injured side. Treatment involves seeking urgent medical assistance and, if possible, the administration of oxygen.

### Open or sucking chest wound

An open or sucking chest wound is a wound that has gone through the chest wall and into the lungs. This open wound will allow for air to enter the chest. This is a serious medical situation and needs to be treated as such.

If the object that caused the wound is still in place penetrating the chest, do not remove it – leave it for medical professionals, no matter how tempting.

Signs and symptoms are the wound itself, the object in place, the sound of air being sucked into the chest cavity through the wound and severe respiratory distress. The patient is almost certainly going into shock, with the associated symptoms.

Treatment as highest priority is to seek urgent medical assistance. If the wound is open, apply a

non-stick bandage, such as plastic taped on the sides with the bottom being left free – this is to stop air going in but allows air to escape. If available, oxygen should be supplied. The patient should be placed in the most comfortable position possible and given reassurance until medical assistance arrives.

## Abdominal injuries

The number of body systems within this cavity include the stomach, intestines, liver, pancreas, spleen and kidneys, and major blood vessels also pass through this area.

The most common cause of injury is blunt trauma with the resultant internal bleeding. Other maladies here could be nausea, vomiting and diarrhoea. If the latter occur over a long period, dehydration may occur and this can lead to serious complications for the very old or the very young, so close monitoring is required.

A history of the cause should be sought, along with medical assistance. Monitoring for shock is needed and some pain may be alleviated by laying the patient on their back, raising their legs and bending their knees.

Evisceration is when organs from the abdominal area protrude from a wound. If this occurs, call for urgent medical assistance. The management for this is to never try and replace the organ in the wound, nor touch the wound or organ. If needed, cover the wound with a non-stick dressing, monitor the patient for shock and give reassurance until medical assistance arrives.

## Management of medical conditions

### Heart attack

A heart attack occurs when a coronary artery is blocked and that part of the heart can be damaged through a lack of oxygen. With a heart attack, every minute is vital. If CPR has been commenced with the support of a defibrillator then this greatly increases the patient's chances of recovery with little or no damage.

Signs and symptoms of a heart attack:

- profuse sweating before the attack
- pale face
- restricted feeling across the chest, as if the chest is being squeezed
- nausea
- dizziness
- pain radiating from the chest out to the extremities.

### Checklist 3.7

- 1 Identify signs and symptoms as well as primary management for each injury.
- 2 Apply bandages, slings and splints appropriately in the treatment of particular injuries.

Management of a heart attack:

- seek urgent medical assistance
- put the person, if they are conscious, in the most comfortable position possible, either sitting or reclining
- loosen any tight clothing
- assist with any medication they may have
- monitor closely.

If no heartbeat is present, commence CPR and attach a defibrillator and, if a shockable rhythm, use it.

## Stroke

A stroke occurs when a part of the brain is damaged or destroyed because it is deprived of blood, caused by a ruptured or blocked blood vessel, which carries the oxygen and nutrients the brain needs to function. A stroke must be treated with the care and treatment of a major medical incident as time is vital. The support and drugs that stroke victims require are only available in hospitals.

The damage to the section of the brain means that the symptoms may vary.

Signs and symptoms of a stroke:

- loss of functions such as movement down one side of the body, speech, coordination, balance, memory or even vision
- drooping of one side of the mouth
- headaches
- incontinence
- shock.

Management of a stroke:

- seek urgent medical assistance
- reassure the patient
- put the patient into a position of comfort, but always ensure a clear airway
- keep warm.

Signs of stroke: FAST

Once you recognise the signs of stroke, call 000. A stroke is always a medical emergency.

You can check for symptoms of stroke using the FAST (face, arm, speech, time) test. It involves asking three simple questions:

- Face: Check their face. Has their mouth drooped?
- Arm: Can they lift both arms?
- Speech: Is their speech slurred? Do they understand you?
- Time: This is critical. If you see any of these signs, call 000 straight away.

## Diabetes

Diabetes is the imbalance of sugar and glucose in the blood system. The pancreas, a gland in the

body, secretes insulin, which is needed to convert the sugar in the blood into energy. This imbalance in the blood can come in two forms:

- hypoglycaemia – low blood sugar
- hyperglycaemia – high blood sugar.

Diabetics can be diagnosed as two types: type 1 – an insulin-dependent diabetic; and type 2 – which can be controlled through diet, tablets (which excite the pancreas to produce more insulin) and exercise.

### Hypoglycaemia

The most common diabetic emergency is hypoglycaemia (low blood sugar) and can be caused by:

- alcohol
- not eating regularly or enough
- too much insulin
- excessive physical activity
- disease or fevers.

Signs and symptoms of hypoglycaemia:

- signs of shock
- confused or aggressive (may appear drunk)
- rapid pulse
- shallow breathing
- sweating
- may lose consciousness.

Management of hypoglycaemia:

- seek urgent medical assistance
- if patient is conscious give something sweet, a drink, jelly beans or chocolate, but not a diet soft drink; repeat this every 5 to 15 minutes until medical assistance arrives.

If the diabetic becomes unconscious:

- place in the recovery position
- do not give them anything by mouth.



**Figure 3.11** A device for testing blood sugar levels for people with diabetes

## Hyperglycaemia

It is important to note that you should not try and administer insulin but wait for medical assistance.

Hyperglycaemia can be caused by:

- stress
- infection
- too much food
- not enough insulin or tablets
- other medicines.

Signs and symptoms of hyperglycaemia are:

- signs of shock
- constantly thirsty
- passing large amounts of urine
- drowsiness
- infections
- weight loss
- breath that smells like acetone or almonds
- varied degrees of consciousness.

Management of hyperglycaemia:

- seek urgent medical assistance
- give sugar-free liquids.

If in doubt as to a high or a low diabetic emergency, treat as low and supply the sweet drinks.

The diabetic will be in a much more serious medical situation if hypoglycaemic rather than hyperglycaemic.

## Epilepsy

Epilepsy is a disorder of the nervous system where the cells that carry normal electrical activity 'fire' in a continuous uncoordinated and uncontrolled way. This uncontrolled electrical activity results in fits and seizures.

The causes of these fits can be a head injury, high temperature, tumours or poisoning – although in many cases the cause may never be identified.

Signs and symptoms of epilepsy:

- becoming unconscious or unaware
- muscle spasms
- frothing around the mouth
- incontinence
- eyes roll back
- could fall to the ground.

Management of epilepsy comes in two phases. The first is during the fit:

- do not restrain them
- do not try and put something in their mouth
- protect them from possible injury
- place something soft under their head.

The second is after the fit:

- DRSABCD
- loosen any tight clothing
- reassure the person
- roll them into the recovery position
- call for medical assistance
- monitor closely

- if the patient falls asleep, let them but monitor them closely.

## Asthma

Asthma sufferers have sensitive airways and when they have been exposed to various triggers there is a narrowing of these sensitive airways, resulting in increasing difficulty to breathe. When dealing with an asthma sufferer the worst-case scenario needs to be considered, as a severe asthma event must be treated as a medical emergency and urgent medical assistance must be sought.

The triggers of asthma have been identified to cause any of the following:

- the inside of the airways or their lining becomes swollen or inflamed
- the muscle around the airways constricts
- mucous is secreted causing the narrowing.

These triggers may include:

- colds or the flu
- exercise
- allergies
- food additives
- stress
- drugs
- changes in weather
- pollen in the air.



Figure 3.12 Asthma may have a number of causes

Signs and symptoms of a mild asthma attack:

- rapid pulse
- wheezing
- rapid breathing
- no difficulty in speaking in sentences.

Signs and symptoms of a moderate asthma attack:

- rapid pulse
- pale
- distressed
- loud wheeze
- able to speak in phrases or short sentences.

Signs and symptoms of a severe asthma attack:

- anxious and distressed
- very rapid pulse
- only able to speak in single words
- may have signs of shock.

Management of asthma attacks – for a mild or moderate attack:

- reassure them
- sit them upright
- give them four puffs of a ‘blue/grey’ reliever – this is best with a spacer:
  - allow the patient to breathe normally, holding their breath for four seconds after each puff
  - give four single puffs of the reliever, allowing them to take four breaths between each puff
  - wait four minutes and, if no improvement, repeat the process.
- seek medical assistance if no improvement.

For a severe attack:

- reassure them
- give them reliever
- seek urgent medical assistance.
- monitor closely.

## Anaphylaxes

Anaphylaxis is a severe allergic reaction, which is life threatening and can be caused by an insect bite – most commonly bees – drugs, medication such as penicillin, food allergies such as nuts, shellfish or eggs or chemicals.

Signs and symptoms of anaphylaxes:

- swelling of the skin, of the throat, tongue and face
- difficulty breathing and swallowing
- signs of shock
- anxiety
- dizziness or a reduced level of consciousness.

Management of anaphylaxes:

- seek urgent medical assistance
- reassure the patient
- administer an EpiPen (an auto-injector of a dose of adrenaline), if available, following the instructions on the pen
- be prepared to commence CPR.



**Figure 3.13** An EpiPen contains a dose of adrenaline to manage an anaphylactic reaction. Nuts are a common cause of allergies and anaphylaxes.

## Poisoning

Poisons can be ingested, inhaled, absorbed or injected into the human body. The type of treatment will depend upon the type of poison, the age and size of the person as well as the amount of poison involved.

The first step is to ensure the safety of the person supporting the person poisoned.

Signs and symptoms depend upon the type of poison involved – the patient may exhibit some or all of the following:

- pale cold clammy skin
- signs of shock
- headache
- altered state of consciousness
- breathing difficulties
- nausea and vomiting.

Management of a poisoned person:

- ring the poisons information hotline on 131126 for support and information as to the correct procedures to follow
- seek urgent medical assistance.

For swallowed or ingested poison:

- do not induce vomiting
- do not give anything to drink
- keep the container and send to the hospital with the patient
- reassure the patient
- DRSABCD.



**Figure 3.14** Signs and symptoms of poisoning depend on the type of poison involved

For inhaled poisons:

- ensure personal safety
- move the patient to clear air
- monitor the patient
- reassure the patient
- DRSABCD.

For absorbed poisons:

- ensure personal safety by making certain you do not come into contact with the poison and use safety equipment that is available
- remove clothing from the patient
- monitor the patient
- reassure the patient
- DRSABCD.

For injected poisons:

- ensure personal safety from sharp objects
- reassure the patient
- place the patient in recovery position
- DRSABCD.

## Bites and stings

The frequency of bites and stings in Australia is high but in most cases they are only minor and do not include any major medical events. If a patient is suspected of being bitten by a snake or spider, no attempt should be made by the rescuer to capture the spider or snake to identify the cause of the bite, as they will also be put in danger.

The venom from most venomous creatures in Australia is slow moving so this can be factored into the treatment. A pressure immobilisation bandage will slow the movement of the venom.

Signs and symptoms of bites and stings:

- bite marks or sighting of a snake
- altered state of consciousness
- slow pulse
- nausea and/or vomiting
- possible collapse
- difficulty in speaking, swallowing or breathing.

Management of bites and stings:

- ensure safety of everyone involved in the event
- reassure the patient
- keep the patient still
- apply a pressure immobilisation bandage
- seek medical assistance.

Do not:

- apply a tourniquet
- remove the pressure immobilisation bandage
- cut the bitten area
- suck the bitten area.

The pressure immobilisation (PIM) bandage should not be applied in all instances of a bite or sting. It is suitable for the following:

- snake bites
- funnel-web spider bites
- blue-ringed octopus bites
- box jellyfish stings.

It is not suitable for the following:

- redback spider bites
- bee, wasp and ant stings
- tick bites
- bluebottle jellyfish stings
- venomous fish stings.

The most common occurrences of bites and stings in Australia are detailed as follows.

### Funnel-web spider bites

Signs and symptoms of a funnel-web spider bite:

- pain at the bite site
- tingling around the mouth



**Figure 3.15** Funnel-web spider

- vomiting and nausea
- difficulty breathing
- sweating
- abdominal pain
- coma.

Management of a funnel-web spider bite:

- apply a PIM bandage
- call for urgent medical assistance
- keep the patient still
- reassure the patient
- DRSABCD.

### Redback spider bites

Signs and symptoms of a redback spider bite:

- intense pain at the bite site
- pain increases and spreads
- sweating
- signs of shock.

Management of a redback spider bite:

- reassure
- DRSABCD
- cold compress applied to the bite site
- seek urgent medical assistance.



**Figure 3.16** Redback spider

### Bee, wasp and ant bites

For the vast majority of people, these stings are a minor irritation, but for those with an anaphylactic reaction, they can be life threatening, so anyone stung should be closely monitored until a reaction can be discounted.

Signs and symptoms of bee, wasp and ant bites:

- evidence or sighting of the sting
- swelling and redness in the bite area
- pain at the bite site.

Management of bee, wasp and ant bites:

- reassure the patient
- remove stinger if possible by scraping with a sharp fingernail
- apply a cold compress to the sting area
- if there is any anaphylactic reaction, seek urgent medical assistance.

### Marine creature stings and bites

Australia is surrounded by ocean and many incidents of bites and stings occur with marine creatures. Care needs to be taken when entering the water in many areas of Australia, starting with reading the signage that now appears on most beaches.

### Bluebottle jellyfish (Portuguese man o' war) stings

Signs and symptoms of a bluebottle jellyfish sting:

- lines of tentacles sticking to the skin
- stinging sensation
- reddening of the skin
- pain around the stung area
- a possibility of an allergic reaction similar to bee sting – this is rare but those who have the reaction to a bee sting can have the same to a bluebottle jellyfish sting.

Management of a bluebottle jellyfish sting:

- remove tentacles with the ends of the fingers – do not rub them



**Figure 3.17** Bluebottle jellyfish

- reassure the patient
- hot water immersion, as hot as the patient can stand it, without scalding them (care must be taken here with young patients as they are more susceptible to scalding)
- if hot water is unavailable, cold compress can help with pain management
- if an allergic reaction is identified, seek urgent medical assistance.

### Blue-ringed octopus bites

Usually found in rock pools and shallow rock areas on the east coast, blue-ringed octopuses will only bite if handled or disturbed. In extreme cases, a bite can cause paralysis of the respiratory muscles, and there is at present no anti-venom but patients can recover with oxygen therapy and CPR.

Signs and symptoms of a blue-ringed octopus bite:

- sighting of a bite mark
- nausea and vomiting
- numbness
- altered consciousness
- breathing difficulty in extreme cases.

Management of a blue-ringed octopus bite:

- seek urgent medical attention
- reassure the patient
- monitor the patient for shock
- apply a PIM bandage



**Figure 3.18** Blue-ringed octopus

- oxygen therapy, if available
- CPR, if required.

### Box jellyfish stings

Box jellyfish are found in the shallow tropical waters of north-west Australia, northern Queensland and the Northern Territory. They are one of the most dangerous stingers found in Australia.



**Figure 3.19** Box jellyfish

Signs and symptoms of a box jellyfish sting:

- instant severe pain
- sting marks that look like whipmarks on the skin
- rapid, irregular pulse
- shock
- the patient may lose consciousness and stop breathing.

Treatment of box jellyfish stings:

- seek urgent medical assistance
- reassure the patient
- do not rub the sting
- flood the sting area with vinegar for a minimum of one minute (please be aware that recent research has questioned the suitability of this treatment)
- apply a PIM bandage
- CPR and oxygen therapy, as required.

### Exposure to heat and cold

The human body maintains a temperature between 36–37 degrees Celsius. Emergencies occur when the body is unable to maintain this core temperature in cold conditions (hypothermia) or in hot conditions (hyperthermia).

## Hypothermia

Signs and symptoms of hypothermia:

- Mild:
  - shivering
  - clumsiness
  - slurred speech
  - pale cold skin.
- Moderate:
  - slight shivering or shivering ceases
  - pulse slow
  - altered state of consciousness.
- Severe:
  - no shivering
  - pale and cold skin
  - unconscious
  - pulse may cease or be very faint.

Treatment and management of hypothermia:

- protect from the environment
- warm slowly
- remove cold or wet clothing
- give warm sweet drinks
- seek urgent medical assistance
- monitor closely.

Do not:

- massage patient
- give alcohol or caffeinated drinks
- expose to areas of high heat.

## Hyperthermia

Signs and symptoms of hyperthermia:

- flushed, hot dry skin
- rapid breathing
- nausea and vomiting
- muscle cramps
- thirst
- headaches.

Management of hyperthermia:

- rest patient in the shade
- lie person down
- cool patient slowly by sponging with cool water
- give small sips of fluids
- seek medical assistance
- monitor closely.

## Heat stroke

Heat stroke is a far more dangerous condition than hyperthermia. This is where the body can no longer cool itself and the core temperature stays above 40 degrees. This is a medical emergency and needs to be treated as such.

## Checklist 3.8

- 1 Identify signs and symptoms as well as primary management for each medical condition.
- 2 Explain the nature of the identified medical conditions.

Signs and symptoms of heat stroke:

- flushed, hot dry skin
- lack of sweating
- altered state of consciousness
- staggering walk
- rapid pulse
- signs of shock
- headache
- collapse and seizures.

Management of heat stroke:

- seek urgent medical assistance
- protect from the elements
- remove clothing
- cool patient and, if possible, place ice-packs on the largest blood vessels at the groin, neck and armpits
- give the patient fluids in small amounts, if possible
- monitor the patient closely.



**Figure 3.20** Heat stroke is a dangerous condition and should be treated as a medical emergency

## 3.3 Factors the individual needs to consider in administering first aid

### Physical environments

#### Driving questions 3.9

What are the potentially negative consequences that could result from administering first aid? How can these be minimised?

#### Traffic accidents

If you are acting as a first aider or supporting someone in a road traffic accident then you need to adhere to an emergency action plan and follow the DRSABCD as closely as possible. A simple set to remember is the three Cs when assessing a site. Be: cool, calm and calculating as to what to do.

Look at the scene and ensure, first, your safety, safety of bystanders and finally the accident victim. Danger could include where you park your car, other traffic, spilt fuel or even chemicals, damaged overhead power lines, other vehicles involved in the accident and glass – to name a few.

When assessing the area of an accident, look at the management of other traffic (warn them of the accident) and the vehicles involved in the accident. These vehicles need to be secured and stabilised by making certain they are turned off and will not move by putting the handbrake on or even chocking the wheels. Only when you are satisfied of your safety after careful observation should you approach the accident victims and begin your assessments and treatment.

Common injuries in road accidents are head and abdominal injuries. Often the victim will go into shock and will need to be continually monitored and reassured. The patient should never be moved, unless there is immediate danger.

When notifying authorities about an accident, you will be asked the following:

- location of the accident
- number of injured people
- situation or how it happened
- types of injuries
- nearest cross street, if possible.

If there is any other information that is required, the emergency operator will lead you through it.

Remember, when making the phone call, never hang up until told to do so.

#### Water environments

Whether an inland waterway or a beach, each type of aquatic environment has its own set of dangers and these need to be dealt with before any attempt at rescue can be made. Sadly, it is often reported in the media that a rescuer drowned while attempting a rescue.

The environment of the rescue needs to be carefully reviewed and a realistic understanding of the skills of the rescuer must be made so that a safe rescue can be attempted. The best form of rescue in any aquatic environment is where the rescuer does not leave dry land; the next is an assisted or non-contact rescue. Australia has a unique set of aquatic environments. For inland waterways, hazards of water flow, submerged objects, debris, eroding and steep river banks, and water temperature are just a few factors that need to be taken into account.

When helping or conducting a rescue in these areas, the rescue plan should first look at using an aid to assist. This could include any item that can float or that the victim could hold or grab onto. Any victim rescued from an aquatic environment needs to be monitored for shock, for complications from swallowing excessive water and, if they stop breathing, urgent medical assistance should be sought and CPR should be commenced.

Beach and ocean environments have their own set of dangers, in addition to the marine creatures. Dangers such as rips and fast outgoing currents are the most common. If a swimmer is in trouble, the first consideration a rescuer should make – as with all rescue situations – is personal safety. They should assess the conditions and consider if their own skills are high enough to cope with the rescue. If not, it is better to seek immediate professional assistance and/or see what aids are available to assist in the rescue.

When approaching a victim in difficulty, they will be in a state of panic, therefore, they need to be approached with care. Before assistance is given, ensure the victim is calm and able to follow instructions. When they have been returned to the shore, they need to be closely monitored for shock and excessive swallowing of water. If they start to vomit, seek urgent medical assistance. If they stop breathing, commence CPR.

## Electricity

High-voltage electricity must be seen as life threatening and dealt with with extreme care. The basic principles of dealing with an event involving any form of electricity are:

- do not touch the patient while the power is on, as you will receive an electric shock as well
- turn off the main switch in the meter box
- seek urgent medical assistance as there could be the presence of severe burns, internal injuries or lack of breathing
- for burns, cool the area and do not remove clothing
- for lack of breathing, commence CPR.

If high-tension cables are involved – due to a vehicle accident – the car could be live with electricity and if touched could lead to further victims. Until the area has been deemed safe by the relevant authorities, everyone should remain distant from the vehicle and any cables that may have been brought down. Bystanders need to be made aware of the danger areas.

Each crisis situation must be seen as unique and dealt with in a calm and calculating way where there is minimal danger to the rescuer and maximum benefit to the victim.

### Summary 3.10

What considerations does a first aider need to make in the following situations?

- traffic accident
- water environment
- presence of electricity.

### Checklist 3.11

Formulate specific self-protective strategies that should be observed when faced with the physical environment situations.

## Infection control and protection

### HIV/AIDS and blood borne viruses

The skin is the body's largest organ and is our primary defence against infection. While the likelihood of cross-infection in most instances is low, precautions must always be taken against diseases such as HIV/AIDS

(human immunodeficiency virus/acquired immunodeficiency syndrome), along with other **blood borne viruses**, such as hepatitis B, hepatitis C and other infectious diseases.

To lessen the chance of cross-infection, the following simple rules should be followed:

- avoid contact with blood and other body fluids
- use protective equipment whenever body fluids are involved – these can include gloves, glasses, face shields
- handle with care any sharp objects and place them in yellow sharps containers
- any clothing that comes into contact with body fluids should be destroyed or disposed of safely
- if any body fluids get onto the skin then this area should be thoroughly washed with soap and water
- if fluids get into the eyes then eyes should be thoroughly rinsed while they are open.

In all cases, seek medical guidance as to the next procedures. Care needs to be taken with any material involving body fluids – for both the immediate moment as well as for other people coming in contact with the material later on, such as cleaners or waste collectors – by placing it in clearly marked or specially designed bags that need to be disposed of in a safe manner.

**blood borne viruses** used to refer to hepatitis B and C

### Checklist 3.12

- 1 Describe the procedures to be taken to reduce the risk of contact with body fluids in first aid settings.
- 2 Describe the procedures to be taken in the event of contact with body fluids in first aid settings.

## Legal and moral dilemmas

First aid, or any form of aid, can be defined as any form of aid that is supplied to a person as soon after an event as possible or when they have fallen ill. This immediate care prior to the arrival of trained medical assistance can be the difference between life and death or even a complete or partial recovery with no long-term effects.

### Legal implications

There are a variety of laws and regulations that can come into play in an accident event. Occupational health and safety (OHS) laws make the safety of all

in the workplace the responsibility of everyone. If a hazard is identified, it is the responsibility of all to identify and report this to ensure the problem is rectified as soon as possible. To assist a victim at the scene of an accident and to do so in a responsible manner that assists the patient can be seen as responsible citizenship.

The important points that need to be remembered from a legal point of view when assisting a victim at an accident scene are:

- Before you can start helping a patient in any way, you need to have the patient's consent; if they do not give it, do not touch them.
- If the patient is unconscious, you have implied consent, even if it is to only put them in the recovery position.
- If the patient is under 18, you should seek permission from their parent or guardian.
- You cannot treat a patient for any more than the extent of your training.
- Once you have started treating a patient, you need to continue to do so to the level of your training and no more until trained medical aid arrives.

If a 'duty of care' exists, as in the case of a teacher, then legally this person needs to act.

## Moral implications

Legally, there is no requirement for a person to assist another during an emergency. However, moral implications present a different issue for many people. Where there is no duty of care, quite often people are hesitant to respond.

The decision to commence first aid procedures is an individual one in many cases. The majority of people would act immediately for a friend or a family member. The moral dilemma often arises when a stranger is involved. In these cases, the first aider needs to ensure that they have considered potential danger to themselves in regards to blood-borne viruses and other danger issues. As stated, once you commence first aid you must see it through to its conclusion, whatever that may be.

If a person undergoes first aid training then this may, in fact, indicate that person's willingness to assist others if the need arises, whether there is an existing relationship or otherwise.

## Common-sense versus heroics

In all situations involving danger to the rescuer, a common-sense approach needs to be taken. The person who is attempting the rescue needs to know their limitations and to act within them and not put themselves in danger. The questions that must be considered in a possible rescue situation include:

## Checklist 3.13

- 1 Debate the legal and moral dilemmas associated with providing first aid.
- 2 Distinguish between a manageable first aid situation and an emergency situation.

Do I have the skills to effect this rescue? Would it be more effective to go for more professional help? Is it better to get a person from a burning car and be injured myself or wait for the fire brigade? In the past, there have been many cases where the rescuer has become the victim, or added to the number of victims.

These are all decisions that must be made in each rescue situation, but for the rescuer to end up as injured as the patient is not a common-sense approach. In all rescue events they must be judged and the actions of the rescuer need to be within the limits of safety and common sense.

## Support following a critical incident or first aid event

Any situation that involves an injury to a fellow human being can be a traumatic experience and can affect the rescuer in many different ways. The term post-traumatic stress disorder (PTSD) is the common description of people suffering under the stress of dealing with this situation.

Signs and symptoms of stress:

- trouble sleeping
- lethargy
- loss of appetite
- lack of concentration
- flashbacks.

If not dealt with, these can develop into long-lasting problems.

## Debriefing

Immediately after a first aid event, the whole situation should be reviewed; in fact, in some organisations it is a standard procedure. The review or debrief needs to be conducted by someone of authority and is conducted in such a manner that it is not to review whether someone did the right or wrong thing, but whether the procedures were effective and to learn how to improve these procedures. Many volunteer organisations see the

debrief as a learning exercise for all members to not only improve their skills, but also their training.

## Counselling

For post-traumatic stress disorder, counselling is the best way to deal with it. Most volunteer organisations have critical incident counsellors to help their members with this, and they are always available to support. In many cases, the local doctor will either act as the counsellor or be able to point people in the right direction to professional counsellors.

Counselling and the debrief are frequently discounted as not being important, but they need

to be seriously considered by all involved in first aid events for their own continued well-being. Responsible citizenship also means keeping an oversight of all of those who were involved in the event as to their continued well-being.

### Checklist 3.14

Identify available sources of support for those involved in the delivery of emergency first aid.



**Figure 3.21** Counselling is the best way to deal with post-traumatic stress disorder

## Chapter summary

- Situational analysis is important in determining the order and priority of treatment, in particular where there are multiple people requiring first aid.
- Priority assessment is based upon the vital signs of the patient: their level of consciousness, the danger they are in and the extent of their other injuries.
- DRSABCD (danger, response, send, airways, breathing, CPR, defibrillation) provides a structure to follow for a patient who is not responsive.
- An automated external defibrillator (AED) will administer electric shocks to the heart. It is used only when the patient has stopped breathing, and will only operate if it detects a shockable rhythm in the patient's heart.
- When dealing with responsive patients, use the STOP regime (stop, talk, observe, prevent further damage).
- Performing CPR allows oxygen and blood to be circulated when a patient is in cardiac arrest, and involves chest compressions (in sets of 30) and mouth-to-mouth resuscitation (two rescue breaths after every set of compressions).
- Managing bleeding should begin with personal protection, such as gloves, sterile dressings around the wounded area and the use of disposable equipment. Bleeding can be reduced by applying pressure at the wound to restrict the flow of blood.
- A victim of neck or spinal injury should be immobilised.
- Medical referral is an important part of delivering first aid and involves keeping records of the event for use if the patient requires further medical assistance.
- Fractures are generally classified as either complicated (the fracture can damage nearby organs or blood vessels, open (bone is visible through the skin) or closed (no visible sign of damage)).
- At all times, it is important to reassure a conscious patient and regularly monitor them for shock.
- Dislocation should be managed by splinting the dislocated joint in the position most comfortable for the patient.
- Head injuries can be either open (bleeding wounds to the face or head) or closed (no visible sign of injury).
- Nasal injuries are the most common facial trauma, the signs of which include bleeding, deviation of the septum and swelling.
- Burns are classified by the surface area and depth of the burn, and are either superficial (affecting the top layer of the epidermis), partial thickness (affecting the epidermis and part of the dermis) or full thickness (through both the epidermis and dermis to the subcutaneous layer).
- When dealing with chemical burns, if possible, reference should be made to an MDS (material data safety) sheet, which will give information about the correct procedure.
- The most common chest injuries are fractured ribs, flail chest, collapsed lung and open or sucking chest wounds.
- The FAST (face, arm, speech and time) test is used to check for symptoms of stroke. Once the symptoms are confirmed, the emergency services should be contacted immediately.
- Diabetes comes in two forms – low-sugar (hypoglycaemia) and high-sugar (hyperglycaemia). If in doubt, diabetic shock should be treated as if it is hypoglycaemia, as it is a much more serious medical situation.
- When treating bites and stings, you should not apply a tourniquet, or cut or suck the bitten area.

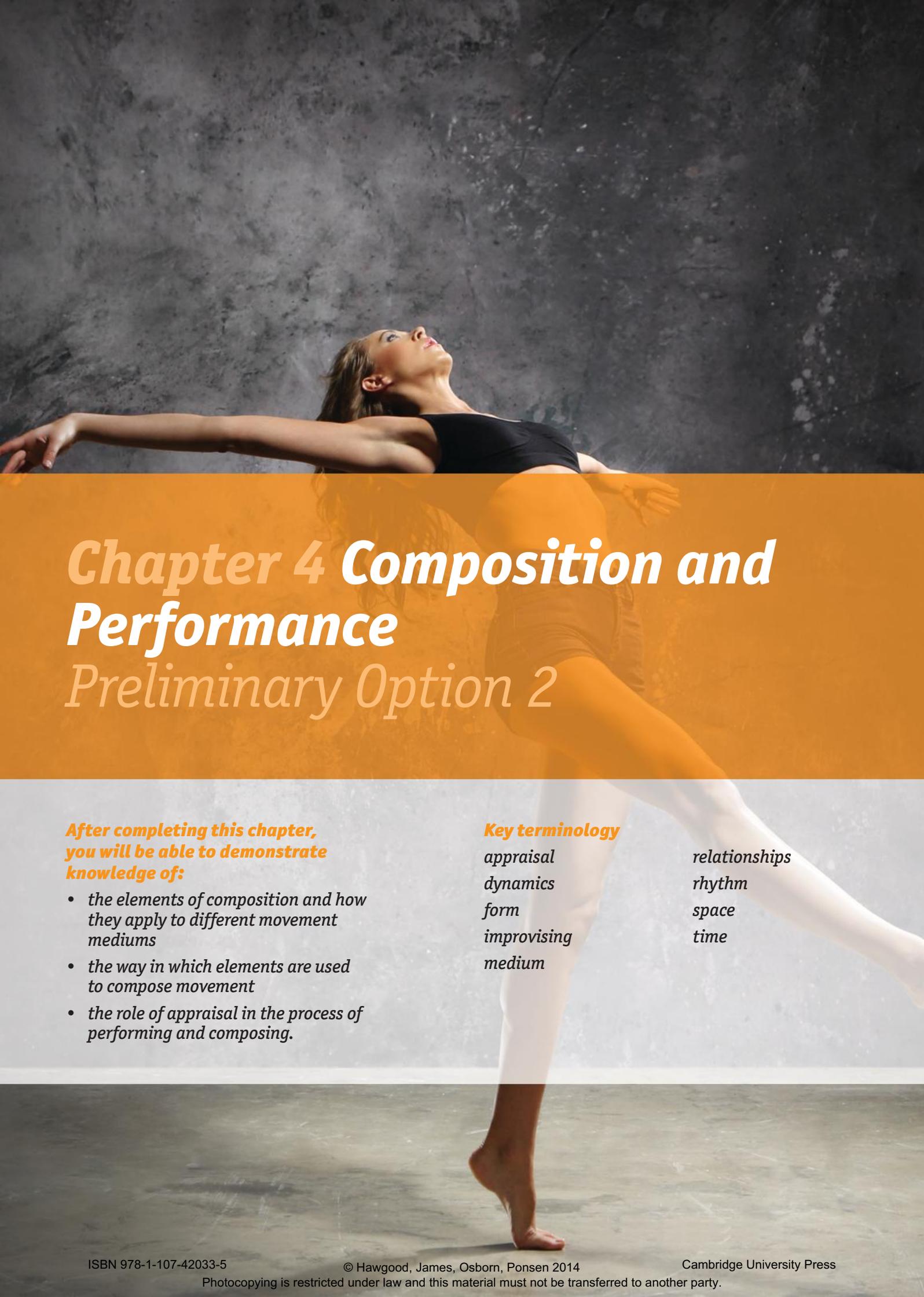
## Chapter summary

- When treating hypothermia you should warm the victim slowly and seek urgent medical assistance. When treating hyperthermia you should cool the victim with shade and cool water and also seek medical assistance.
- Whenever administering first aid, it is important to be aware of the physical environment and any potential dangers it presents before commencing treatment.
- Precautions must be taken to ensure that cross-infection is avoided, such as avoiding contact with blood and other body fluids, and using protective equipment at all times.
- If the patient is conscious, you are legally required to get their consent (or the consent of their guardian if they are under 18) before commencing first aid. If the patient is unconscious, then consent is implied.
- If 'duty of care' exists, as in the case of a teacher, then legally this person is required to act.
- Once you have commenced first aid, you must continue treating the patient to the level of your training until medical aid arrives.
- You should consider dangers to yourself before commencing first aid.
- Any event that involves injury can be traumatic for the person providing first aid, so it is important to debrief after a first aid event, and seek counselling if stress symptoms develop.

## Exam-style questions

- 1 Outline the priority assessment procedures.
- 2 Outline DRSABCD.
- 3 What are the signs and symptoms of shock and how would you treat it?
- 4 Identify the signs and symptoms of a dislocation and explain the management of the injury.
- 5 Discuss the considerations needed when managing the physical environment during a first aid situation.
- 6 Discuss the moral obligations associated with delivering first aid.





# Chapter 4 Composition and Performance

## Preliminary Option 2

**After completing this chapter, you will be able to demonstrate knowledge of:**

- the elements of composition and how they apply to different movement mediums
- the way in which elements are used to compose movement
- the role of appraisal in the process of performing and composing.

### **Key terminology**

appraisal  
dynamics  
form  
improvising  
medium

relationships  
rhythm  
space  
time

## 4.1 The elements of composition and how they apply to different movement mediums

### Driving question 4.1

How do you think a coach, composer or choreographer produces a successful performance?

Humans use different movements linked together to achieve a purpose or idea. How this movement is constructed in a particular context is called composition. Composition is the act of combining parts to form a whole to create a movement piece. The movement piece will usually have a beginning, middle and end to construct the performance.



Figure 4.1 Dancing is an expression of movement



Figure 4.2 Gymnastics is a constructed piece of movement



Figure 4.3 Coaches create movement in a team for a desired outcome

**medium** type of movement – includes dance, gymnastics, aerobics and game strategies

Movement is then expressed through different **mediums** to create performance. The elements of composition are manipulated in a way to reflect the desired outcome of the performance or game/skill.

Throughout this unit the movement mediums explored and applied are in dance, gymnastics, aerobics and game strategies. The purpose of the movement will determine how the elements of composition are put together for the desired outcome. For example, a gymnast desires the highest score possible for their routine. The coach will work to create a routine incorporating difficult skill that will also highlight the skill level of the performer.

Coaches, composers and choreographers have the task of creating movement that will result in a desired outcome. For example, an aerobics instructor will use the same elements of composition when devising a routine.

## Space

**space** the space in which a dancer/gymnast/athlete has to perform

**dynamics** the level of energy or force applied to the execution of a movement or movement sequence

Every movement and every **space** has its own **dynamics**. The space in which a dancer, gymnast or athlete has to perform in reflects the interrelationship between the performance space and the way in which this space is used. The athlete moves in the performance space as directed by the game, skill being completed or choreographic piece set. The figures created in the space may be circles, squares or triangles but

all the time conveying a message to the audience. Shapes can be formed with the whole body or one body part, individually or in pairs and groups. Angular, straight, round, twisted, flat or spread out may be the overall shape chosen for the movement. The two broad categories for shape are:

- Symmetrical: Balanced shape from side to side – creates a sense of order, control or stillness.
- Asymmetrical: Unbalanced shape – creates a sense of disorder, confusion or difference.

A performer has different types of space to consider:

- Performance space: The area in which a performance or activity occurs (e.g. a playing court/dancers' stage).
- Personal space: The space around the performer's body, which they can reach from a fixed position. The actions occurring around the individual may cause this space to either expand or contract.

## Going further 4.2

### Collaborate

Exploring the element of space, participate in a game of 3 vs 3 basketball on a full-size court. Reduce the playing area to half size and then again to within the 3-point line. Discuss how your movement changed with the reduction of playing space.

- General space: The open space shared with other people or objects. This may include equipment or props in the movement space.

A skilful athlete will be able to manipulate the spatial elements of movement to successfully complete their performance. The performer using movement to give meaning, value and interest for the audience will highlight effective use of the space.

## Direction

In everyday activities we use direction to complete basic movements. We move from one space to another by travelling in a set direction. The act of simply moving forwards or backwards often occurs without thought; however, direction can be more complex when movements such as sideways, diagonal, circular and zigzag patterns are created.

The body often dictates the path of movement by the lead of a particular body part. For example, a gymnast performing a forward roll will ensure their head is tucked under and body curves around to follow the circular path of the movement. A soccer player will move their leg from a backward to forward position when in the act of striking the soccer ball.

For the movement to have the greatest success, a variety of directions are often combined to best use the performance space. A dance, gymnastics or aerobics routine will ensure variety exists for visual aesthetics. However, often in a games context, movement may be fixed to ensure greatest success. For example, a softball player will move in a straight line to get to the next base as quickly as possible; however, their movement may be altered to outmanoeuvre the opponent if they are going to be tagged. Generally in game situations, a forward direction is used to travel towards an opponent's goal. A touch football player may use a zigzag path in their forward movement towards the try line.

The floor pattern of a dance, gymnastics or aerobics routine influences its aesthetic effect. As a performer moves through space during a dance, a



**Figure 4.4** Cheerleading uses direction to complete basic and complex movements

floor pattern will be evident. The audience will see this floor pattern not at one glance, but gradually – in time – as made by the performer. It is essential that floor patterns are kept exciting to ensure the routine maintains interest; for example, spirals or figures of eight.

## Level

Level is the height of a movement. This movement can occur on different levels within a space, either personal space or general performance space. In all movement mediums there are three types of levels:

- **Low:** This is the area from the ground to hip level. Actions within this level include lying, rolling, crouching, crawling.
- **Medium:** This is the area between the shoulders and the hips. Actions within this level include walking, running, standing.
- **High:** This is the area above the shoulders. Actions include jumps and leaping.

A variety of levels are used in performance to increase interest or demonstrate the skill of the athlete. When composing a routine, a dancer

or gymnast will use different levels in most movements. A dancer preparing to leap will run in the middle level then jump high into the air, landing back in the middle level. They may add further height to their movement by extending their arms high above their head during the leap.

An aerobics routine will display the use of level as a compositional tool in the following way:

- **Starting position:** Medium level holding a static position.
- **Routine:** High levels using star, tuck, split jumps, extension of arms and/or legs.
- **Low levels** using splits on floor, body rolls, etc.

The use of levels in games and sports is essential for athletes to experience success in their desired sport. A rugby player will use all levels in play. Tackling an opponent to the ground or involvement in a ruck occurs in low levels, while involvement in the line-out occurs up high. The choice of movement by an athlete – for example, throwing the ball – will have a different meaning when performed at different levels. A basketball player will decide whether a bounce (low) pass, chest (middle) or lob (high) pass is most appropriate for successful execution of throwing the basketball.

Athletes responding to height must also choose the correct skill for success. In cricket a player can use vertical bat strokes (low level) to play the ball with the batsman's head directly above the point of contact. At this point, the bat can either be stationary and facing straight back down the wicket – known as a block or defensive shot; angled to one side – known as a glance or deflection; or travelling forwards towards the bowler – known as a drive. Horizontal bat shots include the cut and the square drive. These are played across the mid-section of the batsman. Other situations may call for the hook shot when responding to a ball bouncing at or above chest height. The bat is swung in a horizontal arc above the body.

## Dimensions

Dimension is a measure of spatial extent. It refers to the amount of personal space that can be used in the performance or general space. The main dimensions of space are height, depth and width.

The movement that can occur within the performance space is directly related to the dimensions set by the activity/sport. A choreographer must know the measurement of the performance space to ensure all areas are effectively used but also create movement that fits the space. The type of skills, number of performers and direction of performance impact the routine devised. A smaller space may require movement to be reduced to adequately meet the set space.

Skilful performers will be able to adapt to dimensions of performance space that are different from their usual practice area. A dance group using a set area within their dance studio may not be guaranteed the same stage dimensions for their concert or competition. The perception of their own body's movement must be adapted accordingly. An open performance may also require performers to adjust the amplitude of their dance routine to ensure a successful performance. A smaller stage will require dancers being closer together and aligning arm/leg movements more closely together. However, a larger stage will require dancers to extend movements strongly to achieve long lines and spread themselves across the whole performance space.

The dimensional element of movement will impact the relationship of the body to its own parts or other objects in space. A wide or large movement is created when arms and legs are extended into the space. A small or narrow movement is when all parts are brought as close to the centre as possible. Often a performance will incorporate movement passing from one width to another. This is the process of shrinking (bending) and expanding (stretching out) movement. By exploring the space in front, behind, above and below the body, a performer can shrink, reach,

sink to the ground, bend or stretch out to create variety and a visually aesthetic performance. In a game sense, an athlete will change the dimensions of their body in response to other players or objects. Often a player in defence will extend their arms above or in front to block a shot or have a wide stance to reduce the space available for their opposing player. Similarly, when attacking, an athlete may bend down and shrink their body position to use less space. In touch football, an attacking player will keep their movements small to dodge duck under an opponent to score a try. A defender will fully extend their arms to be ready to make the tag.

Dimension can also be analysed in terms of the playing space. This significance is highlighted in court and field games where governing bodies dictate the exact measurements of a court size according to specified criteria. For example, in soccer, the field is much larger than for futsal on an indoor court. The diagrams here highlight the difference in field size between 11-a-side soccer and futsal.

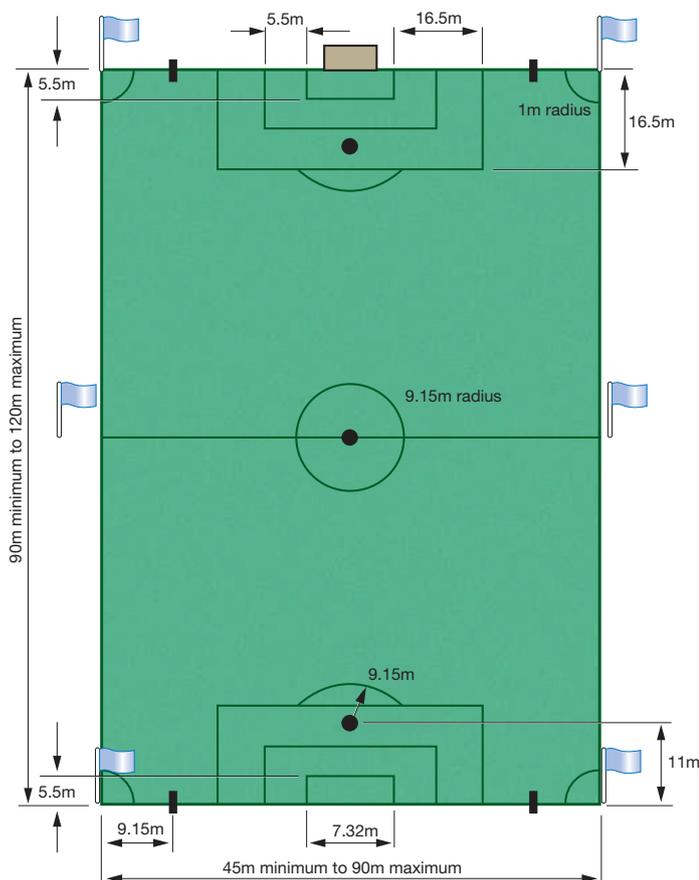


Figure 4.5 Dimensions of a soccer field

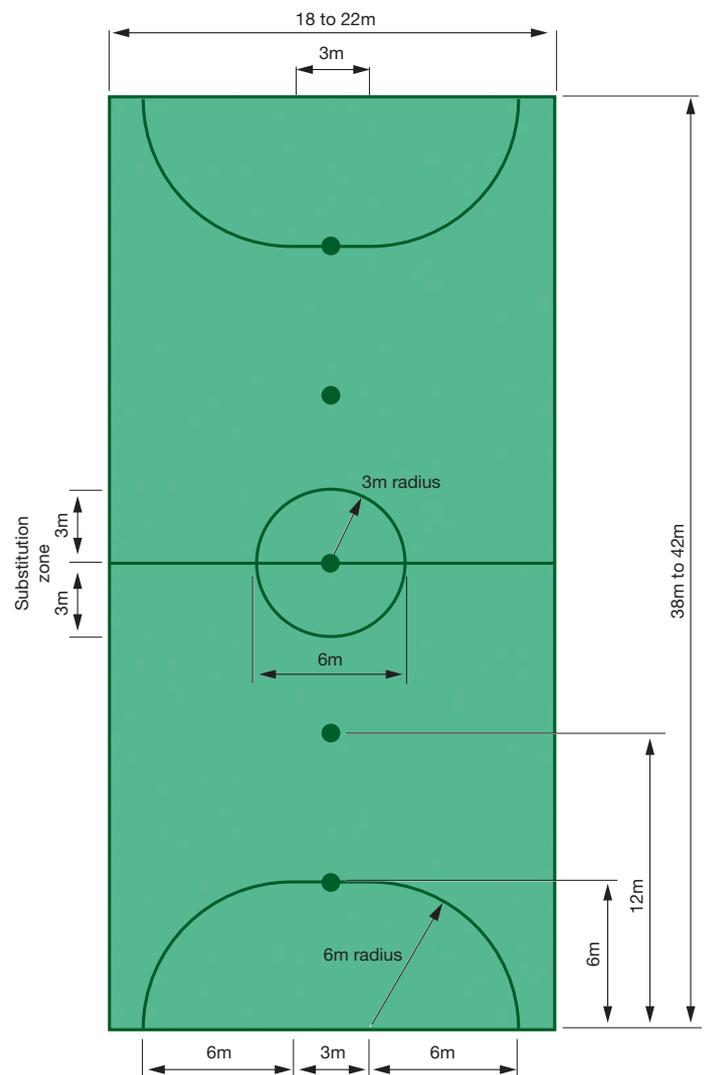


Figure 4.6 Futsal (indoor soccer) field dimensions

Court or field dimensions can also be altered according to the age or size of the athletes. Children's sports, for example, often involve reduced court and field sizes and have lower and smaller goal posts to accommodate their smaller size.

Players and coaches need to adjust their tactics and movements in order to make the most of different spaces.

When performing on stage or field, an athlete needs kinaesthetic sense or body awareness in relation to their movement space. Kinaesthetic sense is the perception of the body's movements that are gathered through receptors in the tendons, muscles and joints and relayed to the brain. A kinaesthetic awareness will increase the chance of successful performance as the athlete can more accurately direct and control their movements and also learn movements demonstrated to them.

## Patterns and formations

Patterns are the imaginary floor lines or pathways made by a performer as they move from one point to another. They vary according to the chosen path



**Figure 4.7** A water polo player changes the dimensions of their body, raising their arms up, to reduce space for the opposition



**Figure 4.8** Dancers will adjust their movements depending on the space available on stage

## Going further 4.3

### Inquire

Participate in a sports game of your choice. Imagine you are the coach of a team in this sport. Demonstrate and record ways the players on the team could create space while participating in this game.

- 1 How is space used in gymnastics?
- 2 Describe a sporting example where changing body shape will determine a different outcome for the athlete.

## Going further 4.4

### Collaborate



**Figure 4.9**

- 1 Using the above image, describe how direction and formations can be varied to design a simple aerobics routine.
- 2 Choose either a simple aerobics or dance routine. Manipulate the movement piece of the elements of composition to highlight the use of directional change.
- 3 Get your partner to write down the exact directional changes made between your first and second routine.
- 4 What impact did this have on the visual appeal of the routine?

and may be straight, angular, curved or twisted patterns, or combinations of these four basic movements such as square, circle, zigzag or spiral.

A pattern can also be created by a piece of equipment. During artistic floor routines a gymnast will throw the apparatus into the air, tumble and then catch it in one movement. The flight of the apparatus and the tumbling of the gymnast both create different patterns. This is a designed pattern where the movement sequence was planned. Another example of a designed pattern is when a Rugby League team practises set positional plays they will execute during a game when attempting to score a try. However, when a winger runs down the side of the field, then quickly changes direction to 'get around a player', this is known as a spontaneous movement pattern. Coaches will use patterns to strengthen team plays, highlight weaknesses and create individual player profiles for greater success.

Formations are made while performing offensive moves, defensive moves or movement phrases designed by the players or performers. Fixed routines are evident in dance, gym and aerobics as well as in sports contexts. Many dances have set formations that follow a specific floor pattern for the entire dance. Bush dances incorporate long rectangles, square dancing uses squares and circles are used in folk dancing. An aerobics routine will tend to change formations every eight seconds using different shapes, directions and patterns.

Formations within a game sense are frequently used in offensive and defensive play. Zone defence

is commonly used in basketball in response to the positioning of opposing players. Coaches must successfully use players' skills to dodge, out run, change directional play and weave in an attempt to successfully counteract the strategies of the opposing team.

## Dynamics

Dynamics is the level of energy or force applied to the execution of a movement or movement sequence. Energy propels or initiates movement. The magnitude or intensity of the energy exerted, expanded or released is force. By interchanging the play between these forces, dynamics can be created in movement.

To treat movement dynamically is to impart to it various shadings of intensity. It involves the control of energies imparted to movements, to the duration of the gesture and the distance it travels in space. A single movement such as the lifting of an arm can be changed dynamically when it is varied from weak to strong, from slow to fast, from moving upward a small distance only to extending it to its fullest reach. When the dynamics of a movement are changed, the entire feeling or tone of the movement is altered.

## Force

Force (composition and performance) refers to magnitude or intensity of the energy exerted, expended or released. The amount of force given will directly affect the quality of the movement. The effective application of dynamics in performance will be evident by the contrasts that exist: weak, strong; slow, fast; explosive, jerky.

Force can be generated by the performer or be a reaction to force applied by an opponent or object. Some movements require a greater amount of force than others to be successful. A gymnast completing a handspring vault must apply force during the run up and jump onto the beat board, then use this force to propel through the air and again apply force off the vault, then absorb all force with a solid landing by bending their knees. Other movements require less intensity for successful completion. For example, a golfer who is about to putt the ball.

Movement can be described as strong or weak. It is merely the application of force applied to a movement. Strong movements require a high degree of energy to complete them. This energy can be released continuously and evenly; for example, a 1500 m track event or in a sudden, explosive action as in a 100 m sprint start. Basic movement can also be performed strongly, like jumping, striking and

### Summary 4.5

Define and provide examples of:

- direction
- level
- dimensions
- patterns and formations.

### Checklist 4.6

Using a variety of spatial elements, complete the following.

- 1 Perform space in dance and gymnastics.
- 2 Create and reduce space in games situations.
- 3 Design a simple aerobic routine by varying direction and formation.

kicking. A dancer can apply strong intense body movement to portray anger, power and conviction. Using less intense actions will portray softer, lighter, flowing movements and passive, gentle emotions. A skilful choreographer can vary the intensity of movements through a dance routine to tell a story or convey a message.

Skilful players and dancers can effectively manipulate the amount of force given to a movement to achieve successful performance. Often jerky movements are the reaction of unskilful performers reacting to force applied to them. Absorbing force successfully uses the whole body as a sponge to silence the movement without interrupting the result; for example, catching a baseball and absorbing the force into the hands and body.

## Flow

Flow is the movement of the body or an object through space and time. The movement elements that best describe flow are bound and free, and movement can occur on a continuum between the two.

Free flow is simply allowing the body movement to flow unhindered or uninterrupted. This type of movement is difficult to stop and the athlete is generally not attending to any cues. This type of flow is generally displayed by more skilful performers, who can take risks successfully and automatically complete the movement rather than having to think about what they are doing. Their body flow becomes fluent and feels like an outpouring of skill. This is commonly seen

## Going further 4.7

### Create

A school has decided to host a dance competition with other local schools. Each dance group has been asked to compose a routine titled 'Emotions'. Describe how the dynamics of movement can be altered in dance to represent emotions, such as anger or sadness.

## Summary 4.8

Define and provide examples of:

- force
- flow.

## Checklist 4.9

Identify how changing dynamics can achieve specific purposes.

among dancers when performing an **improvisation** task (that is, creating spontaneous or unplanned movement).

Bound flow movements are those in which energy needs to be restrained.

This will be required in situations where one movement needs to be restrained to allow another movement to occur. For example, when a soccer player stops running so that they can focus on shooting a goal, the running movement is controlled or *bound*. Bound flow is also often seen when a performer is learning a new skill or movement sequence and will stop and start in practice as the new skill is mastered.

**improvisation**  
performing  
with little or no  
preparation

## Time and rhythm

Time and rhythm are essential elements of movement in all mediums.

**Time** refers to when the movement occurs and for how long. **Rhythm** describes the way in which the movement is organised according to patterns or sequences.

The successful execution of a dance, gymnastics routine or sports skill is directly related to time and rhythm. Without these elements movement will appear uncoordinated and ineffective:

- musical applications (e.g. beat, tempo, accent)
- duration
- momentum
- self-paced versus externally paced
- timing.

**time** refers  
to when the  
movement occurs  
and for how long

**rhythm** the  
way in which  
the movement  
is organised  
according to  
patterns or  
sequences

## Musical applications

Movement in artistic sports relies heavily on musical accompaniment for performance. Dance, gymnastics, cheerleading, aerobics and synchronised swimming use the musical elements of time and rhythm to create a movement piece. There are a number of concepts to consider:

- **Beat:** This is the basic underlying pulse that is continuous throughout a piece of music.

## Going further 4.10

### Create

Improvise freely by yourself, simply being aware of the speed of your motion. Try abrupt changes from fast to slow. Try gradual acceleration. Try coming out of a very fast movement immediately into a very slow one.

It occurs at regular intervals, usually represented by a musical note that describes the timing of the beat. The beat can also be irregular, representing instability.

- **Bars:** Beats are often grouped together to form bars. These are beats that are grouped into a recurring unit. Usually bars are two, three or four counts per bar, and each has a distinctive feel. For example, bars with four counts resemble a march; bars with three counts suggest a waltz.

- **Tempo:** Tempo is the speed of the beat. It gives the performer an indication of how fast the movement is to be performed. Tempo can be constant, creating a steady predictable pulse, or it may vary to create a different mood. For instance, a faster tempo may help to communicate excitement or fear.
- **Accent:** This is the emphasis (stress) put on a particular beat within a bar. This is usually at the first beat of the bar but can be varied to create interesting **syncopation**.
- **Rhythmic patterns and phrases:** Within music or movement, there are often repeating patterns that create structure or meaning to the performance. For example, a waltz is a repeating pattern of 'one-two-three, one-two-three'. Alternatively, the structure may be more phrase-like. A bush-dance may involve a sequence of movements (e.g. heel and toe, heel and toe, slide, slide, slide, slide). There is a natural beat to this sequence and it is an example of a rhythmic phrase that repeats throughout the dance.

**syncopation**  
accenting a normally weak beat in a bar to create an unusual stress pattern



**Figure 4.10** Dancers give their dance a mood depending on the tempo of the music

## Duration

Speed and duration are interrelated. Duration refers to how long it takes to perform a movement or the time in which a movement must be performed. A fast movement has a short duration. A single movement of long duration will understandably be slow. Sometimes movements are repetitious, though a series of fast movements can last for a long time. A successful choreographer considers quick, moderate and slow aspects of movement and tries to use them in forming interesting time patterns, which are relevant to the routine. It is necessary that the total length of the routine communicates the ideas or set criteria of the performance piece. Routines that are too long lose their impact, and routines that are too short either leave the audience surprised and wishing for more or puzzled, not having enough time to understand the meaning.

Sports coaches must also ensure set game plays are of suitable duration to be effective in the game. For instance, attacking in a Rugby League game on the opposition line must be short and precise to outmanoeuvre defensive players and score a try. Coaches also use certain rules to slow down the rate of play if the players need time to refocus and gather a defensive position; for example, time out in basketball.

Duration also directly affects the length of time in which players must complete movements. Netball Australia, for example, dictates four 15-minute quarters. There is a three-minute break

between the first and second quarter and the third and fourth quarters. The half-time break is five minutes. Injury time is up to two minutes. A player must pass the ball or shoot for goal within three seconds of receiving the ball.

## Momentum

Momentum dictates the speed at which a movement is performed. The movement constantly undergoes changing speed, either accelerating or decelerating. The type of movement to be performed is directly related to speed in determining the success, safety and outcome. An athlete learning a new skill may start off slowly then gradually increase the speed as the skill is learned.

Momentum is increased for sprinters in all sports to reach their desired outcome as quickly as possible; for example, the 100 m sprint in athletics. Other movements may require the momentum to be slowed to ensure a smooth transition to the next movement; for example, a dancer performing pirouettes to move into a chassé.

In most movements speed is not constant. It is either accelerating or decelerating depending on the skill/sport. The control of movement exhibited by the athlete or team dictates their expertise. Team sports often use momentum to control play or confuse opponents into mistakes.

## Self-paced versus externally paced

Movement has been examined by timing and control; however, the impact of the environment in which the movement is performed also determines the extent to which an athlete can control their performance.

Movement can be influenced by two main factors:

- 1 **Self-paced:** Skills where the performer has control over timing, including the beginning and end of a movement. The environment is stable and predictable and the athlete has time to make decisions. They decide the pace at which movement should occur. Examples include a tennis serve, discus throw, swinging a golf club.
- 2 **Externally paced:** Skills where the pace and timing is controlled by outside influences. The environment, music or opponents determine the time and control of movement available to the performer. Movement is in response to an opponent, ball or musical rhythm, etc. The unpredictability forces the performer to respond in a variety of different ways, which may or may not have been practised. For example, weather, playing surface, playing a shot in cricket, tackling a player in soccer, executing a set play in Rugby Union.

## Timing

For a dance, gymnastic or aerobics routine to successfully achieve the desired outcome in a performance, the timing of the choreographed moves must be perfect. This becomes vital when movement is performed to music, as an out-of-time performer is glaringly noticeable. It is glaringly obvious when a dancer is out of time with the music. A choreographer will choose music of a speed at which the performer can stay in time. This is essential to the aesthetic appeal of the dance or routine. Timing can also be manipulated to create a visually appealing performance such as pausing then quickly moving. Timing is also important when performing in pairs or a group.

Timing within a sporting context is essentially the same. An athlete must time their pass or shot in response to the flow of the game, or swing the bat at the appropriate moment to contact the ball

## Going further 4.11

### Inquire

- 1 What is the role of rhythm in dance and aerobics?
- 2 How could dynamics add quality to a dance performance?
- 3 Why is timing important in games? Investigate how rhythm and timing relate to sports movements (e.g. golf swing or running tempo) and compare this with its application in dance, gymnastics or aerobics.
- 4 Select a sport and discuss the use of team formation in offence and defence.
- 5 What is the difference between self-paced and externally paced movement? Discuss the impact each would have on the process of composing movement in games.

## Summary 4.12

Define and provide examples for:

- musical applications
- duration
- momentum
- self-paced timing
- externally paced timing.

## Checklist 4.13

- 1 How do rhythm and timing relate to different movement mediums? Provide one example for dance, gymnastics and games.
- 2 How do self-paced and externally paced activities affect the composition of movement?

in softball. A diver must time the force applied to the diving board to gain maximum height so that all skills are completed before they make contact with the water.

When a skilful athlete is familiar with their game, various situations within the game and with opposing players, they can predict performance and respond appropriately. This is known as

**anticipation** the ability to predict to various cues and to respond accordingly

**anticipation** (e.g. when a footballer intercepts a pass and scores a try). Anticipation is better developed among more skilful performers.

**relationship** how the performer's body parts relate to one another when moving and how the mover relates to individuals, groups, apparatus, objects and other factors such as rhythm, music, boundaries and rules

## Relationships

The **relationship** a performer has with their movement space has a focus on with whom or with what the body is relating as it moves. It is how the performer's body parts relate to one another when moving and how the mover relates to individuals, groups, apparatus, objects and other factors such as rhythm, music, boundaries and rules (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)).

The message expressed by a performer during movement is dependent on how they manipulate movement with their own body, the movement space and the timing of movement in relation to other performers. The energy assigned to each movement generates curiosity for the audience.

The human body is an impressive machine and it is easy to overlook the coordination of individual body parts when one observes an athlete in motion. In reality, there are many different body parts that may be working together, or quite independently. The athlete's ability to manage separate body parts in the pursuit of a single objective will be crucial in determining success or failure.

The relationship between body parts is important in developing technique. For example, a swimmer must be aware of several different

body parts, and orchestrate them, in order to move forward through the water as efficiently as possible. Arms and legs must move at different speeds (e.g. freestyle with a two, four or six beat kick) while the body rotates along its long axis to minimise drag.

Body parts (or individual performers) may move in unison (same movement at the same time) or in contrast (different movements at the same time). Using swimming as an example, the butterfly stroke is an example of arms moving in unison, while in freestyle, the arms work in contrast – as one arm strokes, the other recovers.

The points of contact that are made during movement directly influence the outcome. For instance, the placement of a gymnast's feet upon landing during a floor routine will influence how the body is positioned in preparation for the next movement. In the same way, the point of contact of a racquet on a ball will determine where the shot is played.

Sometimes there may be multiple points of contact and all can influence the movement pattern that is created. For example, where several players tackle another player in rugby, the way that each player's body makes contact will determine where and how the tackled player will fall in relation to the tackler.

## Other people

The relationship a performer has with other people directly impacts the quality of movement that can be created. A dance troupe or team will be successful if they are cohesive and can use teamwork for a common purpose. The movement language spoken between performers can be verbal or non-verbal. Verbal language is demonstrated by player calls, encouragement or informing of a defender approaching. Non-verbal language might be expressed through facial expression, gestures or hand movements. In dance and gymnastics non-verbal language powerfully portrays the message of a performance. In baseball, non-verbal cues are used between the pitcher and catcher.

The following are the people a performer can have a relationship with.

### Audience

The choreographer's goal is to create movement that will deliver a story or message through physical movement. The dancer, however, must continue this connection with the audience by subtle or obvious gestures, eye contact, proximity and costumes. A connection is vital for successful performance.

A relationship may already exist between the audience and performer when the audience supports the team or country of the athletes they



**Figure 4.11** Figure skating pairs use lifting and catching skills to execute movement skills

are watching; for example, their local AFL team or their country in the Commonwealth or Olympic games.

### Performers

In group situations, the relationship of the performers within the group or team directly impacts the quality of performance. The choreographed moves of a dance or aerobics routine will place performers in set positions and they must be in this position as dictated by the routine. This relationship is expressed through various movement patterns such as canon, performing the same movement at different times; unison, moving at the same time; or contrast, the slow versus fast speed of movement.

### Opponents

A skilful performer will study their opponent to anticipate their movements in competition. They can use video analysis and game strategies to outmanoeuvre them in future encounters.

### Team members

An effective relationship between team members is evident when all members are aware of their purpose and role within the team. The ability to rely on team members in set plays, blocking a ball or receiving a pass gives advantage to the entire team. Trust and communication must exist so that if a strategic play must be adopted all members can adapt to put another tactic in place.

### Partners

These intimate relationships require each person to perform to the best of their ability for successful execution of movement skills. Often partner relationships involve lift and catch skills; therefore, the performers require a high degree of trust and communication. The strength of a partner performance is evident when emotive movements are integral to the performance; for example, a love story expressed in the ballet *Romeo and Juliet*.

### Apparatus and equipment

The way the body uses apparatus or equipment specific to a movement medium will directly govern the success of that movement. The relationship between the body and the manipulation of equipment must be perfected for successful performance in game situations. Poor manipulation and control may reduce performance; for example, a hockey player with poor racquet control or a baseball player with a bat that is too heavy.

Equipment such as racquets, bats and clubs can be used as an extension of the body and act as a lever for performance. They can increase the amount of force applied and absorbed in a movement. As an athlete becomes more skilful, they can make this relationship appear effortless. A lacrosse player can use their stick and basket to outmanoeuvre opponents.

If an athlete incorrectly uses a piece of equipment or apparatus, performance will be



**Figure 4.12** The pommel horse is an apparatus that requires precision in its use to avoid injury

negatively affected. Gymnasts must be able to use various apparatus such as rings, vault, beam and bars. They must also manipulate moving apparatus for rhythmic gymnastics to keep flowing movement to score maximum points. A dancer will use various pieces of equipment to add to their performance and help express meaning in their movements (e.g. hats, chairs, scarves).

### Team formations, positional play, partner work

The understanding an athlete has regarding team formation, the position they hold in the team and specific skills executed within that role will determine the success of the team. This involves being in the correct position, executing strategies for offence and defence and capitalising on individual strengths. The manipulation of the elements of composition within each medium will determine the creativity and success of the performance.

#### Team formations

Positional play can create scoring and slow or speed up play in a game situation. The team formation and set plays or moves are influenced by the position of players, the game plan, and number of players on the field, weather and tactics of the

opposing team. In soccer a team formation may be attacking with a 4–3–3 setup, or use a 5–3–2 setup in defence.

The application of team formations is very much dependent on the game conditions, available players and the opposition.

In dance and aerobics, formations are used to create visual appeal and interest. Choreographers will move performers into different formations to highlight various skills and requirements of the routine. Aerobics uses strength and flexibility to vary team formations.

#### Positional play

In field sports, most players identify a position in the game where they may specialise to enhance the team's overall performance and success. Many sports have offensive and defensive players with each player knowing what they are doing and the appropriate move intended for their position. An attacking player will aim to get the ball to score, whereas a defensive player is mostly concerned with preventing any scoring attempt by the opposition.

#### Partner work

In dance, pair ice-skating and aerobics, partners work towards their shared objective of a perfect performance. Various combinations of space, unison, contrast, shadowing and mirror are used to achieve creative and appealing routines.



**Figure 4.13** Team formation on a soccer field

## Going further 4.14

### Create

- 1 Evaluate how rhythm and timing relate to two different movement mediums that you have studied.
- 2 Describe how the elements of composition can be manipulated to plan an attacking move in a chosen sport.
- 3 Select a movement medium. How is each element used to compose movement in this medium?
- 4 Analyse the purpose of the following group formations: A defensive strategy in a games context versus a transition in a dance sequence.
- 5 Complete the following compositional task to create a movement piece:
  - start in a low shape
  - rise to a parallel balance
  - turn and gesture
  - perform two high-level moves
  - travel and leap with firm and light qualities
  - stretch and contract with firm tension
  - swing, give into gravity and move to the floor with free flow
  - support your weight on one arm and one other body part
  - rise and gesture with one arm
  - travel in a circular pathway using a combination of skips, hops, runs and a jump with a shape
  - balance on one leg
  - travel using a combination of turns
  - finish in a static position.
- 6 Write your thoughts in the form of a journal entry describing your feelings and how you came to the end of the movement piece.

## Summary 4.15

Define in terms of relationships:

- other people
- apparatus and equipment
- team formations, positional play, partner work.

## Checklist 4.16

What is the purpose of various group formations across the various mediums? Provide an example for dance, gymnastics and games.



Figure 4.14 Ballet dancers in formation

## 4.2 Understanding how the elements are used to compose movement

### Driving question 4.17

How does a choreographer use the elements of composition to create and arrange a super performance or routine?

### Going further 4.18

#### Create

With a partner, improvise a movement piece in your chosen medium that communicates a message. You must not use spoken language to convey this idea. Report back to the class by performing your movement piece.

### The process of creating movement

The process of creating movement begins after the elements of composition have been examined. These elements, or building blocks, are used specifically within their medium to create movement, routines and strategies. The desired outcome within the chosen medium is possible when variations of spatial elements, dynamics, time, rhythm and relationship are practised. Careful planning is required in creating movement as it can be used to communicate an idea or message, solve a problem or score a goal. For example, in dance, a choreographer will manipulate the stage space, relationship between the dancers and movement pattern to create performance. A touch football coach will use similar principles to create attacking sequences with combinations of players, their positions and formations to break defensive lines.

When using the elements of composition to create movement, a number of factors are important to consider:

- defining the purpose or motivating factors
- generating movement relevant to the purpose
- exploring variations to known movements and combinations
- learning skills that relate to the purpose
- selecting and refining movements.

When creating movement a choreographer will consider the skill level of the performer to decide what elements of movement are included.

Using the kinaesthetic sense of the performer and their ability to **improvise** movement also contributes to overall routines created.

**improvise** to spontaneously perform or compose, often guided by a prepared structure

### Defining the purpose or motivating factors

The first step when creating movement is to consider: 'Why are we doing this?' From here the intentions of movement and purpose can be clearly defined. For example, in netball the purpose is to score the highest to win; however, other sports require a low score to be the winner, such as golf, individual swimming and track events.

The movement medium will directly determine the purpose of the movement to be created. Some of the purposes of movement include:

- to score
- achieve personal-best results
- win
- aesthetic appeal
- entertainment
- communicate idea/message
- inspire others
- display high degree of difficulty
- outplay opposition.

In the mediums of dance, gymnastics and aerobics, the following are stimuli that are used to rouse the mind and initiate and create activity:

- Auditory stimuli: Music (mood, style, length, phrasing), percussion, human voices, words, songs, poems.
- Visual stimuli: Pictures, sculptures, objects, patterns, shapes, etc.
- Kinaesthetic stimuli: Making movement about movement itself (e.g. gestures).
- Tactile stimuli: Material (smooth, swing, manipulated by dancers).
- Ideational stimuli: Convey a story or idea.

### Generating movement relevant to the purpose

There are basic movements that are integral to all movement mediums. The choreographer or coach must select skills of the appropriate skill level for the performer and that reflect the purpose

of the intended movement. The basic skills of movement are:

- **Locomotor:** Skills that involve moving from place to place. Basic walking, running and jumping to more coordinated moves such as leaping, tumbling, sliding and dodging.
- **Non-locomotor:** Skills performed on the one spot around the same base of support. These include twisting, swinging, bending, balancing, rising, falling, stretching and squatting.
- **Manipulative skills:** Skills involving the control of objects. Often used in conjunction with loco and non-locomotor skills. These skills include striking, rolling, heading, batting, catching, kicking and throwing.

The degree of difficulty and complexity of the skills to be incorporated into the movement piece will be chosen in conjunction with the skill level of the performer/s. When forming a gymnastics routine, the choreographer may incorporate skills with a high degree of difficulty to score the highest amount of points. If the athlete is not skilful enough to execute the routine effectively, this will defeat the purpose of the routine.

Apart from considering the type of movement to be included, the manipulation of the elements of composition must also be considered when generating movement relevant to its purpose. In rhythmic gymnastics, the dynamic, spatial and timing elements are considered, along with the relationship of the ribbon with the gymnast.

It is helpful for a choreographer to give freedom of movement to the performer when rehearsing so the purpose can be owned and portrayed accurately to the audience. A coach will devise appropriate team formations and strategies to suit the state of play. Groups and teams must also work together in a unified way to ensure all movements of the piece or game strategy are coordinated and efficient.

## Exploring variations

If all movement was predictable and similar it would lose value for the audience and eventually the athletes themselves. Choreographers and coaches have the task of encouraging performers to extend and vary their movements. This helps to make a movement phrase or game strategy more creative or interesting.

Variation to known movement combinations can be simple or complex in nature. A gymnast can vary the dimensions in which they complete their skill in using roll, twists, leaps and tumbling as opposed to performing these skills in the vertical dimension. An aerobic routine can take the basic side step and add a double touch or curl to give variety. The choreographer can manipulate music tempo and

intensity of moves (strong, soft) and direction of travel for creative interest.

A coach can give variety to known game strategies by manipulating the speed at which they are performed and different attacking and defensive patterns to give their team advantage. The pace of play, angles of run and flight direction of the ball contribute to the variation in play.

Coaches and choreographers manipulate elements of composition to build and create new pieces of movement. The freedom to perform movements on different beats, at different times or in different patterns is the beginning of new and exciting moves.

## Improvising

Improvisation is performing with little or no preparation. Often it is initiated by a certain stimuli, with a spontaneous response and the creation of new movement. Rather than combining movement in an awkward or rigid manner, skilful performers will consider how the moves flow and connect in the created piece. Less inhibited performers experiment with space, shape, force and flow. The movements will gel together with a beginning, middle and natural completion of movement.

During improvisation there are moments when a movement 'feels right'. When this occurs, the improvised movement phrase can be recaptured to provide the basic ingredients for the movement piece. This process is repeated until the choreographer is satisfied that the movement piece has a natural ending.

In a game sense, an athlete can use improvisation to make a play work. The opposing team may create an unpredictable factor that prevents the practised set play from occurring. A skilful player will be able to respond to this and create a play to make their movement and team successful. It is important for training sessions to simulate opposition moves for players to practise these sorts of situations in readiness for them occurring in a game.

## Learning new skills that relate to purpose

A performer may be asked to complete a movement pattern or sequence that they are not familiar with. If a performer has a strong understanding of the basic fundamental skills required for their performance, then they will understand the importance of learning new skills to develop into a more skilful player. These new skills may be working on overcoming weakness or simply the logical progression of an existing skill or movement.

Gymnastics, dance and aerobics have overlapping skills that can be used within each of these different mediums to complete a performance. A range of complementary skills is useful to expand the repertoire of the performer. For example, different levels, arm shapes and speed of movement might be used. A dancer may adapt the strength of an aerobics routine to perform more powerful movements. Gymnasts often rely on dance techniques to enhance performance.

## Selecting and refining movements

The process of selecting and refining movement in dance, gymnastics and aerobics is very important. This process examines the purpose of the movement; for example, did the routine meet the criteria and intended result? This is often determined by age, skill level and experience of the performer. This analysis allows coaches and choreographers to develop skills in a sequential manner.

### Going further 4.19

#### Create

- 1 Use the following task to explore and extend your movement repertoire in a new movement medium.
- 2 Use the following quote by Marcel Marceau to create movement: 'In silence and movement you can show the reflection of people'. It must:
  - have a clear beginning, middle and end
  - be a maximum of three minutes of unified movement
  - have one instance of repetition, unison, canon, action and reaction.

### Checklist 4.20

For a selected medium:

- 1 Which elements of composition relate to the purpose of dance?
- 2 Which elements of composition relate to the purpose of gymnastics?
- 3 Which elements of composition relate to the purpose of games?

The refining of movements will also consider the choice of music for the performance. Were the performers able to keep in time? Did their movements 'speak' the language of the selected music? Was the audience able to connect and engage with the performance? Asking these questions enables the growth and development of the performer in their chosen medium.

In a game situation, patterns of play and movement skills are practised but ultimately it is the athlete who will decide which are to be performed during competition. An athlete may work in conjunction with the coach or strategist in refining team plays, or rely solely on what they are told to do for team success.

## The process of combining and arranging movement

It is important to understand the process of combining and arranging movement in each of the mediums of this chosen unit. The movements used in performance, when combined together into a pattern or structure, create phrases. These phrases are formed into sequences and finally linked together to create the final routine. This section examines how movement in each medium is arranged.

## The rules and conventions of the medium

There are certain rules and conventions that define the type of performance created in each of the mediums. An analysis of these mediums will highlight the characteristics relevant to individual skills.

### Dance

There are many types of dance with no direct rules impacting on a performance. It is the role of the choreographer and dancer to explore movement.

The various styles of dance are determined by how the body is used to express feeling or action. The body and expressive style of the movement is the basis for a dance performance. Based on these two common factors, consider the ways in which the following different styles can be grouped:

- Cultural/tribal dance: It is reflective of culture and storytelling from tribal origins.
- Traditional dance: Folk, square, bush dancing.
- Social dance: It is for socialising, thus usually performed with a partner or in groups (e.g. Latin, hip hop, ballroom, new vogue).

The following dance disciplines have set steps that must be performed in a routine. If competing, the specific requirements must be included in the routine:

- Performance/technical dance: This requires a high level of skill (e.g. classical ballet, jazz, modern/contemporary, character, musical theatre).
- Twenty-first-century dance: Bollywood, krumping, Zumba.

### Gymnastics

The execution of skills, arranging movement sequences and deductions taken during judging are the main concerns of gymnastics. The different forms of this medium are:

- Artistic: Floor and various pieces of apparatus.
- Rhythmic: Gymnastic skills manipulating either a ribbon, club or ball.
- Trampoline: Large and double-mini trampoline.
- Educational: Exploring movement and gymnastic skills.
- Acrobatic: Paired and group routines, incorporating aerial manoeuvres.
- Cheerleading: Choreographed routines using gymnastic, acrobatic and dance skills.

There are strict rules that a gymnast must comply with when competing in certain competitions. For example, in rhythmic gymnastics:

- Competitors are required to use the entire floor area during their routines.
- They should not favour either hand during the routine, instead maintaining a balance between left and right-hand work. The apparatus should remain in motion constantly.
- There is a time limit of 75–90 seconds for each routine, with 0.05 of a point deducted for every second over or under the limit.
- Each routine must end with the apparatus touching some part of the competitor's body. The routine and music must end simultaneously.
- Coaches are forbidden from communicating with the gymnast, musician or judges during a routine.

In rhythmic gymnastics there are three judging panels: technical, artistic and execution. The technical judges assess the level of difficulty within the routine, giving a mark out of five for the individual event and four points for group events. Artistic judges look at the routine's choreography, musical accompaniment choice of apparatus, body movements, originality and mastery. They also give a mark out of five for individual routines and six for group events, which are weighted more heavily in favour of artistry. Execution judges look at the precision of apparatus and body movements, looking at expression and technical faults. In both individual and group events, the execution judges give marks out of 10.

In the individual event, the marks are added to give a score out of 20, which is then halved to give a score out of 10. For group routines, the total score

is not halved, and remains out of 20. For more information about rhythmic gymnastics, check out the ABC Olympic Games website (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)).

### Aerobics

Aerobics includes general aerobics classes for fitness and competitive aerobics. There are many fitness aerobics class styles including body pump, combat, step, Zumba, CX works, sha'bam and body balance. These cater to a wide variety of ages, skill and fitness levels and specific needs. The moves are completed to music and classes are arranged with a number of workout songs highlighting different body parts or fitness components.

Competitive aerobics requires a routine of 90–110 seconds with four compulsory moves to be performed: crunches, kicks, push-ups and star jumps. Each must be performed at least four times consecutively and be identical in execution. Other moves are permitted in the routine but are not to be of a gymnastic nature.

### Games

The elements of composition are directly impacted by the rules that govern various sports. These rules dictate where and how movement occurs, and what and how it is to be performed. Each game has specific rules that govern the play of the game. When considering the element of dimension in space when composing movement, it differs significantly between sports: in netball the court is in thirds; in touch football there's a five-metre line in defence; and in basketball a three-second rule applies in the key.

An athlete may find it difficult to move between games that have differing rules and conventions. A basketball player may find the limiting space and foot movement restrictions of netball difficult.

### Sequencing

Sequencing is the organisation and structure of a movement, the arrangement and alternation of different phrases, sections and sequences with different qualities. A number of movement sequences are arranged by the choreographer or coach to become the final composition or team play. They are usually joined together by connecting phrases. It is like a story that has a beginning, a middle and an end.

Sequences can be formed in game situations in isolated or whole situations. For example, a kick at the goals in Rugby Union or a serve in volleyball can be considered in isolation. As more skills are required to complete a movement the sequence becomes more complex. A netball team will use a series of offensive passes to bring the ball from the

## Going further 4.21

### Inquire

Research one type of aerobics fitness discipline (e.g. body pump, step). Outline what specific skills are used in this discipline under the following headings.

Chosen discipline:	
Element of composition	Skills used in this discipline
Space: – Direction – Level – Dimension – Pattern	
Dynamics	
Time and rhythm	
Relationships	

Table 4.1 Aerobics fitness skills

centre pass down into the goal third, and end in a shot being taken by the goal shooter or goal attack to score a point.

In the mediums of dance, aerobics and gymnastics, a number of sequences are joined together to complete the routine. How these

sequences are structured is referred to as its **form**.

**form** the shape and structure of movements and sequences within a performance

Often the form is influenced by the music that accompanies the routine.

Within some movement mediums, the sequencing of movement can be displayed in very different ways.

Gymnastics can be performed in either rhythmic or artistic sequencing, while within a dance sequence the routine can vary; for example, between classical ballet and funk/hip hop.

## Transitions

Transitions are a natural evolvment from one thing to the next, between individual movements, between phrases, and between major sections of a dance, routine or game. A performance would appear rigid and unusual if the performer were to simply change direction, use a different skill or move between different levels suddenly if the change were not carefully integrated into the movement. It would be disturbing and distracting for the audience rather than flowing, smooth and continuous.

A transition needs to appear effortless and incorporated into the movement phrase as determined by the movement context itself. It can be a simple jump or tempo change and vary in size, but it must fulfil the function of the movement.

## Repetition

Repetition is the act of repeating a movement or movement phrase. It gives the audience an opportunity to see a movement more than once and adds focus to the performance. A performer can create variety with repetition by manipulating the elements of composition such as direction, shape, speed and levels.

Repetition is useful for performers learning a new skill, as the movement can be more easily learned with familiarity. An aerobics instructor often begins a routine with the basic steps of the routine. These are performed several times to ensure correct execution and familiarity before adding more complex moves to the piece (e.g. directional changes or arm sequence).

In most games, many movements or skills are repeated continuously throughout performance. Throwing and catching are fundamental to many sports. Tennis and golf are individual sports where repetition is commonly used.

Too many repetitions may ruin a performance. It is essential that the choreographer apply this

## Summary 4.23

Define and provide examples for:

- sequencing
- transitions
- repetition
- variation.

## Checklist 4.24

- 1 Explore a range of ways of linking movement between phases of a performance; for example, moving on and off stage, turning defensive formation into attacking formation, moving from a balance to prepare for a tumbling run.
- 2 Select one movement medium. Recommend ways to combine and arrange movement when designing performance.

## Going further 4.22

### Inquire

- 1 What is the difference between movement exploration and improvisation? Discuss the purpose of each in the process of movement composition.
- 2 How can the specific rules and conventions of each movement medium influence the process of creating movement? Give examples.
- 3 Explain the role of transitions in movement composition. What are the characteristics of effective transitions? Identify ways of linking movement phrases in aerobics or gymnastics.
- 4 Create a 90-second sport aerobics routine to a music track of 152–155 beats per minute. The complete performance should reproduce the compulsory elements (high kicks, push-ups and jumping jacks) and skill elements (static strength, power, flexibility and dynamic strength) within the time and space (7 x 7 m) constraints of a sport aerobics routine.

process carefully, especially when creating a routine so as not to 'overkill' or make the move tedious and boring for the audience. A coach must prevent their teams' plays from becoming predictable and easy to outmanoeuvre when creating effective and successful routines.

## Variation

It is often said that variety is the spice of life. This is true of movement – in dance, gymnastics and aerobics it adds variety and interest. It keeps motivational levels high for both the audience and the performer. Music provides an easy avenue for variety to be included in a routine as the choice of moves will be characterised by the tempo and rhythm.

The use of variation in sports gives the coach opportunity to create attack and defence strategies that aim to eliminate the predictability of their teams' movements. This will increase options available for players to use their skills for successful combinations.

Where there is a set criteria for performance, such as gymnastics, there may be little opportunity for variety. A performer will rely on their personal style and interpretation of the movements to give individual flair to the routine.

## 4.3 Examining the role of appraisal in the process of composing and performing

### Driving question 4.25

Based on the information studied thus far, what do you predict to be the main indicators of appraising in the process of composing and performing movement?

### Ways of appraising

The process of creating movement, whether it is simple or complex, will have a measure of value or determining worth placed upon it. This can be based on personal opinion informally or by more official means with specific criteria. It is a

**appraisal** a judgement made on the quality of the performance. Such **appraisal** gives a performer or choreographer feedback about the performance, either in a subjective or objective way. This analysis of performance is critical to the success of the finished work.

There are three different ways to appraise performance:

- observing
- analysing
- experiencing.

When we watch a performance we use our senses to determine the outcome of the performance. This may be visual appreciation of the movement and sound associated with it.

### Observing

The main techniques used to appraise movement are either subjective or objective observation. Subjective observation is made by how the observer feels – the way in which their thoughts and mood are affected by the performance. It is judged from an aesthetic perspective, applying to quality and style of the performance, particularly in gymnastics and dance routines. The use of subjective observation can be considered unreliable, as variation will exist between observers as human appreciation for desirable movement differs between people.

Objective observation is based on indisputable facts about the outcome of the performance, occurring without bias or prejudice. There is a set criteria used to analyse performance still within an artistic perspective that uses set marks for specific movement skills, rating scales or checklists.

### Analysing

The establishment of performance norms upon which to appraise performance is essential to interpreting movement. Using the technical aspects of the performance usually allows observers, or judges, to calculate, rank, evaluate and compare performances. This can be achieved when standard performance norms are established where scores can be assigned to the performance, then converted to a score that can be compared and interpreted in relation to a larger group.

	Age							
Percentile	10	11	12	13	14	15	16	17+
95	9	8	9	10	12	15	14	15
75	3	4	4	5	7	9	10	10
50	1	2	2	3	4	6	7	7
25	0	0	0	1	2	3	4	4
5	0	0	0	0	0	0	1	0
Repetitions								

**Table 4.2** The number of pull-up repetitions before exhaustion for selected percentile rankings of boys aged 10 to 17+

Percentile	Age							
	10	11	12	13	14	15	16	17+
95	42	39	33	34	35	36	31	34
75	18	20	18	16	21	18	15	17
50	9	10	9	8	9	9	7	8
25	3	3	3	3	3	4	3	3
5	0	0	0	0	0	0	0	0
Seconds								

**Table 4.3** The time, in seconds, for a flexed-arm hang before exhaustion for selected percentile rankings of girls aged 10 to 17+

An example of this is the flexed arm hang measuring muscular strength.

A common normative testing scale is the use of percentile rankings, based on the actual performance score. A person who scores in the 70th percentile has received a rank indicating a score better than 70 per cent of people taking the test. The physical fitness tests conducted are an excellent example of analysis performance in percentile ranks compared with others in a similar age group across the country.

Perform pull-ups to exhaustion on a bar that allows hanging without touching the floor. Begin by hanging from the bar with an overhand grip. Pull your chin over the bar and then lower until your arms are straight. Kicking and jerking is not permitted. Table 4.2 (page 171) gives percentile rankings for this test for boys.

Perform a flexed-arm hang to exhaustion on a bar that allows hanging without touching the floor. Begin timing when hanging from the bar with an overhand grip and chest close to the bar. Stop timing when (1) your chin touches the bar, (2) your head tilts back in an effort to keep your chin from touching the bar and (3) your chin falls below the level of the bar. Table 4.3 above gives percentile rankings for girls.

Another common form of analysis is the use of statistics. This might reflect the number of runs scored per game of cricket in a season, winning serves in volleyball or successful scoring goals in AFL. This information can be used by a coach to develop or improve game tactics and strategies or by individual performers, highlighting a weakness they can improve on; for example, percentage of successful goals made.

## Experiencing

This form of appraising performance is valuable for performers, coaches, choreographers and judges. It

commonly relates to performers who have mastered the skill or performance and can internally make a judgement on the quality of their movements. They will have a **kinaesthetic sense** if the movement has been performed correctly.

To become a skilled judge, whether using subjective or objective observation, continual practice of assigning quality to movement is necessary. Watching a variety of performances from beginners to advanced will enable judgement to be made with accuracy and confidence. Discussing performances in groups by applying the judging criteria and sharing ideas with others will develop the skill of **critical approach**.

## Aspects for appraisal

The four aspects discussed below enable a performance to be appraised critically and without bias. The performance can be appraised reliably and produce a valid and true measure on all occasions. It creates a fair appraisal for all.

The more experienced a judge of performance, the better they will understand and interpret a performance. They can then identify strengths and weaknesses, provide feedback, motivate performers and develop their individual skills in the movement medium.

## Elements of composition

The elements of composition discussed earlier in this unit are imperative to the success of the

**kinaesthetic sense**  
perception of the body's movements that is gathered through receptors attached to tendons, muscles and joints and relayed to the brain

**critical approach**  
this question-based approach to the study of PDHPE involves proposing a range of solutions to the problems being studied; it may involve consideration of alternatives to practices that have been accepted or in place for extended periods of time

## Summary 4.26

What are the ways one can appraise a performance?

## Going further 4.27

### Inquire

- 1 What is the difference between objective and subjective appraisal?
- 2 Explain the importance of experience in the process of appraising performance.
- 3 Describe how the use of observation is used to appraise performance.

performance or movement chosen. The following questions can be used to appraise the performance or movement based on these elements:

- **Space:** Is the whole space being used to the best advantage? Were patterns and shapes used effectively to add appeal? Did the players effectively draw out the opponents to create space for an attacking move?
- **Dynamics:** Was the performance controlled and did it display flow and force appropriately? Did the players powerfully perform their skills?
- **Timing and rhythm:** Are the movements used appropriate to the music selected? Did the movements last the duration of the selected piece?
- **Relationships:** Are there positive relationships between the performers? Have the elements been manipulated to add variety to the dance? Did the positioning of players allow successful completion of set plays? Were the chosen props appropriate for the movement piece and level of skill of the performer?

## Creativity and innovation

The success or failure of a performance is very dependent on the use of creativity and innovation across all movement mediums. Has their inclusion in the performance enhanced aesthetics and interest for the audience? A choreographer must ask this question to give performers the best opportunity of success. In gymnastics, demonstrating moves with increased difficulty makes a gymnast more competitive. In dance and aerobic competitions, creativity can be an official component of the judging criteria; for example,

in the Rock Eisteddfod. The simple movements created into a unique combination and sequence, combined with epic music or themes, can become a creative production.

Creativity within the games medium reduces predictability and allows teams to create advantage over their opponents. A team will be considered heroes if a set play can create space, cause confusion among the opposition and put a player into a gap to score the winning try or goal.

## Arrangement of movement

In any performance, movement should flow and appear to be the next logical action. Using transition effectively will create a continuous movement sequence. The purpose of the movement must be expressed with correct skill selection and sequence arrangement. The flow of movement phrases and their continuity will aid a smooth creative performance. A gymnastic routine on any given piece of apparatus will arrange movements in order to create a sense of flow and display the skills of the gymnast. In games, the arrangement of movement patterns can strengthen identified weak spots and create more suitable and successful strategies.

## Achievement of purpose

A successful performance will aim to achieve something, whether it is to score a goal, communicate an idea, express emotion or entertain with skill and composure. When appraising a performance, a judgement will be made as to whether this purpose has been achieved. The purpose, aim or goal might be obvious to the choreographer or performer but leave the audience left wondering. A successful and skilful performer will communicate their purpose and intention through their movements, music and/or props. An experienced appraiser may not give a flattering evaluation if the performance doesn't fulfil the purpose.

## Summary 4.28

Outline the aspects of appraisal.

## Checklist 4.29

Design criteria to appraise a performance. The criteria need to reflect each of the aspects of appraisal. Once the criteria are set, apply them to a performance.

In games, the final score easily identifies which team or player is successful. The purpose is to win.

## Establishing and applying criteria

In order for appraisal to be fair and consistent, a set of criteria is established in most movement mediums. Whether it is composition rules, deductions or scoring systems, they are established on set standards to create consistency in evaluation for all competitors. This set of criteria is usually established before a performance and describes specific requirements of the activity a judge is looking for. It aids the observer in evaluating and appreciating the quality of the performance in various movement mediums and styles.

Each movement medium will require a set of criteria for measuring performance in each activity. A standard set of procedures may be used by a number of judges; however, their understanding of the specific details of each criterion must be established for consistency in judging.

### Going further 4.30

#### Create

- 1 Design a set of criteria that could be used to appraise a performance in your selected movement medium. Base the criteria on the aspects of appraisal.
- 2 What is the role of appraisal in movement composition and performance?
- 3 As a teacher at the school, you have been asked to assist with the judging of the dance groups for the dance competition your school is hosting. Each aspect of appraisal is given to a different teacher to judge and you have been asked to assess the elements of composition in the routine. Design judging criteria that can be used to assess the elements of composition in each school's dance. Justify your criteria.

### Checklist 4.31

Choose either dance, gymnastics or aerobics. Utilise appraisal feedback to identify areas for modification, and design a suitable feedback form to give a competitor or coach/choreographer at the end of the performance.



**Figure 4.15** Composition is made up of the following elements – space, dynamics and relationships

Movement medium	Criteria for judging
Dance	<ul style="list-style-type: none"> <li>• Technical competence: logical and coordinated execution of technical skills in chosen style</li> <li>• Use of compositional elements of movement: development, variation and creativity</li> <li>• Communication: effective expression of purpose with audience, partner</li> <li>• Presentation: entertaining, stage presence demonstrated</li> <li>• Stage craft: story or mood enhanced through lighting, costumes, props, scenery or sets</li> </ul>
Gymnastics	<ul style="list-style-type: none"> <li>• Two main components make up the initial score itself: difficulty and execution. A difficulty panel made up of two judges and an execution panel made up of six judges determines the score.</li> <li>• Difficulty scoring: Each element a gymnast includes in his or her routine includes an associated difficulty value as set in the Code of Points. The difficulty score includes the top eight element values for women and top 10 element values for men. This provides the foundation for building the final score.</li> <li>• Routines on each apparatus also require specific basic skills and elements that each gymnast must include. Meeting these requirements can contribute up to 2.5 points to the overall difficulty score. Finally, connection value points are added for gymnasts who link successive elements together without error. Each connection value is awarded at 0.1 or 0.2.</li> <li>• Execution scoring: In execution scoring, each judge on the six-person panel begins with a base score of 10 points and deducts from this base for errors. These judges take into account how well a gymnast performs the routine, considering overall technique, artistry and composition of the routine. Small errors incur deductions on the low end, around 0.1. Significant errors, like falls, incur up to a full-point deduction. Gymnasts also incur neutral deductions for execution when stepping out of bounds, for attire and podium violations, and for violating time requirements.</li> <li>• Specific apparatus score alterations: In addition to the basic scoring guidelines, certain apparatuses have special scoring considerations. Each vault has a predetermined number and difficulty score. The coach or gymnast enters the score that is displayed to the judges. Additionally, scores on the vault, pommel horse and parallel bars do not include connection values.</li> <li>• Final scores: When determining the final score, judges on the difficulty panel confer and reach consensus regarding their score. Judges on the execution panel each submit a score, and the highest and lowest scores are dropped. Averaging the four remaining scores determines the total execution score. Adding together the resulting difficulty and execution scores determines the final score. Strong scores are between 15 and 16 points and exceptional score rankings begin at 16 and above.</li> <li>• Red, yellow and green indicators: Three colour indicators are also making an appearance alongside final scores during television coverage: red, yellow, and green. These indicators represent the severity of the deductions as related to each final score. Green indicators tell the viewer that the routine incurred deductions less than or equal to 1.2 points. Yellow indicators reflect deductions in the 1.3 to 1.9 range. Red indicators reflect a deduction of 2.0 or more points. These indicators, when compared to other gymnasts' scores, help indicate the strength of the overall score in comparison to the field (see <a href="http://www.cambridge.edu.au/prelimpdhpe1weblinks">www.cambridge.edu.au/prelimpdhpe1weblinks</a>).</li> </ul>
Aerobics	<ul style="list-style-type: none"> <li>• Routine must be between 90–110 seconds in length</li> <li>• Score comprises – 60% skill component: <ul style="list-style-type: none"> <li>– Strength – upper and lower body (the performance and combination of seven basic aerobic movements involving both the arms and legs: March, Jog, Skip, Knee Lift, Kick, Jack and Lunge)</li> <li>– Flexibility – full range of joint movement</li> <li>– Form – technical control</li> <li>– Exercise selection – varied, safe, balanced use of major muscle groups</li> <li>– Transitions – coordination, flow, creativity</li> <li>– Synchronisation – teams or pairs must match in style and execution</li> </ul> </li> <li>• Score comprises – 40% presentation component: <ul style="list-style-type: none"> <li>– Showmanship</li> <li>– Creativity</li> <li>– Musical selection and interpretation</li> <li>– Appearance</li> <li>– Physique</li> </ul> </li> <li>• A winning routine will typically show clean and balanced movements with perfect technique. The routine will include at least one element from the four element groups of dynamic strength, static strength, jumps/leaps and flexibility/balance; with a maximum of 10 elements (for individuals) or 12 elements (for mixed pairs, trios or groups).</li> </ul>
Games	<ul style="list-style-type: none"> <li>• Skill execution – running, weaving, passing</li> <li>• Game techniques – skills specific to the game</li> <li>• Physical fitness – speed, agility, balance, coordination, reaction time, power, cardiovascular endurance, muscular strength and endurance</li> <li>• Perceptual motor ability</li> <li>• Teamwork</li> <li>• Team and individual scores</li> </ul>

**Table 4.4** Criteria for judging performance in selected categories

## Chapter summary

- Movement is expressed through different mediums to create performance. The composition of this performance will usually have a beginning, middle and end.
- Space refers to the performance space, but also to the space around the performer's body, and the relationship of the performer to other people and objects.
- Movement in a space will have a number of characteristics – direction, level (height) and dimensions in the space, as well as whether the movement relates to a particular pattern or formation.
- Every movement and every space has its own dynamics – the level of energy needed to execute the movement.
- The force of a movement refers to the magnitude or intensity of the energy exerted, expended or released. A movement can be described as strong or weak.
- Flow is the movement of the body or an object through space and time. A movement can be unhindered (free), or require energy to be restrained (bound).
- Movements occur in time as well as in space. Time refers to when a movement occurs and its duration.
- Rhythm describes the way in which the movement is organised according to patterns or sequences.
- A movement's duration and momentum are interrelated. Duration refers to how long a movement takes to be performed, while momentum dictates the speed at which the movement will occur.
- Timing can be an important aesthetic element in performance, but is equally crucial in the success of a movement in sports (e.g. a pass).
- Movements can be self-paced or externally paced, depending on the environment.
- The relationships between a movement's space, dynamics and timing will change based on the context and goal of the movement.
- Defining the purpose and moving factors behind a movement will determine its composition.
- The basic skills of movement are locomotor, non-locomotor and manipulative skills.
- Variation within movement is important, since the context for each movement will be different.
- Improvisation involves performing with little or no preparation, as well as the ability to adjust movements as the context for them shifts.
- An awareness of the conventions of a medium (musical genre, sporting discipline, etc.) will enable a performer to make better informed decisions about movement composition.
- Other organisational elements of movement include sequencing, transitions, repetition and variation.
- Appraising the value of a movement composition, and having an appropriate criterion for judging this value, is a crucial aspect of improving the performance.
- There are three different ways to appraise performance – observing, analysing and experiencing.
- Techniques of observing are either subjective or objective.
- Analysing performance can be achieved when standard performance norms are established and scores can be assigned and related to larger groups.
- Experiencing as a means of appraising requires a kinaesthetic sense for appraising oneself, or skill of critical approach.
- Four aspects of appraisal enable a performance to be appraised reliably and without bias: elements of composition, creativity and innovation, arrangement of movement, and achievement of purpose.

## *Exam-style questions*

- 1 What are the features of space?
- 2 How can changing dynamics achieve a specific purpose?
- 3 How do timing and rhythm relate to different mediums?
- 4 What is the effect of self-paced and externally paced timings on composition of movement?
- 5 What is the purpose of group formations? Provide examples.
- 6 How can movement between phases of a performance be linked?
- 7 What are the aspects of appraisal and how can they be used?
- 8 What are three different ways to appraise performance and how might they be applied to an example of a movement medium?





# Chapter 5 Fitness Choices

## Preliminary Option 3

**After completing this chapter, you will be able to demonstrate knowledge of:**

- the definition of exercise and what it means to different people
- the various ways that people choose to exercise to improve fitness
- the factors that influence how people choose fitness activities.

### **Key terminology**

commodity  
exercise  
fitness

incidental  
physical activity  
sedentary behaviour

# 5.1 The meaning of exercise to different people

## Meanings of exercise

People engage in physical activity every day and are motivated to do so for a variety of reasons.

**incidental**  
unstructured and  
unplanned

Some activity occurs **incidentally** as a result of everyday tasks and chores (e.g. walking up stairs and mowing the lawn). While these incidental activities have a positive effect on

one's health it is the more traditional forms of exercise (e.g. jogging, swimming, cycling) that attract participants, often with the specific goals to improve their fitness. There are many options available for individuals wishing to exercise and their choices will be closely linked to their motivations. Some people wish to exercise for

### Driving question 5.1

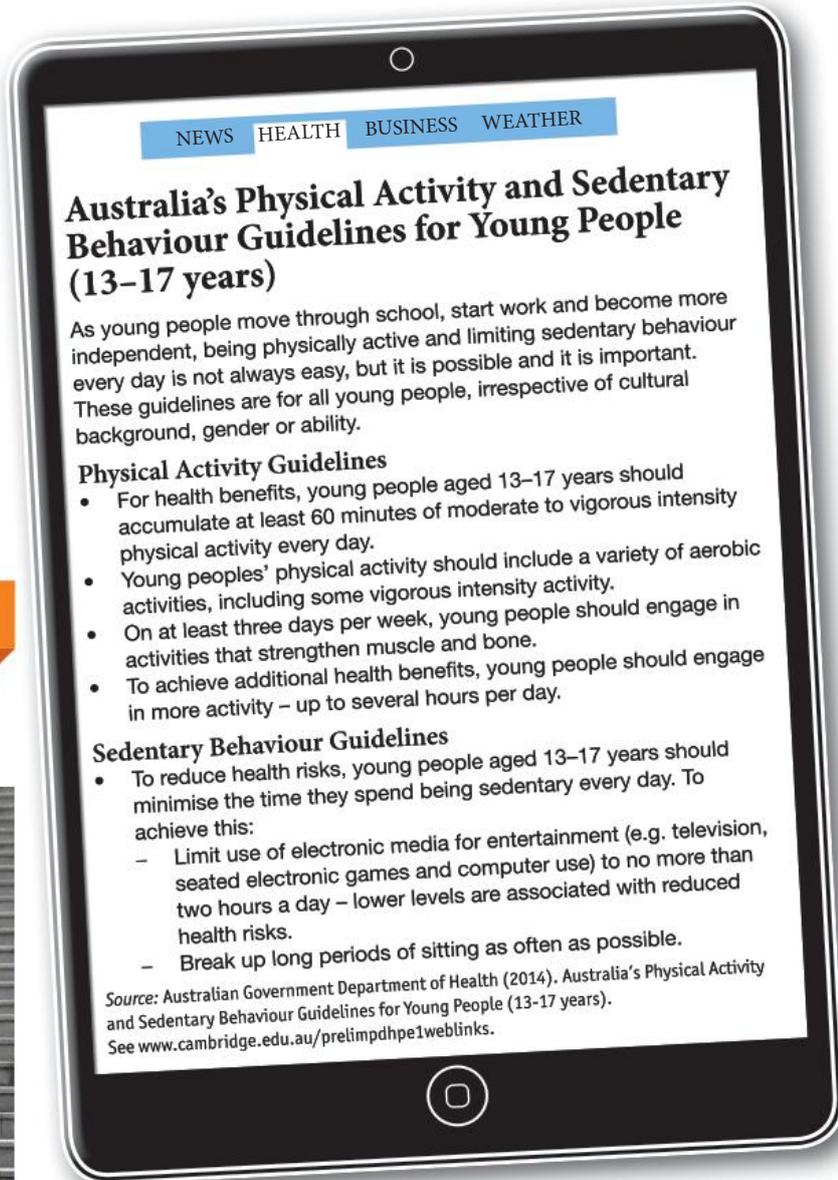
How important is exercise to you?



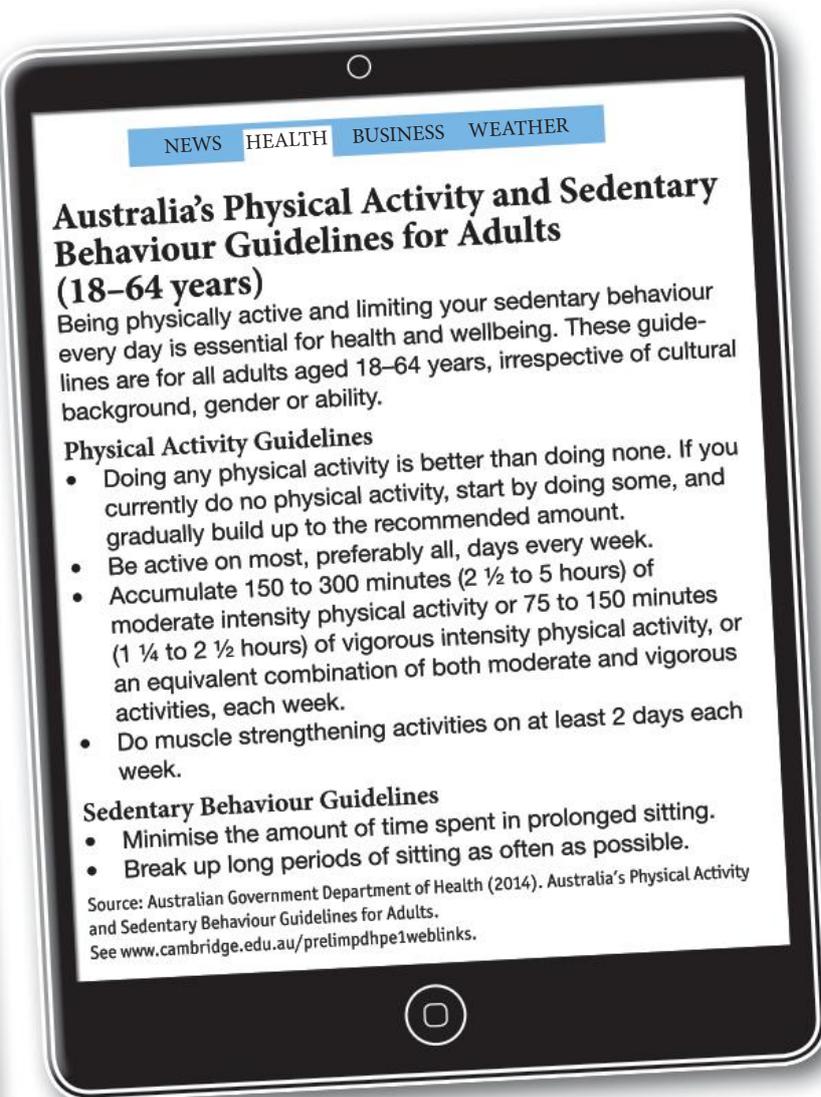
**Figure 5.1** Walking to work is an example of incidental exercise



**Figure 5.2** Hiking is a more traditional form of exercise



**Figure 5.3** Swimming often attracts participants specifically looking to improve fitness



## Exercise as a form of physical activity

Our bodies engage in **physical activity** every day, whether it is walking to school, washing the car or swimming laps at the pool. Physical activity is essential to everyday life but, as suggested in the guidelines at left, can also take the form of exercise. Exercise is the specific involvement in physical activity that aims to improve health and fitness. To be defined as exercise the activity should be (as with swimming): repetitive, sustained and aimed at improving one of the fitness components (e.g. cardiorespiratory fitness).

**physical activity** movement that results in energy expenditure

Physical activity is the term used to define the movement of the human body through any action or task. Physical activity can include all tasks associated with physical movement. Exercise, however, is a form of physical activity that specifically aims to improve one's fitness.

The involvement of individuals in exercise designed to improve fitness is enormously beneficial. Individuals engaging in exercise as part of a regular routine will significantly decrease the risk factors associated with cardiovascular disease, obesity, stroke and high blood pressure. There are also social, emotional and cognitive benefits in being physically fit.

The Australian Government Department of Health has physical activity and sedentary behaviour guidelines for all age groups. The guidelines for young people specifically include suggestions on limiting electronic media use and breaking up 'screen time' with physical and social activity.

health, some to lose weight, some to de-stress and others just for enjoyment. Whatever the reason, fitness is important and closely linked to one's physical health.

Moderate-intensity physical activity (approximately 3–6 METs)	Vigorous-intensity physical activity (approximately >6 METs)
Requires a moderate amount of effort and noticeably accelerates the heart rate	Requires a large amount of effort and causes rapid breathing and a substantial increase in heart rate
Examples of moderate-intensity exercise include: <ul style="list-style-type: none"> <li>• Brisk walking</li> <li>• Dancing</li> <li>• Gardening</li> <li>• Housework or domestic chores</li> <li>• Traditional hunting and gathering</li> <li>• Active involvement in games and sports with children or walking domestic animals</li> <li>• General building tasks (e.g. roofing, thatching, painting)</li> <li>• Carrying/moving moderate loads (&lt;20 kg)</li> </ul>	Examples of vigorous-intensity exercise include: <ul style="list-style-type: none"> <li>• Running</li> <li>• Walking/climbing briskly up a hill</li> <li>• Fast cycling</li> <li>• Aerobics</li> <li>• Fast swimming</li> <li>• Competitive sports and games (e.g. traditional games, football, volleyball, hockey, basketball)</li> <li>• Heavy shovelling or digging ditches</li> <li>• Carrying/moving heavy loads (&gt;20 kg)</li> </ul>

**Table 5.1** Moderate and vigorous-intensity physical activity

Source: WHO.

## Exercise and its relationship to fitness

Fitness and the state of being fit is a difficult

**exercise** physical activity that is planned or structured and requires physical effort

concept to define. Individuals often **exercise** to increase fitness. However, like one's health, fitness is dynamic and each individual is different. For example, when comparing the level of 'fitness' of a professional cyclist with that of someone who rides to work

there are obvious physiological differences. While the professional aims to perform at a very high level and needs an elite level of fitness, the person riding to work may also class themselves as fit simply because they ride to work every day and maintain a healthy weight and feel better for it. Some more information about the Physical Activity Spectrum can be found at the Physical Activity Network for Wales website (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)).

Each individual will define their state of fitness at different levels. Within the pursuit of fitness there are various components to which one may have a greater ability. Let's compare the professional cyclist again, but this time with a professional surfer. You could not argue that either is fitter than the other; however, both athletes have specific talents and abilities that make them better suited to their sport. For example, the cyclist may possess excellent cardiorespiratory fitness, muscular endurance and power while the surfer may have a greater level of flexibility, agility and balance.

The components of fitness can be broken into two distinct categories. There are the components

## Checklist 5.4

- 1 Critically examine to what extent exercise should be a part of lifestyle.
- 2 Critically examine what it means to be fit.

that will improve the general health and well-being of individuals – these are known as health-related components; and there are components that will specifically enhance sporting performance – these are referred to as skill-related components.

Health-related components of fitness:

- cardiorespiratory fitness
- flexibility
- muscular endurance
- strength
- body composition.

Skill-related components of fitness:

- speed
- power
- coordination
- balance
- agility
- reaction time.

For those individuals seeking a greater level of fitness, exercise is the key contributing factor. As an example, if the professional surfer wished to improve their flexibility, their coach may design a program that included yoga. If the cyclist wished to improve power, they may increase the number of workouts in which they train at a high intensity on a cycling ergometer. The ride-to-work commuter may wish to improve their cardiorespiratory fitness – to do so they could add a longer weekend ride to their training schedule. Whether it be a desire to improve one's general health or a goal to enhance a specific component in order to improve sporting performance, an exercise program is paramount. Nutrition and other factors play a role but exercise is the key to improved fitness.

## Going further 5.2

### Communicate

A 17-year-old is not meeting the recommended guidelines for daily exercise. Suggest ways they could increase their daily exercise to meet these guidelines.

## Summary 5.3

- 1 Contrast between physical activity and exercise.
- 2 What does it mean to be 'fit'?
- 3 Classify your personal physical activities according to the Physical Activity Spectrum.

## The value that people place on exercise and fitness

### Changing attitudes to fitness

For the large portion of human life on this planet, the use of exercise in the pursuit of **fitness** has not been required. The modern-day attitude to fitness focuses on improving health,

**fitness** the body's ability to function efficiently and effectively



**Figure 5.4** High-intensity training can help a cyclist improve power

enhancing sporting performance and preventing lifestyle disease.

The hunter-gatherer lifestyle of early humans required men and women to walk, run, paddle, dig and hunt for their food. These humans had no choice – fitness was essential to survival. As populations grew and settled in one place, agriculture became the predominant method of supporting life. This primitive form of farming also demanded a high level of physicality to support life. With the onset of the Industrial Revolution at the beginning of the eighteenth century, humans invented many new tools and machines that performed crucial labour-saving tasks. From this time until the present day, the human body has gradually withdrawn from many of the everyday tasks that maintained the fitness of individuals. Whether it be hunting for food, farming or performing demanding labour tasks, until recently fitness and survival have been intertwined with life itself. Now that humans live in a world with many new labour-saving tools, jobs that no longer require

physicality and forms of entertainment that result in **sedentary behaviour**, fitness has been removed from life. The human life form, which evolved in a highly demanding and physical world, now lives in a sedentary one. Exercise is now, more than ever, a necessity –

humans must participate in planned exercise to ensure they avoid disease and improve their health.

Fitness now exists as a notion separate to that of life. This means that now people participate in exercise based on their motivation to do so. While our culture values fitness and health on the one hand, the contemporary human often indulges in the sedentary way of life and neglects their fitness. The increasing levels of obesity in most Western countries are just part of the evidence that indicates poor levels of fitness.

Recent findings from the Australian Institute of Health and Welfare (AIHW) indicate the following:

- 60 per cent of males get sufficient exercise
- 50 per cent of females get sufficient exercise
- 15 per cent of people are sedentary
- 18–29-year-olds are the most active adult age group.



**Figure 5.5** Women get slightly less sufficient exercise compared to men



**Figure 5.6** The health and wellness industry, including gyms, shows how fitness has become a commodity



**Figure 5.7** While 15 per cent of people are sedentary, older Australians are becoming increasingly active

## Fitness as a commodity

The participation of individuals in exercise has been both enjoyed and valued for many hundreds

**commodity** a product that can be bought and sold

of years. However, it has become a **commodity**. The commodification of the fitness industry began gaining strength in the 1970s. The emergence of health clubs and gyms coincided

with the proliferation of the knowledge and understanding of physiology and how one can alter fitness for the better. Weights training and aerobics are examples of the products gyms began developing in order to sell to their clientele.

The health and wellness industry has expanded enormously over the last two decades. A significant sector is the fitness industry. The industry now offers an almost endless list of options – from step aerobics to boot camp. Individuals can now access 24-hour gyms, personal trainers, online workouts and, of course, many different clubs and associations that support the pursuit of fitness (e.g. running groups). The many businesses that service our fitness needs compete fiercely with one another to make a profit. As well as the gyms, trainers and others that directly support and encourage fitness, there is also an array of companies that have tapped into the fitness boom with ‘must have’ clothing, ‘cutting-edge’ technology and ‘essential’ supplements. The clever use of advertising has seen compression clothing, heart-rate monitors, GPS tracking devices and protein shakes become commonplace in the pursuit of improved fitness.

The Australian Fitness Industry recently released a report that provided a detailed overview of the industry itself. The major findings were:

- The fitness industry offers a diverse range of services from small personal training studios to large franchises.
- Over 4 million Australians participate in the fitness industry. The typical clients are 25–34 years old, with higher rates for females than males.
- The fitness industry is growing faster than the broader sport and recreation industry.
- The economic outlook is for further growth.
- The fitness industry is innovative and shapes the consumer’s desires.

### Summary 5.5

- 1 How have attitudes to fitness changed over time?
- 2 Discuss the cultural differences in relation to attitudes to fitness.
- 3 What has been the result of fitness becoming a commodity?
- 4 Discuss the growth of the 24/7 gym and the possible reasons behind them.

### Checklist 5.6

In small groups, discuss with a range of people what their exercise habits are and the value they place in exercise. Compare the various answers with other people.



**Figure 5.8** The typical fitness industry participant is 25–34 years old and female

## 5.2 The ways in which people choose to exercise for fitness

### Driving questions 5.7

What are your preferred ways to exercise?  
What is it about this that appeals to you?

The options available for people wishing to exercise are vast. Motivation, goals, time, enjoyment, environment and access to resources are just some of the elements that shape what form of exercise individuals decide to participate in.

Exercise can be broken into two categories:

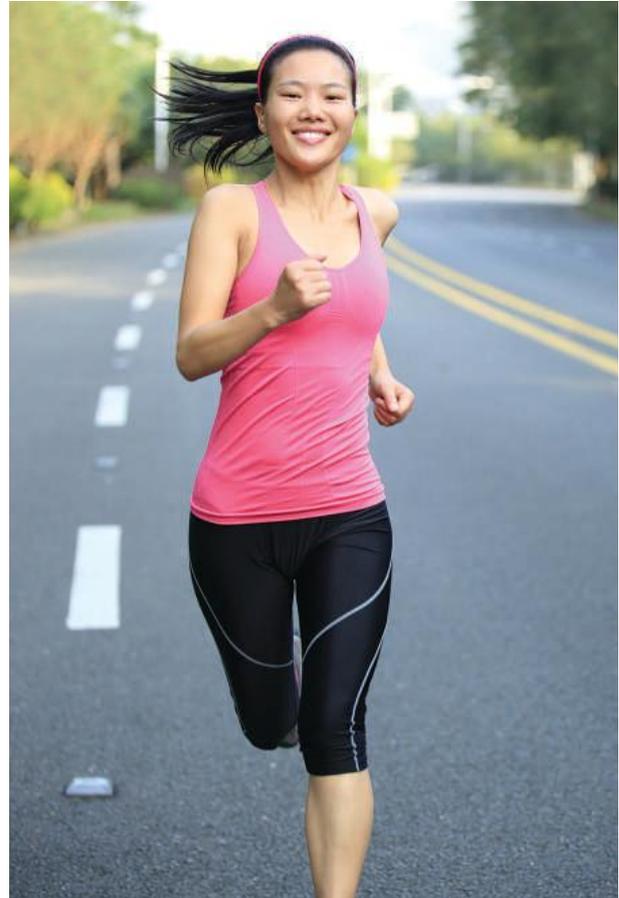
- 1 Individual fitness activities: These are activities that require only the one person to participate in in order to achieve a greater level of fitness. For example, swimming, cycling and yoga.
- 2 Group fitness activities: These are activities more commonly participated in by people within larger groups. Often the group element increases the social enjoyment as an addition to the health benefits gained. For example, team sports and aerobics classes.

Individual fitness activities traditionally can be participated in by the individual at a time that most suits them. Alternatively, the group activity most often has a structure that dictates time. For instance, someone who does weight training can simply access the gym at a time that is most convenient to them (particularly with the introduction of 24-hour training rooms), whereas the person who wishes to do aerobics must do the class at a specific time. There are many other pros and cons for individual and group fitness activities. Beyond all the analysis of which is better, they both fundamentally facilitate the improved health of individuals, which is essential to the ongoing health of our society.

### Individual fitness activities

#### Power walking and running

Power walking is a form of exercise that involves walking at a speed greater than a normal walk. Most people will power walk at a speed between 4–8 km/h. A participant must also have at least one foot in contact with the ground at all times. This is



**Figure 5.9** Running can be performed either moderately or vigorously

an important part of the definition as it separates power walking from running/jogging. Power walking offers participants a low-impact, aerobic workout. Power walking is also inexpensive and convenient.

Running can be performed either moderately or vigorously. It is an extremely effective exercise option as it improves cardiovascular fitness and burns fat. It is inexpensive, convenient and time efficient.

#### Swimming

Swimming can take many different forms as an activity. Whether swimming in a pool, lake, baths or ocean, the participant can use any number of strokes and drills to improve their aerobic fitness. Swimming has been a popular form of exercise for many people who may have found it difficult to participate in something like running/jogging, which has a significant impact upon joints. Many elderly people can maintain their fitness through a



**Figure 5.10** Swimming is a popular form of exercise in Australia

low-impact exercise such as swimming. Swimming has also been shown to positively affect those individuals with breathing-related issues such as asthma.

## Cycling

Cycling has significantly increased in popularity over the last decade. Not only does cycling provide a great aerobic form of exercise but it is also a popular form of transport and general recreation. The act of cycling involves an individual riding a bicycle. The rider generates power by using their legs and feet to push down on the pedals, which drives the chain, which, in turn, makes the wheels move. The fundamental mechanics create an efficient movement and most adults can



**Figure 5.11** The popularity of cycling has had a dramatic increase over the last decade

comfortably cycle at between 20–30 km/h. The growth in popularity of events like the Tour de France has driven the growth of cycling as a form of exercise. Most major cities in Australia now have numerous cycling clubs and informal ‘bunches’ or groups that meet and train together. Cycling can also be enjoyed away from the roads, such as mountain biking.

## Weight-training programs

The use of weights to increase muscular strength is a very popular form of exercise. The human obsession with increasing one’s strength can be traced back over many thousands of years. The ancient Spartan society, which placed significant value on physical superiority, used many primitive forms of weight training to increase the strength of their soldiers; for example, the soldiers would lift large rocks and baby animals. Over time weightlifting programs and methods have become more sophisticated. A well-designed program can



**Figure 5.12** Weight training increases muscle strength and density

increase muscle density and strength, as well as power. While traditionally individuals would lift weights in a gym, more and more people are setting up home gyms. Some examples of weightlifting techniques include bench press, upright row, dead lift and squats.

Isometric weight or resistance training involves applying a force against an immovable object. This type of training will develop the strength of the muscle at a specific point. In contrast to isometric forms of weight training, an individual can also use isotonic-training programs. An isotonic exercise

involves lifting a weight (e.g. a dumbbell) through the full range of movement like a bicep curl. This is the most common form of weight training. The isokinetic machines represent the newest form of weight training. These machines ensure that while the muscle is lifting the weight, the same level of resistance is applied through the full range of movement.

### Going further 5.8

#### Inquire

Participate in a weight-training session.

- 1 What body areas were predominantly targeted?
- 2 What benefits would continued involvement in weight training provide?

### Tai chi

Tai chi is a form of Chinese martial arts. While tai chi began as a form of self-defence, it has evolved into a modern version that very much focuses on health and wellness. Most modern forms of tai chi involve the slow and precise movement of body parts. The low-impact nature of tai chi has made it very popular with elderly people. It is not uncommon for tai chi to be used in nursing homes as a means of stimulating the movement of people who may no longer have the ability to engage in more vigorous forms of exercise. Tai chi has a holistic approach that many people find spiritually awakening as well. For this reason, tai chi's popularity has grown with people who desire a workout for the mind, body and soul.



**Figure 5.13** Tai chi is a form of exercise focused on health and wellness

### Pilates and yoga

Pilates was developed in Germany in the first half of the twentieth century. Over the last 10 years it has enjoyed enormous growth. Pilates aims to build muscular strength, flexibility and endurance. In particular, the movements of Pilates focus on what is commonly referred to as core strength. Anatomically, the pelvic, spinal and abdominal region of the body is targeted in balance and coordination-based movements.



**Figure 5.14** Pilates and yoga build strength, flexibility and endurance

### Going further 5.9

#### Inquire

Participate in a Pilates session.

- 1 What body areas were predominantly targeted?
- 2 What benefits would continued involvement in Pilates provide?

## Emerging individual fitness activities

### Night-time mountain biking

Night-time mountain biking is a wonderfully challenging aerobic experience that is growing in popularity. Quite simply, this type of cycling happens off road, on dirt trails in the darkness of the night. Cyclists ride with a powerful light to aid in the illumination of the track they are riding. However, the light is not perfect and for a competent mountain biker, the element of darkness



**Figure 5.15** Night-time mountain biking is a relatively new fitness activity

adds extra challenge. The rider has less time to react, which improves their riding skills. This activity also allows the cyclist to engage at a time possibly more suitable to their lifestyle (i.e. night-time) as mountain bike riding can be done after work commitments.

### Free solo rock climbing

Free solo rock climbing, or free soloing, is a form of rock climbing in which the climber ascends on their own with no gear (no harness, no rope, no bolts, etc.). It is an intense form of exercise that requires immense muscular strength, endurance and concentration. This type of climbing was made famous by Alex Honnold, an American who climbed Yosemite’s Half Dome in 82 minutes – a climb that takes most experienced climbers several

## Checklist 5.10

- 1 Participate in a range of individual fitness activities and evaluate their value to the individual.
- 2 Discuss the possible reasons why people choose to exercise on their own.
- 3 Complete the following table.

	Benefits of the activity	Availability	Who would be attracted to this activity	Cost	Time commitment	Sources of further information	Personal reflections on participation
Running							
Swimming							
Cycling							
Weight training							
Tai chi							
Pilates/ yoga							
Emerging individual fitness activity							

**Table 5.2** Fitness activity evaluation



**Figure 5.16** Alex Honnold, free solo rock climber

days to achieve. This form of exercise has grown in popularity within the climbing community as it offers further challenge and opportunity to enhance one's skills.

### Summary 5.11

- 1 Identify a range of individual fitness activities.
- 2 Discuss the benefits that three of these activities provide.
- 3 Identify an emerging individual fitness activity and discuss the reasons for this.

## Group fitness activities

### Aerobics and aquarobics

Aerobics was one of the initial group exercise activities to grow out of the USA during the late 1960s. This form of exercise spread quickly and by the 1980s was a quintessential part of the exercise industry. Aerobics involves a group of participants following the choreographed routine of a lead instructor. The routine is normally accompanied by high-tempo music and provides a full-body workout. Most commonly, the aerobics session will focus on improving cardiorespiratory fitness, muscular strength and flexibility.

Aerobics remains the forerunner of many other group exercise activities. Aquarobics represents

one of the activities that builds on the principles of aerobics. This form of aerobic activity takes place in the water. Similar to aerobics, participants are led through a routine by an instructor. In contrast to aerobics, participants must complete the movements against the resistance of the water. This assists in making the effect on muscular strength and endurance greater. The water also helps to lessen the impact on joints and bones, therefore making this form of group fitness very popular with older groups of people.



**Figure 5.17** Aquarobics is popular with older groups of people



**Figure 5.18** Step aerobics class

### Pump, step and spin classes

Pump, step and spin classes all build on the basic format and structure of traditional aerobics. The group follows the choreographed movements of the instructor, often to the beat of music.

Pump classes, however, specifically focus on muscular endurance and strength by using small weights (e.g. dumbbells and small barbells). A pump class involves high repetition of many



Figure 5.19 Spin class

specific weightlifting movements (e.g. squats at a low weight).

Step aerobics closely resembles traditional aerobics in its movement and style. However, the major difference between the two forms is the inclusion of an elevated platform – the step – in the class. Depending on the individual, the step can be adjusted in height. The inclusion of the step does increase the potential effect on fitness. Yet, this aerobic option also provides gymnasiums with another product to ensure variety and choice in their schedule of workouts.

Spin classes, one of the most contemporary group fitness activities offered in gyms, are also very popular. The spin class involves each participant sitting on a stationary bike. The bike has a weighted fly wheel, which can increase resistance against the wheel. The use of the weight on the wheel helps to simulate the riding conditions on a regular bicycle

(e.g. riding up a hill). Spin classes are a popular option for cyclists as it provides an indoor option during bad weather. The classes involve many high-intensity intervals aimed to fatigue the muscles and push the cardiorespiratory system to its limits.

## Circuit training

Circuit training is a high-intensity workout. Participants move through a large variety of exercises. Many of the exercises and activities used during a circuit are heavily influenced by other forms of aerobics. For example, a circuit may include components of resistance training, jogging, step aerobics, pump and so forth. The major difference is that each component only makes up a small part of the activity. A typical circuit involves the participant performing push-ups for 30 seconds. At the end of this time, a buzzer sounds to signal



Figure 5.20 Example of a woman practising circuit training

### Going further 5.12

#### Inquire

Participate in a spin bike session.

- 1 What body areas were predominantly targeted?
- 2 What benefits would continued involvement in this class provide?

### Going further 5.13

#### Inquire

Participate in a circuit session.

- 1 What body areas were predominantly targeted?
- 2 What benefits would continued involvement in circuit training provide?

the participant to move to the next exercise, which might be sit-ups, followed by step-ups – and so forth as the circuit continues.

## Team games

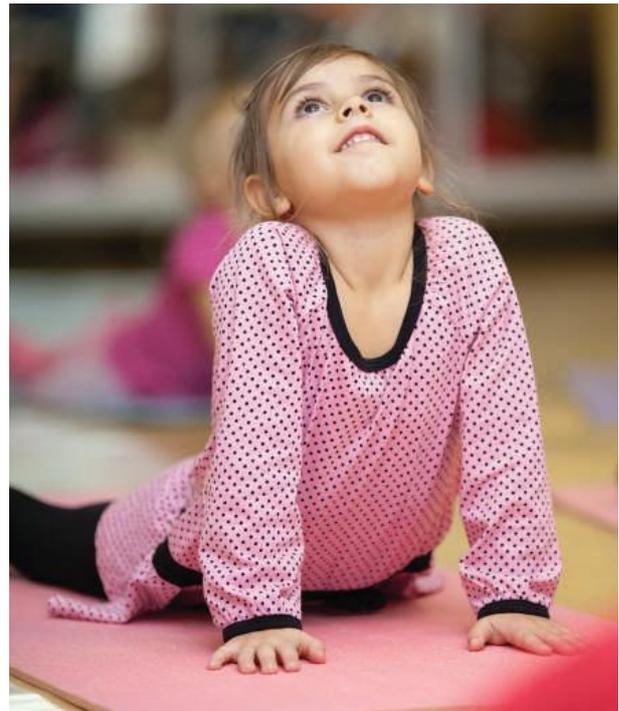
Team games represent the original format of all group exercise. Netball, soccer, Rugby League, Rugby Union, AFL, basketball and hockey represent the most played team sports in Australia. All of these games involve a structured contest in which a team must attempt to score points and defeat their opponents. Most commonly, these sports involve a great deal of running, jumping, passing, throwing, catching and kicking. Team games provide a great avenue, particularly for children and teenagers to participate in physical activity. Young people, through team games, can improve socialisation and maintain a healthy lifestyle. The participation in team games by adults drops away as many people do not possess the time and energy to commit to the structure of team games.

## Exercise for specific groups

Many different forms of exercise exist for specific groups. Often these forms of exercise have been developed to cater for the specific need of the



**Figure 5.21** Gentle yoga classes are suitable for the final trimester of pregnancy



**Figure 5.22** Children should be encouraged to have fun when exercising

group. For example, women, particularly in the final trimester of pregnancy, are discouraged from vigorous exercise. Therefore, many gyms and personal trainers now offer specific classes for pregnant women. Some popular forms of pregnancy exercise classes include pregnancy yoga, pregnancy Pilates and aqua-natal classes. While exercise is strongly encouraged for everyone, for groups with special needs – such as pregnant women – it is important for it to be specially tailored to meet the specific needs and safety requirements of the group.

Children will naturally engage in physically demanding play. However, some structured exercise should also be encouraged. At a young age (infants and early primary school) the focus should largely be on developing fundamental movement skills. Fundamental movement skills include movements such as running, hopping, skipping, jumping, throwing, catching, dodging and many more. These movements are proven building blocks to physical exercise and sporting participation. The young child who can competently perform fundamental movement skills has been shown to engage in physical activity more confidently and for longer periods of their lifetime. While the exercise should aim to develop fundamental movement skills, the teacher, coach or parent should also ensure the child is having fun when exercising.

People who train to specifically improve fitness may do so because they participate in sport at an elite level or simply because they take their health very seriously. This individual would need



**Figure 5.23** Older people should be encouraged to stay active

a program specifically designed to improve the component of fitness they aim to enhance. The training principles of specificity and progressive overload would need to be carefully implemented, along with recovery, to ensure one's fitness is extended.

It is vitally important for the aged population to remain physically active. Research indicates that as people age (particularly from 60 onwards) physical ability begins to diminish. If, however, people remain active as they age, the decline is more gradual. Often injury, sickness and motivation will affect what sort of exercise this group of people can do. The lower impact options with good resistance training but decreased aerobic demand are most beneficial; for example, aquarobics or circuit training. The emotional, social and psychological benefits of exercise for older people are also immense.

## Emerging group fitness activities

### Boot camp

Boot camp exercise sessions are now commonplace on beaches and parks around Australia. The name is taken from the military camp of which all new recruits must attend. This camp is renowned for its physical demands. As such, the commercialised boot camps now run by personal trainers often involve participants working out using techniques formerly reserved for military recruits, such as participants performing tyre lifts

and runs, push-ups, obstacle courses, mud runs and so on. Boot camp workouts are executed with a similar structure to that of a fitness circuit but are normally done outside and using implements and aids not found in a regular gym.



**Figure 5.24** Boot camps now take place all over Australia

### CrossFit

CrossFit is currently experiencing a massive growth phase in Australia. It is a regimen of constantly varied, functional movements performed at high intensity in a communal environment. Participants can compete each year in the CrossFit Games.



**Figure 5.25** CrossFit is currently experiencing a massive growth phase in Australia

Rich Froning has claimed the title of the World's Fittest Man as a result of winning this event several years in a row.

### Adventure racing

Adventure racing is a new form of off-road triathlon in which small groups or teams must work together to complete the race. Often disciplines like cross-country running, ocean swimming, orienteering, kayaking and mountain biking are included. Teams must work closely together reading maps,

problem-solving and finding hidden checkpoints, all while racing as quickly as possible to the finish line. Adventure racing offers a fun and challenging alternative to triathlons and because of the team element, it is socially rewarding as well.

### Going further 5.14

#### Inquire

Participate in a boot camp session.

- 1 What body areas were predominantly targeted?
- 2 What benefits would continued involvement in boot camp provide?

### Going further 5.15

#### Create

- 1 Propose suitable fitness activities for the following people:
  - a A 22-year-old part-time university student.
  - b A 13-year-old boy who has never played competitive sport.
  - c A 34-year-old pregnant woman who has been active her whole adult life.
  - d A 68-year-old man who has been involved in sport his entire life.
- 2 Design a circuit or boot camp session targeting a fitness component.



**Figure 5.26** Adventure racing for kayaking

## Summary 5.16

- 1 Identify a range of group fitness activities.
- 2 Discuss the benefits that three of these activities provide.
- 3 Identify an emerging group fitness activity and discuss the reasons for this.
- 4 Access the document from Sports Medicine Australia (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)). Outline the guidelines recommended for pregnant women when exercising.

## Checklist 5.17

- 1 Participate in a range of group fitness activities and evaluate their value for the individual.
- 2 Complete the following table.

	Benefits of the activity	Availability	Who would be attracted to this activity	
Aerobics/ aquarobics				
Pump/step/spin class				
Team games				
Exercise for pregnant women				
Exercise for children				
Exercise for the aged				
Emerging group fitness activity				

**Table 5.3** Group fitness activity evaluation



**Figure 5.27** Zumba has emerged as a popular group fitness activity in the last few years

Cost	Time commitment	Sources of further information	Personal reflections on participation

## 5.3 The influences on people's choices of fitness activities

### Driving questions 5.18

What factors influence your choice of fitness activity? Identify 'encouragers' and 'blockers'.

### Settings for exercise

• **settings** places or social contexts at which populations engage in daily life; these settings present as potential sites for health-promotion activity that targets the relevant populations

There are many **settings** in which people exercise. The setting refers to the place and/or environment in which the exercise occurs. For example, people can exercise at home, at a gym, in a pool, on a tennis court or on a cycleway – just to name a few.

#### Exercise at home

People who exercise at home often do so because they do not possess

the time to access a gym or they don't have the ability to leave their home. Exercise in the home environment can take many different forms and has proven very popular with stay-at-home parents who can exercise and still maintain supervision over their children. People who work long hours can also find exercise at home beneficial as they can save on time by working out from home first thing in the morning or before bed. The most

popular forms of at-home exercise include the use of machines and DVD workouts.

Most sports and exercise stores now sell quality resistance-training products. This can allow the at-home exerciser to set up a home gym. Modern home gyms can be designed to meet the needs of the participant, although it can be quite expensive to set up. Other than resistance-training machines, exercise bikes and treadmills also remain popular as home-exercise options.

A more affordable option to facilitate exercise at home is through using an exercise DVD. From yoga to aerobics, there is a large selection of DVDs available on the market for people wishing to exercise at home. These DVDs most commonly feature a lead instructor who leads the at-home participant through an exercise routine.

#### Community facilities

Community facilities can be a wonderful resource for people to access in their pursuit of fitness. They are run for the benefit of the local people and their specific needs. Access is also often at a lower cost compared to that of a fitness centre. PCYC (Police Citizens Youth Club) centres, the surf club gymnasium and suburban tennis courts are popular examples of community facilities that people can access. It is also common to see running tracks, velodromes, ovals, ocean baths, racquetball courts and skate parks in communities that have been funded and taken care of by local council and citizens. As well as being a low-cost option for the participant, the community facilities are close to home and offer social engagement opportunities.

#### Fitness centres and personal trainers

Fitness centres are an excellent resource for people to improve their physical health. A quality fitness centre will offer a range of products and services, including traditional classes like aerobics, step and yoga; an array of resistance-training weights and machines; lap pools; and other complementary aids like physiotherapy and massage. The variety means that no matter what the motivation levels, ability or time availability of an individual, the fitness centre most likely offers a solution. On top of these benefits, the quality of staff and equipment is in most cases very high. Many fitness centres also offer child-minding services. This kind of service, as well as other



Figure 5.28 You can exercise at home



**Figure 5.29** You can exercise with a personal trainer at a private studio

incentives, helps to encourage all types of people to become members. All fitness centres charge their members a fee – the cost of these memberships can be quite expensive, but is required in order to maintain the quality of the centre.

A personal trainer is a fitness professional who can design, prescribe and instruct people in different forms of exercise. In most circumstances, the personal trainer, as the name suggests, works in a one-on-one format with their client. The client engages the professional assistance of a personal trainer to help shape their fitness program. The personal trainer begins the relationship by assessing the client's motivations and fitness goals. This information is used in conjunction with a pre-program physical assessment to form the basis for an exercise program. The personal trainer assists their client by providing advice and motivation throughout the exercise program. Some personal

trainers may remain with their client throughout all of their sessions while others may simply set up the exercise program and then check in at regular intervals. Depending on the scope for which the personal trainer has been engaged, they may also be able to provide advice on diet, lifestyle and injury management. The advantage in having a personal trainer is that the client is given specific advice and tuition aimed to improve their health. The personal nature of the exercise programs means the fitness gains are more significant.

## Exercise clubs

Exercise clubs are a great way for people to exercise in the company of likeminded people. The exercise club is defined loosely by a group of people meeting regularly to participate in a form of exercise. Some clubs may focus on competition while others place greater value on participation and fun.

Park Run is a great example of a thriving exercise club. As the name suggests, Park Run is a club for runners of all abilities. The concept involves people coming together at a local park and running a timed 5 km circuit. There is no need to be fast or competitive as the emphasis is on getting people active and improving upon your own time each week. Park Run was initially an idea developed in London but has spread quickly throughout the world. Australia's first Park Run was held in 2011 on the Gold Coast. Many towns and cities now host Park Run. This club is run by the community for the benefit of individual and community health. The club is free to join and quite literally attracts the full range of ages, abilities and



**Figure 5.30** You can exercise as part of a club or organisation

styles. It is not uncommon to see people running with their children in prams or with their dog on a leash. As well as providing people with a pathway to improving health, Park Run facilitates social and community engagement.

## Cultural groups

Australia is a multicultural country. People of many and varied cultural beliefs and traditions have chosen to call Australia home. People from non-Anglo backgrounds have brought with them to Australia different forms and settings for exercise. Post-World War II Australia supported the immigration of Italian and Greek migrants, who drove the popularity of soccer; while the Asian migrations through the 1980s and 1990s allowed for greater accessibility to exercises like tai chi.

The Aboriginal people of Australia are closely linked to the land and this is represented by its forms of dance and other sports. Indigenous people continue to use dance as a method of storytelling and an avenue to improving fitness. There are also many sports unique to the Indigenous culture that facilitate fitness. Perhaps

the most well-known is Marngrook, a game that involves punt kicking and catching. The game is played on a large field and features many participants. Marngrook was particularly popular within western Victorian Indigenous communities. Marngrook has many similarities to modern-day Australian Rules Football and evidence suggests the people who wrote the rules to this uniquely Australian game at the end of the 1850s were influenced by Marngrook.

## Advertising and promotion

Advertising can come in many different forms, from traditional magazine lift-outs and television commercials to pop-ups on the internet and cookies, which follow your internet usage patterns and then use advertisements that target your browsing trends. For example, someone who is on the internet looking at websites that contain information about health and fitness could be tracked by an advertising company that may then bombard this person with advertisements for gym memberships. The primary objective of an advertisement is to promote and sell the product or service that it advertises. Advertising agencies and marketing departments specialise in using a whole range of techniques to persuade potential customers to buy their product or service.

### Summary 5.19

- 1 Outline the range of opportunities that exist for a person to exercise from home.
- 2 Discuss why there has been a growth in women-only gyms.
- 3 Given the cost of gym memberships, what do you believe is the minimum number of times you would need to attend to get value for money?
- 4 What exercise options are available within your local area?



Figure 5.31 Internet pop-ups are based on your browsing trends

### Checklist 5.20

Consider the range of exercise activities and settings available to you.

- 1 Do these fitness activities suit your fitness needs?
- 2 Could you continue to participate in this fitness activity in the future?
- 3 Are there any other fitness activities more suitable for you?

## How do you know who to believe?

*Caveat emptor* is a Latin term that translates to 'let the buyer beware'. This is sound advice for people who are trying to investigate which health and fitness product or service they should purchase. Simply taking an advert on face value can be risky. Advertisements may use misleading and persuasive techniques to convince the buyer of the worth of a product or service. The potential consumer should take time when making their decision to conduct some personal research. Checking the individual's or organisation's qualifications and registration to a governing body, along with speaking with people who have had first-hand experience with the product or service, will assist in ensuring the claims made can be fulfilled. For example, when selecting

a personal trainer, the customer should look for someone with minimum qualifications (Certificate IV in Fitness) who is registered with Fitness Australia, the association of which all personal trainers must be members. By taking the time to conduct some research and ask some questions, the potential customer can make a more informed and valid decision about their health and fitness.

## Promotional techniques

Advertising companies and marketing departments are well known for using creative, clever and sometimes unethical techniques to sell a product or service. Advertisements within the health industry are no exception. The use of language can manipulate people's thinking; words like 'quick', 'simple', 'transformation' and 'easy' are often used in advertisements for weight-loss products. Particular campaigns may also target specific groups or demographics. For example, Contours is a gym specifically for women. It advertises a non-intimidating environment with friendly staff that makes it feel like you are working out with a friend. In order to encourage an impulse sale, advertisements tend to offer limited time sales; for example, with phrases such as: 'Sign up now and get your first five workouts for free'.

## Accuracy of information

The Australian Competition and Consumer Commission (ACCC) is the regulator of competition and fair trade in the marketplace. This organisation champions laws that prevent false advertising. However, detailed information in advertisements is often glossed over or hidden behind language that can be misleading or inaccurate. As a consumer, it is important to use caution when viewing advertisements for health and fitness products (let the buyer beware). Comparing similar products, talking with experts or checking the credentials of the advertiser are all good strategies to help test the validity of any claims made in an advert.

## Ethics and advertising

The ethics of a matter refers to its measure of morality – whether it is right or wrong. It is not uncommon for the language and/or pictures used in advertisements to be misleading in their presentation or manipulative in their purpose. A common example in the exercise equipment industry is the advertisement of something that is said to be a 'quick fix'. This term suggests that by using the piece of equipment the user will gain results quickly. While the device may assist in achieving a certain

goal, most health goals require a holistic and long-term approach. That is, the user may also require a nutritional plan to accompany the new form of exercise and should engage in activities that can be sustained long term. While laws, ethical codes and professional standards exist to discourage this type of advertising, it remains the responsibility of the buyer to be vigilant, thorough and aware when researching the claims of advertisements.



**Figure 5.32** Consumers must remain alert to potentially misleading advertising and 'quick fix' claims

### Going further 5.21

#### Inquire

Find a fitness advertisement in the following media forms: print, television and internet.

- 1 Who is the advertisement targeting?
- 2 What does the advertisement offer?
- 3 What are the benefits of the service?
- 4 Are the claims believable?

### Going further 5.22

#### Create

- 1 Outline some key steps in determining whether or not a product or service is reputable.
- 2 Summarise the key points raised within the Fitness Australia code of ethics (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)).

## Motivators and barriers to participation

In a recent survey by the Australian Bureau of Statistics (ABS), the main barriers to participation in sports and physical recreation were age, injury or illness, not interested, time and cost. The main motivators were health and fitness, well-being, enjoyment and social/family.

### Access to facilities

The access of an individual to resources and centres that promote exercise can be a major factor that influences participation. For people who live in isolated communities, access to a health club or gym for weight training can be very limiting and, therefore, a barrier. In contrast, if a cycleway runs directly behind your house, this could be a real motivating factor for participating in cycling.

### Convenience of use

Convenience refers to simplicity and the ease at which an individual can engage in exercise. For example, if the local gym is only open during business hours then it would be inconvenient for the regular working person to use the gym and they may, therefore, simply not exercise at all. Many gyms now use strategies and offer services to make their centre more convenient; for example, most gyms offer child-minding services.

### Cost

Whether it be jogging, playing a team sport or doing aerobics, cost can be a substantial barrier. Registration, membership fees and equipment are some of the things that can make exercising very expensive. Often people will prioritise the mortgage, rent, feeding their children and so on over the cost of a new pair of joggers so they can take up running. Whatever the associated costs are, with each form of exercise cost is likely to be a predominant factor in what people choose to do.

### Feelings about fitness and exercise

People's attitudes and feelings about all types of things are shaped when they are children. The same can be said for exercise. Those children who are exposed to positive exercise experiences from a young age are not only more skilful but also far more likely to enjoy exercise throughout their life. On the other hand, if a young person is rarely exposed to physical activity or is provided with negative feedback around their performance, they

disengage from exercise during adolescence and seldom return.

### Exercise as a priority

Making exercise a priority is a strong motivational tool. Long work hours, family commitments, other forms of entertainment and social engagements are just some of the ways in which one's life fills quickly, leaving no time for exercise. As the national physical activity guidelines recommend, adults should be participating in 30 minutes of moderate-intensity exercise most days of the week, most people fall well short of this recommendation. If exercise is not a priority, people will simply not participate.

### Influence of other responsibilities

Any one individual can have many conflicting responsibilities. Work and family are two components that require a significant commitment of time and energy. These responsibilities are also often deemed more pressing than exercise; that is, a deadline at work or a sick child will take priority over exercise. Life's other responsibilities often rank above exercise and, therefore, exercise is neglected.

### Summary 5.23

- 1 What are the main motivators for people to be involved in sport and physical activity?
- 2 What are the main barriers for people to be involved in sport and physical activity?
- 3 Suggest ways to overcome the barriers to participation.

### Checklist 5.24

- 1 What motivates you to exercise?
- 2 How have you been influenced to choose a preferred form of fitness?
- 3 What feelings may people experience when establishing a training program?
- 4 What barriers exist that prevent or limit your opportunities for exercise for fitness?

## Chapter summary

- Physical activity is the term used to define the movement of the human body through any action.
- Physical activity can be incidental – as a result of everyday tasks and chores – or it can take the form of exercise or activity, which aims to improve health and fitness.
- Regular exercise will significantly decrease the risk of factors associated with cardiovascular disease, obesity, stroke and high blood pressure.
- The Department of Health outlines Physical Activity Guidelines for all age groups.
- Fitness is made up of two distinct categories of components: ‘health-related components’, which improve physical health, and ‘skill-related components’, which specifically enhance sporting performance.
- Technological and cultural change has reduced the amount of incidental physical activity in our lives, so exercise is even more of a necessity.
- Only 60 per cent of males get sufficient exercise, and only 50 per cent of females (AIHW).
- Since the 1970s, there has been a gradual commodification of the fitness industry, with health clubs and gyms becoming a popular means of achieving physical well-being.
- Over 4 million Australians participate in the fitness industry, with higher rates for females than males.
- Fitness activities can be individual (cycling, swimming, etc.) or group activities (team sports, aerobics).
- Fitness activities will often be created to target specific groups of people, such as pre-natal yoga for pregnant women, or children’s athletics programs.
- Emerging fitness activities include boot camp programs, CrossFit and Adventure Racing.
- People often choose to exercise at home, with the use of machines and DVD workouts being the most popular.
- The multicultural nature of Australia has brought a diverse range of fitness activities from around the world, such as tai chi and soccer.
- It is important to check the qualifications and registration of a fitness product or service to ensure that its advertising claims are legitimate.
- Fitness associations are governed by a code of ethics, which outlines professional standards for the industry.
- A number of factors are barriers to participation in sports and recreation, including access to facilities, cost and personal priorities.

## Exam-style questions

- 1 Describe factors that have impacted on changing attitudes towards fitness.
- 2 Discuss the impact of viewing fitness as a commodity.
- 3 Outline a range of individual fitness activities.
- 4 Outline a range of group fitness activities.
- 5 Outline suitable exercise activities for older people.
- 6 Using two examples, discuss the benefits of an activity and who would be attracted to this activity.

## *Exam-style questions (continued)*

- 7** Outline suitable exercise activities for pregnant women.
- 8** Discuss the benefits of three fitness activities.
- 9** Outline the range of settings that people may choose to exercise in.
- 10** Outline the barriers to participation.
- 11** Discuss how consumers can know who and what to believe in relation to fitness advertising and promotion.



# *Chapter 6 Outdoor Recreation*

## *Preliminary Option 4*

**After completing this chapter,  
you will be able to demonstrate  
knowledge of:**

- *the benefits of outdoor recreation*
- *the technical skills and understanding that are required to safely participate in outdoor recreation*
- *the impact that group dynamics has on outdoor recreation.*

**Key terminology**

*autocratic  
conservation  
democratic  
laissez-faire*

*self-efficacy  
strategic non-  
intervention*

## 6.1 Examining the value of outdoor recreation

### Reasons for participating in outdoor recreation

Outdoor recreation refers to a broad range of physical activity that in most cases involves close contact with and mastery of the natural environment. Rock climbing, white-water kayaking, mountain biking and adventure racing are just some examples of the types of outdoor recreation activities enjoyed by people around the world. Often regions of the world blessed with immense natural beauty attract people engaging in these activities. For example, Queenstown in New Zealand promotes itself as the world capital for adventure tourism. It is from this region that sports like bungee jumping, wakeboarding, snowboarding and hang gliding have developed.

Outdoor recreation represents an avenue of physical activity that is currently experiencing

#### Driving question 6.1

Why do you think people participate in outdoor recreation pursuits?



**Figure 6.2** Rock climbing fosters a close relationship with the natural environment



**Figure 6.1** Snow sports such as snowboarding are a popular form of outdoor recreation around the world

growth. For example, the sales of mountain bikes have been rising steadily over the last 20 years; however, recent data represents a sharp increase. The ability to use outdoor recreation as a means of connecting to the environment, improving fitness and increasing social interaction all make good reasons for participating in outdoor recreation.

#### Stress management and relaxation

In the modern-day Australian society most people live in large cities and work in stressful jobs while trying to balance the responsibilities associated with their family, their health and their well-being. Stress and anxiety are commonplace within the lives of many people. Outdoor recreation provides an ideal method for managing stress. Using spare time to reconnect with the environment



**Figure 6.3** People commonly feel a greater sense of calm when they are surrounded by the natural environment

and engaging in one form or another of outdoor recreation can be very useful in releasing the associated tension that goes with stress. People commonly feel a greater sense of calm when they are surrounded by the natural environment. Through the medium of physical activity in this environment individuals can shed the stress of modern life and find peace and harmony.



**Figure 6.4** White-water rafting is an example of a thrilling outdoor recreation activity

## Enjoyment, challenge and excitement

The core of outdoor recreation (i.e. physical activity in the outdoors) goes to the very nature of why people participate in the different forms of activity. The appeal to test your ability, great or small, against the perils of uncontrolled variables (e.g. weather, waves, mountains, rivers) is often ranked as the number one reason for participation. For example, a mountain climber must constantly be making decisions about where to anchor their ropes, how the changing weather will affect their ascent, at which altitude they should start using oxygen – and so on. It is this element of adventure that places people outside of their comfort zone and creates challenge. Through challenge, people may have to work harder, take risks and think outside the square – these elements all heighten the sense of achievement and excitement. Danger



**Figure 6.5** Adventurers Justin Jones and James Castrission

is another factor that increases the sense of challenge and excitement; for example, abseiling (heights) and downhill mountain biking (speed). The sense of enjoyment and excitement that people experience while participating in outdoor recreation is evidenced by the obsessive nature with which people train, participate and share their adventures. It is not uncommon for a form of outdoor recreation to be something that defines a person (i.e. their passion).

## Social interaction

Most outdoor recreation activities would be classed as individual sports; however, the majority of participants who engage in the likes of white-water kayaking and hiking do so within groups. The shared experience of these pursuits is a tremendous avenue for building friendship and social networks. The challenging nature of outdoor



**Figure 6.6** The allure of being in a state of equality with the environment can provide immense clarity and peace of mind

recreation means people may need to overcome adversity to achieve the desired outcome. Through this adversity strong social bonds will be developed. For instance, Justin Jones and James Castrission (pictured in Figure 6.5) – an Australian duo that were both the first to cross the Tasman Sea in a kayak and the first pair to trek from the coast of Antarctica to the South Pole and back – have highlighted the importance of their friendship to the success and enjoyment of their experiences.

### Appreciation of the environment

The sheer natural beauty of the mountains, the rivers, the open plains and the oceans provides the key motivation for many people's involvement in outdoor recreation. The allure of being in a state of equality with the environment can provide immense clarity and peace of mind. Sea kayaking is a great example of an environmentally friendly activity that provides the participant with a great medium for appreciating the beauty of the ocean and coastline. The lack of noise allows the paddler to interact more closely with marine life and the agility of the vessel allows for closer exploration of unique coastal features.

Many outdoor recreation clubs and associations actively work with the authorities to develop management plans for the land and/or the ocean they use. These plans are put in place by the administrators and users to ensure future generations can also enjoy what the local environment has to offer. It is important for participants to look after the land they use so as to avoid unnecessary ecosystem destruction.

### Health and fitness

Outdoor recreation is a wonderful way to maintain fitness. Most forms of outdoor recreation are physically demanding. For example, rock climbing requires the participant to demonstrate

### Summary 6.2

- 1 Outline a range of outdoor recreation activities.
- 2 Outline the reasons why people may participate in outdoor recreation.

components of fitness like muscular endurance and flexibility, while cross-country and trail running require cardiorespiratory fitness, speed and good body composition. An individual's health is measured not only through physical well-being but also their mental, emotional, intellectual and spiritual well-being. The direct connection of outdoor recreation to the environment has been demonstrated to improve many aspects of an individual's health: self-esteem, confidence, concentration and sense of purpose.

The appeal for outdoor recreation as a form of maintaining health and fitness is also evidenced by the upward trend in adventure racing. Individuals and teams can participate and compete in a variety

of racing styles; for example, off-road triathlons, mud runs, mountain bike enduros and kayaking races. The increased prevalence of these races is inspiring and motivating people more so than ever to train and participate in all forms.

### Checklist 6.3

What benefits may result for the individual from participation in outdoor recreation?



**Figure 6.7** Mud runs such as the Tough Mudder competitions are showing a strong upward trend

## 6.2 Understanding the technical skills required to safely participate in outdoor recreation

### Driving question 6.4

Think about the most common injuries and dangers associated with outdoor recreation pursuits. What mistakes and errors do you think these people make?

### Planning skills

The thorough preparation of participants for outdoor recreation is essential. The type of activity, the duration and the location of the activity will impact upon the scope and detail that goes into planning. Outdoor recreation and preparedness go hand in hand. Just like a sprinter who warms up, an adventurer must carefully plan their expedition.

Planning for a trip can begin many months or even years before engaging in the activity. Through planning the participant increases their awareness of the variables associated with achieving the goal and mitigates many of the potential dangers.

### Environmental planning

There is no question as to the importance of considering the potential environmental hazards when planning for outdoor recreation. As its name suggests, outdoor recreation involves participants engaging in activity within the wilderness. Many of the most popular forms of outdoor recreation take place in remote and isolated locations where the weather can change quickly or where maps may lack details about natural obstacles. Awareness of the weather patterns and the local terrain of the area in which someone decides to walk, ride, climb or paddle is a major part of planning.

If a group of hikers were going to the Blue Mountains National Park for an expedition, it would be important for them to be familiar with the weather and even be able to read the weather indicators. They should also understand and carry topographical maps of the area. In planning their expedition they should choose to go at a time between the extremes of the seasons. Just as a hiker plans for the terrain and weather where they intend to walk, a sea kayaker should plan for the tides, swell and winds on the water. A mountain climber should plan for the effects of altitude, snow and wind and so the environmental considerations continue with each different activity. Websites such as the Bureau of Meteorology (BOM) are an ideal location to research weather patterns, attain forecasts and check the rainfall radar.

### Emergency management planning and risk assessment

The risk and challenge associated with outdoor recreation is a large part of its appeal. However, it is important for participants to assess these risks and create appropriate plans in order to mitigate their potential impact. The purpose of a risk assessment (often a written document) is to identify the risk and prepare appropriately so as to ensure the risk is avoided. Along with each risk, the participant



Figure 6.8 Considering the weather forecast is vital in planning outdoor recreation pursuits

will identify ways of negotiating the risk and how to react in the event of a specific emergency.

Escape routes are alternative routes that the participant can access in the event of an emergency. For example, a hiker who is walking the popular Great North Walk, which connects Sydney to Newcastle, should be aware of major roads and rail lines they could access in the event of an emergency. Along the Pacific Highway, small townships and railway stations are in most cases close by to the Great North Walk and are an ideal escape route should any of the following scenarios present themselves to the group: the weather changes, the participants are struggling with the demands of the activity and/or an injury is suffered.

The remoteness of many outdoor recreation activities combined with the associated dangers mean the participants should be prepared for any first aid situations. All participants should have some basic first aid training, preferably a Senior First Aid certificate. Often expedition leaders will possess advanced qualifications such as the Wilderness First Aid certificate. The participants should further prepare for their chosen activity by ensuring they are carrying an appropriately set up first aid kit. Some forms of activity may require specific types of equipment. Most kits should contain the following essentials: compression and triangular bandages, sterile wound dressings, roll of tape, antiseptic lotion/ointment, instant cold pack, basic pain relief medication (paracetamol), survival/space blanket, band aids, scissors and tweezers. When participating in groups, it is advisable to split the contents of the kit between

people so as to spread the weight evenly. It is also important for individuals who have specific needs to carry with them their medication; for example, an asthmatic will carry their puffer.

Before even departing for an activity, the lines of communication should be opened. The activity plan (maps, locations, objectives, etc.) should all be outlined to someone who is not going. This person can then relay this important information to authorities should the need arise. Many national parks also require approval to access, which aids in the administration of the park and also provides the authorities responsible for the park with an overview of your intended plan.

Modern-day forms of communication have advanced significantly and have facilitated safer participation. Mobile phones have greater signal strength than ever before and should be taken within the participant's kit. Mobile phones can contact 000 and/or 112 in the event of an emergency. The 000 number will work even if the phone has no SIM card and is locked – as long as there is mobile coverage in the area. If the activity is planned to take place in extreme isolation where regular mobile coverage is limited or non-existent then the participant should consider a satellite phone and/or Personal Location Beacon (PLB), sometimes known as an EPIRB. The satellite phone utilises technology that connects you to the telephone network via a satellite. A PLB transmits a radio signal direct to emergency services. The radio signal is only set off in the event of an emergency and will allow authorities to pinpoint your location and send the appropriate resources.



**Figure 6.9** Modern-day forms of communication have advanced significantly and have facilitated safer participation



**Figure 6.10** Most smartphones have built-in GPS systems and mobile phones in general have greater signal strength than ever before

Likelihood				
Consequences	Very likely Could happen anytime	Likely Could happen sometime	Unlikely Could happen but very rarely	Very unlikely Could happen but probably never will
Kill or cause permanent disability or ill-health	1	1	2	3
Long-term illness or serious injury	1	2	3	4
Medical attention and several days off work	2	3	4	5
First aid needed	3	4	5	6

**Legend:**

1: top priority – do something immediately

6: low priority – do something when possible

**Table 6.1** Risk-assessment matrix

A reconnoitre or reconnaissance – or as it is colloquially referred, a ‘recce’ – is an important part of outdoor recreation. Reconnaissance involves the participants familiarising themselves with the location of the planned expedition. Such familiarisation is of importance in the scenario of it being a multiday activity and/or if the participants have not travelled over the routes before. For example, consider a group planning a week-long sea kayak expedition around the Whitsunday Islands. The group should complete one day of the expedition prior to starting. This would help to allow the group to adjust to conditions and solve any planning problems prior to beginning the trip.

## Food and water considerations

Food and water provide the human body with its energy to function. Put simply, without food and water the body will shut down. Dependent upon a variety of factors, it is estimated a human can survive for up to three weeks without food but for only a matter of days without water. The need for food and water to prolong life makes nutritional considerations extremely important. Add to this the energy demands of activities like hiking, climbing or paddling and the participating individual must take great time and care to ensure they have a plentiful supply of water, and have chosen food that will provide high levels of sustained energy. Factors that must be considered when devising a meal plan include: type of activity, duration, location, weather, potential emergency scenarios, food weight, food waste, potential for resupply and what sort of preparation is required for the food for consumption.

It is recommended that the average adult consume two litres of water per day. In a situation where an individual is physically active, the

requirement increases. Temperature will also impact upon the amount of water required. As well as for drinking, water is usually needed to assist in meal preparation, meal clean-up and for hygiene purposes. In planning how much water they will require for their chosen activity, participants will need to consider the weight of the water. One litre is equal to one kilogram. This means, although essential, water is heavy. If the activity is a multiday one then the ability to find fresh water and sanitise it will be a critical skill. As a general rule, three to four litres of water per day will be sufficient for one person.

The food consumed should be high in carbohydrate value and have a low glycaemic level. This will ensure the energy taken from the food is sustained and long lasting. While lollies and chocolates are great snacks, they will only provide a short-term burst of energy. The major meals in particular should feature food like rice. There are many food items that can be found in supermarkets that make ideal food for expeditions. Many of these foods need only a small amount of water and the heat of a basic camp stove to prepare for eating. Most outdoor shops also sell dehydrated foods that require similar preparation. The way in which the food is packaged is also important. Once the food is consumed, what remains of the packet should be lightweight and crushable so it is easy to continue carrying until the appropriate waste disposal centre is found.

## Resources for safe participation

Whether it be a rock climber’s harness or a sea kayaker’s paddle, each and every activity has specific equipment that is required for participation. There are also some more general items that are common across most outdoor recreation pursuits.

Clothing is a very important consideration when planning. Temperature, precipitation, wind and the type of activity will influence your clothing choice. If conditions are hot and dry, it is important to wear loose and comfortable clothing with great breathability. There are many synthetic garments that specialise in 'wicking' away sweat. One-hundred per cent cotton garments are also very breathable. The purpose of dressing for hot conditions is to decrease the chance of overheating while protecting against sunburn. When conditions are colder, clothing becomes even more important as this provides the participant with their primary barrier against the elements. Layering is a technique used to ensure warmth. Layering, as the name suggests, involves wearing multiple

garments over the top of one another. This helps to trap warm air against the body but also makes the gradual removal of clothing easier as one begins to warm up. The initial layer should be a thermal. The mid-layer should enhance warmth. One-hundred per cent merino wool shirts and jackets are very popular mid-layer options as they are extremely warm and breathable. Commonly, adventurers use Gor-Tex products as the final layer or outer shell. Gor-Tex is an extremely durable but lightweight synthetic product that is both waterproof and windproof. Gor-Tex is also breathable, which means that as the participant heats up the jacket does not become sweaty and uncomfortable. Hot or cold, when participating in outdoor recreation the outer shell is really important to carry. In climates of extreme cold, participants should also seek to protect their extremities (head, fingers and toes). Gloves, beanies, socks and footwear are all important considerations.

If the choice of activity is a multiday expedition then the participant will also need to choose an appropriate shelter. It is always advisable to seek quality products so as to ensure durability. It is also extremely important that the tent be lightweight. Carrying a tent can be a real burden so it is a good idea to separate sections of the tent between



Figure 6.11 Thermal underwear



Figure 6.12 A Gor-Tex jacket



Figure 6.13 One hundred per cent merino wool shirts and jackets are very popular mid-layer options as they are extremely warm and breathable

members of the expedition party. A lightweight sleeping bag with an appropriate weather rating for the region of activity is another important resource. Other resources that will need to be considered should the expedition last multiple days include: cooking and water sanitation equipment, small tools, packs/rucksacks and waterproof bags and/or covers.

Most of these general resources, like the specialist equipment, can be quite expensive to purchase. However, in situations where you are relying on these resources for safety, the value of comfort and health cannot be underestimated. The quality of your resources and equipment is a key component to success and enjoyment. Most of the high-end equipment is purchased with lifetime warranties, meaning they are tested to last for many, many years. When purchasing equipment and resources for outdoor recreation, one should remember the mantra: buy once, buy well!

## Legal and administrative requirements

Like many of life's little and great challenges, outdoor recreation has its associated risks. It is through the richness of these challenging experiences that one can gain meaning and purpose. In most forms of outdoor recreation, the adult participating accepts the risks associated with that particular activity. For example, a surfer knows they could be taken by a shark. In some scenarios, such as tour groups and school groups, the participants may need to complete official forms that acknowledge the risks and/or provide parent/guardian permission for their involvement. As well as accepting responsibility for one's involvement in outdoor recreation, there are other administrative duties. Many national parks and state parks require written knowledge of your intention to complete an activity. Each different park may have varying rules and regulations and it is a requirement of the participant's to research these thoroughly. If

permission is required, ensure the correct procedure is adhered to. Not only do these protocols ensure that the sacredness of the park is protected, they also mean that authorities are aware of your movements should an emergency present.

A trip intention form is a key piece of administration that should be completed before departing for an expedition. This form will outline the planned route, campsites, daily objectives, escape routes, estimated finish times and relevant maps. The trip intention form should be left with the governing authorities and a family member and/or a trusted friend not participating. This form can then be given to emergency services in order to track the group if the need arises.

## Going further 6.6

### Create

- 1 Using the risk-assessment matrix in Table 6.1 (on page 210), create a risk assessment for a chosen outdoor recreation experience.
- 2 Create a list of equipment required for an overnight experience during summer. Use the categories: clothing, personal equipment and group equipment. How would this equipment list differ during winter?

## Campsite selection

### Geographic, environmental and climatic considerations

Participant health and safety should be the primary concern when choosing and establishing a campsite. Consider the following factors:

## Checklist 6.5

- 1 Design a planning checklist to ensure the planning of an outdoor experience runs safely and smoothly.
- 2 Create a list of essential requirements for an outdoor experience. The list should ensure that manageable and comfortable loads are carried by the participants.



Figure 6.14 Campsite selection must be done with participant health and safety in mind

- Water:
  - Is there a good supply of fresh water nearby?
  - Is the site position in a watercourse (i.e. a dried river bed or tidal beach)?
  - Is there a risk of flash flooding from heavy, sudden rainfall?
  - Is fog or frost forming close to water sources?
- Ground coverage:
  - Is ground level?
  - Is the area free of debris (e.g. rocks and sticks that can make sleeping very uncomfortable)?
  - Are there animal nests or burrows?
  - Is it safe and/or permissible to ignite a fire?
- Shelter and isolation:
  - Is there protection from the prevailing wind?
  - Is the site aesthetically pleasing?
  - Are you isolated from other groups or people?
  - Is there shade protection from the hot sun?
  - Are there any hazards (e.g. mosquitoes, old and rotted trees, disused mineshafts)?

## Establishing the campsite (fireplace, waste disposal)

It is advisable to select and establish a campsite prior to sunset. All the duties associated with setting up the site are far more complex without natural light. If participants are a part of a larger expedition team, it is a good idea for the leader to assign specific tasks to people to assist in the efficiency of the site establishment. For example, while some people are erecting the tents, others can be starting to cook the evening meal, digging the latrines and/or getting a fireplace prepared. Once the site has been selected, the participants will need to establish the following features within their campsite:

- Tents/sleeping area:
  - Choose a level area free of debris and away from any hazards.



**Figure 6.15** A fire is an important component of a campsite, but safety measures must be taken

## Going further 6.7

### Collaborate

Using the picture below, assess this area for suitability as a campsite.



**Figure 6.16**

- Fireplace:
  - A fire can only be lit where the park authorities deem appropriate and the fire services do not have bans in place. It is important to be aware of these factors before starting the expedition.
  - The fireplace should be a central location within the site.
  - The area in which the fire is to be lit should be levelled and cleared.
  - Digging a small pit can help prevent the fire spreading.
  - When building the fire be sure to maximise oxygen flow through the fuel source (timber). Without oxygen the fire will not burn.
  - Once the need for the fire is finished, be sure to put it out. Allow the fire to burn down and then cover with dirt. Pouring water over a hot fire can create a lot of steam, which can burn. This is also a waste of water. Carefully smothering a fire will block the fire's oxygen supply and put it out.
  - Ensure all participants know the location of the extinguished fire so no one walks over it.

## Tree fall evaluation

It is unlikely that larger tree branches will fall. However, if the wind is high and a tree is rotted, the chance of a branch falling is greater. In assessing the quality of a site and in particular where the tents are set up, participants should carefully examine the tree branches above and around them. Falling tree branches can cause serious injury and/or death.

## Summary 6.8

What are the key factors to determine when selecting a campsite?

## Conservation skills

### 'Leave no trace' camping

'Leave no trace' camping refers to the practice of leaving a campsite in the same condition it was upon your arrival. In order to uphold the ecosystems and natural beauty of the location, the impact on the area should be minimal. This ensures the flora and fauna are unaffected and that the area can be enjoyed by people for many years to come. For this reason, most national parks and state parks have designated campsites. These are generally cleared areas where tents can be established without campers needing to clear the vegetation. Then upon leaving a site, the campers should take all their rubbish, fill in their latrines and ensure any fires are inactive.

### Minimal impact practices

Minimal impact practices must be adopted by all those who enjoy outdoor recreation. In some way or another, the very presence of humans in a natural environment will create a disturbance many times without the knowledge of the participant. Mountain biking can cause erosion, rock climbers may leave rubbish and scuba divers could break coral. Authorities are now working

with **conservation** groups and outdoor recreation associations to achieve the right balance. Most parks and reserves now have in place strict rules and regulations that ensure a minimal impact upon the environment; for example, designated camping areas and managed bike and hike trails.

**conservation**  
preservation from neglect

### Ethical issues

The ethical issues associated with outdoor recreation are in a large part to do with the environmental impact. At the Everest Base Camp, season after season for many years mountaineers have come to try and conquer the highest peak in the world. Unfortunately, the increasing numbers of people bring with them tents, climbing equipment, medical supplies and even helicopters. These resources have all had an impact on the most sacred mountain in the world. This scenario is a representation of the dilemma facing governments and national park authorities all over the globe. People have a desire to access national parks and reserves, which enhances their well-being and

## Summary 6.9

- 1 What is the essence of 'leave no trace' camping?
- 2 Outline minimal impact practices in relation to outdoor recreation.
- 3 Investigate and outline the main points of the Bushwalkers' Code.



Figure 6.17 Everest Base Camp



Figure 6.18 Mount Everest (known as *Qomolangma* in Tibet)

## Checklist 6.10

- 1 What planning and behaviour implications do the following statements have for those participating in the outdoors?
  - a 'Take nothing but photos and leave nothing but footprints.'
  - b 'Leave the area cleaner than you found it.'
- 2 Should areas be set aside as human-free?
- 3 Should 4WD and hiking be banned from some areas?

health. It can also provide economic benefits, such as jobs for the area. However, when people enter the parks they also impact upon them and facilitate destruction. If these areas – which support the most vulnerable and beautiful ecosystems – are not protected, then the human race will lose some of its most precious resources.

## Navigation skills

### Map reading

The ability to read and use a map effectively is an essential bushcraft skill. While global positioning systems (GPS) are increasing in popularity and accuracy, learning to read a map remains a crucial skill when venturing into the wilderness. Even in instances where participants are following a track, they should carry a map and compass to be used as a way of confirming their location and, in the event the participant finds themselves lost, they can use these resources to help map their escape route.

The best kind of map for navigation is a topographic map. These are specifically designed with navigation in mind. A topographic map exists for almost all regions across Australia and each individual map represents a different region to the next. When viewing a topographic map, the reader should first identify the legend, which contains a summary of all the important information contained on the map. The legend will contain the symbols that represent landmarks like rivers, swamps, roads and rail lines and even types of vegetation. Within the legend, or close by, the map's scale will also be noted. The scale represents the distance on the map compared with the actual distance. For example, if the scale is 1:25000, then 1 cm on the map represents 25 000 cm on the land (or 250 m);

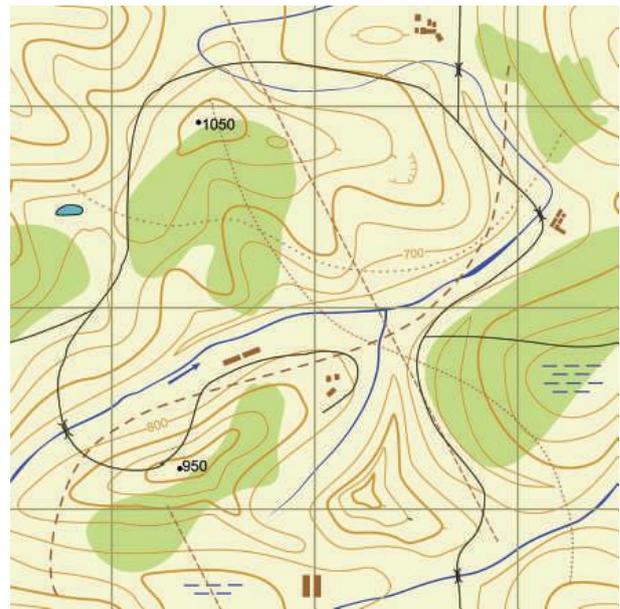


Figure 6.19 An example of a topographic map

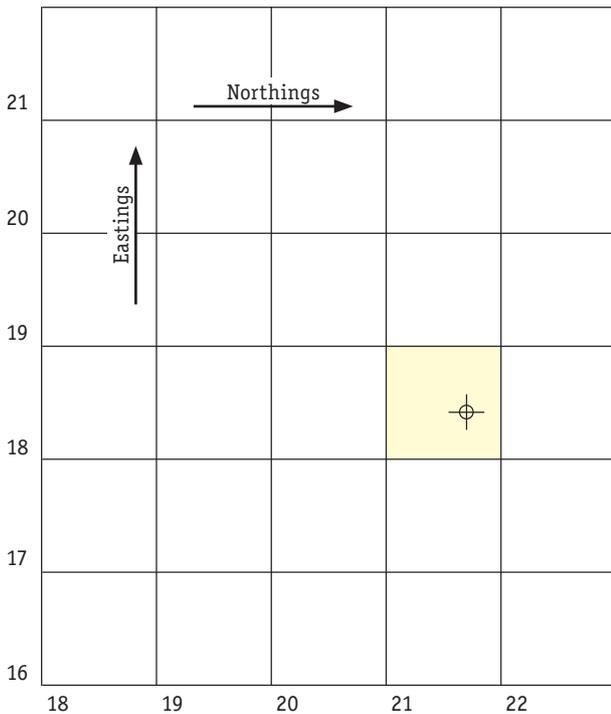
1:25000 is the standard on most topographic maps, which means 4 cm on the map generally represents 1 km on the land.

The reader must also pay careful attention to the contour lines. The contour lines join places of equal height. Each line will be labelled with its height (in metres) above sea level (e.g. 450 m indicates that the land on this line is 450 metres above sea level). The contour lines reveal much about the land and its terrain. Contour lines will inform the reader of the land's shape and steepness as well as its height. If contour lines are closer together, this indicates height is gained or lost quickly. If the contour lines are spread further apart, this indicates that there is a more gentle gradient.

### Grid bearing

Grid references are the vertical (north to south) and horizontal (east to west) lines that run through a topographic map. The vertical lines on the map are known as eastings and the horizontal lines on the map are known as northings. The grid references very effectively break the map down into smaller segments and allow the readers to not only pinpoint locations but communicate these locations in a very specific manner. The grid bearing is a number that pinpoints a location on the map. The bearing is communicated as a number where the easting appears first and the northing second. In a four-digit grid bearing like 21–18 the 21 represents the easting and the 18 represents the northing. Using the grid in Figure 6.20 the reader follows the easting marked 21 and the northing marked 18. The point at which these two lines intersect marks the bearing 21–18. To be more specific, experienced navigators will use six- and eight-digit grid bearings. In a six-

digit bearing like 217–184, the first three numbers represent the easting while the second three numbers represent the northing. To use a six-digit bearing, the same principle applies as with a four-digit bearing, but with the additional number comes greater accuracy, i.e. on the easting marked 217, the map reader simply moves up seven more points on the bearing of 21.



**Figure 6.20** Sample grid pinpointing the six-digit bearing of 217–184

In the grid above, two example bearings have been provided.

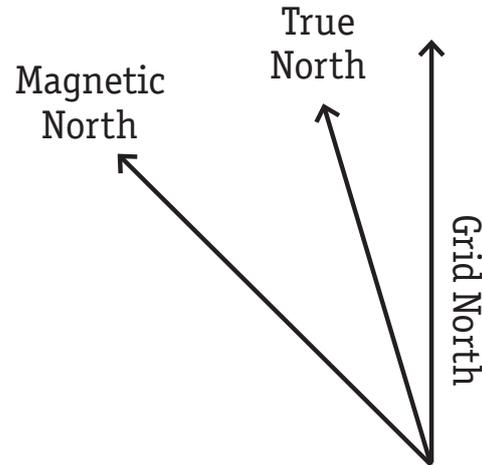
- 1 Grid bearing 21–18: A four-digit bearing provides the map reader with a general location. The yellow shaded box represents this grid bearing.
- 2 Grid bearing 217–184: The six-digit bearing gives a more exact location (as illustrated by the crosshair symbol) and is most commonly used when people are navigating using a topographic map.

## Magnetic bearing

A compass is a navigational instrument that shows direction. The modern-day version of this instrument was predated by similar tools reaching right back into the first and second centuries BC. Using a compass accurately can take many years of practice. When used correctly the compass is an extremely useful navigational tool. The correct method is to hold the compass flat. The red needle will then point to the magnetic north.

## True north

The magnetic north is in the direction of the North Pole. The actual direction of the North Pole is referred to as true north (i.e. there is a variance between true north and magnetic north). Furthermore, because the map you are reading is flat and the Earth is round, the user must also allow for the variation between grid north and magnetic north.



**Figure 6.21** North types

## Measuring distance

The scale on a topographic map is key to the reader measuring distance. As previously mentioned, most topographic maps have a scale of 1:25000 or 1 cm on the map to every 25000 cm on the actual land. Measuring the distance between two points can be done using a ruler if the aim is to measure **'as the crow flies'**. However, if a group is walking on a track or paddling down a river, the path is rarely straight. The easiest and most accurate way to measure these distances is by using a length of string.

**'as the crow flies'** the straight-line distance between two points, disregarding physical obstacles

## Going further 6.11

### Inquire

Participate in a range of map-reading and compass-reading activities.

## Summary 6.12

- 1 What is the difference between true north, grid north and magnetic north?
- 2 What does a topographic map normally include?

Cut the string to the distance according to the scale and simply manipulate the string around the track or river to determine the distance.

## Natural navigation

The sun can provide a very broad guide for navigation. It is known that the sun rises in the east and sets in the west. With this knowledge, basic direction can be determined by simply observing the sun. The stars can also assist in determining direction. Being able to use the stars in the night sky does, however, require great skill. The navigator using the stars must also have a sound knowledge of celestial formations. For example, by using the Southern Cross formation and Pointers, a skilled navigator can determine south. It should be noted that different formations can be observed in the Northern and Southern Hemispheres.

### Checklist 6.13

- 1 Estimate the approximate time that it would take to walk the Pacific Motorway from Hornsby to Newcastle.
- 2 Go to the website Blue Mountains Australia: Bushwalks and bushwalking tracks (see [www.cambridge.edu.au/prelimpdhpe1weblinks](http://www.cambridge.edu.au/prelimpdhpe1weblinks)) and choose one easy, one medium and one hard walk within the Blue Mountains. Determine the approximate time that it would take to complete each one.

## Emergency management skills

### Wilderness First Aid

The vast majority of outdoor recreation activities take place in isolated areas, often several hours from emergency help. This means that participants should be suitably qualified and experienced in what to do in an emergency scenario. Medical emergencies, bushfires, flooding, inclement weather and simply getting lost are the most common situations that require special management skills. Before embarking on an expedition or similar, participants should be thoroughly trained and understand all the potential risks. For example, it is always strongly recommended that all participants attain the standard Senior First Aid certificate

and that at least one member has the Wilderness First Aid qualification. The best course of action is always preparedness and prevention; however, if an emergency situation does present itself it is important to remain calm and rational.

A quick change in weather, such as a sudden downpour or the arrival of a cold front and/or poor hydration are all factors that can lead to thermoregulation issues. Thermoregulation is the ability of the body to maintain its regular core temperature. The average core temperature of a human is 37 degrees Celsius (this can change slightly based on a variety of variables). The body should maintain a regular core temperature within 0.5 to 1 degree of the 37 degrees. If the core body temperature is raised, the condition is known as hyperthermia. If the core body temperature is lowered, it is called hypothermia. The occurrence of either condition is a failure of thermoregulation and can have very serious consequences for the sufferer. (Refer back to the signs, symptoms and treatment of hyperthermia and hypothermia in Chapter 3 on page 143.)

### Snake bite

Many venomous snakes live in the Australian wilderness. Snakes should be respected as it is we humans who are entering their land. Simple precautions should be taken, such as wearing boots, gaiters and long pants and treading carefully in areas of potential snake occupation (e.g. logs, long grass). If a snake is spotted, give it plenty of space and time. In most cases the snake will clear away quickly. Generally, snakes only strike out if they are directly threatened.

Signs and symptoms:

- pain at the area of the bite
- headache
- nausea



**Figure 6.22** The taipan is one of the most poisonous snakes in Australia

- vomiting
- loss of consciousness.

Treatment:

- immobilise the affected limb or body part
- apply a pressure immobilisation bandage
- if applicable also use a splint
- seek urgent medical assistance ASAP.

## What to do if you are lost

If a group conducting an expedition find themselves lost, the following points should be closely adhered to:

- 1 Remain calm and rational. Good decision-making is crucial in grim situations.
- 2 Seek shelter and discuss the issue with the team.
- 3 Study your maps and consider retracing your steps to the last known position.
- 4 The participant may also be able to gain further insight into their location through carefully reading their map and looking for any manmade or natural features.
- 5 If the team is unable to re-locate their route of travel, the best thing to do is to remain in that location and stay together as a group.
- 6 If the proper procedure has been followed in the preparation for the expedition, authorities should be able to find the group when they do not return at the pre-advised estimated time of arrival.
- 7 If the group must wait for a search party, the following steps should be followed: stay together, establish a smoky fire, create a shelter, conserve energy and food.
- 8 A satellite phone and/or PLB could be activated in these situations as well.



**Figure 6.23** When used correctly the compass is an extremely useful navigational tool

## Bushfire procedures, lightning, flooded rivers

If bushfire presents an imminent danger, follow these guidelines:

- listen carefully to warnings and heed their advice
- remain hydrated
- dampen clothing (woollen clothing ideal)
- take shelter in a hole, cave or stream
- stop, drop and roll if your clothing catches fire
- once the front has passed, remain vigilant as the surrounding area will be hot, trees will be weakened and may tend to fall, and the wildlife may be erratic.



**Figure 6.24** It is very important to follow the bushfire guidelines

If an electrical storm is predicted or occurs, follow these guidelines:

- avoid camping near large trees
- stay away from metal/wire objects
- stay in your tent.

Crossing large flooded rivers is dangerous. If possible, avoid the need to cross a river by mapping routes that utilise bridges or natural crossing points. If participants do need to cross a river, the following guidelines should be adhered to:

- check the depth and speed of the river
- leave footwear on
- remove heavy objects like packs/rucksacks
- use a stick (planted on the upstream side for stability)
- move across the river by walking slowly in a diagonally downstream direction
- observers should be prepared with a rescue rope
- if the river is too deep, too fast or contains too much debris, do not cross.



**Figure 6.25** Electrical storms necessitate careful consideration to avoid danger of electrocution



**Figure 6.26** Crossing large flooded rivers is dangerous; guidelines must be adhered to

### Summary 6.14

- 1 What are the signs and symptoms of hyperthermia and how would you treat it?
- 2 What are the signs and symptoms of hypothermia and how would you treat it?
- 3 What are the signs and symptoms of a snake bite and how would you treat it?
- 4 Outline what you would do if you became lost.
- 5 What do you need to consider in terms of bushfires, lightning and flooded rivers?

## Checklist 6.15

- 1 Analyse the following situations and propose prevention and management strategies:
  - a Hiking in an alpine environment.
  - b Bushwalking in Far North Queensland during summer.
  - c Being bitten by a venomous snake.
  - d Becoming lost while trekking in the Warrumbungle Mountains.
- 2 Describe how you would construct an emergency shelter using natural materials.

## Skills needed for other outdoor activities relevant to the experience

### Canoeing and kayaking skills

Canoeing and kayaking are popular forms of outdoor recreation. They allow the participant to interact with a river, harbour, lake or ocean with little impact on the ecosystem. With the right kind of craft this activity is also a popular medium for conducting an expedition. The multiday exploration of a river system or island group is a great way to make full use of all the benefits of canoeing and kayaking.

A canoe and kayak are similar in that they both act as a vessel that provides transport across water.

Both activities also require the use of a paddle to power the craft. Other than that, these are two very different types of boats. A canoe will carry two to three people at a time. It is open and sits quite high in the water, and a canoeist uses a paddle with a single blade. A kayak only carries one or two people and the paddler and paddles actually sit inside the boat and secure themselves with a 'spray deck' or 'skirt', which keeps the water out of the cockpit. Furthermore, the kayak paddle has two blades, and generally the kayak moves faster. The canoe is the more traditional craft and is a great boat for new users to build confidence and refine the paddling skills. Most long-term paddlers use a kayak for the majority of their pursuits. The kayak is faster, more comfortable and possesses greater storage capacity for expedition requirements. Sea kayaking in particular has grown in popularity recently.



**Figure 6.28** A canoe is a more family- and beginner-friendly vessel and moves more slowly than a kayak



**Figure 6.27** A kayak only carries one or two people, and is steered by a paddle with two blades

When canoeing or kayaking:

- Always wear appropriate safety equipment (e.g. a personal flotation device [PFD], shoes, helmet, wetsuit/rash vest).
- Notify someone of your paddling intentions or paddle in a group.
- Understand and be able to read the waterways you are paddling.
- Be confident and proficient in paddling techniques and rescue scenarios.
- Be a strong swimmer.
- Study the weather patterns predicted for the day of paddling.
- Know your limits (i.e. if the obstacle, weather or distance are beyond your capabilities then do not proceed).

## Abseiling skills

Abseiling remains a very challenging activity for many people. The fear associated with heights means this activity induces fear and anxiety not found in many other outdoor recreation activities. Abseiling involves the participant descending in a controlled manner down a wall (synthetic or natural). The abseiler wears a harness and is secured by a rope. Using gravity and a special descending device such as a 'figure 8', the abseiler can walk backwards down the wall or cliff. As confidence and competence grows, the abseiler may also jump and move faster down the drop. Once the abseiler breaks through the initial fear, there can be an immense level of satisfaction, enjoyment and achievement.

When abseiling:

- Always ensure the equipment you are using has been checked by professionals. Avoid using old equipment.
- Wear a helmet, gloves, closed-in shoes and a properly fitted harness.
- Always abseil with other people. When you are learning, ensure there is always someone with you who is more experienced to provide tuition and mentoring.
- Ensure you have knot-tying skills and the ability to anchor your main ropes.
- Ensure you have rescue skills.



**Figure 6.29** An abseiler must be willing to navigate steep heights

# 6.3 The impact that group dynamics has on the outdoor experience

## Leadership styles

In general terms, a leader is someone who is able to influence, persuade and even demand certain qualities or tasks of a group of individuals bound together by a common goal. Put simply, the leader is responsible for the group's success and failure. A leader is often nominated to their position through a vote, or a more informal process. While leadership is a dynamic role that requires a masterful combination of many styles dependent upon the scenario, the general qualities of leadership are grouped into four sub-categories.

### Democratic

This type of leader is most commonly voted to their position and continues to rely on the combined voice of all members in moving forward. The **democratic** leader will seek counsel from members and even a vote to help make decisions. Collaboration and cooperation are driving motivators for this leader. See Table 6.2.

**democratic** considering the ideas and opinions of others

Table 6.2.

### Laissez-faire

**Laissez-faire** is a French word that means 'let them do as they will'. A laissez-faire leader is one who steps away from the decision-making and

**laissez-faire** a relaxed approach to leadership

allows the group to guide themselves. This often results in a lack of direction and disorganisation. See Table 6.3.

### Autocratic

An **autocratic** leader is one who asserts their authority by making all the decisions without any consultation. The autocratic leader provides a clear directive and expects the group to achieve the goal. See Table 6.4.

**autocratic** using authority without consultation

**strategic non-intervention** the deliberate decision to monitor rather than intervene when people are faced with a challenge or problem; this allows for the development of resourcefulness, problem-solving skills and personal growth

### Strategic non-intervention

The **strategic non-intervention** style of leadership involves the group leader being removed from a situation. Once in a position of observation, the leader can closely study the steps and actions

## Summary 6.16

- 1 Provide a basic outline of each leadership style.
- 2 What type of leadership do you believe you exhibit?
- 3 Which type of leadership style do you most respond to?

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• All group members feel valued</li> <li>• The group can influence and shape the team's direction and purpose</li> <li>• A great variety of options and ideas are raised</li> <li>• All group members are provided with opportunities to demonstrate initiative and even leadership</li> <li>• Can facilitate healthy conflict</li> </ul>	<ul style="list-style-type: none"> <li>• The decision-making process can be long</li> <li>• Different opinions can create tension between group members and create destructive conflict</li> <li>• The leader's own wisdom and foresight may be undermined</li> </ul>

Table 6.2 Democratic leadership

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• Can promote other potential leaders to step forward and develop</li> <li>• Can allow group members, even if only momentarily, to feel at ease and free from responsibility</li> </ul>	<ul style="list-style-type: none"> <li>• Decisions are either not made or made with little consideration</li> <li>• The group is unlikely to achieve their intended goals</li> <li>• The group may feel disjointed and unmotivated</li> </ul>

Table 6.3 Laissez-faire leadership

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• Decisions are made quickly and confidently</li> <li>• The leader can be held to account for the actions of the group because their responsibility is clear</li> <li>• Group members know exactly what is expected</li> </ul>	<ul style="list-style-type: none"> <li>• The good ideas that exist outside of the leader are ignored</li> <li>• Group members have limited opportunity to feel involved and may disconnect from the goal</li> <li>• Disrespect may develop between group members and toward the leader, which can destroy trust</li> </ul>

**Table 6.4** Autocratic leadership

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• Provides group members with leadership development opportunities</li> <li>• Allows the group to learn through experience</li> <li>• Effective method of assessment</li> </ul>	<ul style="list-style-type: none"> <li>• Scenarios in which the group fails must be debriefed effectively to ensure the right learning is achieved</li> <li>• If the leader fails to step in at the correct time, the group's safety might be jeopardised</li> </ul>

**Table 6.5** Strategic non-intervention leadership

## Checklist 6.17

- 1 Suggest suitable situations for each of the leadership styles.
- 2 What distinguishes each of the leadership styles?

the group takes in achieving their goal. The leader will re-enter the group when they have feedback, or when invited to, or when the situation has become too great for the group to manage without intervention. See Table 6.5.

## Understanding group dynamics

### Stages of group dynamics

Groups and teams, when studied, go through a series of stages before they can become a truly successful team. Some teams of people may never really move beyond one particular stage and, therefore, never fulfil their true potential. While most teams progress through the stages, most teams also falter and move back through stages as new team members come, new priorities beckon or the context simply changes. The way in which individuals interact within a team is referred to as group dynamics. A good team must be willing to adapt and change within their environment to ensure longevity, success and fulfilment.

The stages of group dynamics follow these steps:

- 1 **Forming:** This initial stage is when group members are introduced to each other. People may have mixed feelings of excitement and anxiety. This stage is characterised by some sort of orientation, which introduces the people and the tasks. Building trust within the group is a key element for the leader to facilitate. If the people in the group can form a trusting relationship with one another, this can allow them to navigate future hurdles with greater ease.
- 2 **Storming:** This stage often involves conflict. The conflict is a result of different people with different perceptions, abilities and backgrounds coming together to achieve a common goal. The realities of the tasks that lay ahead may bring tension and conflict to the surface. This early obstacle can cause morale to drop and can even jeopardise the end goal. If the conflict is facilitated correctly, it can be constructive – indeed, the term healthy conflict is often used during this stage.
- 3 **Norming:** Resolving issues and moving forward with constructive processes, procedures and behaviours are clear signs the group has moved into this third stage. The group is now able to work more efficiently and is beginning to make real progress through the tasks.
- 4 **Transforming:** This is the ideal stage, which all groups should aspire to achieve. Not all groups succeed in getting to this stage, but those that do are trusting of one another, welcome open communication, are energetic and are focused on achieving the team goal. Selfishness and self-interest are not acceptable behaviours. It is within this environment that a team can achieve maximum efficiency and fulfilment.

## Conflict resolution

Conflict occurs often within groups and among people. It is the result of two or more people opposing another's ideas or goals. How the conflict is handled and eventually resolved is crucial for the group's ongoing success. Conflict should be welcomed as it can bring underlying tension into the open and allow for resolution. It is often what is unsaid or said behind someone's back that can be most destructive to a group. In order to allow for resolution, the conflicting parties should be provided with opportunity to openly discuss the issue. In discussing the issues, both parties should focus on the facts and avoid making emotionally driven comments. This process can be mediated; however, in most cases rational people should be able to achieve a resolution that appeases both parties. The nature of working with other people means that you cannot be selfish and you must be prepared to compromise and perhaps even sacrifice your own goals for the sake of the group.

## Team building

Team building can unite, re-invigorate and enlighten a group. It is the term used to describe a process that often involves activities designed to facilitate teamwork. Just as a weightlifter should lift weights to strengthen their muscles, a group should also endeavour to practise and refine the skills of teamwork. Team-building tasks that build trust and rapport, encourage communication, require intelligence and creativity and facilitate fun will strengthen the teamwork of groups at various stages of development.

## Cooperation

In various industries, sporting arenas and even within families, it is the group that uses teamwork

most effectively that reaps the results. Teamwork allows people to achieve things that an individual would not consider possible on their own. To be a functioning team, however, groups must cooperate. Cooperation in the outdoors is particularly important. If groups cannot cooperate, then goals, tasks and objectives can become as they were to the individual: impossible. For example, establishing a campsite, as previously mentioned, can be done far more efficiently if people share tasks. In a party of three, one person can be cooking dinner, another pitching the tent and the final member can be establishing the latrine.

## Facilitation skills

### Communication skills

Communication is the way in which people relay messages between each other. The most obvious form of communication is verbal; however, the often more subtle nonverbal forms of communication are more powerful. Eye contact, facial expressions and hand signals are all common nonverbal forms of communication used in outdoor recreation. Openness and honesty should be the motivators behind all forms of communication. The type of communication particularly in the outdoor recreation context must be tailored to the specific scenario. If an expedition is at a critical point and safety is an issue, then the message should be communicated in a clear, concise and direct manner. If, however, the group leader is attempting to debrief a particular situation then the opinions and ideas of all members should be heard in a respectful manner. When information is given accurately and the people receiving the information listen carefully, mistakes can be avoided and the experience enhanced. It is this interaction with people that can leave a lasting impression.

### Decision-making

Outdoor recreation and its associated activities provide a wonderful environment to sharpen decision-making skills. Being decisive is important. An action taken that does not consider its outcome can be detrimental. For example, a snowboarder must quickly decide which line to take when boarding down a mountain while a group of hikers may take longer to decide the most appropriate place to cross a river. Both examples require a definitive choice. A poorly considered option or even hesitation could result in accident or injury. With time and practice,

### Summary 6.18

- 1 What are the stages of group dynamics?
- 2 What does it mean to be assertive?

### Checklist 6.19

- 1 Working in small groups, solve a range of simulated initiative challenges.
- 2 What actions would enhance group cohesion when working in teams?

decision-making and the ability to make the right choice will improve. And the skills associated with making decisions in the wilderness can be applied across all aspects of one's life.

## Flexibility

In a fitness sense, flexibility refers to the range of movement around joints. In terms of group dynamics, flexibility refers to the range of movement around decisions and options. In a literal sense, a group leader needs to be able to quickly adjust and adapt to various scenarios as they are unfolding. The weather, the health of the participants and other unexpected obstacles mean a one-size-fits-all approach is both immature and unsafe. All participants must be prepared and willing to adjust and adapt should the situation call them to.

### Summary 6.20

Describe what skills might facilitate the solving of problems faced during outdoor experiences.

## Understanding strengths and weaknesses

Even the most experienced adventurers have failed to fully understand their weaknesses and consequently experienced misfortune. Analysing strengths and weaknesses should form one part of the risk assessment. Through understanding and preparing for weaknesses, participants are helping mitigate a risk factor. Comparatively, knowledge and confidence of one's strengths will allow the participant to make decisions that are more likely to succeed.

## Participant readiness

Outdoor recreation is challenging. Whether it is a two-hour mountain bike ride along the local trails or a multiple-day cross-country skiing expedition, the participant must be physically, emotionally and mentally prepared for what is ahead of them. A poor level of fitness and skill can lead to injury and an inability to enjoy the activity. The rigours of the activity can emotionally drain a participant and mental weakness can lead to bad decision-making. Like anything, the participant should train for their chosen activity. Gradual exposure to the activity is key. In the example of

the multiday skiing expedition, the participant in the lead would need to learn all skills of skiing and surviving in alpine conditions. They would also need to train and practise skiing for long periods of time. It would be highly advisable to conduct a practice version of the expedition that only involved a one-night stay.

It is also an important responsibility of the leader or organiser to make potential participants aware of what is ahead of them. This provides the individual with the appropriate information and can allow the person to self-screen. Further to this, the leader should possess the skill to accurately assess the capabilities of those that wish to participate with those that can participate.

## Self-efficacy

**Self-efficacy** is the belief in one's own ability to achieve a goal. This belief can also be referred to as confidence. The challenges, the decisions and the general experience of outdoor recreation is a tremendous way in which to develop self-efficacy. The belief that is developed in outdoor recreation can be transferred across one's entire life. Through the experience of outdoor recreation, participants will push their abilities to their full potential and because of this their confidence and belief can flourish.

**self-efficacy**  
belief in one's own  
ability

## Balancing challenge and safety

Risk is an important part of life. It is through risk that people can develop new skills and learn things about themselves and others that may have otherwise gone unknown. Risk has always been a part of life and, in particular, growing up. It is, however, important to manage potential risks so as to ensure the safety of participants. Challenge by choice is a common philosophy applied in outdoor recreation. The rationale is that the leader presents all participants with the challenge but the choice is that of the participant. The leader must balance this choice with positive encouragement and gentle persuasion as some participants, upon encouragement, may choose to have a go.

A good way to manage risk is to assess its potential for harm within the bounds of the individual's or the group's level of competence. This means the participant should only attempt those challenges that fall within their abilities. As an addition to this, if participants wish to extend their abilities, they should do so gradually. For example, the snow skier should build gradually through the different difficulty levels. Start with the green circle, then the blue square, followed by the black

diamond and finally the double black diamond. Jumping from the green circle run to the black diamond run would be an example of a participant taking risks outside of their level of competence.

### Pushing the comfort zone

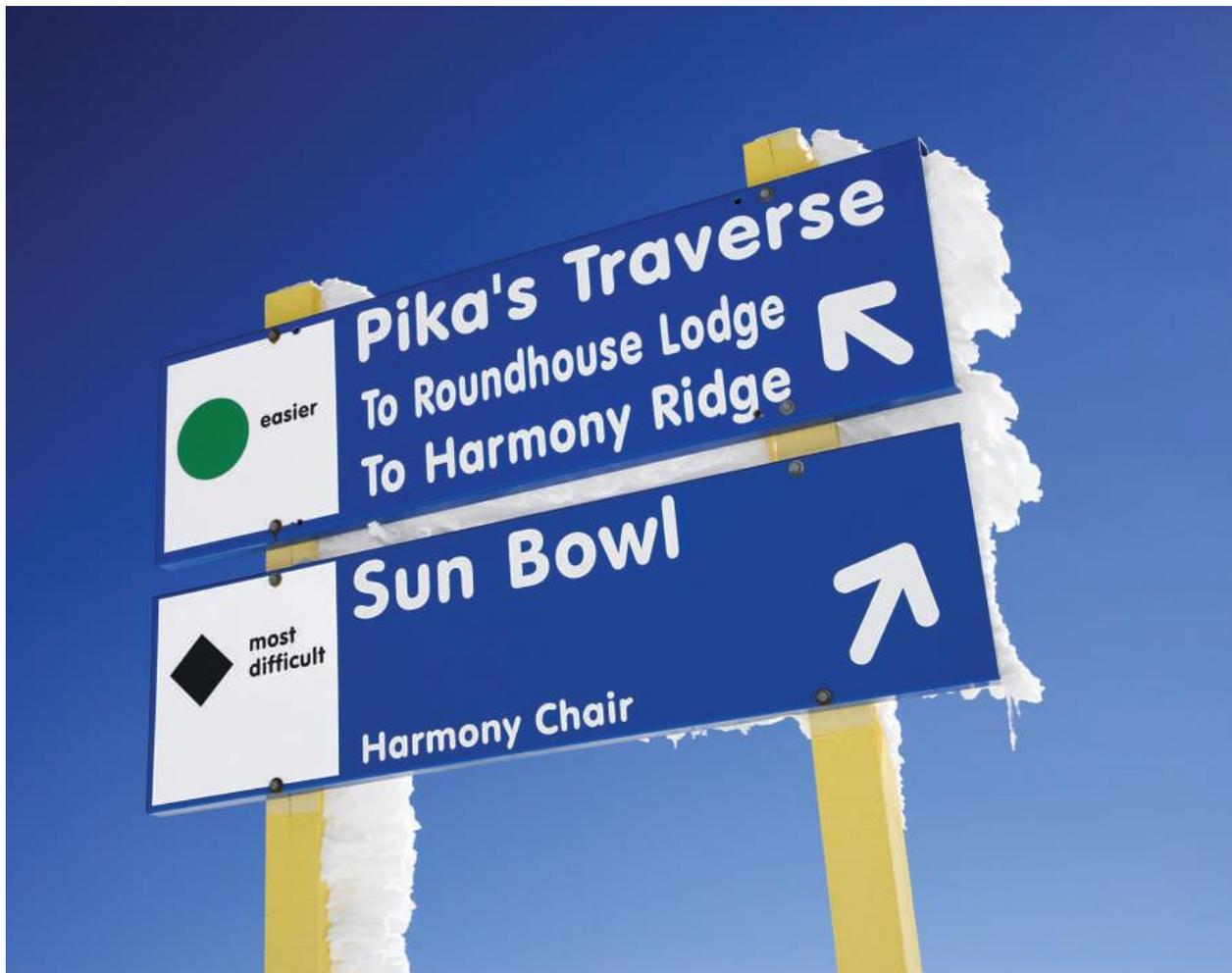
Comfort zone is a metaphoric term used to describe a person's ability to extend themselves physically and emotionally beyond their normal level. Sir Edmund Hillary conquering Mount Everest and Cas and Jonsey kayaking from Australia to New Zealand are examples of people who have pushed outside of their comfort zone to achieve something truly unique. These are, however, extreme examples and what these people achieved has been within their level of competence and experience. Comfort zone is relative to the individual. Everyone has a different level at which they begin to feel uncomfortable. This is the key point when considering the notion of comfort zone; each individual must be prepared to take the course of action that they desire. Forcing people to push their limits can have a negative effect.

### Summary 6.21

What are some of the considerations a leader makes before participants engage in challenging outdoor recreation pursuits?

### Checklist 6.22

- 1 How do you control risks when participants are encouraged to push their comfort zones?
- 2 What ethical considerations confront a leader in balancing challenge and safety?



**Figure 6.30** Jumping from the green circle run to the black diamond run would be an example of a participant taking risks outside of their level of competence

## Chapter summary

- Outdoor recreation usually refers to physical activity that involves close contact with the natural environment (e.g. rock climbing, white-water rafting, hiking).
- Outdoor recreation is experiencing growth, as many people view it as a source of relaxation, adventure and personal challenge.
- The majority of participants who engage in outdoor recreation activities do so within groups.
- Most forms of outdoor recreation are physically demanding and test not only a person's physical state but also their mental and emotional well-being.
- Outdoor recreation requires thorough preparation in order to mitigate potential dangers from the environment, in particular the weather.
- A risk assessment is important for identifying ways of negotiating risk during outdoor activities; this can include first aid training, planning of escape routes, and setting up lines of communication to others in case of emergency.
- Mobile phones can contact 000 and/or 112 in the event of an emergency, even if the phone has no SIM card or is locked, provided there is mobile coverage.
- Often participants will perform a reconnaissance of an outdoor location to familiarise themselves with it prior to a planned expedition.
- Adequate food and water is a critical part of outdoor recreation preparation, as well as appropriate equipment, clothing and shelter.
- Many outdoor recreational activities have legal and administrative requirements, such as a trip intention form being lodged with the appropriate national park service or authority.
- It is important to consider the climate and geographical location when choosing a campsite.
- Conservation of the area is important when using a campsite, including fire management and proper waste disposal.
- Navigation skills, such as map reading, understanding grid bearings and the use of a compass, are important in ensuring that participants do not get lost.
- In the case of emergency, Wilderness First Aid will reduce the impact of health hazards, which may include hypothermia, exhaustion or snakebite.
- Individual outdoor recreation activities have their own set of required skills.
- The leadership style within an outdoor recreation group will play a part in the group's effectiveness, and will depend on the type of activity involved and the personalities of the people involved.
- Correctly managing group dynamics, and resolving potential conflicts, are major factors contributing to the success of an outdoor recreation team.
- Participants should always strike a balance between the challenge of outdoor recreation and safety.

## Exam-style questions

- 1 Discuss reasons for participation in outdoor recreation.
- 2 Identify the outcomes that may result from participation in outdoor recreation.
- 3 Outline the different leadership styles.
- 4 Describe the planning procedures you would follow to ensure that a bushwalk during summer ran safely and smoothly.
- 5 Discuss the concept of 'leave no trace'.
- 6 Outline the factors that would need to be considered when selecting a campsite.
- 7 Analyse how group dynamics and leadership styles could be used to prepare a group of strangers for an outdoor recreation experience.
- 8 Propose prevention and management strategies for a group of hikers in terms of getting lost.
- 9 Outline the treatment you would provide for a member of your bushwalking group who was showing signs of hypothermia.

# Glossary

**abrasion** occurs when the outer skin layers are scraped due to being dragged along a hard or rough surface; they tend to bleed less and can be characterised by having small particles embedded in the wound

**acceleration** refers to the rate of change of the movement speed of a body in motion

**advocacy** a combination of individual and social actions aimed at gaining support and commitment for a particular goal or program

**aerobic** when energy for movement is being created in the presence of oxygen

**agility** the ability to change the direction of the movement of the body with speed, accuracy and efficiency

**agonist** the contracting muscle

**amputation** the severing of all or part of a body such as a finger or limb

**anaerobic** when energy for movement is being created in the absence of oxygen

**anatomy** the study of the structures of the body and their relationships

**angular momentum** the quantity of rotational motion, which is the product of its speed and mass

**angular motion** movement of a body along a curved path with a fixed axis

**antagonist** the relaxing muscle

**anticipation** the ability to predict various cues and to respond accordingly

**applied force** a force that is acting on another object

**appraisal** a judgement made on the quality of the performance

**artery** carries blood away from the heart

**'as the crow flies'** the straight-line distance between two points, disregarding physical obstacles

**ATP** adenosine triphosphate – the molecule that transfers energy between cells in the body

**autocratic** using authority without consultation

**avulsion** this is where a flap of skin or flesh has been totally or partially removed

**balance** the ability to maintain an equal distribution of weight to maintain a stable body position

**base of support** the size and shape of an imaginary line that is drawn around the parts of the body in contact with the ground

**biomechanics** study of mechanical laws and how they relate to the movement of living organisms

**blood borne viruses** used to refer to hepatitis B and C

**body composition** the distribution of fat, bone and muscle in the body, as well as the specific measurements of height, length and girth of the various parts of the body

**capillary** where gases are exchanged within tissues

**cardiac output** the volume of blood ejected by the left ventricle of the heart per minute; it is generally measured in millilitres per minute

**cardiorespiratory endurance** the ability of the heart and lungs to deliver sufficient oxygen to the working muscles over a sustained period of continuous and strenuous exercise without excessive fatigue

**centre of buoyancy** the point at which all the mass of the water displaced by an immersed object in it is concentrated

**centre of gravity** the point at which all the mass of an object is equally concentrated

**commodity** a product that can be bought and sold

**concentric** during an isotonic contraction the muscle shortens

**conservation** preservation from neglect

**coordination** the ability to execute a series of muscular contractions and joint actions, to produce motor skills and movements that are smooth, efficient and accurate

**critical approach** this question-based approach to the study of PDHPE involves proposing a range of solutions to the problems being studied; it may involve consideration of alternatives to practices that have been accepted or in place for extended periods of time

**democratic** considering the ideas and opinions of others

**dermis** the inner layer of skin

**determinants of health** the range of personal, social, economic and environmental factors that determine the health status of individuals and populations

**displacement** the length of space between the start and end points, if connected in a straight line

**distance** the length of space between two points

**diversity** covering a range of groups, communities

**drag** refers to the nature of the resistive force that is exerted on an object trying to move through fluid

**dynamic** continually changing

**dynamics** the level of energy or force applied to the execution of a movement or movement sequence

**eccentric** during an isotonic contraction the muscle lengthens

**embedded object** this is a wound with an embedded object still in place

**enabling** action in partnership with individuals and groups, providing resources and support to empower them to promote and protect their health

**environmental factor** cause of disease or illness based on location and surroundings

**epidermis** the outer layer of skin

**equity** resources are allocated in accordance with the needs of individuals and populations with the desired goal of equality of outcomes

**exercise** physical activity that is planned or structured and requires physical effort

**expiration** the act of releasing air from the lungs into the external environment

**fitness** the body's ability to function efficiently and effectively

**FITT principle** a framework for developing fitness programs that emphasise the variables Frequency, Intensity, Type of exercise and Time or duration of exercise

**flexibility** the absolute range of motion that a specific joint or group of joints can produce

**force** refers to a push or pull effect upon an object, resulting from the object's interaction with another object

**form** the shape and structure of movements and sequences within a performance

**health** a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity

**health literacy** the ability to understand and interpret health information and services and utilise this information in ways that promote and maintain good health

**health promotion** the process of enabling people to increase control over and to improve their health

**health status** the health of an individual or population measured against an identifiable standard

**heart rate** the number of times the heart beats in one minute

**improvisation** performing with little or no preparation

**improvise** to spontaneously perform or compose, often guided by a prepared structure

**incidental** unstructured and unplanned

**incision** a cut caused by a sharp object (e.g. knife or glass); usually a narrow, deep wound that bleeds profusely

**inspiration** the act of drawing air into the lungs from the external environment

**intersectoral collaboration** different sectors of society work together in a coordinated manner in order to tackle a particular issue or achieve an agreed outcome; the combined effort is more effective and the outcome more sustainable than the health sector working in isolation

**interval training** periods of very intense physical activity, interspersed with periods of rest and recovery; aimed at developing anaerobic energy systems

**isometric** the muscle remains the same length while developing tension

**kinaesthetic sense** perception of the body's movements that is gathered through receptors attached to tendons, muscles and joints and relayed to the brain

**laceration** a jagged-edge wound caused by things such as wire or rough-edged objects

**lactate** a naturally occurring by-product of cellular respiration, which is associated with the fatigue related to high-intensity exercise

**laissez-faire** a relaxed approach to leadership

**line of gravity** an imaginary line passing vertically from the point of centre of gravity of an object down to the ground

**linear motion** motion along a straight line

**Magnus effect** refers to the forces and effects that act upon an object that is spinning as it moves through fluid

**maximum heart rate** an approximate calculation of the maximum heart rate an individual can work to; measured as 220 minus your age (i.e. the MHR of a 25-year-old would be 195 bpm)

**medium** the type of movement – includes dance, gymnastics, aerobics and game strategies

**momentum** motion determined by mass and velocity

**motion** refers to the change in position of an object, with respect to time and its reference point

**muscular endurance** the ability of a muscle or group of muscles to repeatedly exert a force against a resistance

**muscular strength** the amount of force that a contracted muscle or group of muscles can produce against a resistance

**Ottawa Charter** the charter represents the views of the World Health Organization's first international Conference on Health Promotion. It outlines prerequisites of health and the importance of enabling, mediating and advocating for health. It outlines five essential actions for health promotion:

- build healthy public policy
- create supportive environments
- strengthen community action
- develop personal skills
- reorient health services

**physical activity** movement that results in energy expenditure

**power** the ability to exert a maximal force through rapid muscular contraction in as short a time as possible

**profile drag** a drag force that is determined by the shape of an object

**punctures** these types of wounds are characterised where a sharp object has penetrated the skin (e.g. the end of a piece of wire or an arrow)

**reaction force** a force that is acting in the opposite direction to the applied and external force

**reaction time** the elapsed time between detecting and interpreting a stimulus, making a correct decision and then executing the related movement

**relationship** how the performer's body parts relate to one another when moving and how the mover relates to individuals, groups, apparatus, objects and other factors such as rhythm, music, boundaries and rules

**relative health** comparison to another's health

**reorienting health services** moving the focus of the health sector towards health promotion, prevention and supporting the well-being of the whole person to complement traditional roles of diagnosis, treatment and rehabilitation; the health sector is encouraged to also adopt a key role in coordinating other sectors to work for health

**resilience** the process and capacity that allows individuals to successfully adapt to challenges in their lives; resilience is related to the development of personal life skills, such as social problem-solving, assertiveness, negotiation, social support accessing skills and a sense of connectedness

**rhythm** the way in which the movement is organised according to patterns or sequences

**risk factors** physical, social and emotional risks that have a negative impact on health

**sedentary** not engaged in physical activity; inactive

**sedentary behaviour** activities that require low levels of energy expenditure

**self-efficacy** belief in one's own ability

**settings** places or social contexts at which populations engage in daily life; these settings present as potential sites for health-promotion activity that targets the relevant populations

**social construct** a concept that has meaning and shared understandings based on people's ways of seeing, interpreting, interrelating and interacting

**social justice** a value that favours measures that aim at decreasing or eliminating inequity; promoting inclusiveness of diversity; and establishing environments that are supportive of all people

**socio-cultural factor** cause of disease or illness based on family, friends, etc.

**socio-economic factor** cause of disease or illness based on education, employment or income

**space** the space in which a dancer/gymnast/athlete has to perform

**speed** the ability to move the whole body, a body part or limb, or an object as quickly as possible

**strategic non-intervention** the deliberate decision to monitor rather than intervene when people are faced with a challenge or problem; this allows for the development of resourcefulness, problem-solving skills and personal growth

**stroke volume** the volume of blood ejected by the left ventricle of the heart during each systemic contraction; it is measured in millilitres per beat

**subcutaneous layer** the tissue beneath the dermis

**supportive environments** the places people live, work and play that protect people from threats to health and that increase their ability to make health-promoting choices

**surface drag** a drag force that is determined by the surface material of an object

**syncopation** accenting a normally weak beat in a bar to create an unusual stress pattern

**synovial joint** a joint that can move freely

**time** refers to when the movement occurs and for how long

**triage** deciding the order and priority of treatment to multiple patients or casualties

**vein** carries blood to the heart

**velocity** speed in a given direction

**ventilation** refers to the depth and rate of breathing; ventilation rate is measured in breaths per minute and ventilation depth is measured in either millilitres per breath or litres per minute

**VO<sub>2</sub> max** the maximum amount of oxygen a person's body can absorb during exercise; it is measured in the millilitres of oxygen absorbed into the muscles per kilogram per minute

# Index

- Abbott, Tony 41, 42–4
- abdominal injuries, management of 136
- abrasions 128
- abseiling skills 221
- acceleration 88, 106
- adventure racing 193
- advertising, and ethics 199
- advocacy 48
- aerobic endurance 84
- aerobics 168, 189
- agility 91
- agonist muscle 73
- alcohol use
- binge drinking 21
  - costs to society 19
  - young people 20–2
- amputation 129
- anaerobic and aerobic training 94–8
- anaerobic energy systems 97
- anaerobic respiration 84
- anaphylaxes, management of 139
- anatomy 66
- angular momentum 107
- angular motion 105
- antagonist muscle 73
- anticipation 161
- apparatus 162–3
- applied forces 117
- appraisal of composition and performance
- achievement of purpose 173
  - analysis 171–2
  - arrangement of movement 173
  - aspects 172–4
  - creativity and innovation 173
  - elements of composition 172–3
  - establishing and applying criteria 174–5
  - experience 172
  - methods 171–2
  - observation 171
- aquarobics 189
- arteries 81
- ‘as the crow flies’ 216
- asthma 12, 138–9
- ATP (adenosine triphosphate) 73, 102
- audience, relationship with 161–2
- Australian Better Health Initiative (ABHI) 52
- Australian Competition and Consumer Commission (ACCC) 199
- Australian Dietary Guidelines for Children and Adolescents 24, 48, 50
- Australian Guide to Healthy Eating 25
- Australian Institute of Health and Welfare (AIHW) 11
- autocratic leadership style 222, 223
- avulsion 129
- balance 92–3, 108
- base of support 92, 109–10
- binge drinking 21
- biomechanics 104–11
- bites, management of 140–2
- bleeding, management of 125, 128–9
- blood 78–9
- blood borne viruses 145
- blood pressure 81–2
- body composition 88–9, 111
- body mass index (BMI) 16, 88
- Bolt, Usain 95
- bones, major bones involved in movement 68–73
- boot camp 192
- Boyle’s Law 78
- burn injuries, management of 133–5
- bushfire procedures 218
- campsite selection 212–13
- cancer 14
- canoeing skills 220
- capillaries 78, 81
- cardiac output 100–1
- cardiopulmonary resuscitation (CPR) 123, 124–5
- cardiorespiratory endurance 84–6
- centre of buoyancy 111, 112, 113
- centre of gravity 92, 108–9
- centre of mass 113
- challenge, and outdoor recreation 205
- chemical burns 135
- chest injuries, management of 135–6
- childhood obesity 42–4
- chronic disease
- in young people 14
  - and risk factors 31
- circuit training 190–1
- circulatory system 78–82
- comfort zone, pushing 226
- Commonwealth government, health promotion 48–9
- communicable diseases 14
- communication skills 224
- community development 57
- community exercise facilities 196
- community groups, health promotion 47–8
- composition elements
- application to movement mediums 152–63
  - appraisal 172–3
  - dynamics 157–8
  - and process of creating movement 165–7
  - relationships 161–3
  - space 153–7
  - time and rhythm 158–61
- composition and performance
- see also* appraisal of composition and performance
  - combining and arranging movement 167–70
  - creating movement 165–7
  - defining purpose or motivating factors 165
  - exploring variations 166
  - improvising 166
  - related skills 166–7
  - relevance to purpose 165–6
  - repetition 170
  - role of appraisal 171–5
  - rules and conventions of medium 167–8
  - sequencing 168–9
  - transitions 169
  - variation 170
- concentric contractions 75
- concussion, management of 132
- conflict resolution 224
- conservation 214
- contraception 17
- coordination 91–2
- critical approach (appraisal) 172
- CrossFit 192–3
- Culture, influence on health 29
- cycling 186

- death rates, young people 11–12
- decision-making skills 224–5
- defibrillation 123
- democratic leadership style 222
- dermis 133
- determinants of health
- changing influence over lifespan 38–9
  - conceptual framework 35
  - definition 11
  - diagram 40
  - environmental factors 34–6
  - impact of 26–7
  - individual factors 27–8
  - interrelationship of 41
  - modifiable and non-modifiable determinants 36–8
  - socio-cultural factors 28–30
  - socio-economic factors 31–4
- diabetes, management of 137–8
- dimensions of health 3–4
- dimensions (spatial extent) 154–6
- direction (movement) 153–4
- directional terms of the body 66
- dislocations, management of 131
- displacement 105
- distance
- definition 105
  - measuring 216–17
- diversity 61
- drag (resistance) 112
- drink-driving preventive strategy 58–60
- DRSABCD 122–3
- drug use *see* illicit drug use
- duration, time and rhythm 159–60
- dynamic nature of health 5
- dynamics 153, 157–8
- eccentric contractions 75
- education, influence on health 31
- electrical burns 134–5
- electrocution 135
- embedded objects (injuries) 129
- emergency management planning and risk assessment 108–10
- emergency management skills 217–19
- enabling process 46
- environment, appreciation of 206
- environmental factors influencing health 34–6
- epidermis 133
- epilepsy, management of 138
- equipment 162–3
- equity 61
- ethical issues
- and advertising 199
  - outdoor recreation 214–15
- Evans, Cadel 95
- exchange of gases (respiration) 78
- exercise
- advertising and promotion 198–9
  - at home 196
  - choices of activities for fitness 185–95
  - definition 182
  - emerging group fitness activities 192–3
  - emerging individual fitness activities 187–9
  - group fitness activities 189–91
  - individual fitness choices 185–7
  - influences on choice of fitness activities 196–200
  - meanings of 180–2
  - motivators and barriers to participation 199–200
  - as physical activity 181
  - relationship to fitness 182
  - settings 196–8
  - for specific groups 191–2
  - team games 191
  - value placed on 182–4
- exercise clubs 197–8
- expiration (exhalation) 77–8
- externally-paced movement 160
- eye injuries 132–3
- facilitation skills 224–5
- family
- impact on perceptions of health 9
  - influence on health 28–9
- FAST test 137
- first aid delivery
- common sense versus heroics 146
  - and electricity 145
  - HIV/AIDS and blood borne viruses 145
- infection control and protection 145
- legal implications 145–6
- moral implications 146
- physical environment
- considerations 144–5
  - traffic accidents 144
  - in water environments 144
  - in wilderness 217–19
- first aid patients
- assessment and management 122–7
  - crisis management 124–7
  - DRSABCD structure 122–3
  - injury management 128–36
  - management of medical conditions 136–43
  - medical referral 126
  - moving 126
  - priority assessment procedures 122
  - situational analysis 122
  - STOP regime 123
  - unconscious casualties 126–7
- first aiders
- counselling 147
  - debriefing 146–7
  - support following critical incidents 146–7
- fitness
- changing attitudes to 182–3
  - as a commodity 184–5
  - definition 182
  - and outdoor recreation 106–7
  - relationship to exercise 182
- fitness activities
- emerging group activities 192–3
  - emerging individual activities 187–9
  - group activities 189–91
  - individual activities 185–7
  - influences on choice of activities 196–200
- fitness centres 196–7
- fitness industry
- advertising and promotion 198–9
  - and fitness as a commodity 184–5
- FITT principle 94–6
- flexibility (fitness) 87–8
- flexibility (group dynamics) 225
- flooded rivers 218

- flotation 111–12  
 flow (movement of body) 158  
 fluid mechanics 111–18  
 fluid resistance 112–16  
 force (composition and performance) 157  
 force (muscular)  
   absorption 117  
   application by body 116–17  
   application to object 117–18  
   strength 86  
 form (movement) 169  
 formations 156–7  
 fractures, treatment of 129–31  
 free solo rock climbing 188–9  
 frequency 94–5  
 Fresh Tastes NSW Health School  
   Canteen Strategy 48, 49–50
- game-based conditioning 97–8  
 games 168  
 general motion 105  
 genetics 27–8  
 global health 53–4  
 government, health promotion  
   responsibilities 48–51  
 grid bearing 215–16  
 group dynamics  
   conflict resolution 224  
   cooperation 224  
   facilitation skills 224–5  
   impact on outdoor  
     experience 222–6  
   leadership styles 222–3  
   stages 223  
   team building 224  
   understanding strengths and  
     weaknesses 225–6  
 gymnastics 168
- head injuries, management of 131–2  
 health  
   definitions 2–3  
   dimensions of 3–4  
   a holistic concept 3  
   and individual  
     responsibility 41–5  
   meanings of 2–5  
   perceptions of 6–10  
   relative and dynamic nature 4–5  
   as a social construct 39–45
- health behaviours, of young  
 people 11–24  
 health decisions 27  
 health literacy 27, 56  
 health promotion  
   approaches and strategies 52–5  
   definition 18  
   lifestyle/behavioural  
     approaches 52–3  
   nature of 46–7  
   Ottawa Charter 51, 56–60  
   preventative medical  
     approaches 53–5  
   public-health approaches 54–5  
   responsibility for 47–51  
 health services, reorienting 57  
 health status  
   definition 6  
   of young people 11–14  
 health and wellness industry 185  
 Health Workers Initiative 55  
 heart 79–81  
 heart attack, management of 136–7  
 heart rate 95, 98–9  
 heart rate based training 96  
 heat stroke, management of 143  
 hyoid bone 68  
 hyperglycaemia 138  
 hyperthermia, management of 142–3  
 hypoglycaemia 137  
 hypothermia, management of 142–3
- illicit drug use  
   cost to society 19  
   young people 22–3  
 immunisation 53  
 improvisation 165, 166  
 incidental activity 180  
 incisions 128–9  
 income, influence on health 31–4  
 Indigenous peoples, mortality  
   rates 14  
 individual factors influencing  
   health 27–8  
 injury management  
   abdominal injuries 136  
   burn injuries 133–5  
   chest injuries 135–6  
   cuts and lacerations 128–9  
   dislocations 131  
   electrocution 135
- eye injuries 132–3  
 fractures 129–31  
 head injuries and  
   concussion 131–2  
 nasal injuries 133  
 teeth injuries 135  
 inspiration (inhalation) 77  
 intensity 95  
 international organisations, health  
   promotion 51  
 intersectoral collaboration 56  
 interval training 96  
 isometric contractions 75
- joint actions 71–3  
 kayaking skills 220  
 kinaesthetic sense 93, 172
- lacerations 128–9  
 lactate 97  
 lactate levels 101–3  
 laissez-faire leadership style 222  
 leadership styles 222–3  
 ‘leave no trace’ camping 214  
 level (height of movement) 154  
 lifestyle/behavioural approaches to  
   health promotion 52–3  
 lightning 218  
 line of gravity 109  
 linear motion 104–5  
 local government, health  
   promotion 50–1  
 lower extremity (bones) 69  
 lung function 77–8
- magnetic bearing 216  
 Magnus effect 115  
 map reading 215  
 Marngrook 198  
 maximum aerobic speed training 96  
 maximum heart rate (MHR) 96, 97  
 Measure Up campaign 52–3  
 media  
   impact on perceptions of  
     health 8–9  
   influence on health 30  
 medical conditions, management  
   of 136–43  
 mediums (movement)  
   definition 153

- rules and conventions 167–8
- mental and emotional health 4
- momentum 88, 107, 160
- motion 104–7
- movements, selecting and refining 167
- muscle contractions 75
- muscle relationship 73
- muscular endurance 86–7
- muscular strength 83, 86
- muscular system 73–5
- music, time and rhythm 158–9
  
- nasal injuries, management of 133
- National Health Priority Areas 16
- National HPV Vaccination Program 53
- National Immunisation Program 53
- National Partnership Agreement on Preventive Health 54
- National Physical Activity Guidelines 15, 100, 181
- natural navigation 217
- navigation skills 215–17
- neck injury, treatment of 126
- Newton's laws of motion 116
- night-time mountain biking 187–8
- non-government organisations (NGOs), health promotion 48
- NSW Health organisational chart 50
- NSW State Health Plan 2023 49
  
- obesity/overweight, young people 16
- opponents 162
- Organisation for Economic Co-operation and Development (OECD) 12
- Ottawa Charter 51, 56–60
- outdoor experience
  - balancing challenge and safety 225–6
  - impact of group dynamics 222–6
  - participant readiness 225
  - pushing comfort zone 226
  - self-efficacy 225
  - understanding strengths and weaknesses 225–6
- outdoor recreation
  - campsite selection 212–13
  - emergency management planning and risk assessment 108–10
  - emergency management skills 217–19
  - environmental planning 208
  - food and water considerations 210
  - guidelines if you become lost 218
  - legal and administrative requirements 212
  - minimal impact practices 214–15
  - navigation skills 215–17
  - planning skills 208–12
  - reasons for participating 204–7
  - resources for safe participation 210–12
  - skills needed 220–1
- participant readiness 225
- partner relationships 162
- partner work 163
- patterns 156–7
- pectoral girdle 68
- peers
  - impact on perceptions of health 9
  - influence on health of individuals 28
- pelvic girdle 68–9
- perceptions of health
  - impact of media, peers and family 8–9
  - implications of different perceptions 7
  - influencing factors 6
  - of others 6
  - as social constructs 7–8
- performers, relationships 162
- personal trainers 196–7
- physical activity
  - exercise as 181
  - young people 15–16
- physical fitness
  - health-related components 83–9
  - skill-related components 89–94
- physical health 3
- pilates 187
- poisoning, management of 139–40
- polio eradication 53–4
- positional play 163
- power (muscular strength) 86, 89–90
- power walking 185
- preventative medical approaches to health promotion 53–5
- private health insurance 32–4
- profile drag 113
- public policy, and health 57–8
- public-health approaches to health promotion 54–5
- pulmonary and systemic circulation 81
- pulmonary ventilation 77–8
- pump classes 189
- puncture wounds 129
  
- reaction forces 117–18
- reaction time 93–4
- relationships, between composition elements 161–3
- relative health 4–5
- relaxation 204–5
- religion, influence on health 29–30
- reorienting health services 57
- resilience 48
- respiratory system 76–8
- rhythm and time 158–61
- risk factors 26
- running 185
  
- safe sexual practices 17
- schools, health promotion 47–8, 54
- sedentary behaviour 15, 183
- self-efficacy 225
- self-paced movement 160
- sequencing 168–9
- sexual assault 17
- sexual health, young people 16–17
- sexually transmitted infections (STIs) 16, 17
- shock, treatment of 125–6
- skeletal system 66–8
- skin cancer 17–18
- skull 68
- smoking *see* tobacco use
- snake bite, management of 217–18
- social constructs 8
- social health 3–4
- social interaction, and outdoor recreation 205–6
- social justice 30, 60–1
- socio-cultural factors influencing health 28–30

- socio-economic factors influencing health 31–4
- space, as element of composition 153–7
- speed 90
- spider bites 140–1
- spin classes 190
- spinal injury, treatment of 126
- spiritual health 4
- stability 108
- state governments, health promotion 49–50
- step aerobics 190
- stings, management of 140–2
- STOP regime 123
- strategic non-intervention leadership style 222, 223
- stress management 204–5
- stroke, management of 137
- stroke volume 100
- subcutaneous layer (skin) 134
- substance use, young people 18
- sun protection, young people 17–18
- supportive environments 56, 61
- surface drag 113
- swimming 185–6
- synovial joints 69–71
- Tai chi 187
- team building 224
- team formations 163
- team games 191
- team members, relationships 162
- teenage pregnancy 16–17
- teeth injuries, management of 135
- tempo training 97
- thorax 68
- time and rhythm 158–61
- timing 160–1
- tobacco use, young people 18–20
- training
  - immediate physical responses 96–103
  - see also* anaerobic and aerobic training
- transitions 169
- tree fall evaluation 213
- triage 122
- true north 216
- type (activity) 96
- upper extremity (bones) 68
- veins 81
- velocity 105–6
- ventilation rate 99
- vertebral column 68
- VO<sub>2</sub> max 85–6, 101
- weight-training programs 186–7
- women, archetypes 10
- workplace health promotion 54–5
- World Health Organization (WHO) 46, 51
- yoga 187
- young people
  - alcohol use 20–2
  - health behaviours 11–24
  - health status 11–14
  - illicit drug use 22–3
  - national indicators of health and well-being 13
  - nutrition 23–4
  - obesity/overweight 16
  - physical activity 15–16
  - protective behaviours and risk behaviours 15–24
  - sexual health 16–17
  - and substance use 18
  - sun protection 17–18
  - tobacco use 18–20
- youth mortality 14

