TOPIC 1
What does health mean to individuals?

OVERVIEW

1.1 Meanings of health
1.2 Perceptions of health
1.3 Health behaviours of young people
1.4 Topic review

OUTCOMES

In this topic students will:

- identify and examine why individuals give different meanings to health (P1)
- explain how a range of health behaviours affect an individual's health (P2)
- describe how an individual's health is determined by a range of factors (P3)
- use a range of sources to draw conclusions about health and physical activity concepts. (P16)

This topic provides an understanding of foundation concepts in preparation for the topics that follow and for the HSC course. It examines the meaning of health, explores the interactions between the various dimensions of health and considers how health is a dynamic and relative concept.

We investigate how people's perceptions of health differ and analyse the degree to which these perceptions are socially constructed. In addition, we investigate the health behaviours of young people, challenge the accuracy of common perceptions of young people's health behaviours and consider the impact these behaviours could have on their current and future health.

1.1 Meanings of health

Health is a topic of considerable interest to individuals, medical professionals, community and welfare groups, and all levels of government. The level of interest expressed in issues related to health is not surprising: it is the subject of extensive research, receives significant coverage in the media, is a major focus of government policies, and is an area of concern for many people seeking to improve their lifestyle and maximise their current and future health.

Health is considered one of the most important determinants of our quality of life and many people feel that they have some control over it. It is a valuable resource, but it is often taken for granted and not clearly understood.

FIGURE 1.1 Health can mean many things to people.

1.1.1 Definitions of health

People attribute different meanings to the term health. In order to understand issues related to health, it is firstly important to understand what is meant by the term health as it applies to individuals and the community.

Inquiry

What does health mean to me?

1. Use a device to create a collage containing at least seven images that show what the term health means to you.
2. Share with a partner and discuss reasons for choosing the images included in your collage. Note similarities and differences between what the term health meant to you and your partner.
3. As a class discuss the type of images that were selected and the reasons people gave for the images chosen. What do the different responses tell you about people's understanding of the term health?

The concept of health is diverse and means different things to different people. This diversity can be recognised by considering the different meanings of health that have developed over time.

Early meanings of 'health'

In the past the term health was closely associated with how well a person's body functioned physically, and in particular with their capacity and ability to perform physical activity. Prior to World War II, health was viewed as the opposite of illness. If there was no evidence of disease or physical illness, we were considered healthy and any breakdown in the body system meant that it was not healthy. This view of health suggested that if you were ill, medicine, drugs and doctors were able to return you to a healthy state.

This early definition of health was recognised as being too narrow and one dimensional in its perception of what was involved in a person's health. Its failure to take into account an individual's mental, social or spiritual well-being meant that the definition had severe limitations. For example, a person may not be suffering from a physical illness, but may be experiencing depression or emotional stress. Without appropriate support and treatment this could develop into distress that significantly impacts on the person's everyday life and their overall level of health.

World Health Organization's definition of 'health'

In 1946, the World Health Organization (WHO) developed a definition of health that is still accepted today. Health was defined by the WHO as 'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'. This definition gave greater recognition to a more holistic concept of health by recognising the whole person and focusing on more than the physical aspect of health and the absence of disease or illness.

However, the definition has limitations as it suggests that people cannot be considered truly healthy unless they have *complete* physical, mental or social well-being. Under this definition an individual who has a physical impairment, a mental health diagnosis or is socially isolated cannot be considered healthy. The fact that we all experience times when we are sick, sad or lonely means that according to this definition optimal health is virtually unachievable. A further weakness of this definition is that it fails to acknowledge that a person's state of health is always changing.

1.1.2 Dimensions of health

We now understand that a number of dimensions all play an important role in determining a person's state of health. These dimensions include a person's physical, mental, social and spiritual well-being. We also understand that a person's level of health is the result of an interaction between these different dimensions and that a balance between all four dimensions is essential to produce general well-being and satisfaction.

Physical health

Physical health relates to the efficient functioning of the body and its systems, giving people the capacity to carry out everyday activities and be free from illness. It is the most visible dimension of health.

FIGURE 1.2 Good health is much more than a physical state — it encompasses many dimensions.





While our heredity and genetic makeup determine our physical potential, physical health is largely determined by lifestyle and behaviour.

Key lifestyle choices that affect our physical health include:

- participating in regular physical activity
- nutrition and diet
- the use of alcohol and drugs
- seeking medical care when needed
- having sufficient rest and sleep.

Social health

Social health refers to our interactions with other people (family, friends and others), as well as the social and communication skills and abilities we display. Good social health means we feel a sense of connection and belonging to various people, and to the wider community in which we live. We are able to interact effectively with people in an interdependent, appropriate and cooperative way. We can form and maintain positive relationships that provide us with a network of support and appropriately manage situations where relationships may break down.

Mental health

Mental or **emotional health** refers to our state of emotional well-being. People who have good mental health generally possess a positive outlook and a sense of purpose and control over their lives. This enables them to realise their full potential, cope with the everyday stresses of life, work productively and contribute effectively to the community. Factors that contribute to our mental health and the resilience needed to cope when faced with sad or difficult times include:

- our self-concept (the way we see ourselves), self-confidence and self-esteem (the way we feel about ourselves)
- our sense of connection or belonging to different significant groups such as family, peers or school
- our ability to appropriately express emotions such as love, anger and frustration
- the range of coping and help-seeking skills we have developed
- our ability to think creatively and be flexible when making decisions and resolving problems
- biological factors, particularly a family history of mental health problems.

Spiritual health

Spiritual health relates to feeling a sense of purpose and meaning in our life. Good spiritual health helps us to feel connected with others such as family members, peers, our community, to a religion, culture or the environment. Beliefs, values, and the ethics we hold are factors that influence our spiritual health. Our level of spiritual health can be influenced by an awareness and understanding of ourselves. It can also relate to our ability to do things such as set realistic goals, appreciate the needs and feelings of others, and have ambitions and aspirations.

Our individual level of health is the result of a complex interaction between these four dimensions and is continually changing. A breakdown in one dimension of health is likely to impact on the other dimensions, while improvements in one area can enhance our overall sense of health and well-being in all areas. For example, if you are hospitalised after a cycling accident, as well as suffering physical injuries, you might feel angry about what happened, frustrated about being confined to bed and lonely because you are away from family and friends. Once you recover from these injuries and are discharged from hospital you will be able to resume school or work and socialise with others. This will help you overcome concerns about your injuries, and feel happier and less cut off from friends and family.

Inquiry

Dimensions of health

Recall a time in your life when one dimension of your health was poor; for example, when you experienced a relationship breakdown or loss. Consider how other dimensions of your health were also affected during this time. Draw a mind map or a flow chart to illustrate your ideas.

FIGURE 1.3 Health is a result of interactions between all the dimensions of health.

1.1.3 Relative and dynamic nature of health

Health is the result of a continually changing process. From a personal perspective it may be represented as a continuum, with optimum health or a positive state of well-being at one end and very poor health or being extremely unwell at the other end. Judging where we are along the health continuum at any point in time is highly subjective as people see health in different ways, have different perceptions about what is optimal or 'normal' and define the extremes of the continuum differently. Furthermore, when assessing their level of health people consider their past and current circumstances, as well as comparing themselves to others. For example, if we compare our physical health to that of an Olympic athlete we may not believe ourselves to be totally healthy.

The subjective judgements that people make about their level of health demonstrate the **relative nature** of health, with our health being relative to others and ourselves over time. For example:

- someone with breast cancer who has a breast removed in a mastectomy may consider her health poor compared to how it was previously or compared to others without cancer. However, she may consider her health good during her recovery compared to how it was while she was undergoing treatment.
- a person who has bipolar disorder may consider themselves well when they are taking prescribed medication, undergoing treatment, and are able to fulfil work and personal responsibilities, compared to how they felt prior to diagnosis and treatment
- people with a disability or chronic disease may describe themselves as healthy, especially if their disability or disease has little impact on their ability to lead an active, productive life
- we might consider ourselves very healthy, but believe we are very ill when we have influenza, which is a passing virus.

FIGURE 1.4 We perceive our health relative to the health of others. Our health may not be as good as that of an elite athlete, but it is better than that of a patient in hospital.

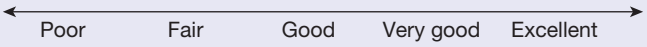
Inquiry

Relative and dynamic nature of health

Read the case study on Bradley and answer the following questions.

1. Describe how the various dimensions of Bradley's health were affected by different circumstances in his life and discuss the possible interactions that occurred between the various dimensions:
   - physical health
   - emotional health
   - social health
   - spiritual health.
2. Identify the events described by Bradley that have:
   (a) positively impacted on his health and well-being
   (b) negatively impacted on his health and well-being.

3. Draw a health continuum similar to the one shown below.



   Use this continuum to rate Bradley's health at the following times in his life. Place each letter (a) to (e) at the relevant place on the continuum.
   (a) after the loss of his friend in a car accident
   (b) after finding out his girlfriend cheated on him
   (c) after being diagnosed with depression
   (d) after seeing his GP and social worker on a regular basis
   (e) after delivering the formal presentation to his school.
4. Explain the reasons for the ratings you have given Bradley's health at each of those points in time. What does this tell you about how a person's health changes over time?
5. As a class, discuss how this case study demonstrates the dynamic nature of health.

CASE STUDY

Bradley

By Bradley, 18

Depression can strike anyone at any time. Take me for example. I was a typical teenager at high school. I had good grades and got on well with people and I was a prefect.

Then, as fate would have it, I lost a dear friend of mine in a car accident. At that moment, my life went into a rapid downward spiral, but I forced myself to carry on. I refused to admit I had a problem or seek help. At the beginning, I bought into the stereotype that prefects were supposed to be perfect students.

As the time went by, my relationship with my then girlfriend became shaky, my grades began to fall and day to day life became a burden. Soon enough, I learnt that my then girlfriend had cheated on me with my then best mate. I then knew it was time to turn this thing around.

I began to think, my life is nowhere near as bad in comparison to some people. This little epiphany changed my view on my own situation. I made an appointment with the school social worker who referred me to a local GP who diagnosed me with depression. From there on I had a few appointments with the GP and I continued to speak with the school social worker on a twice a week basis. We used cognitive behavioural therapy and I began to conquer my dark passenger.

I knew there were people around school who felt similar to me or who were heading down the same dark road, so I decided I needed to address this issue. I arranged with my principal to allow me to make a formal presentation to the whole school. I stood up in front of the whole school and told them my story. It was the hardest thing I ever had to do. But looking back, I realise it was the best thing I could do.

The next day I was told that my speech has inspired one person to seek help. It may have been only one person who received my message, but that is one person I know I have helped. I could lie and say that the journey to recovery was simple, but it wasn't. There were times I fell. But the thing is, you can never just lie down. Depression is a disease and you need to fight it with everything. Trust me, the journey may be tough but you will overcome the darkness.

My message is simple; there is always hope. I want people to know that it doesn't matter who you are or where you come from, depression can strike anyone. Nobody is perfect. I hope my story is enough to show that anyone can suffer with depression. I urge anyone who feels even slightly like they may have depression to seek help. Better to have a false alarm than to leave it too late. Remember, you are not alone!

Source: www.youthbeyondblue.com/get-involved-and-help-others/connect-with-others/personal-stories/story/bradley.

The case study on Bradley demonstrates that health is relative to our own circumstances and that of others, and that our level of health is never static. Our health varies over time, fluctuating from minute to minute, day to day and year to year. Illness, accidents, personal experiences or environmental factors can move our level of health any number of times during our lives from very well to well, off-colour to ill, very unwell to critically ill and then back to full health. These continual changes in our state of health mean that health is **dynamic**.

Application

Conduct a polarised debate

Conduct a debate to explore the relative nature of health and the different interpretations that people have of the concept of good health. Some questions for debate are:

1. It is possible for a person who requires regular medication to be considered healthy.
2. You can be healthy without being physically active.
3. Elderly people cannot achieve the same level of health as young people.

A polarised debate is set up by dividing the class into two sides, one supporting the affirmative and the other side the negative. The debate begins with a comment from the affirmative and proceeds with a comment in turn from each side. If a comment reaffirms their side's position, the student remains on that side. If a student speaks against their side's position, they 'cross the floor' and move to the other side. The debate is concluded when there is no movement from either side or there are no further comments.

Evaluate the arguments presented by members of your class at the conclusion of the debate.

1.2 Perceptions of health

People's perceptions of health can be highly subjective. These differing perceptions have implications for the priority we give to taking action to maintain or improve our health and the type of action that is taken.

Resources

eLesson: Perceptions of health (eles-2920)

1.2.1 Perceptions of our health

Making judgements about your current state of health can be highly subjective. The way we judge our health may be different from the way a health professional or a professional athlete does. The meanings we give to health will most likely be based on what we have learned about health, along with our own experiences or on those of people we know. They will be reflected in our behaviour and may be different to the interpretation that others have.

Statistics such as the number of visits to a health professional, number and length of hospital admissions, or number of days absent from school or work due to illness can be used to provide some objective information about a person's physical health status. However, to determine a person's state of health more holistically — that is, their state of social, mental and spiritual well-being — some level of self-assessment is needed.

When making judgements about our level of health and well-being our **perceptions** are influenced by a range of factors, including:

- our personal interpretation of the term health
- our beliefs about our capacity to achieve good health
- our environment
- our health behaviours and lifestyle
- our past level of health
- messages about health conveyed by family, peers and the media
- the value we place on the importance of striving for and maintaining a positive state of well-being.

These perceptions vary constantly throughout our lives. As we age, our definition of health changes to reflect our changing experiences, expectations and beliefs about what good health looks and feels like.

FIGURE 1.5 The way we perceive our health is influenced by a wide range of factors.

Application

How does health change over time?

1. Divide the class into seven groups. Each group is allocated a period within the life cycle (see table 1.1 for the seven periods).
2. Each group is to come up with at least two reasons for why health may improve or decline in the life cycle period they are allocated. These reasons should be accompanied by supporting examples. An example is provided in table 1.1.
3. Groups share their ideas with the class either via an online collaboration tool such as Google Drive or through a whole class discussion.

TABLE 1.1 Why health may improve or decline in the life cycle

Period	Reasons health may improve	Reasons health may decline
Infancy and toddler years (birth–3 years)	A number of vaccinations to immunise against many common infectious diseases are given in the first years of life (e.g. whooping cough, diphtheria and polio).	
Childhood (4–11 years)		

TABLE 1.1 Why health may improve or decline in the life cycle (*Continued*)

Period	Reasons health may improve	Reasons health may decline
Early adolescence (12–16 years)		
Late adolescence (17–24 years)		
Early adulthood (25–39 years)		
Middle years of adulthood (40–64 years)		
Senior years (65 years onwards)		

Application

How do perceptions of health change with age?

1. Divide the class into six groups. Each group is allocated a period within the life cycle (see table 1.1 for the six periods excluding infancy and toddler years).
2. Using five questions devised by your group, interview 10 people whose age falls in the life cycle period allocated to your group; for example, 10 people aged between 17 and 24 years. The five questions you ask people should reveal the views these people have about health; for example:
   - What does the term health mean to them?
   - Why is health important to them?
   - What type of behaviours do they consider healthy?
3. As a group, summarise and report on your findings to the class.

Application

How healthy do others think I am?

1. Using a five-point scale (excellent, very good, good, fair, poor) rate your current level of health.
2. Write an explanation that clearly shows the reasons for your rating. Ensure you refer to the various dimensions of health when explaining your rating, rather than just focusing on one or two.
3. On your continuum use a different symbol (e.g. an asterisk) to show how you would have rated your health 12 months ago. Write an explanation of why your rating has changed (if it has) or why you feel it has stayed the same.
4. Choose four other people (including at least two adults) and ask them to rate your health using the same five-point scale, then ask them to explain the reasons for their rating. Record their comments.
5. Compare and contrast the perception you have of your own health and the perceptions of your health by others. Propose possible reasons for any differences that are found.
6. Discuss your findings with the class, highlighting similarities and differences.

1.2.2 Perceptions of the health of others

Just as our perception of our own level of health is influenced by a range of factors, so too are our judgements about the health status of others. Our different ways of seeing and interpreting the living conditions, fitness levels and health behaviours of various groups significantly shape our notions of how healthy people in different circumstances are likely to be. We may hold stereotypical beliefs about particular groups in the community and this may limit our ideas about their likely health status.

FIGURE 1.6 Different interpretations of people's health and fitness influence the perceptions we have of others' health.

Application

How healthy do we think other people are?

1. Divide the class into small teams and allocate each team a card with the name of one of the following groups:

Elderly people	Homeless people	Young people
People with a physical disability	Parents	Males
Elite sports players	Aboriginal people	Refugees

2. Each team then discusses where they believe their particular group of people is placed on the health continuum. Record ideas on butcher's paper about the reasons for the group's placement.
3. Use two sheets of A4 paper (one labelled excellent and the other labelled poor) to set up a health continuum on the floor of the classroom. Have a representative from each team place the card identifying their group on the continuum to show how healthy they perceived their group to be.
4. Allow all class members to view where various groups have been placed on the continuum. After several minutes invite students to pick up any card they believe should be placed elsewhere on the continuum and stand holding the card in the spot it was placed.
5. Facilitate a class discussion on where they feel the group could be placed and why they have different perceptions of the health status of the group.
6. As a class discuss the reasons that people's perceptions of health can be similar or different from others. Summarise the ideas generated by the discussion in a mind or bubble map.

1.2.3 Implications of different perceptions of health

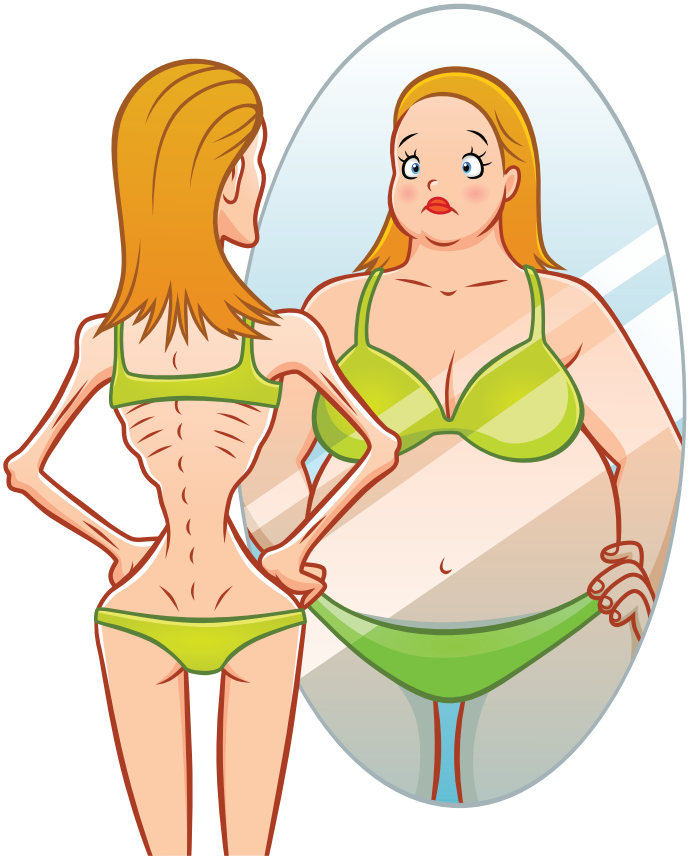
People develop their own interpretation of what being healthy means and are likely to perceive their level of health and the health level of others differently. This has a number of implications for both the individual and society as a whole.

Implications at an individual level

On an individual level, people's perceptions of their health have a significant influence on their lifestyle choices and behaviours relating to health. For example, a person who regularly drinks large amounts of alcohol and recognises that this drinking behaviour is having a detrimental effect on their health is more likely to stop drinking, limit their alcohol intake or seek professional help than someone who does not believe their alcohol consumption is causing them harm. Similarly, a person who recognises that they are experiencing symptoms of depression is more likely to seek support or undergo counselling than someone who is unfamiliar with the symptoms of depression, or disregards or dismisses these symptoms.

Being able to accurately assess our level of health assists us to be proactive about our health and take appropriate action to address health concerns. On the other hand an incorrect or distorted assessment of our health status, such as perceiving ourselves to be a healthy weight when in reality our weight fits into the overweight category, could prevent us from recognising a need to make changes to our current lifestyle in order to improve our health.

FIGURE 1.7 Inaccurate perceptions of health can lead to behaviours that may harm our health.



Inquiry

An individual's health behaviour

Read the case study on 'An individual's health behaviour' and then complete the following.

1. Predict how Mel would define the concept of good health, giving reasons to support your prediction.
2. Using a continuum, indicate how the following people are likely to rate Mel's current level of health. Underneath your continuum provide brief reasons for why you believe each person would have this perception of Mel's level of health.
   (a) Mel
   (b) Her parents
   (c) Her friends
   (d) Her old swimming coach
   (e) Her doctor
3. Discuss the impact that Mel's perception of health has upon her health choices and behaviours. Use examples to support your response.

CASE STUDY

An individual's health behaviour

Mel is a year 12 student who considers herself to be relatively healthy. She consistently attends school and tries hard to keep up with her school work. She sometimes finds the amount of work challenging and gets really stressed before exams. This makes it hard for Mel to sleep, so she often feels tired, irritable and flat. Because she sleeps in late most days, Mel often does not have time to eat breakfast or pack lunch. She tends to grab a coffee on her way to school and buy something for lunch from the school canteen when she has money with her.

Mel used to be very active, training for swimming four mornings a week and playing in the school's basketball team. However, she stopped these activities at the beginning of year 11 after getting a part-time job. She now works four-hour shifts on both Saturdays and Sundays in a local fast food store. Although gaining weight since she stopped swimming, Mel is not overly concerned about her lack of physical activity because she doesn't think she is overweight and the photos she shares of herself on Instagram always get lots of likes.

At weekends Mel likes to relax and go to parties with her group of close friends. They occasionally have a really big night out, particularly during holiday breaks, and drink heavily. There have been a couple of times when Mel has called in sick to work due to being tired and hung-over. On a couple of occasions she has also hooked up with someone she just met at one of these parties, but is not worried about getting pregnant because she has been on the contraceptive pill for a couple of years.

Differing perceptions of health also have the potential to reinforce **stereotypes**. For example, a belief that being skinny or well tanned is healthy may encourage negative health behaviours such as skipping meals, excessive dieting, or sun baking. The perception that women's health and well-being could be endangered by competing in traditionally male sports such as rugby league and boxing serves to reinforce notions of women being weak and delicate. This perception also limits the range of physical activities available to female athletes and restricts opportunities to test their capabilities.

Differing perceptions of health may also contribute to varying expectations of people's capabilities and levels of responsibility for managing their health. A perception that the elderly are frail, weak and unable to participate in strenuous activity may discourage older people from continuing to be active. Alternatively it may result in others taking control of aspects of elderly people's lives and thereby limiting their participation in everyday tasks that involve a degree of physical exertion. Likewise the belief that young people should be strong, fit and active may mean that those who are overweight are seen as solely responsible for their condition and any necessary action required to improve their health. The differing expectations that come with people's different perceptions of health are likely to impact on the degree of support that individuals provide to others.

Implications at the policy level

At a societal level the perceptions of the health status of Australians held by various levels of government, health professionals, non-government organisations and other interest groups are likely to drive government policy, expenditure and action, and impact on the agenda set by various organisations. Statistics of ill health are often gathered to measure the health of individuals, communities and nations. These statistics show rates of **mortality**, **morbidity**, **life expectancy** and years of life lost to premature mortality, as well as causes of hospitalisation. The analysis of trends of illness and disease evident in these figures, known as epidemiology, has significant implications for health promotion and health care within Australia. It is used to identify areas of health that are emerging concerns, determine risk factors that contribute to ill health and target prevention or intervention strategies towards particular population groups or health issues. This determination of health priorities impacts significantly on the allocation of expenditure and the provision of resources and support by all levels of government.

Conflicting perceptions often arise about the areas of health that should be given highest priority, leading to competing demands for the finite resources allocated by the various levels of government. This can result in insufficient funding for particular health issues, inadequate or inappropriate support being provided to meet specific needs, or poor resourcing or a perception by certain groups that this has occurred. People who feel

that funding and resources have been incorrectly allocated may feel resentful and disempowered. They may feel that resources have not been distributed equally.

Insufficient allocation of resources and limited budgets can also limit the number and range of strategies that can be implemented to address various health issues. Decisions need to be made about how to most effectively allocate money, meaning that opportunities to undertake research, instigate proactive approaches or commit to long-term projects may be restricted.

1.2.4 Perceptions of health as social constructs

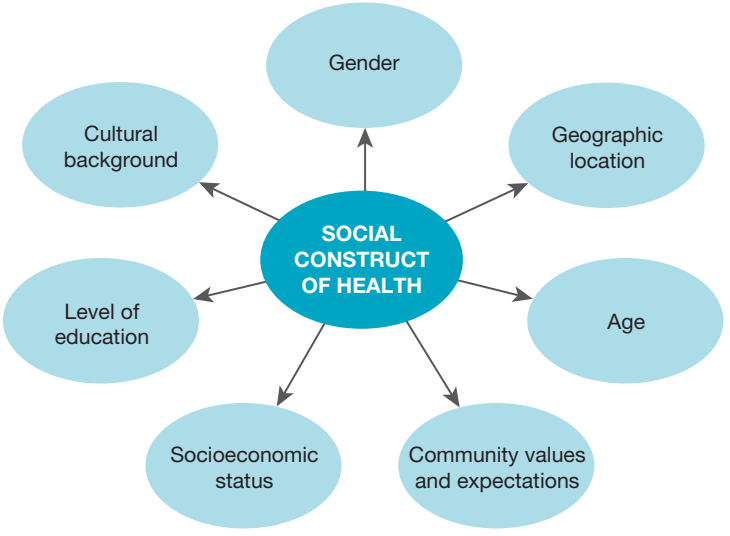
We should now recognise that different people have different perceptions about what they believe good health means and what it involves. So what is it that shapes our perceptions? Our views regarding what constitutes good health and who possesses it are largely influenced by the social, economic and cultural conditions of our family and the society in which we live. This is referred to as our **social construct**.

A number of factors are likely to play a role in our social construct of health, including:

- socioeconomic status
- geographic location
- cultural background
- gender
- age
- level of education
- community values and expectations.

All these factors have an influence on the understanding we develop of what good health involves, the expectations we form about our health potential and the health-related choices we make. Perceiving health as a social construct also means that our understanding of health will continue to change over time.

FIGURE 1.8 Numerous factors play a role in the social construct of health.



Inquiry

To what extent are perceptions of health socially constructed?

Read the snapshot 'One in five school-aged children in NSW considered overweight or obese' and then respond to the following questions to consider the degree to which perceptions of health are socially constructed.

1. Explain why people's perceptions of what is considered a healthy weight have changed over time.
2. Describe the possible impact that this change in perception could have on people's health behaviours in relation to eating and physical activity.
3. Outline two other ideas or perceptions of health that are socially constructed and describe factors that you feel have a major influence on people's perceptions.

SNAPSHOT

One in five school-aged children in NSW considered overweight or obese, new research shows

By Sue Daniel and Antigone Anagnostellis

Australians need to reset their understanding of what is a normal weight, with more than one-in-five school-aged children in New South Wales now considered overweight or obese, health experts say.

New data indicates there is a disconnect within society about what is now considered a 'normal' weight, said Kerry Chant, chief health officer at NSW Health.

'GPs have told us that sometimes it's actually hard for them to raise healthy weight with families,' Dr Chant said.

'That's partly because 70 per cent of parents of children who are overweight think their child is about the right weight, so the GPs said to us, we need some more help with some practical tools.'

New tools to address the growing childhood obesity epidemic have been launched including a website showing a healthy weight calculator and a video of a nutritionist giving a guided tour in a supermarket to highlight better food choices.

Dr Chant said new and clear ways have to be found to reach families.

'As a society we've got fatter. So we've got over 50 per cent of adults are overweight or obese,' she said.

'And sadly one in five children are above a healthy weight in NSW, so you can imagine that the norms of healthy weight have actually changed.'

Obesity treatment must be equitable

Australian Medical Association spokesman Brad Frankum said the most insidious problem with the obesity crisis is that it is unevenly distributed.

'Western Sydney and the Nepean Blue Mountains are in the top three metropolitan areas in Australia when it comes to overweight and obesity rates so we need to do everything we can to ensure that access to prevention and treatment is equitable,' Professor Frankum said.

'I don't quote these figures to fat shame or judge people in the community where I work. We're just talking about the most significant health issue that Australia is facing.'

Professor Frankum said it was important to normalise healthy eating early on, because research showed more than 80 per cent of children who were obese become obese adults.

'There does seem to be an element of metabolic setting that happens in childhood that once you reach puberty — if you're overweight, it does become harder to lose weight beyond that, so it is something to do with the way the body gets used to the nutrients that it gets.'

Dr Chant said the new tools would help parents to recognise when their children were overweight.

'They may take it as a judgement, they may take it as blame, and so to better support general practice we need to develop tools to normalise and promote the conversation,' she said.

Source: www.abc.net.au/news/2017-05-13/one-in-five-nsw-children-now-considered-obese-or-overweight/8523762.

Socioeconomic status

Our **socioeconomic status** is linked to our level of income, education, employment and occupation. Research has found that the higher a person's socioeconomic status, the healthier they are likely to be. Those in the lowest socioeconomic groups are generally at greatest risk of poor health, suffer more illnesses and disability and have a lower life expectancy. They are more likely to engage in risky health behaviours such as smoking and being inactive and also rate aspects of their health, such as oral health, as fair or poor (*Australia's health 2016*).

Social and economic disadvantage is closely linked with poorer levels of emotional health, which is characterised by:

- a loss of a sense of control, status or power
- higher levels of stress
- low self-esteem
- feelings of unfair treatment, bitterness and resentment.

The differences in health status that are evident between people from different socioeconomic backgrounds are likely to lead to people from lower socioeconomic backgrounds having different expectations about their health potential. They have less money to invest in positive health behaviours, such as taking out fitness centre memberships, are exposed to more dangerous working and living environments, and have limited choices when accessing health care. Therefore it is likely that those from lower socioeconomic backgrounds will develop different meanings of health and well-being to people belonging to a higher socioeconomic group.

Geographic location

Location is also likely to play a role in the formation of people's definition of what it means to be healthy. Geographical areas can be broadly divided into urban, rural and remote. People from each area have varying social constructs for health and well-being. This is due to the unique features of these locations and the different social circumstances of the people who live there. In comparison to urban dwellers, people in rural and remote areas have relatively poor access to health services and recreational facilities, meaning they consult medical practitioners less often and may have restricted opportunity to participate in organised physical activity and receive social support. They are also exposed to harsher environments and are less exposed to health promotion and self-care messages. These differences are likely to affect the perceptions of health formed by people living in remote locations, as well as how they assess their current state of health.

FIGURE 1.9 The social construct of health for people in rural and remote areas is influenced by their relatively poor access to health and medical services, and the harsh environments in which many people live and work.

Inquiry

Perceptions of health as a social construct

Dan and Marco are both 16 years old and suffer from asthma. Their condition is under control if they follow their asthma management plan and avoid the triggers that have led to asthma attacks in the past, such as strenuous exercise and poor air quality.

- Dan lives in Palm Beach, Sydney, where his mother has a medical practice and his father teaches yoga. Dan attends the local high school and surfs or swims for an hour most days before doing homework and having dinner.
- Marco lives with his father and younger brother on a remote property in far west New South Wales. He rises at 5.00 am to help with farm work, completes his studies via distance education, cooks dinner, then studies again before bed.

1. Compare how each of the boys might perceive their own health. Give reasons for the similarities and differences discussed.
2. Use examples from the case study or other relevant examples to write an explanation of why perceptions of health are socially constructed.

Cultural background

Population groups from different ethnic backgrounds or cultural heritages (for example, Aboriginal and Torres Strait Islander peoples) may have vastly different explanations or meanings for health and well-being to groups from other racial backgrounds (for example, people from a European background). From the perspective of Aboriginal and Torres Strait Islander peoples, the meaning of health is much broader than the World Health

Organization's definition provided in section 1.1.1. 'Aboriginal health' means not just the physical well-being of an individual but refers to the social, emotional and cultural well-being of the whole community in which each individual is able to achieve their full potential as a human being thereby bringing about the total well-being of their community. It is a whole of life view and includes the cyclical concept of life—death—life (National Aboriginal Community Controlled Health Organisation, NACCHO). This emphasis on the health of the entire community makes it essential for health professionals and services to work in collaborative partnership with local Aboriginal communities to support the health of Aboriginal peoples.

People from different cultural backgrounds may also hold deep-seated beliefs and ideas related to health that are learned and passed on from one generation to the next. As a result, perceptions of health take on different meanings within some cultural groups. For example, in some cultures certain diseases or conditions, such as mental illnesses, are considered to be a sign of weakness or a personal failing rather than a diagnosed health concern. This can create significant stigma for those experiencing these diseases and contribute to feelings of shame or guilt, especially in cultures where the behaviour of an individual is felt to reflect on their family. Ideas about 'healthy weight' can also differ between cultural groups. What is considered overweight in one culture may be perceived as 'strong' in other cultures. According to the beliefs of people from these cultural groups, being a larger body size means they have an energy store to use in times of famine, leading to a perception that strong women are desirable and healthy.

FIGURE 1.10 The increasing acceptance of alternative medicine, such as acupuncture, has influenced people's ideas about what is involved in good health.

The values and beliefs of the dominant culture act as a powerful influence on ideas constructed about health. Dominant cultures have greater social power and therefore more participation and influence in decision making among administrators, politicians and economists. Ultimately this affects the way health is seen in the broader community. The predominant view of health in Australia is derived from the majority middle-class, Anglo-Saxon urban population. According to this view, for example, a person's health is still primarily judged according to their state of physical health. Furthermore, the emphasis of health treatment should be on modern, scientific health care and mainstream medicine, which relies on drug treatment or surgery. However, traditional practitioners, naturopaths and other alternative practitioners (for example, acupuncturists) are being increasingly used and some methods adopted by mainstream medical practitioners as options or alternatives. **Alternative medicine** and practices are therefore gaining more respect from the dominant culture as people's values and attitudes change about what good health means and what is involved in achieving good health.

Perceiving health as a social construct allows us to consider the broad social and cultural factors that impact on an individual's behaviour. When we view health as a social construct it allows us to:

- explain why certain people choose to behave in particular ways
- understand how social norms are established in cultural subgroups
- realise how our concept of health can take on different meanings in particular social contexts.

1.2.5 Impact of the media, peers and family

The media, our peers and our family have a particularly significant impact on the perceptions we develop about health. These three groups exert a strong influence on the ideas that people form about what constitutes good health and the value they place upon various aspects of health.

The media

The media are a factor that impact on an individual's social construct of health. Some of the main forms of media include the internet, music, video games, movies, television, newspapers and magazines.

The media play a significant role in disseminating health-related information. For example, news stories on binge drinking, television advertisements about skin cancer or feature articles in magazines on obsessive compulsive disorder all seek to raise awareness and increase people's understanding of these health issues.

FIGURE 1.11 Images consistently seen in the media have a significant impact on people's ideas about health.

Stories in the media also influence people's perceptions through the depth of information they provide, the way this information is presented and the frequency of this presentation. A continued focus on a particular health issue can draw the public's attention to that particular topic, possibly at the expense of other areas of concern. It can also affect people's perception of the risk that they will experience a particular health problem, its likely severity and the future prevalence of this problem within the community. For example, media coverage relating to HIV/AIDS has contributed to a heightened knowledge and awareness of this particular virus in comparison to other sexually transmitted infections such as chlamydia or hepatitis B, which receive less coverage but are far more prevalent in the community.

The media are influential in shaping attitudes, values and behaviours relating to what good health looks like and means. Misleading messages in the media about health can contribute to misconceptions or distorted perceptions of health. For example, magazines, television, movies and other forms of media are full of images of tanned, attractive, slim women and men with athletic, muscular physiques. The constant portrayal of these body shapes as essential elements of good health has a significant effect on people's assessment of their level of health, while also exercising considerable influence on what they do in an effort to look this way.

Sustained media coverage of a particular health issue can lead to such attention and heightened public concern that it can influence government policy, priorities and health expenditure. For example, frequent front page stories about road crashes involving young people have been a critical factor in increasing community awareness and intensifying concerns about the over-representation of young people in accident statistics. Discussion provoked by this media coverage has contributed to the introduction of laws relating to zero blood alcohol levels, reduced engine capacity, passenger restrictions for learner and P-plate drivers and bans on their use of mobile phones while driving, while also contributing to ongoing debate about further changes that could reduce the number of young people involved in crashes.

SNAPSHOT

An open letter to advertisers, media decision makers and teenagers

To whom it may concern,

My name is Stella Lycos, 16 years old. I have some issues of great concern to me that I would like to discuss with you.

My friends and I are currently being negatively affected by the advertising industry. Every day of every year images, slogans, brands and other forms of advertisement are being constantly thrown at us, preached to us, and marketed to us. In primary school we were briefly talked to about body image and self-esteem and how to prepare ourselves for high school and in turn, life. Sitting in that classroom I listened but I did not feel one bit concerned. I thought that self-esteem and body image was going to be about as concerning and relevant as filling out tax return forms.

Now that I am in high school, I have begun to realise that the way women and girls are portrayed in media and advertising has a greater link with body image and self-esteem issues than I ever imagined. It's easy to think that you can choose what you listen to and see and just ignore what you wish. But when we are constantly bombarded with messages that are telling us that we are too fat, too thin, not toned enough, don't have the right clothes and should probably be out partying while keeping up good grades and becoming the thriving young women that we were meant to be; it's hard.

The Australian Psychological Society told the Senate Committee Inquiry into the sexualisation of children in 2008, 'the values implicit in sexualised images are that physical appearance and beauty are intrinsic to self-esteem and social worth, and that sexual attractiveness is a part of childhood experience . . . Girls learn to see and think of their bodies as objects of others' desire, to be looked at and evaluated for its appearance.' I can say from personal experience that all these years of constant advertising images and messages about what girls and women look like are deeply affecting me and my peers. I am a human being, not an object to be used or altered to fit in to society. But sometimes it's hard to see my body for what it is and instead see it for what it's not. I know that it's not my own original thoughts telling me that I am not good enough; it's what has been taught to me. Feeling content and fulfilled in a nation that is riddled with graphic advertisements aimed at young people seems to no longer be an option.

At my school, bullying isn't tolerated. But my friends and I are getting bullied every day and for the most of it, it's not from other teenagers. We are getting bullied by media and advertisers. Being told over and over again that we are inadequate has serious damage on our minds, maybe even permanent damage. Teenagers are particularly vulnerable and influenced by advertisement. I am lucky to have a supportive down to earth family and a group of friends who don't care what I look like but I know and I promise you that I still find myself thinking negatively about myself and I know my friends do too. I simply cannot escape the idea that I am not adequate in today's society. No one wants to feel inadequate. So who is going to stand up against these big corporate bullies?

I have been learning about the way media and advertising are regulated, and I have been really disappointed in what I have found out. At the moment the rules which tell companies how they can advertise are inadequate and the system is weak. A voluntary code with no pre-checking of ads and a lack of ASB power to remove advertisements means that advertisers pretty much get away with doing whatever they like. It's not fair to expect me and my friends to stand up and defend our bodies and minds against these huge companies.

I for one can say from personal experience that all these images and messages have had a great effect on me and my peers. It is from these seeds of expectations that low self-esteem, mental illness and eating disorders can sprout.

When it comes to the internet and social media, things feel even worse. Companies are using social media to get their messages across to us 24/7. They bring the images and ideas which we are already exposed to everywhere, into our own homes, and often the images which come this way are much more explicit and intense than what we would be shown in a magazine, on TV or in an outdoor advertisement. I don't want a censored world full of rules and laws prohibiting us to speak freely or be individuals, but I do want a better environment for me and my friends to grow up in.

I'd like to ask you to speak up about these issues on behalf of me and others like me. We need the system to change and we need people like you to help bring about that change for us. I know that there have been other groups that have written reports into these issues but if you ever want to find out firsthand about what it's like to be a teenager in this media environment me and my friends would be more than happy to make ourselves available to talk to you.

Kind regards
Stella Lycos

Source: Open letter by Stella Lycos to advertisers, media decision makers and teenagers, Stella Lycos, *The Age*, 21 July 2013.

Application

How significant is the media's influence on perceptions of health?

Read the snapshot 'An open letter to advertisers, media decision makers and teenagers' and then complete the following activities.

1. Summarise the main arguments expressed in the letter about the impact of the media on young people's perceptions about body image and body weight.
2. Discuss why the young person is concerned about the messages conveyed through the media about health.
3. Analyse the degree to which you feel a person's attitudes and ideas about body weight and body image are socially constructed.

Peers

The group with whom we associate at school and outside of school markedly influences our attitudes about health and the health behaviours we adopt. Along with our family, our peers are the group most likely to influence our ideas, promote certain behaviours and provide support in terms of our health.

FIGURE 1.12 Young people's health attitudes and behaviours can be significantly influenced by peers.

When group members share similar ideas about what good health means and place comparable value on the importance of good health it is easier for the individual to behave in ways that will enhance their health and well-being. For example, when young people recognise that positive mental health is an important component of their general well-being, they are more likely to support individuals who are experiencing emotional difficulties and encourage them to talk openly about their feelings and seek support. However, when mental health problems are perceived as a sign of weakness, an attempt to get attention, or not a significant problem it becomes harder for the individual to recognise or acknowledge that they are experiencing difficulties or ask for help.

Young people's behaviour can be significantly influenced by their peers. Social pressures, along with the desire to fit in, may contribute to decisions being made that are likely to negatively affect their health. For example, decisions to experiment with drugs such as alcohol and cannabis, take risks when driving, participate in sexual activity or spend time sunbaking are more likely to be made by young people when these behaviours are common among their peers. However, when a peer group recognises these behaviours are unhealthy and liable to cause significant immediate or future harm, they are likely to discourage others from engaging in these activities.

Family

Families have a significant influence in the lives of most young people. From our earliest years, our parents are our role models, so the ideas they communicate about what health means and the values they convey about the importance of good health have a strong effect on the perceptions that we develop. Their ideas relating to health also contribute significantly to their health behaviours and the efforts they make to promote behaviours that can positively impact on our own level of health, therefore further influencing the ideas that we form. For example, a belief that participation in sport and physical activity is important for good health is likely to see parents encourage their children to be active and support their involvement in regular physical activity. The values and attitudes instilled in us by our parents play an important part in the development of our own perceptions of health.

The living conditions of families, along with other socioeconomic factors such as income, education and employment, also have a bearing on our ideas about health. People living in **socioeconomic disadvantage** generally live shorter lives and suffer more illness and a lower quality of life than those who are well off. Poverty and unemployment can lead to stress, tension, conflict and a sense of hopelessness, all of which contribute further to poor health. The effect of living in situations where life expectancy is lower, sickness is experienced more frequently and expectations about health are poorer is likely to impact on the ideas young people develop about health and the level of control they believe they are able to exert over it. Poor economic circumstances can also limit the amount of money available to be spent on health-related expenses, therefore affecting the priority given to health and the importance with which it is viewed.

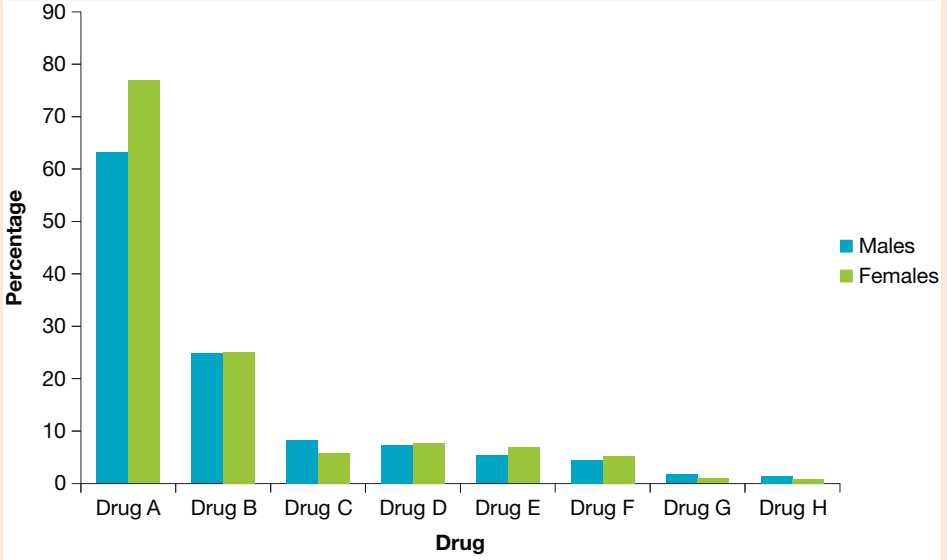
FIGURE 1.13 Families play an important role in our perceptions of health.

Living with a family member who is chronically unwell may also negatively impact on perceptions about health, particularly when a young person is required to take on the role of carer. The ongoing experience of living with someone who suffers poor health as a result of a physical disability, chronic health condition or mental illness has a significant influence on a person's ideas about what good health looks like. Furthermore, the stress and fatigue associated with the responsibility of caring for someone, along with possible social isolation, can have a detrimental impact on the judgements that carers might make about their own health and the expectations they have about being able to improve their health at some point in the future.

Application

How can the media, peers and family influence our perceptions of health?

FIGURE 1.14 Percentage of 12–17-year-old secondary students who indicated they had taken some type of drug in the last four weeks



Source: White, V. & Williams, T. 2016, *Australian secondary school students' use of tobacco, alcohol, and over-the-counter and illicit substances in 2014,* Centre for Behavioural Research i Cancer, Cancer Council Victoria, for Tobacco Control Taskforce, Australian Governmen Department of Health.

1. The graph in figure 1.14 contains data from the National Drug Strategy's *Australian secondary school students' use of tobacco, alcohol, and over-the-counter and illicit substances in 2014* report. It shows the percentage of 12–17-year-old male and female secondary students who reported that they had used some type of drug in the four weeks prior to the survey.
   Look at the percentages shown in each column and predict which of the following drugs relate to each letter A–H:

Cannabis	Analgesics
Tobacco	Alcohol
Ecstasy	Tranquilisers
Inhalants	Image enhancing drugs

2. As a class examine how closely your perceptions of drug use by young people matched the data reported in the survey. This can be found online, in section 6 of the report: 'Use of over-the-counter and illicit substances among Australian secondary students'. Look at the data for use in the last month.
3. Discuss how your class's perceptions of drug use by young people are likely to be influenced by the media, peers and family.
4. Consider how ideas about young people's drug use are likely to affect perceptions of the health of young people who use drugs.

1.3 Health behaviours of young people

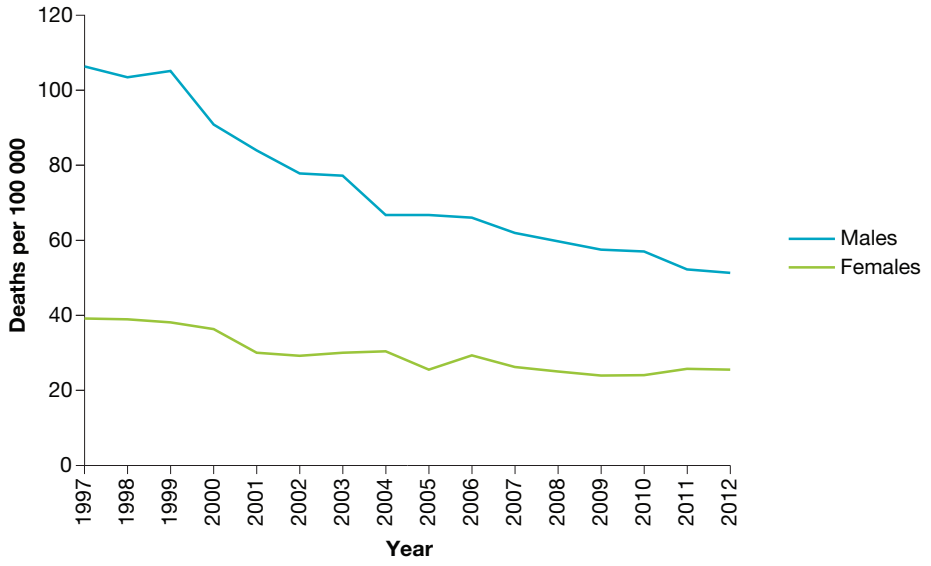
The health of young people is a topic frequently discussed in the media. Stories often report increasing rates of obesity, escalating consumption of junk food, declining levels of physical activity in favour of screen-based activities, regular episodes of binge drinking, a rise in the use of illicit drugs such as ecstasy and ice, increased promiscuity, growing incidence of mental health problems and an over-representation in motor vehicle accidents. Such stories contribute to a perception that young people are in a poor state of health. How accurate are these perceptions? What has current research found about the health status of young Australians and their health-related behaviour?

1.3.1 The positive health status of young people

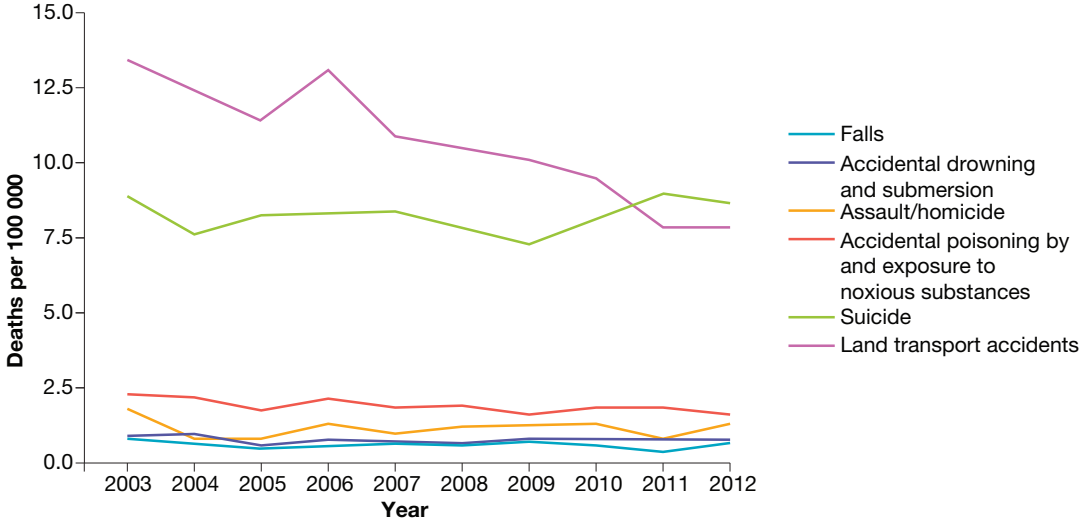
Research into the health status, health outcomes and factors influencing the health and well-being of young Australians is regularly undertaken by the Australian Institute of Health and Welfare (AIHW), with a report card on the health of Australians compiled every two years. According to the latest report, *Australia's health 2016*, the health of young Australians has continued to improve over time and the majority of young people are currently faring well in terms of their health and well-being. Evidence of the positive health status of young people can be found in a continuing fall in the death rate among young people, largely as a result of a decrease in road-related fatalities. Reductions in morbidity from **chronic** diseases such as asthma have also contributed to improvements in young people's health. Further evidence of the positive health status of young people was found in the decline in risk behaviours such as smoking (11 per cent of young people were daily smokers in 2013 compared to 21 per cent in 2001), rates of risky alcohol consumption (39 per cent of young people reported drinking at risky levels in 2013 compared to 49 per cent in 2001) and the use of illicit drugs (in 2013 one-quarter of young people reported using illicit drugs in the past 12 months compared to 33 per cent in 2001). At the same time research found a significant number of young people always (43 per cent) or sometimes (39 per cent) used condoms when having sexual intercourse, helping to manage their sexual health. These positive behavioural changes have the potential to protect and improve the future health of young Australians.

FIGURE 1.15 **(a)** The continual reduction in the death rate of young Australians is evidence of their positive health status. **(b)** An ongoing fall in the number of road-related deaths among young people has contributed significantly to a decline in death rates.

(a) **Death rates among young people aged 15–24, by sex, 1997–2012**



(b) **Causes of injury deaths among all young people 2003–12**



Source: Australian Institute of Health and Welfare. (a) Premature mortality in Australia 1997–2012, www.aihw.gov.au/reports/life-expectancy-death/premature-mortality-in-australia-1997-2012/contents/deaths-among-young-people-aged-15-24; (b) National Youth Information Framework (NYIF) Indicators, www.aihw.gov.au/reports/children-youth/nyif-indicators/contents/summary.

Inquiry

Analysing mortality rates of young people

Look at the two graphs in figure 1.15.

1. Propose reasons for the significant differences in the death rates of males and females that are evident in the graph.
2. As a class discuss strategies and initiatives that have been implemented in recent years that have contributed to the fall in injury related deaths.

The findings of these statistics are substantiated by positive assessments by most young people of their own state of health. According to the *National Health Survey* 2014–15 (Australian Bureau of Statistics) just under 64 per cent of Australians aged between 15 and 24 years old rated their own health as being either excellent or very good, with another 27.7 per cent assessing their health as good. These positive perceptions of their health, supported by the data showing the high level of health currently experienced by many young people in Australia, contrast markedly with some commonly held beliefs of adolescent health.

TABLE 1.2 Self-assessed health status of young people aged 15–24 years, by sex and age group, 2014–15 (per cent)

15–24 years			
Health status	**Males**	**Females**	**Persons**
Excellent or very good	64.1	62.7	63.4
Good	27.2	27.7	27.7
Fair or poor	8.8	9.4	9.1
Total	**100.0**	**100.0**	**100.0**

Source: Australian Bureau of Statistics, *National Health Survey: First Results,* 2014–15.

SNAPSHOT

Junk food, alcohol and drugs fuelling health crisis in young adults

Young people refusing to eat fruit and vegetables and instead loading up on junk food are fuelling the state's obesity crisis.

More than one-third of 18- to 24-year-olds in NSW are knocking back dangerous amounts of alcohol and almost as many have used illicit drugs in the past year.

The worrying findings are contained in a new widespread report that reveals the true state of the health of NSW's young people, covering everything from sexuality to obesity.

The state government report shows young people's diets are feeding the obesity crisis with meals short on fruit and vegetables but rich in junk food and soft drinks leaving up to 37 per cent of them overweight or obese.

And nearly 22 per cent of young women and more than 12 per cent of young men are experiencing high or very high psychological distress.

Social demographer Mark McCrindle said the next generation of young people — dubbed Generation Alpha — will be plagued by obesity and mental health anguish.

'Those high rates of mental health concerns will continue and we will see ongoing struggle for them with proper exercise and [the] challenge of sedentary lives will be exacerbated,' Mr McCrindle said.

But he was confident rates of smoking and drinking among young people would continue to fall.

Source: Edited extract from *The Daily Telegraph*, 12 July 2017.

Application

Survey of perceptions about young people's health

1. Survey four different people, including at least two adults, about their perceptions of young people's health status. Use the following questions and add your own questions to determine people's views. Record their responses and write a summary report of the four people's views.

   Survey questions:

   - Do you think that the health of young people is good? Explain reasons for your answer.
   - Do you think young males are as healthy as young females? Why/why not?
   - Name aspects of young people's health that you feel have improved in recent years.
   - Name aspects of young people's health that you feel have declined in recent years.

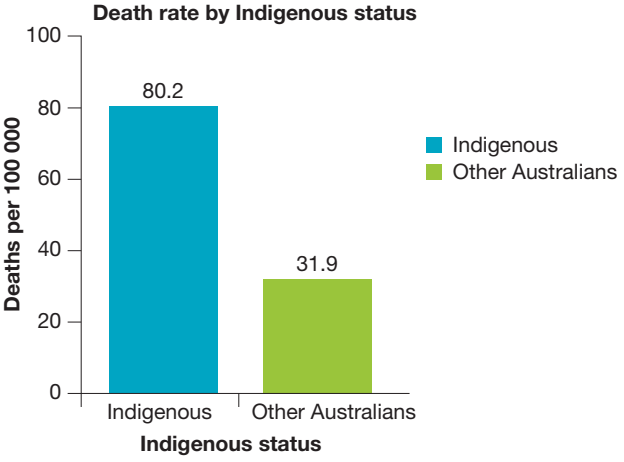
2. Use the **Australia's health 2016: Health of young Australians** weblink in the Resources tab to read chapter 5.4 from the AIHW report.
   (a) Read the key findings on how young people are faring in terms of their health.
   (b) Compare the summary report of your own survey with the key findings from chapter 5.4 of the AIHW report.
3. Read the snapshot 'Junk food, alcohol and drugs fuelling health crisis in young adults'. Describe the impression of young people's health conveyed in the article.
4. Use the findings from chapter 5.4 of *Australia's health 2016* (question 2 above) to assess the accuracy of the article's perception of the health of young Australians (question 3 above).
5. Outline common misconceptions that exist about young people's health status and behaviours.

Resources

Weblink: Australia's health 2016: Health of young Australians

Despite the generally positive picture painted of the health status of young people, research has found that particular groups of young people are not doing as well as others in terms of their health and well-being. These groups include young Aboriginal and Torres Strait Islander people, young people in regional and remote areas and young people experiencing socioeconomic disadvantage. Significant differences in all measures of health are particularly evident between Indigenous and non-Indigenous young people and have been for some time. The AIHW found that death rates for young Aboriginal and Torres Strait Islander people were 2.5 times higher than all other young people (80 per 100 000 compared to 32 per 100 000) and the recent decline in the death rate was much less than that of non-Indigenous young people. They were three times more likely to die as a result of an injury, particularly road crashes, suicides and assaults; experienced higher rates of chronic diseases such as asthma; had a higher incidence of hearing problems; and were more likely to contract a sexually transmitted infection than other young Australians. The proportion of young Aboriginal and Torres Strait Islander people who reported experiencing high or very high levels of psychological distress was more than double that of other young Australians. Research has also found that young Indigenous people were more likely to experience risk factors associated with poor health such as low levels of fruit and vegetable consumption, obesity (1.5 times higher), tobacco use (more than twice as high), physical inactivity, incarceration and lower levels of literacy and numeracy (*National Youth Information Framework (NYIF) indicators AIHW).* For many young Indigenous people these health disadvantages start at a young age and remain throughout their life, resulting in ongoing negative effects on their level of health.

FIGURE 1.16 Comparison of death rates of young Indigenous peoples and non-Indigenous young people, aged 12–24 years, 2008–12

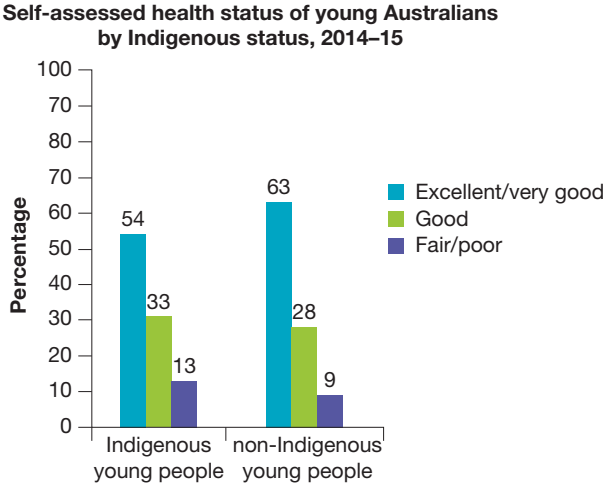


Source: Australian Institute of Health and Welfare, 2015.

In addition to these objective measures, young Aboriginal and Torres Strait Islander people were less likely than other young people to perceive their health as excellent or very good and more likely to rate their health as poor (*Aboriginal and Torres Strait Islander health performance framework 2017 report*).

In addition to identifying specific population groups who were not faring as well as others in terms of their health, various reports have also highlighted specific health issues of concern for young people due to their continued or increasing prevalence, particularly for the above mentioned population groups. The mental health status of young people is one area of ongoing concern. While the 2013–14 *Young Minds Matter Survey* reported that the majority of young people have good mental health, **mental health disorders** continue to be the greatest contributor to the burden of disease for young Australians. Mental health problems and illnesses affect an individual's thoughts, emotions and behaviour. This impact, coupled with the stigma attached to mental disorders, can contribute to isolation and discrimination, both of which negatively affect social well-being. According to this survey 14 per cent of young people aged between 12 and 17 years had experienced a mental disorder in the past 12 months, with this disorder having a severe impact on the daily lives of 23 per cent of these young people. Anxiety disorders were the most commonly diagnosed disorders experienced by young people (7 per cent), followed by attention deficit hyperactivity disorder (6.3 per cent) and then major depressive disorders (5 per cent). However, responses provided by young people themselves suggested that the prevalence of major depressive disorders is likely to be underestimated, with 7.7 per cent of adolescents providing information that showed they met the diagnostic criteria for a major depressive disorder. In addition, nearly one in five (19.9 per cent) young people surveyed reported experiencing high to very high levels of psychological distress, with these feelings being four times higher for those with a major depressive disorder.

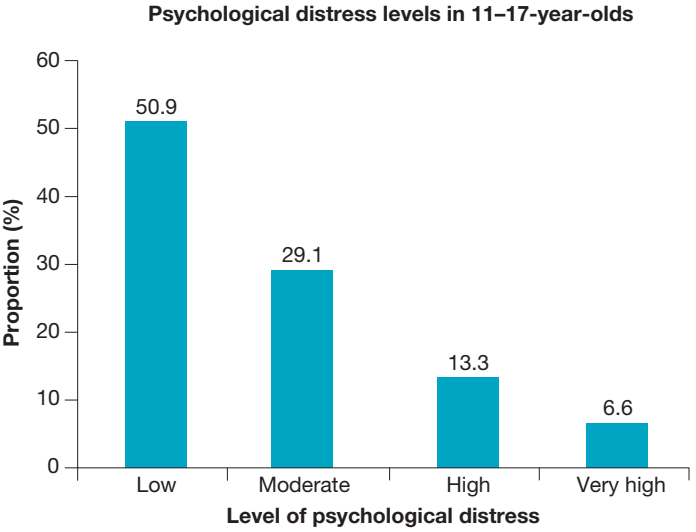
FIGURE 1.17 Self-assessed health status of Indigenous and non-Indigenous Australians aged 15–24 years, 2014–15



Source: Australian Health Ministers' Advisory Council, 2017, *Aboriginal and Torres Strait Islander health performance framework 2017 report,* AHMAC, Canberra.

Various health reports have also highlighted behaviours related to self-harm and suicide as another area of ongoing concern in relation to young people's health. Statistics on the causes of death in 2016 showed suicide (or intentional self-harm) was the leading cause of death for 15–24-year-olds, accounting for 12.3 deaths per 100 000 (Australian Bureau of Statistics). Rates were significantly higher for males than females (18.3 deaths per 100 000 males compared to 6.3 deaths per 100 000 females). The *Young Minds Matter Survey* found that 11 per cent of young people aged 12–17 years had engaged in self-harming behaviour and one in 10 young people aged 16–17 years reported having suicidal thoughts; 4.7 per cent of females and 2.9 per cent of males in this age group also reported having made a suicide attempt in the past 12 months. Significant differences were found between genders, with rates of suicidal behaviour consistently higher

FIGURE 1.18 About half of those aged 11–17 years experience moderate to very high levels of psychological distress.



Source: 'Highlights — The mental health of children and adolescents', *Report on the second Australian child and adolescent survey of mental health and wellbeing*, Australian Government Department of Health 2015, p.9.

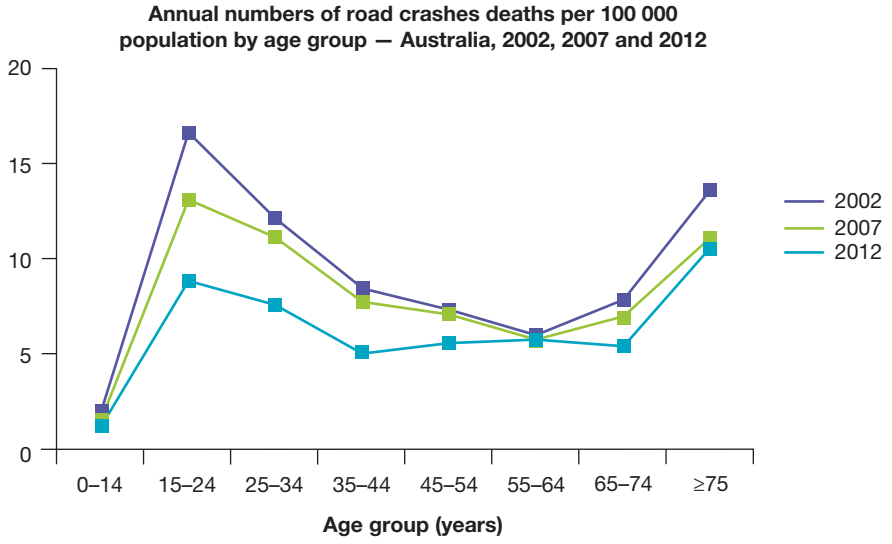
in females. Rates of self-harm, suicide ideation and suicide attempts were also markedly higher among those who self-reported a major depressive disorder. These findings demonstrate that mental health continues to be a key issue of concern for young Australians that needs to be addressed by communities, families and all levels of government.

Road-related injuries are another area of ongoing concern in relation to the health of young people. While road safety statistics from the Australian government show that the number of road-related deaths involving 15–24-year-olds has fallen faster than other age groups in recent years, the number of young people killed or seriously injured as a result of vehicle accidents remains high and they continue to be over-represented in road crash data. This is particularly the case for males, who are three times more likely to die and twice as likely to be hospitalised as a result of a road crash. The injuries suffered as a result of road trauma leave many young people with serious disabilities and long-term conditions that significantly affect their future health and well-being, along with the health of others such as parents, who may need to take on a caregiving role due to the injuries sustained.

The fact that further improvements are still required in some areas of young people's health was also highlighted by the increasing rates of sexually transmitted infections, such as **chlamydia**, with the number of notified cases of chlamydia increasing in the last nine years (*Australia's health 2016*. p. 211).

The increasing prevalence of these health conditions has a significant impact on young people's quality of life and is likely to negatively affect their long-term health as well as their successful involvement in education, employment and the community in general.

FIGURE 1.19 Although the annual number of road death crashes per 100 000 for those aged 15–24 decreased significantly between 2002 and 2012, it remains higher than for all other age groups except those 75 years or older.



Source: Bureau of Infrastructure, Transport and Regional Economics BITRE, 2013, *Young adult road safety — a statistical picture*, Information sheet 51, BITRE, Canberra.

SNAPSHOT

Nearly 1 in 4 teens meet criteria for 'probable serious mental illness': Mission Australia report

By Mazoe Ford

Nearly 1 in 4 Australian teenagers meet the criteria for having a 'probable serious mental illness', a joint report from Mission Australia and the Black Dog Institute has found.

The Five Year Mental Health Youth Report presented findings from the past five Mission Australia youth surveys, during which thousands of adolescents answered questions on several topics, including mental health.

The report found that there are more people in the 15-to-19 age category in psychological distress than there were five years ago.

It also found girls were 'twice as likely as boys to meet the criteria for having a probable serious mental illness', and almost a third of Aboriginal and Torres Strait Islander respondents met that criteria, compared with 22.2 per cent for non-Indigenous youth.

Mission Australia chief executive Catherine Yeomans said the results were 'alarming'.

'The effects of mental illness at such a young age can be debilitating and incredibly harmful to an individual's quality of life, academic achievement, and social participation both in the short term and long term,' Ms Yeomans said.

'Their main concerns are coping with stress, school and study problems, coping with depression and anxiety, and body image.'

Black Dog Institute director Helen Christensen said because adolescence was a time of great change, teenagers needed lots of support.

'I think [the report findings] are considerably disturbing, and I think it speaks to the fact that perhaps [Australia] is not doing enough for young people as they go through adolescence,' Professor Christensen said.

'You can get some people who experience something more serious than the usual angst that most people go through when they're growing up, and because of vulnerability, past traumas, or a number of other factors they're kind of propelled into a deeper and more frightening space.'

Bex Vandersluis, 19, had a difficult upbringing during which she was shuffled between relatives' homes, guardians' homes and youth refuges.

She was diagnosed with depression and anxiety as a child and then post-traumatic stress disorder and disassociation as a 15-year-old.

'I don't really know what it's like now to live without depression and anxiety,' Miss Vandersluis told ABC News.

'To the world you look like you're OK, you have a face full of make-up and a smile on your face, you don't look like you're sad, but inside you feel a bit dead.'

Despite various interruptions to her education, Miss Vandersluis graduated from high school and is now completing an art course.

She eventually wants to become a prosthetic make-up artist and an advocate for mental health organisations.

'There's no reason to be ashamed of feeling hurt, scared, angry, or frustrated over anything because everyone copes with things in different ways,' she said.

'If I can help one person by telling my story, that's what I want to do.'

More young people turning to the internet for support

The report revealed that teenagers were increasingly turning to the internet to help them deal with their troubles.

'This might signal that we have a way to go to reduce the stigma of mental health issues, [because] young people are not prepared to admit they have a problem, so they're looking for the anonymity of researching on the internet to try and seek help,' Ms Yeomans said.

'What we need to make sure is that when young people go to the internet they actually can find evidence-based, self-help tools and ways to refer to help and get the support they need.'

Above that, Mission Australia and the Black Dog Institute are calling for specifically funded, mental health programs in all Australian high schools.

'If we don't do anything we should expect these results to just continue to increase, so we need more early intervention and prevention resources for young people,' Ms Yeomans said.

Professor Christensen said 'schools are the perfect place to start making changes'.

'At the moment we have a mixed bag of different programs that are offered throughout schools, [but] we think there should be a much more evidence-based, strategic approach to reducing depression and anxiety,' she added.

Miss Vandersluis agreed that schools 'need more awareness of what mental illness looks like and how to help'.

'If people know how to recognise it and what to do in those situations we can stop the old way of keeping mental health behind closed doors, like we should be ashamed to feel bad. We shouldn't.'

Source: http://www.abc.net.au/news/2017-04-19/teenage-mental-health-depression-abuse-black-dog-institute/8451736.

Application

Examining key health issues of concern for young people

1. Undertake research on the prevalence of and trends in relation to:
   (a) mental health disorders among young people
   (b) behaviours in relation to mental health.
   Use *at least two* of the following resources for this research:
   - Read the above snapshot 'Nearly 1 in 4 teens meet criteria for "probable serious mental illness": Mission Australia report'.
   - Watch the video using the **Young minds matter video** weblink in the Resources tab.
   - Read the highlights of the survey using the **Highlights: Mental health of children and adolescents** weblink in the Resources tab.
2. Write a summary of your findings. Make sure it includes the following three headings:
   - *Good news about the mental health and mental health behaviours of young Australians*
   - *Areas of concern about the mental health and mental health behaviours of young Australians*
   - *Groups of concern and reasons for this concern*
3. Suggest reasons why a significant number of young people are reporting that they experience high levels of distress.
4. Outline the potential impact (both short and long term) of mental illness at a young age on:
   (a) quality of life
   (b) academic achievement
   (c) relationships and social participation.
5. Research the prevalence of and trends in relation to road injuries among young drivers by using the **Young adult road safety — a statistical picture** weblink in the Resources tab. Complete a summary similar to the one done in question 1. Make sure it includes the following three headings:
   - *Good news about road injuries and deaths in relation to young Australians*
   - *Areas of concern about road injuries and deaths in relation to young Australians*
   - *Groups of concern and reasons for this concern*
6. Propose reasons for the decline in road deaths and the increase in hospitalisations for road crash injuries evident in the graphs presented in the **Young adult road safety — a statistical picture** weblink in the Resources tab.
7. Discuss why injuries and mental health are two of the leading health issues faced by young people.

on Resources

- **Weblink:** Young minds matter video
- **Weblink:** Highlights: Mental health of children and adolescents
- **Weblink:** Young adult road safety — a statistical picture

1.3.2 Protective behaviours and risk behaviours

Adolescence is a period of transition when young people begin to move from being dependent children to independent adults. Along the way they face a range of challenges and start to make decisions about particular health behaviours that play an important role in determining their immediate and longer term health. These health behaviours can be seen as being either **protective behaviours**, because they are likely to enhance good health (such as eating adequate amounts of fruit and vegetables), or **risk behaviours** because they have been found to contribute to the development of health problems or poorer levels of health (for example, smoking). The health and social behaviours that are adopted or reinforced during this time often continue into adulthood, so it is important to identify the prevalence of particular behaviours and analyse the trends that are apparent.

Behaviours that are likely to have the biggest impact on a young person's current and future health include those related to:

- physical activity
- eating habits
- substance use (including tobacco, alcohol and other drugs)
- sexual activity
- help-seeking behaviours
- social connectedness
- risk taking.

Inquiry

Protective behaviours and risk behaviours

Brainstorm your ideas for each of the following and draw two mind maps that summarise your ideas.

(a) Protective behaviours for health issues relevant to young people

(b) Risk behaviours for health issues relevant to young people

Health issues to consider could include:

- healthy eating habits/healthy body weight
- mental health
- sexual health
- drug use
- physical activity
- injuries
- road safety.

Compare your mind maps with those of other class members and discuss your findings.

Behaviours relating to physical activity

A certain level of physical activity is necessary to help achieve and maintain good levels of health. The recommendations outlined in *Australia's Physical Activity and Sedentary Behaviour Guidelines for Young People (13–17 years)* advise that adolescents should:

- accumulate at least 60 minutes of moderate to vigorous intensity physical activity every day
- include a variety of aerobic activities in the physical activity they do, including some vigorous intensity activity
- limit the time they spend being entertained by electronic media (for example, television, seated electronic games and computer use) to no more than two hours a day
- look at breaking up long periods of sitting as often as possible
- engage in activities that strengthen muscles and bones at least three days a week.

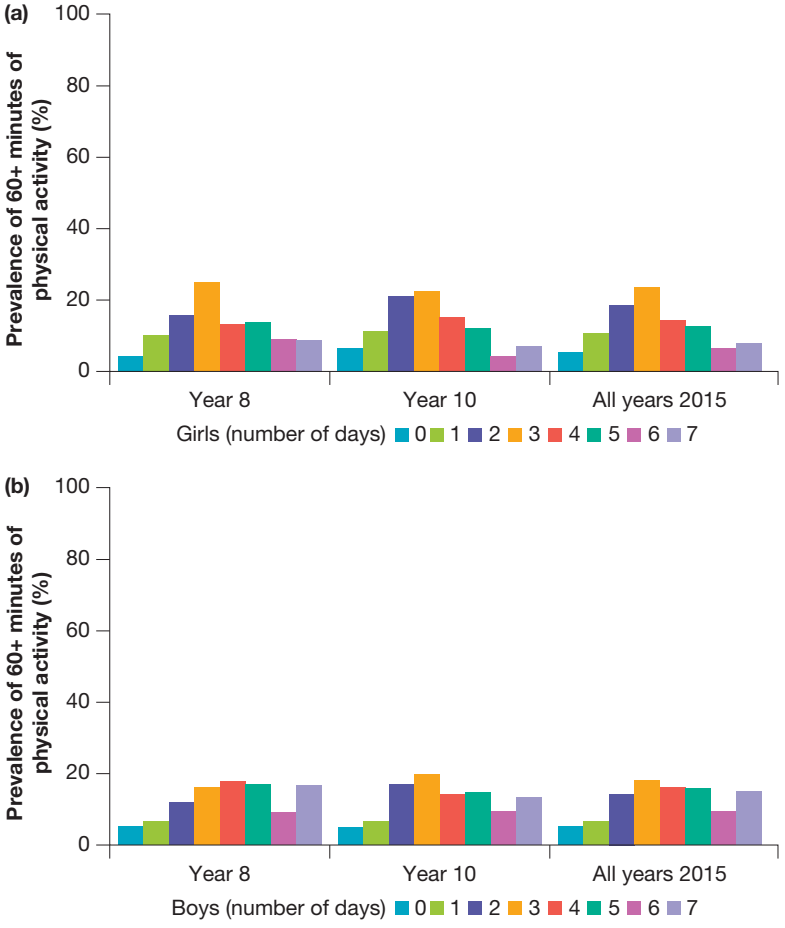
FIGURE 1.20 Regular physical activity is a key protective behaviour for young people's health.

Following these recommendations and participating daily in physical activity offers both immediate and long-term benefits to the health and well-being of young people. People who participate in less physical activity than recommended have a greater chance of suffering diseases, such as **cardiovascular disease**, stroke, **type 2 diabetes**, some forms of cancer, **osteoporosis**, back pain and depression that increase their risk of ill health and premature death.

The *NSW Schools Physical Activity and Nutrition Survey (SPANS) 2015* measured and reported on a range of health behaviours relating to dietary patterns, eating habits, physical activity and fitness. Key findings relating to physical activity from SPANS 2015 include:

- 11.5 per cent of adolescents met the guideline of 60 minutes per day of moderate to vigorous physical activity and 88.5 per cent did not undertake the recommended amount of daily activity
- 59 per cent of adolescents were in the healthy fitness zone for cardiorespiratory fitness
- 35 per cent of adolescents were in the healthy fitness zone for muscular fitness
- 36 per cent of young people followed the recommendation for spending no more than two hours a day on screen time on weekdays. This fell to 17 per cent on weekends, when 83 per cent exceeded the recommendations.

FIGURE 1.21 Prevalence of days participating daily in at least 60 minutes of moderate to vigorous physical activity for **(a)** girls and **(b)** boys, 2015



Source: *NSW Schools Physical Activity and Nutrition Survey (SPANS) 2015: Full Report,* p. 361. Reproduced by permission, NSW Health © 2018.

Inquiry

Trends in relation to young people's participation in physical activity

1. Use the **NSW SPANS summary report** weblink in the Resources tab to research the prevalence of and trends in the physical activity patterns of young people in NSW. Read the sections on physical activity and sedentary behaviour of secondary students.
2. Download a digital version of table 1.3 below using the **Summary table of health behaviours of young people** weblink in the Resources tab or draw up your own using the model provided. This table will be used for many of the inquiry activities in the following sections.
3. Record the findings of your research in a copy of table 1.3 to show the prevalence of and trends in various health behaviours of young people. Use the spaces provided to make notes on any variations found between different groups of young people (e.g. low and high SES groups).
4. Share your findings with the class. Comment on whether these results surprised you and if so, why.
5. Discuss in groups whether these findings match commonly held perceptions about how physically active young people are.

Resources

Weblink: NSW SPANS summary report

Digital document: Summary table of health behaviours of young people (doc-26159)

TABLE 1.3 Summary of research about health behaviours of young people

Health behaviours	Risk or protective	Prevalence		Trend ↑, ↓, (up, down, no change)
PATTERNS OF PHYSICAL ACTIVITY				
		Male	Female	
Percentage who did 60 minutes or more of moderate to vigorous physical activity every day				
Percentage in healthy fitness zone for cardiorespiratory endurance				
Percentage who did not meet recommendations on daily limits on screen time on weekday				
Percentage who did not meet recommendations on daily limits on screen time on weekends				
Differences between groups of young people (e.g. from different cultural backgrounds, locations, socioeconomic status)				
HEALTHY EATING AND DIETARY BEHAVIOURS				
		Male	Female	Trend ↑, ↓, – (up, down, no change)
Percentage who met recommended daily vegetable intake				

(*Continued*)

TABLE 1.3 Summary of research about health behaviours of young people (*Continued*)

Health behaviours	Risk or protective	Prevalence		Trend ↑, ↓, (up, down, no change)
Percentage who met daily recommended fruit intake				
Percentage eating snack foods such as cakes, muesli bars, and biscuits 3+ times a week				
Percentage who drank soft drink daily				
Percentage who ate breakfast every day				
Percentage who ate dinner in front of the TV five or more times a week				
Percentage who ate a meal or snacks from a fast food outlet at least once a week				
Differences between groups of young people (e.g. from different cultural backgrounds, locations, socioeconomic status)				
WEIGHT STATUS				
		Male	Female	Trend ↑, ↓, – (up, down, no change)
Percentage who were overweight or obese				
Differences between groups of young people (e.g. from different cultural backgrounds, locations, socioeconomic status)				
DRUG USE				
		Male	Female	Trend ↑, ↓, – (up, down, no change)
Percentage of 12–17-year-olds who had never smoked				
Percentage of 12–17-year-olds who smoked cigarettes in the last seven days				
Percentage of 12–17-year-olds who smoked cigarettes in the last month				
Percentage of 12–15-year-olds who drank alcohol in the last week				

(*Continued*)

TABLE 1.3 Summary of research about health behaviours of young people (*Continued*)

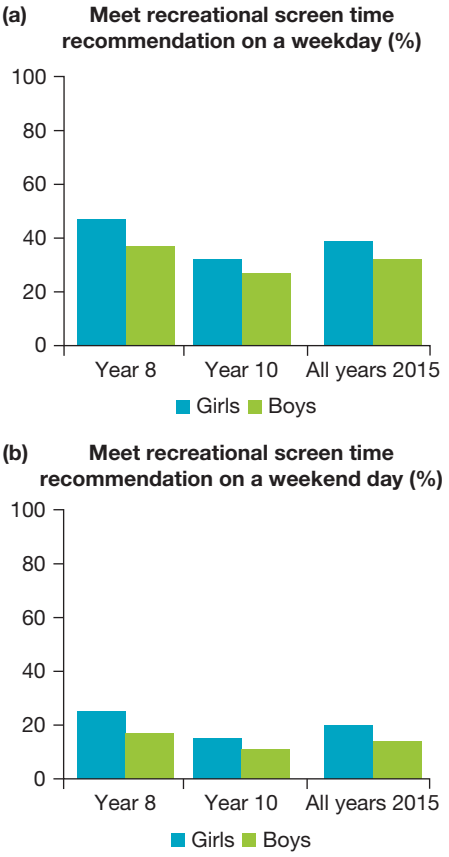
Health behaviours	Risk or protective	Prevalence		Trend ↑, ↓, (up, down, no change)
Percentage of 16–17-year-olds who drank alcohol in the last week				
Percentage of 12–15-year-olds who drank 5+ drinks in last week				
Percentage of 16–17-year-olds who drank 5+ drinks in last week				
Percentage of 12–17-year-olds who used cannabis in the last week				
Percentage of 12–17-year-olds who used ecstasy in the last four months				
Differences between groups of young people (e.g. from different cultural backgrounds, locations, socioeconomic status)				
SEXUAL BEHAVIOUR				
		Male	Female	Trend ↑, ↓, – (up, down, no change)
Percentage who are sexually active				
Percentage who use contraception when having intercourse				
Percentage who had more than one sexual partner in last 12 months				
Percentage who were drunk or high when they last had sex				
HELP — SEEKING AND SOCIAL SUPPORT				
		Male	Female	Trend ↑, ↓, – (up, down, no change)
Percentage who spoke to family when unhappy, sad or depressed				
Percentage who spoke to friends when unhappy, sad or depressed				
Percentage who spoke to no one when unhappy, sad or depressed				
Percentage who participated in voluntary work				

Behaviours relating to healthy eating

The development of healthy patterns of eating helps to ensure an adequate intake of all nutrients essential for good health and protects against a range of chronic preventable diseases that are prevalent among Australians, including **heart disease**, type 2 diabetes, some cancers and obesity. Consuming plenty of fruit and vegetables each day is an important part of having a balanced, nutritious diet. The Australian Dietary Guidelines recommend that people aged 14–18 years consume 5–5 ½ servings of vegetables and 2 servings of fruits each day. Findings from the 2015 SPANS report on the dietary habits of high school students were positive in regards to their intake of fruit, with approximately 80 per cent of adolescents reporting that they consumed two or more pieces of fruit daily. However the proportion of young people who satisfied the recommendations in relation to vegetable consumption was much lower, with only 11 per cent of high school students eating more than five serves of vegetables.

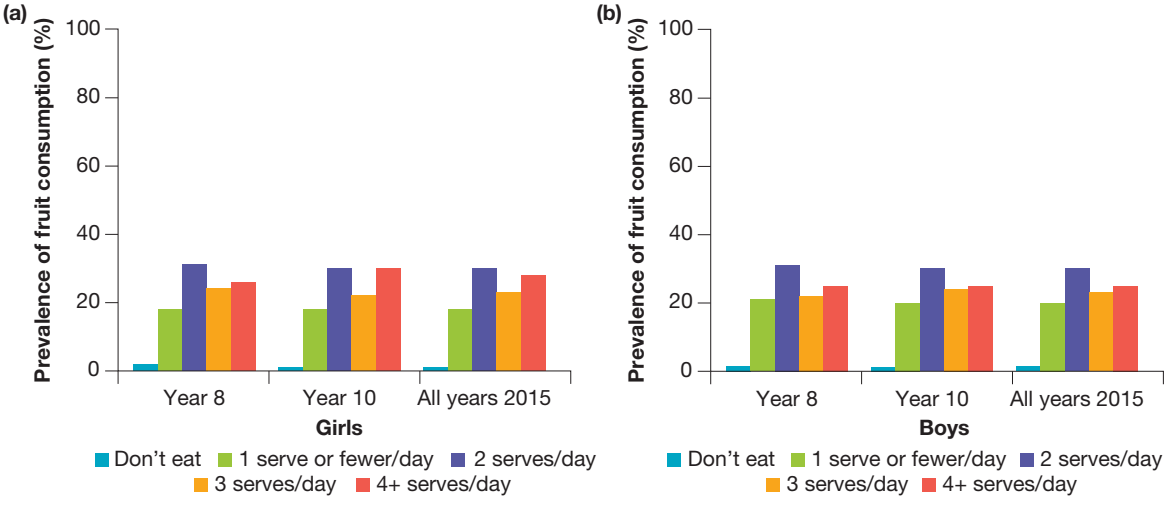
Reducing the intake of foods containing high levels of saturated fat, added salt and added sugar is another key component of healthy eating. Processed snack foods, take away meals, soft drinks and sports and energy drinks generally contain high amounts of saturated fats, salt and/or sugar, meaning their consumption should be limited so they are not eaten daily. According to the SPANS 2015 report a variety of 'extra' snack foods such as chips, biscuits, cakes, muesli bars, chocolate, ice cream and ice blocks were regularly consumed by students, although the number of students consum-ing snack foods such as ice cream, cakes, muesli bars and chocolate had declined since the last survey in 2010. Nearly 10 per cent of students also reported consuming soft drinks on a daily basis.

FIGURE 1.22 Percentage of male and female students meeting recommended daily limits on screen time on **(a)** weekdays and **(b)** weekends, 2015



Source: SPANS 2015 full report, pp. 610 and 615. Reproduced by permission, NSW Health © 2018.

FIGURE 1.23 Usual daily consumption of fruit among secondary students by **(a)** girls and **(b)** boys, 2015

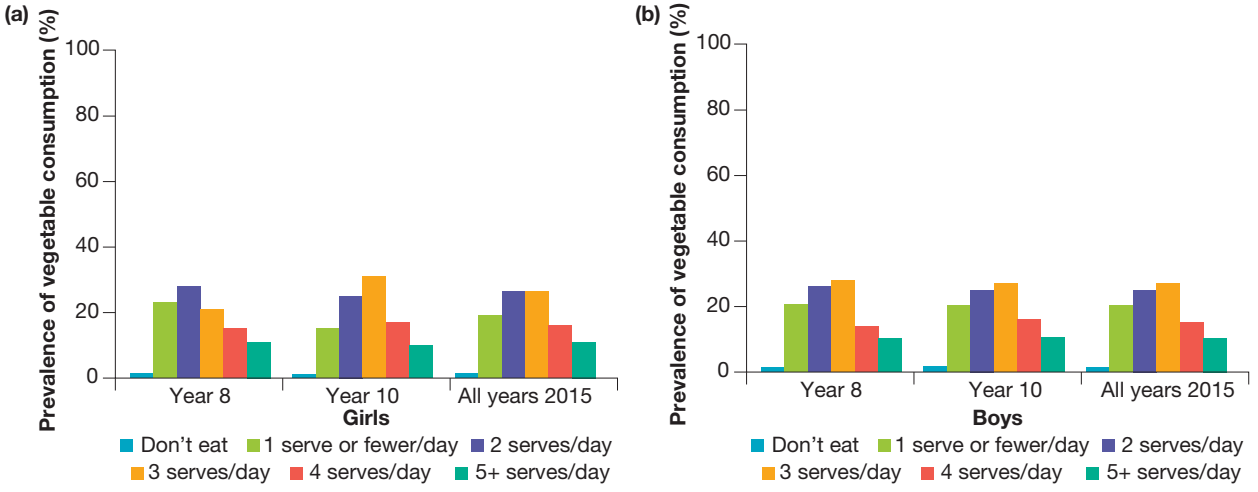


Source: SPANS 2015 full report, p. 156. Reproduced by permission, NSW Health © 2018.

The food choices made by young people are likely to be strongly influenced by a number of food behaviours such as skipping meals, eating dinner while watching television and consuming food and drinks purchased away from home. Research has identified the maintenance of healthy weight to be closely linked to the regular consumption of breakfast and not sitting down to dinner in front of the television.

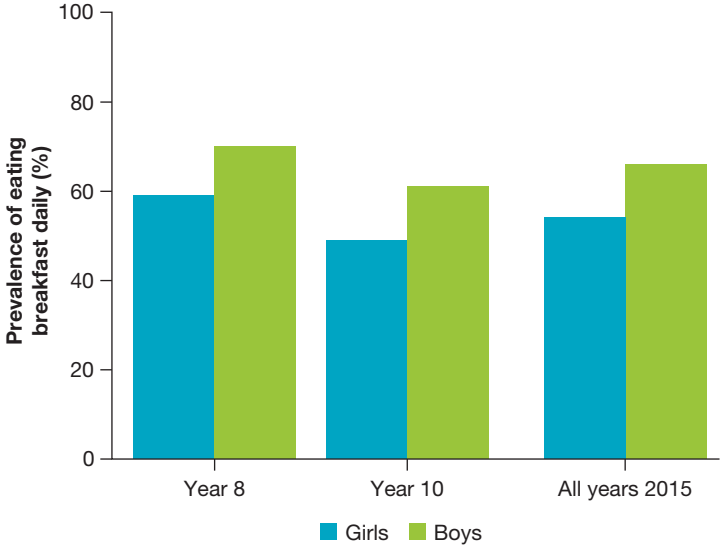
Findings in the 2015 NSW SPANS report indicated that a significant proportion of young people, particularly girls, did not eat breakfast, with 65.5 per cent of boys and only 53.7 per cent of girls consuming breakfast every day. The same survey found that just over 20 per cent of high school students ate their dinner in front of the TV on most days.

FIGURE 1.24 Usual daily consumption of vegetables among secondary students by (a) girls and (b) boys, 2015



Source: SPANS 2015 full report, p. 163. Reproduced by permission, NSW Health © 2018.

FIGURE 1.25 Prevalence of eating breakfast daily among secondary students, by year group and gender, 2015



Source: SPANS 2015 full report, p. 249. Reproduced by permission, NSW Health © 2018.

Inquiry

Trends in relation to healthy eating by young people

1. Use the **NSW SPANS summary report** weblink in the Resources tab to research the prevalence of and trends in relation to healthy eating by secondary students. Read the sections on food consumption and dietary behaviours.
2. Continue to record the findings of your research in your copy of table 1.3 from page 35 to show the prevalence of and trends in various health behaviours of young people. Use the spaces provided to make notes on any variations found between different groups of young people (e.g. low and high SES groups).
3. Research has suggested that skipping meals and eating in front of the TV are risk factors for becoming overweight or obese. Explain why these eating behaviours could be linked to this health problem.
4. Identify other health issues that could be linked to these two eating behaviours.

Behaviours relating to body weight

A lack of regular physical activity, participation in **sedentary** activities, poor dietary habits and the use of passive transport options are generally seen as the behaviours contributing significantly to the increasing risk of young people being overweight or obese. According to research, being overweight during childhood or adolescence is a health risk behaviour as it places a young person at greater risk of obesity during adulthood. Problems associated with body weight, particularly being overweight and obese, contribute to a wide range of immediate and future health problems for young people. In the short term, being overweight or obese is likely to negatively affect a young person's social and emotional well-being, particularly their self-image and sense of confidence, while also increasing their risk of developing cardiovascular diseases and type 2 diabetes. Ongoing problems with excess weight further increase the likelihood that young people will develop these health conditions during adulthood, along with certain cancers, gallstones, disordered sleeping and osteoarthritis.

Data on the number of young people in Australia who are overweight and obese are generally based on measuring a person's **body mass index (BMI)**. BMI is determined by dividing a person's weight in kilograms by their height in square metres (BMI = kg/m^2). The resulting measurements are then used to classify people as **underweight**, an acceptable weight, **overweight** or **obese**.

Numerous studies have found a significant number of young people are overweight or obese. The 2015 SPANS survey found approximately 56 per cent of adolescents were in the healthy weight range, with 6.6 per cent underweight, 21.7 per cent overweight and 5.8 per cent in the obese range. These figures represented an increase in the prevalence of overweight and obesity among NSW secondary students since the previous SPANS survey, particularly among people from low SES backgrounds and students from certain cultural backgrounds.

Inquiry

Health issues relating to body weight

1. Use the **NSW SPANS summary report** weblink in the Resources tab to research the prevalence of and trends in relation to overweight and obesity among young people. Read the section on weight status.
2. Continue to record the findings of your research in your copy of table 1.3 from page 35 to show the prevalence of and trends in various health behaviours of young people. Use the spaces provided to make notes on any variations found between different groups of young people (e.g. low and high SES groups).
3. Explain health issues that young people who are overweight or obese could face:
   (a) during adolescence
   (b) during adulthood.

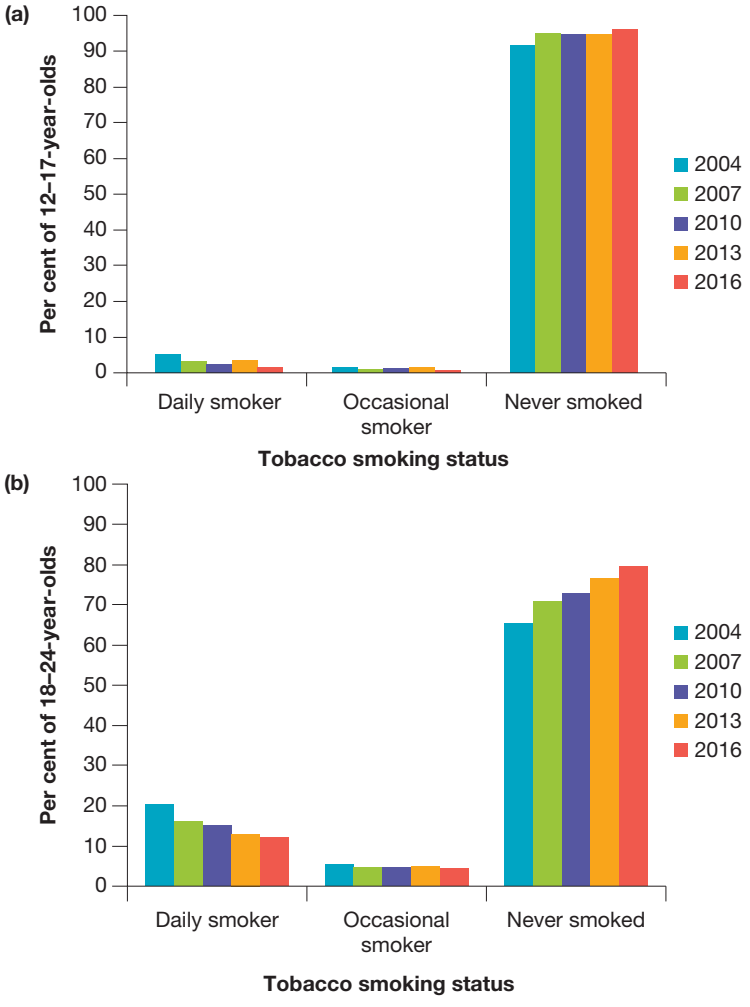
Behaviours relating to drug use

Adolescence is a time when young people may experiment with substances such as tobacco, alcohol and other illicit drugs. The use of all these drugs poses a risk to the health of young people, with their misuse likely to cause numerous immediate and long-term health problems for either themselves or the general community.

While rates of smoking in Australia have continued to decline, tobacco smoking remains the single most preventable cause of chronic ill health and death in Australia. It is a major risk factor for numerous cancers as well as cardiovascular disease, respiratory diseases such as bronchitis and emphysema, circulatory problems and pregnancy difficulties. Smoking is therefore a risk behaviour for young people because of the increased risk of developing these diseases later in life, as well as the likelihood of experiencing immediate health problems such as lower levels of fitness and higher rates of respiratory illnesses. Furthermore, the commencement of smoking at a young age increases the likelihood that a person will continue to smoke, smoke more heavily and have greater difficulty quitting.

The *National Drug Strategy household survey* in 2016 found that 94.1 per cent of 14–19-year-olds had never smoked. The prevalence of smoking among young people has continued to decline in recent years, with only 3 per cent of 14–19-year-olds smoking daily and 1.4 per cent being occasional smokers (see figure 1.26). This reduction in the number of young people smoking suggests that the incidence of tobacco-related diseases is likely to decrease in the future.

FIGURE 1.26 Comparison of tobacco smoking status of young people between 2004 and 2016



Source: Based on data from the Australian Institute of Health and Welfare, *National Drug Strategy household survey 2016*.

Inquiry

Cigarette smoking by young people and perceptions about smoking

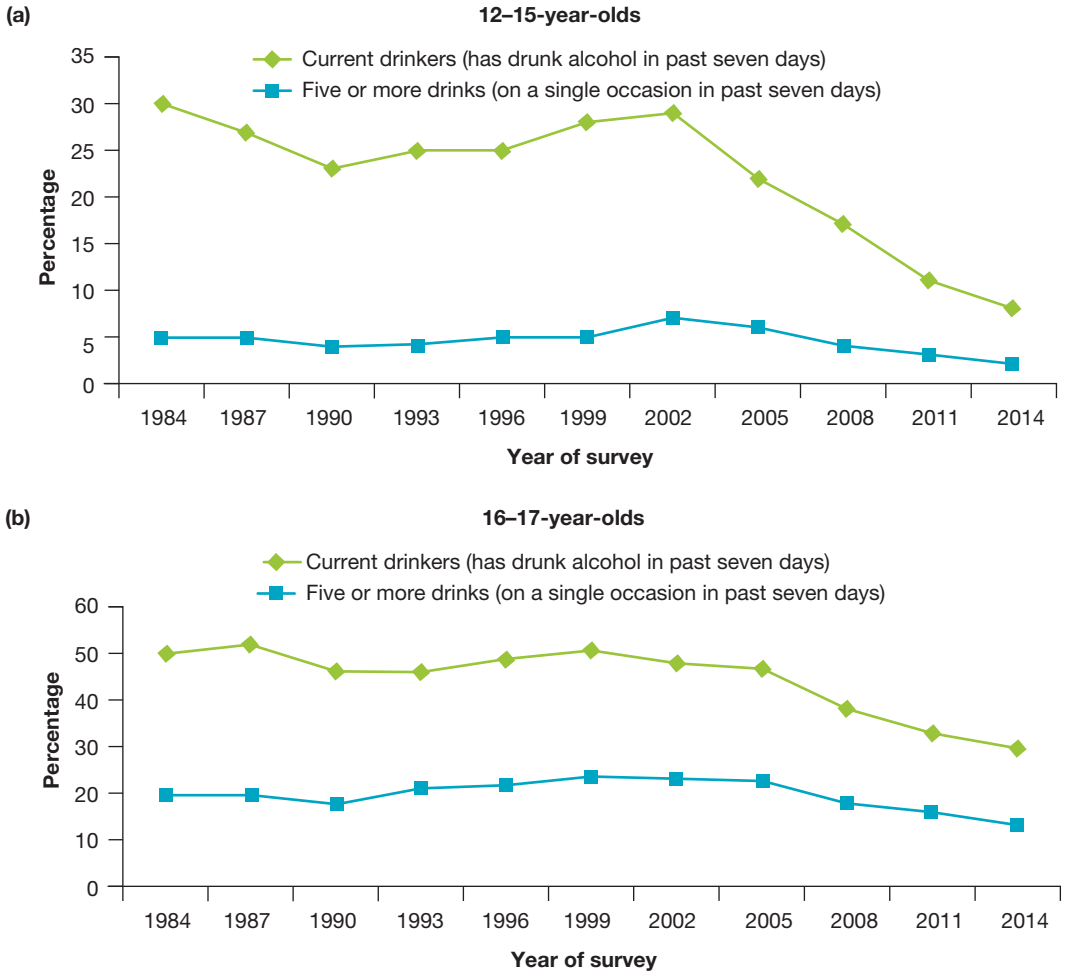
1. Research the prevalence of and trends in relation to cigarette smoking by young people. You can use the **Australian secondary school students' use of tobacco, alcohol, and over-the-counter and illicit substances in 2014 report** weblink in the Resources tab to read about the prevalence of smoking among 12–17-year-olds and trends in cigarette smoking by students. (Look in section 3 of the report.)
2. Continue to record the findings of your research in your copy of table 1.3 from page 35 to show the prevalence of and trends in various health behaviours of young people. Use the spaces provided to make notes on any variations found between different groups of young people (e.g. low and high SES groups).
3. Survey at least 10 different people (including at least five adults) and ask them to predict the percentage of 12–17-year-olds who have smoked cigarettes in the last week. Record the responses.
4. Compare their responses with the data from the Australian secondary school students' use of tobacco 2014 report.
5. Discuss the accuracy of people's perceptions about tobacco smoking by young people. Compare the accuracy of adults' and young people's perceptions and note any differences found. Suggest possible reasons for the perceptions that people have formed.
6. Propose ways to challenge inaccurate perceptions that exist about the prevalence of tobacco smoking by young people.

FIGURE 1.27 Binge drinking contributes to a wide range of alcohol-related risks and harms.

Drinking excessive amounts of alcohol is a major cause of injuries, ill health and death, particularly for young people. Consuming large amounts of alcohol in a short period of time can cause alcohol poisoning that can severely impair brain function, resulting in coma and even leading to death. **Binge drinking** also causes increased confidence, a lowering of inhibitions and the impairment of decision making and motor skills, all of which combine to increase risk-taking behaviour, particularly by young people. Statistics show that they are the population group at greatest risk of alcohol-related injuries and deaths, which most commonly result from road crashes, violence, sexual assaults, falls, drowning and suicide. Along with these physical harms, risky drinking behaviour is also responsible for a range of emotional and social harms likely to impact on young people's health and well-being, such as guilt, embarrassment, relationship conflict and legal problems. In the longer term, excessive drinking contributes to liver diseases such as cirrhosis, cardiovascular disease, diabetes and some forms of cancer.

Data from the 2016 *National Drug Strategy household survey* found that the proportion of young people aged 12–17 years who had consumed no alcohol in the past 12 months had continued to increase in the past 12 years, with 82 per cent abstaining in 2016 compared to 54 per cent in 2004. On another positive note younger age groups were found to have reduced their consumption of alcohol at risky levels (drinking more than four standard drinks on a single occasion in the past month) from 2013 to 2016. Single occasion risky drinking by those aged 12–17 years fell from 8.7 per cent in 2013 to 5.4 per cent in 2016 while rates also fell for 18–24-year-olds from 47 per cent to 42 per cent. However, those aged 18–24 years continued to be the age group most likely to exceed single occasion risk guidelines, and people in their late teens and early 20s remain the age group most likely to consume alcohol at very high levels, with 15.3 per cent reporting they had drunk 11 or more drinks on a single occasion in the past month.

FIGURE 1.28 Trends in drinking behaviour by young people



Source: White, V., & Williams, T. 2016, *Australian secondary school* students' *use of tobacco, alcohol, and over-the-counter and illicit substances in 2014*, Centre for Behavioural Research in Cancer, Cancer Council Victoria, for Tobacco Control Taskforce, Australian Government Department of Health, http://www.nationaldrugstrategy.gov.au.

The *Australian secondary school students' use of tobacco, alcohol, over-the-counter and illicit substances in 2014* report found a decline in the proportion of high-school-aged students who had consumed alcohol in the past week and who had consumed five or more drinks on one occasion. The report also noted a positive trend in the number of students who had never consumed alcohol, with this figure rising from 18 per cent in 2008 to 32 per cent in 2014.

Inquiry

Alcohol consumption and young people

1. Research the prevalence of and trends in relation to alcohol consumption by young people. Use the graphs provided in figure 1.28 and the **Australian secondary school students' use of tobacco, alcohol, and over-the-counter and illicit substances in 2014 report** weblink in the Resources tab to read about the prevalence of and trends in relation to alcohol consumption among 12–17-year-olds. (Look in section 5 of the report.)
2. Continue to record the findings of your research in your copy of table 1.3 from page 35 to show the prevalence of and trends in various health behaviours of young people. Use the spaces provided to make notes on any variations found between different groups of young people (e.g. low and high SES groups).

on Resources

Weblink: Australian secondary school students' use of tobacco, alcohol, and over-the-counter and illicit substances in 2014 report

SNAPSHOT

Don't believe the hype, teens are drinking less than they used to

By Michael Livingston, UNSW, and Amy Pennay, University of Melbourne

Ask your friends and colleagues about young Australians and alcohol and I bet they'll say something about a generation out of control or a binge-drinking epidemic.

The media regularly brings the worst outcomes of young people's drinking to our attention and points to a problematic drinking culture supposedly unique to young Australians. Little wonder people believe things have never been so bad.

The reality is startlingly different. Data recently released by the Australian Bureau of Statistics shows alcohol consumption in Australia has reached its lowest point since the early 1960s, having declined steadily since the mid-2000s. Survey data suggests this decline has been driven almost entirely by reductions in youth drinking.

According to the *National Drug Strategy household survey*, the proportion of 12- to 15-year-olds who reported any drinking in the past year halved, from 35 per cent in 2004 to 18 per cent in 2013. Over the same time, drinking by 16- to 17-year-olds fell sharply as well, from 81 per cent to 59 per cent.

In case you think there must be something wrong with this survey, results from the *Australian secondary students alcohol and drug survey* show similar trends. Between 2002 and 2011, drinking in the past week fell by more than half for 12- to 15-year-olds (from 29 per cent to 11 per cent) and nearly as sharply for 16–17-year-olds (48 per cent to 33 per cent).

Rates of heavy drinking have fallen as well. Teenagers in Australia are drinking less alcohol now than they have at any time since these surveys began in the early 1980s.

There is increasing evidence that these patterns are holding as this cohort of teenagers moves into young adulthood, with weekly risky drinking among 18- to 24-year-olds dropping from 32 per cent to 22 per cent between 2010 and 2013. Declines in drinking are occurring for boys and girls, across all socioeconomic groups and in regional and urban areas. The changes are not isolated in particular population sub-groups.

Remarkably, these trends seem to be part of a global shift. A recent paper identified significant declines in underage drinking in 20 of the 28 countries studied. In countries with similar drinking cultures to Australia such as the United Kingdom, Canada, and Sweden, teen drinking has halved.

Somewhat surprisingly, little attention has been paid to these trends or the reasons behind them. Based on Australian data, we can be reasonably confident that young people aren't shifting to illicit drugs instead of alcohol. Rates of cannabis and meth/amphetamine use have also declined in the past decade.

Similarly, it doesn't seem likely that major policy changes have caused the trends. The decline in youth drinking started well before the alcopops tax in 2008, and alcohol has become more widely available and promoted in recent years.

Attitudes to alcohol have clearly been shifting in Australia, with greater support for restrictive policies, more negative media coverage and increasing public concern. These attitude shifts may be driving the declines in youth drinking, although it is notable that drinking among Australians older than 30 remains unchanged.

It may be that decades of public education campaigns and school programs focusing on youth drinking have finally been effective, but the broader research literature suggests this is unlikely.

The global consistency of the trends suggests a broader shift in youth cultures might be driving change. One possibility is that the increase in the use of social media has altered the way young people interact, reducing the centrality of drinking in socialising. The impact of the internet and social media in young people's lives has increased enormously in recent years. But there is little research into how these changes have affected drinking.

Research has also shown that exercising, eating well and avoiding alcohol and other drugs are important lifestyle choices for many young people. An increasing focus on healthy living may be an important factor in declining youth drinking.

The declines in youth drinking may have been caused by a combination of all of these factors. Further research is crucial so that current trends can be supported through appropriate interventions.

The recent dramatic reduction in teenage drinking is good news for public health, and is a refreshing counter-argument to the way young Australians are often presented.

Source: The Conversation, 21 May 2015.

Application

Drinking behaviour of young people

Read the snapshot article 'Don't believe the hype, teens are drinking less than they used to' and then complete the following.

1. The article suggests that most people believe teenage drinking is 'out of control or a binge-drinking epidemic'. Do you agree that this is the commonly held perception of young Australians and alcohol? Give reasons to support your opinion.
2. Discuss the role of the media in the perceptions people form of youth drinking.
3. What reasons are proposed for the decline in drinking by teens? Do you feel there are other factors that have contributed to the fall in teen drinking?
4. Consider why it is important for people to have more accurate perceptions of youth drinking.

The use by young people of **illicit drugs** such as cannabis, amphetamines, ecstasy and heroin is another behaviour with obvious health risks. Serious injury and death can result from overdoses or the combination of excessive consumption of illicit drugs and risk-taking behaviour by young people. Depending on the drug, the amount used, the frequency of use and the way it is consumed, other significant harms have also been linked with the use of these substances. In the case of cannabis, regular and heavy use has been associated with hallucinations, depression, anxiety, poor memory function, difficulties sleeping and respiratory disease. Similar psychological harms are also likely to result from the regular use of other illicit drugs. Furthermore, the use of illicit drugs can have detrimental effects on the emotional and social health of young people, particularly if they develop a dependence on the drug. Family conflict, relationship breakdown, loss of motivation, involvement in criminal behaviour, troubles with the police and disengagement from school can all result from the use of illicit drugs and cause harm to the overall well-being of young people.

Results from the 2016 *National Drug Strategy household survey* indicate that 22.2 per cent of those aged between 14 and 19 years had used an illicit drug at some time in their lives, with 4 per cent reporting they had used an illicit drug in the previous week. As shown in table 1.4 the use of illicit drugs by young people has gradually declined in recent years, although the prevalence of drug use continues to be higher among males than among females. Cannabis was the most commonly used illicit drug, with just over 12 per cent of teenagers reporting they had used cannabis in the last 12 months.

TABLE 1.4 Trends in rates of recent illicit drug use by young people[(a)]

	Year (percentage)				
	2004	2007	2010	2013	2016
Males					
12–17	11.1	7.4	9.2	13.0	9.9
18–24	36.1	29.3	28.9	31.9	29.6
Females					
12–17	12.8	11.7	11.5	8.4	7.5
18–24	29.0	23.5	25.8	25.1	26.3

(a) Recent use = used in last 12 months

Source: Data extracted from Australian Institute of Health and Welfare, *National Drug Strategy household survey 2016*, data table, chapter 5 Illicit use of drugs, table 5.5.

Inquiry

Trends in cannabis and ecstasy use by young people

1. Research the prevalence of and trends in relation to the use of cannabis and ecstasy by young people. Use the **Australian secondary school students' use of tobacco, alcohol, and over-the-counter and illicit substances in 2014 report** weblink in the Resources tab to download and read about the prevalence of and trends in relation to cannabis use (section 6.3) and ecstasy use by 12–17-year-olds (section 6.10).
2. Continue to record the findings of your research in your copy of table 1.3 from page 35 to show the prevalence of and trends in various health behaviours of young people. Use the spaces provided to make notes on any variations found between different groups of young people (e.g. low and high SES groups).

Behaviours relating to sexual activity

FIGURE 1.29 Young people who choose to be sexually active need to carefully consider the use of contraception to look after their own sexual health as well as their partner's sexual health.

Adolescence is a time of heightened sexual awareness, an intensified interest in sexuality and emerging feelings of attraction towards others. At this time, some young people may choose to enter into close, intimate relationships and begin participating in sexual activity. Being sexually active can lead to a number of short-term harms and long-term consequences for the health and well-being of young people.

Engaging in unsafe sex increases the risk of contracting sexually transmitted infections (STIs), a number of which are increasing in prevalence in young people, notably chlamydia and gonorrhoea. Participating in unsafe sexual activity can also result in an unwanted or unplanned pregnancy. Studies have shown that teenage pregnancies are linked with a range of negative health and social outcomes that impact significantly on both young mothers and their babies. These include increased risk of premature birth, lower birth weight, difficulties finishing school and a lack of financial resources.

Experiences of unwanted sexual activity also lead to consequences that can last a lifetime. Along with the risk of physical harms such as STIs, pregnancy and injury, sexual assault can also result in the victim feeling a range of emotions including anger, shame, guilt, fear, mistrust, betrayal, loneliness and disempowerment. Left unresolved, these emotions can lead to poor mental and social health, which can then impact on other areas of health.

Young people who are sexually active need to look after their physical health by using protective behaviours that reduce or eliminate the possibility of an unwanted pregnancy and of being infected with an STI. These include participating in safer, non-penetrative sexual behaviours such as cuddling, kissing and mutual masturbation, and using a condom when participating in any form of penetrative sex. **Dental dams** can also be used when engaging in activities such as oral sex, which can also transmit STIs.

In terms of caring for their emotional health, it is important that young people endeavour to make sexual choices and develop strategies that will safeguard their reputation, minimise their chances of being used or exploited and prevent sexual assault.

The *Fifth national survey of Australian secondary students and sexual health 2013* examined the sexual behaviour of young people. The survey examined the differing attitudes and behaviour of males and females in sexual relationships, such as their attitudes towards the use of contraception and their participation in sexual behaviour while under the influence of drugs. Results showed that the majority of young people in the surveyed

groups (years 10 and 12 students) were sexually active in some way (69 per cent). The proportion of students who had engaged in sexual intercourse had decreased since the previous survey in 2008, with 23 per cent of year 10 students and 50 per cent of year 12 reporting they had participated in sexual intercourse. Over a third of those surveyed had either given or received oral sex. Around 39 per cent of sexually active students reported having more than one sexual partner in the past 12 months, with this number representing a fall of 6 per cent since the previous survey in 2008. There was a significant difference between the genders in the students' relationship to their last sexual partner, with young men being more likely to have sex with someone they had not met before than young women (14 per cent compared to 4 per cent). Participating in casual sexual encounters and having multiple partners are risk behaviours that increase the possibility of contracting an STI.

A number of young people reported being under the influence of drugs when they participated in sexual activity, with 17 per cent being drunk or high the last time they had sex. A significant number of young people who reported having sex when they did not want to stated that being drunk was the reason for their unwanted sex (49 per cent), with a further 20 per cent indicating they were too high.

The inconsistent use of contraception by sexually active young people is another behaviour that places their health at risk. The *Fifth national survey of Australian secondary students and sexual health 2013* found that most sexually active students used some form of contraception during their last sexual encounter, with 87 per cent indicating they had used some contraceptive method. However, the use of condoms had fallen since the last survey in 2008 (58 per cent in 2013 compared to 68 per cent in 2008), as had the use of the contraceptive pill (39 per cent compared to 50 per cent). Of particular concern was the increasing number of young people using the withdrawal method as a form of contraception. The finding that over 15 per cent used the withdrawal method represented an increase of nearly 6 per cent from the 2008 survey. Knowing a partner's sexual history (32 per cent), trusting a partner (31 per cent), and not liking condoms (30 per cent) were the most common reasons given for not using a condom at the last sexual encounter, along with other types of contraception (such as the pill) being used instead of a condom.

Inquiry

Young people and sexual behaviour

1. Use the information in the above text on behaviours relating to sexual activity to record the prevalence of and trends in relation to young people's sexual health behaviour in your copy of table 1.3 from page 35.
2. Comment on the risk and protective behaviours evident in the findings of the *Fifth national survey of Australian secondary students and sexual health 2013* that are described in the text above. Discuss health issues that could arise from these risk behaviours.
3. Identify other risk behaviours that increase the likelihood young people will experience harms to their health and well-being if they are sexually active.

Another behaviour that can protect the health of young women is being vaccinated against two high-risk strains of **human papillomaviruses (HPV)**, which cause 70 per cent of cervical cancers in women. A free national HPV vaccination program was introduced for 12–13-year-old girls in 2007, with the program extended to include males in 2013. According to the *Fifth national survey of Australian secondary students and sexual health 2013* only 52 per cent of young women reported having been vaccinated against HPV, with nearly 32 per cent unsure. Among males only 10 per cent indicated they had been vaccinated, with the majority (53 per cent) uncertain.

Behaviours relating to establishing social networks and support

Having a strong sense of **connectedness** to family, peers, school and the community has been shown to positively affect the health and well-being of young people. Connectedness refers to the sense of belonging or attachment an individual feels towards people and places they are frequently in contact with. Research has shown connectedness to be a significant protective factor for good mental health, as it is crucial in establishing a positive sense of identity, enhancing **resilience**, creating a sense of purpose and forming networks that can

provide support and advice. These social networks make people feel cared for, loved and valued. Supportive relationships can also encourage healthier behaviour patterns. Groups of young people who find it difficult to live in their community with their sense of identity intact or who feel they do not 'fit in', such as same-sex attracted youth or some ethnic groups, can experience feelings of loneliness, sadness and alienation. Young people who are unable to develop or maintain meaningful positive relationships can feel isolated, have limited avenues of support at times of need and experience higher rates of depression. Participating in peer activities such as sporting teams or church groups, regularly attending school and choosing to be involved in voluntary work are all examples of behaviours that can enhance young people's sense of belonging and help create social networks, thereby protecting their health and well-being.

FIGURE 1.30 Developing a strong sense of connection to peers and other groups is an important protective behaviour.

FIGURE 1.31 Undertaking voluntary work can help young people establish a strong sense of connection to their community.

The Australian Bureau of Statistics 2014 *General Social Survey* found that a number of young people were actively participating in their communities by either involving themselves in a social group or undertaking some form of voluntary work. According to the study, nearly two-thirds of young people participated in a social group, while 42 per cent of 15–17-year-olds indicated they had participated in some form of voluntary activity in the past 12 months. Participation in social and volunteer activities helps to improve the physical, emotional and social health of young people as it assists to:

- develop a sense of connection
- increase self-confidence
- enhance personal skills such as problem solving and communication
- provide opportunities for young people to meet others
- support young people to be active and enjoy themselves.

Behaviours relating to safety

Despite a steady decline in the number of fatal crashes in recent years, road crashes continue to be a leading cause of death and injury for young people. *Australia's health 2016* showed that transport accidents were the main cause of hospitalisations for young males and the third most common reason for females being admitted. As reported earlier in this topic, young drivers continue to be over-represented in road crash statistics despite a decline in the number of deaths. The reasons for the disproportionate number of young drivers in crash data are complex and interrelated. They include:

FIGURE 1.32 Speed is the biggest contributor to road fatalities, particularly for males.

- a lack of experience
- limited ability and judgement
- underestimation of risks
- deliberate risk-taking behaviours such as speeding
- use of alcohol and drugs
- frequently travelling at times of higher risk such as late at night and in the early hours of the morning.

In 2016 New South Wales drivers aged 17–25 years were the group most likely to be speeding when involved in any type of crashes (fatal, serious injury, minor injury). Male drivers in this age group were three times more likely to be speeding than females of the same age in crashes that led to injuries and over four times more likely when the crash resulted in death. Fatigue was another key contributing factor for crashes involving drivers aged 21–25 years, with the number of males significantly higher than females, particularly in fatal crashes.

SNAPSHOT

Young driver crashes: the myths and facts

By Teresa Senserrick, UNSW

Many Australians will recognise young driver crashes as a serious problem. However, few might realise that crashes are the leading cause of death and acquired disability of young Australians, during the otherwise healthiest stage of life (rivalled only by suicide in late adolescence).

Youth aged 17–25 comprise 13 per cent of the Australian population, but 22 per cent of the annual road toll. They are more likely to go to hospital due to a crash than any other age group.

While the statistics are confronting, the myths surrounding them are affronting. Having trained in developmental psychology, I was surprised to hear comments within the road safety community such as: they just think they're invincible, there is nothing you can do about it, and their brains aren't developed properly — following advances in brain imaging research.

The 'youth factor' in crashes

The truth is that newly licensed drivers of any age have the highest risk of crashing in the months following the (very safe) learner period. They are novices of a very complex skill and, as with any complex skill, they make mistakes. Factor in that most new drivers are young and it follows that young people have more crashes.

Why then is this not readily accepted?

A 'youth factor' contributes to the high crash risk. The increased risk for young new drivers is higher than for older new drivers. However, it is questionable whether this is due to intentional or unintentional risks.

In all age groups a proportion of drivers intentionally break road rules; speeding is probably the most widely accepted example. Young drivers are no exception and are more likely to speed and break other such rules than other age groups. Yet this still relates only to a minority.

Developmental factors, however, apply to all youth and particularly contribute to unintentional risks. During childhood, changes in the brain start to occur that strengthen neural connections. They allow quicker and more efficient travel of nerve impulses, as cognitive abilities become more localised to certain brain areas.

It is during middle adolescence — when new licensed driving typically begins — that this process reaches the frontal lobe of the brain. This area is associated with functions such as controlling impulses, overriding emotions and anticipating consequences — all extremely important for ensuring safe driving. This process continues into the early 20s.

Sleep needs also increase at this time, to around nine hours. The hormone that helps bring on sleep is released later at night, around 11pm. With lifestyles typically demanding earlier bed times and rise times, these changes result in youth being prone to fatigue. This is reflected in their over-representation in fatigue and fall-asleep crashes.

Adolescence is also a time of important social shifts, including decreased dependence on parents and greater standing of peers. For reasons such as social outings and casual work, young people drive more at night than adults, which is a higher crash risk time for all drivers. Therefore youth are more likely to be in a crash simply by when they choose to drive.

Adolescent brains are therefore developing 'properly' and in important ways, including changes that facilitate leaving home and moving into the adult workforce. Yes this results in intentional 'pushing the limits' for some. However, for all, everyday factors such as hazards and distractions are not as easy to perceive and manage compared to older drivers.

What then can we do?

Moving towards safer roads

Calls for mandatory driver training are common. However, traditional programs fail to focus on these key factors. Often they target advanced vehicle handling skills in imminent crash scenarios, which, contrary to expectations, are shown to increase crashes. Such complex skills cannot be mastered in a day. Nor can they be applied effectively without practice, yet these skills might be needed months later.

Such approaches increase young drivers' judgement of their skills beyond their actual ability. This results in more rather than less risk being accepted when driving.

Alternatively, licensing conditions for new drivers — including restrictions on night driving and peer passengers — serve to reduce exposure to high-risk conditions. Contrary to some beliefs, they do not punish all for the sake of the intentionally risky few, but rather address inexperience and developmental limitations. They have proven to be the single most successful initiative in reducing youth crash casualties.

With increased cries of 'the nanny state' and a current federal inquiry into restrictions on 'personal choices', it is timely to increase general understanding of the young driver problem (rather than the problem young driver). Through this, we should support initiatives that protect youth during an important stage of development while they learn an also important but complex life skill.

Source: The Conversation, 1 December 2015.

Inquiry

Challenging perceptions about driving behaviour of young people

Read the snapshot 'Young driver crashes: the myths and facts' and then complete the following.

1. What reasons are typically put forward by the road safety community for young driver crashes?
2. The author argues that the 'youth factor' needs to be considered when investigating why new drivers are more likely to be involved in crashes.
   (a) Define the term youth factor.
   (b) Outline the youth factors that contribute to risk behaviours by young drivers.
3. Explain why the author feels it is important to challenge the perception that road crashes involving young people are due to intentional rather than unintentional risks.

Behaviours relating to acquiring knowledge and accessing help

Health literacy skills provide individuals with the ability to access, understand and use health information and services. Developing these skills will enable young people to research health-related information and organisations and critically assess this information and services when making decisions that can promote and protect their health. This not only enhances their understanding of protective and risk behaviours, but also provides young people with a sense of empowerment over their health and well-being. Furthermore, having health services available that are appropriate to the needs of young people and being able to access these services when required is crucial to the diagnosis and provision of early intervention.

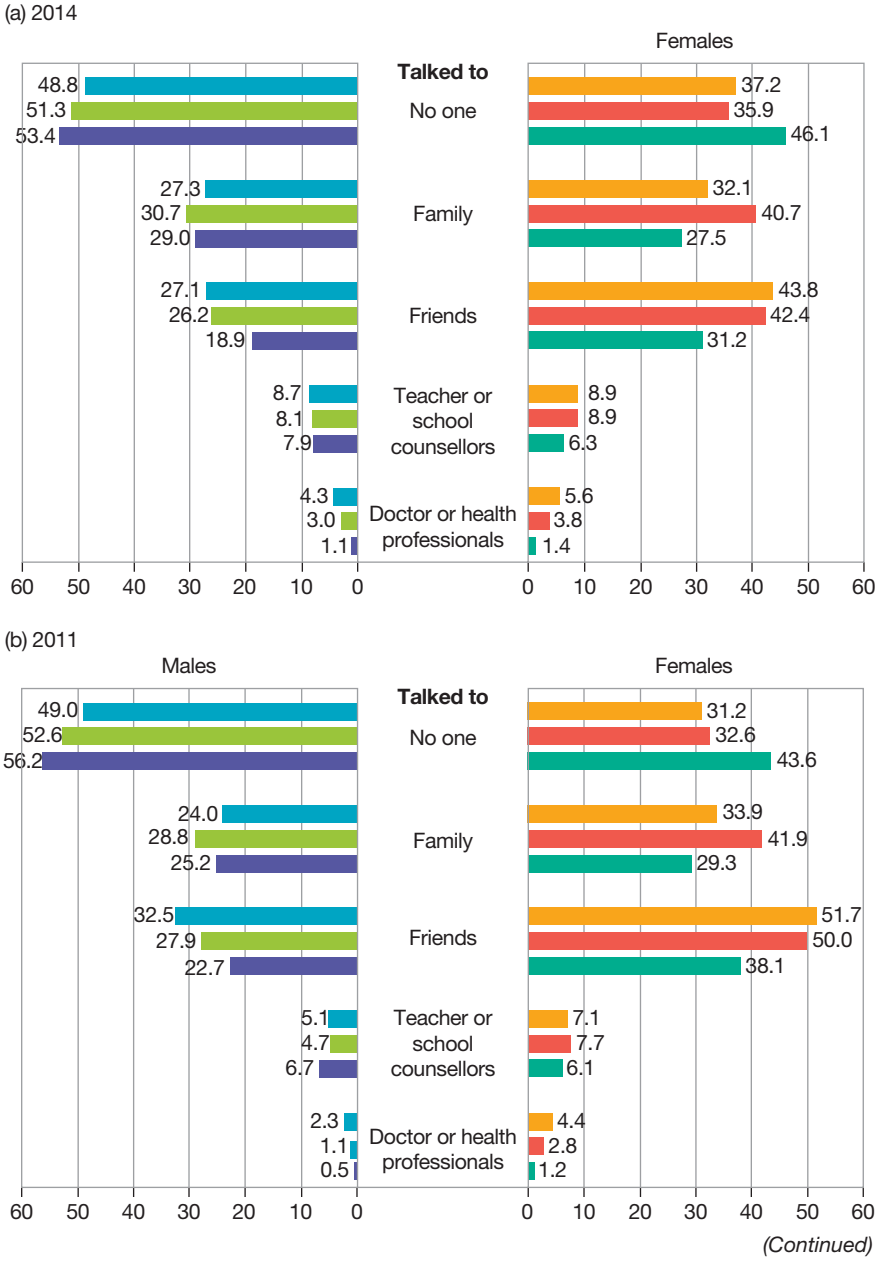
Research has highlighted the importance of accurate knowledge and appropriate attitudes with the adoption and maintenance of health protective behaviours. The *Young Minds Matter Survey* found that 18 per cent of young people reported they had used services for information on mental health issues, self-help strategies, chat rooms and personal support and counselling for emotional and behavioural problems. These services included telephone counselling services, such as Kids Helpline, online services such as Reachout and eheadspace, and face-to-face health services.

However, various studies have shown gaps in young people's knowledge of issues relevant to their health. For example, the *Fifth national survey of Australian secondary students and sexual health 2013* found young people's knowledge of specific sexually transmitted infections, other than HIV, and their effects on health was generally poor, with just over half of students in the survey (60 per cent) knowing that chlamydia, the most common STI in young people, could affect both men and women. Less than half (46 per cent) were unaware that genital herpes had no cure, so once infected a person would always have the virus. The *Report on the*

second Australian child and adolescent survey of mental health and wellbeing found that a key barrier to help seeking by young people with depression was being unsure if they had a problem.

Research has also found that young people can find it difficult or be reluctant to seek help when needed. The *NSW school students health behaviours survey 2014* found that approximately 42 per cent of young people spoke to no one when they were unhappy, depressed, stressed or under pressure. This figure rose to 50 per cent when they were in some form of trouble because of their behaviour. Males were far less likely to seek help when psychologically distressed, with females seeking advice more readily, particularly from friends. The *Young Minds Matter Survey* also found a reluctance among young people, particularly males, to seek help with 52 per cent of 13–17-year-old males indicating they had received informal support for emotional or behavioural problems, while 48 per cent said they had not. These findings highlight that a significant number of adolescents find it difficult to seek help and support.

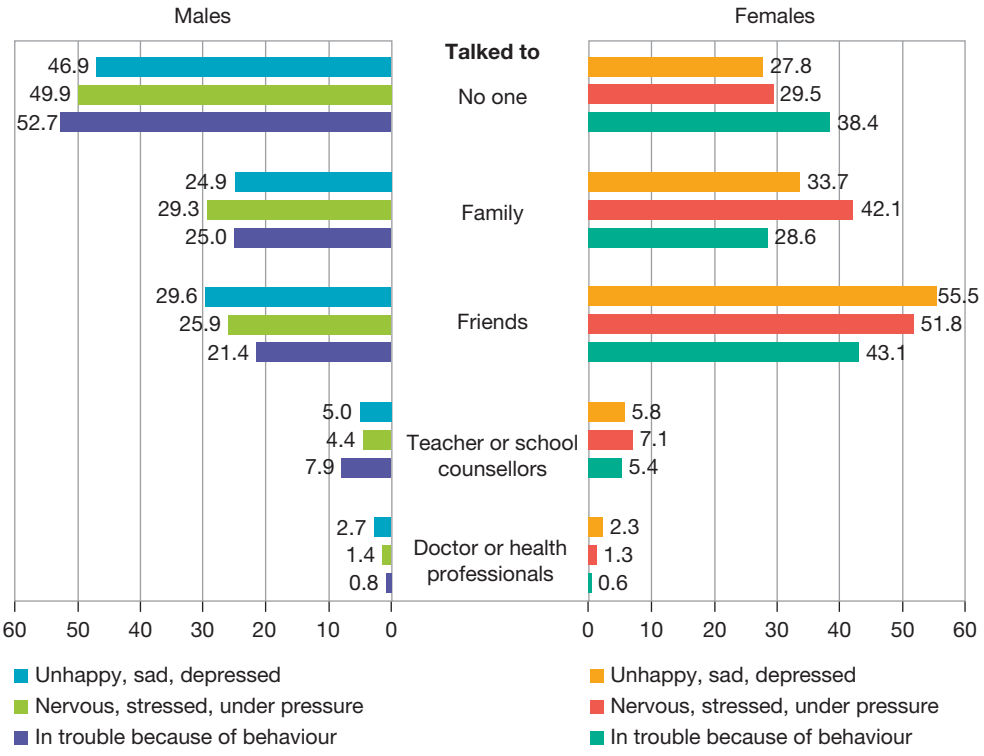
FIGURE 1.33 Person secondary school students aged 12–17 years, NSW, spoke to about psychological distress **(a)** 2014, **(b)** 2011 and **(c)** 2008



(Continued)

FIGURE 1.33 Person secondary school students aged 12–17 years, NSW, spoke to about psychological distress **(a)** 2014, **(b)** 2011 and **(c)** 2008 (*Continued*)

(c) 2008



Source: *NSW school students health behaviours survey* (SAPHaRI), Centre for Epidemiology and Evidence, NSW Ministry of Health. Reproduced by permission, NSW Health © 2018.

The report found that a number of barriers prevented young people who reported having a major depressive disorder from seeking help. The most common barriers were being worried about what others might think or not wanting to talk to a stranger (62.9 per cent), believing the problem would get better by itself (61.7 per cent) and preferring to work out the problem themselves or with the help of family and friends (57.1 per cent).

Inquiry

Understanding the help-seeking behaviours of young people

1. Look at the three graphs in figure 1.33 and use them to understand the prevalence of help-seeking behaviours by young people.
2. Record the findings in your copy of table 1.3 from page 35 to show the prevalence of and trends in various health behaviours of young people.

The effect of multiple protective or risk behaviours

Research has shown that certain health behaviours are often associated with each other and that these behaviours increase the health risks that young people face. For example, a study on risk and protective factors for depression (Cairns et al.) found alcohol consumption, drug use, unhealthy diet and negative coping strategies to be risk behaviours associated with depression, while a healthy body weight and nutritious diet and good sleep patterns served as protective behaviours that reduced the risk of depression.

The presence of multiple health risk behaviours increases the level of harm that young people are likely to experience, both in relation to their health and their overall social and emotional well-being. The *2015 Young*

people in custody health survey reported that the prevalence of a range of health risk behaviours was significantly higher among those in juvenile detention, including higher rates of unsafe sexual practices, smoking, problematic alcohol consumption and illicit drug use. This group therefore tended to be much more likely to experience poorer health, with higher rates of sexually transmitted infections, assault injuries, suicidal behaviour and mental disorders than other young people. These findings highlight the negative health and social outcomes that can result from combined risk behaviours.

The combined interaction of health protective behaviours can contribute to reducing the health risks experienced by young people. Strong family cohesion has been linked with numerous other positive health behaviours that are likely to have significant immediate and long-term health benefits. For example, research has highlighted a range of positive health behaviours associated with families regularly eating meals together. These include a strong sense of family connection, higher intake of lean meat, fruit, vegetables and dairy foods, decreased consumption of high-fat and high-sugar foods, lower incidence of eating disorders, and a reduced likelihood of drug use. Findings such as this suggest that the more health protective behaviours present in a young person's life, the greater the benefit to their overall level of health.

Application

Behaviours that interact to increase or decrease young people's health risks

1. Divide the class into groups of 3–4. Each group is allocated one of the following health issues relevant to young people:
   - sexually transmitted infections
   - mental health problems
   - self-harm/suicide
   - road-related injuries
   - overweight or obesity.
2. Each group is to identify behaviours that can interact to:
   (a) increase the risk of experiencing their allocated health issue
   (b) decrease the risk of experiencing their allocated health issue.
3. Each group is to discuss how these behaviours interact to protect or jeopardise the health of young people.
4. Each group is to present its ideas to the class.

on Resources

Weblink: NSW school students health behaviours survey 2008, 2011, 2014

1.4 Topic review

1.4.1 Summary

- Health is diverse and means different things to different people.
- In the past health was defined as being free from disease or illness. However, the World Health Organization now defines health as 'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'.
- At an individual level, health depends on the interaction of four dimensions — physical, social, mental or emotional and spiritual aspects.
- Health is continually changing; that is, it is dynamic. Health is also relative, meaning that people consider their health in relation to the health of others and in relation to their own circumstances.

- People develop perceptions about their own state of health and the health of others. These perceptions are social constructs, meaning that how we see health is based on our own experiences and the social, economic and cultural conditions that we live in.
- The perceptions of health we develop affect our own personal health attitudes, beliefs and behaviours. They influence our expectations about people's ability to achieve good health. Government policy, priorities and expenditure are also influenced by perceptions of health.
- The media, peers and families all influence how health is perceived and the values, attitudes and beliefs we develop about the importance of health. They also influence our health knowledge, skills and behaviours.
- The health of most young Australians is generally good. However, young Indigenous Australians, young people living in regional and remote areas and young people who suffer socioeconomic disadvantage have poorer levels of health in comparison to their peers.
- The high incidence of mental health disorders, injuries and communicable diseases such as chlamydia among young people are also areas of concern.
- The behaviours that young people adopt in relation to physical activity, healthy eating, substance use, sexual activity, help seeking, social connectedness and risk taking are likely to have a protective or harmful effect on their current and future health.
- Health protective and health risk behaviours can interact to decrease or increase the level of risk that a young person is likely to face in relation to their current and future level of health.

1.4.2 Questions

Revision

1. Use examples to **discuss** how and why people's health is constantly changing. (P3) (5 marks)
2. **Describe** factors that have a significant influence on people's perception of their health. Provide examples to illustrate how the various factors can affect the perceptions people form. (P1) (4 marks)
3. **Compare** how two distinctly different social groups (e.g. young people and the elderly) are likely to perceive health. Discuss the possible implications these differing perceptions may have on their health behaviours. (P1) (6 marks)
4. Health is now seen as a social construct. **Explain** what this means, using examples to support this explanation. (P3) (5 marks)
5. **Outline** how the media can influence people's perceptions about health. (P1) (3 marks)
6. **Identify** measures of health that provide indicators of the positive health status of young people. (P16) (3 marks)
7. **Outline** areas of concern relating to the current health of young people and discuss reasons for these areas being identified as concerns. (P2) (5 marks)
8. Critically **analyse** how a range of risk and protective behaviours are likely to impact on young people's immediate and future health and well-being. (P2) (8 marks)
9. Using examples, **explain** why the interaction of multiple risk factors contributes to poorer levels of health. (P3) (4 marks)

Note: For an explanation of the key words used in the revision questions above, see Appendix 2, page 400.

on Resources

Interactivity: Revision quiz: auto-marked version (int-7252)
Interactivity: Missing word interactive quiz (int-7251)
Digital doc: Revision quiz (doc-26268)

1.4.3 Key terms

alternative medicine refers to various medical methods and practices that are not recognised as being conventional or traditional approaches to medicine. *p. 20*

binge drinking refers to the consumption of excessive amounts of alcohol in a short period of time. It commonly involves drinking to get drunk. *p. 42*

body mass index (BMI) is the most common method of determining whether a person's weight fits into a healthy range. It is calculated by dividing their weight in kilograms by their height in metres squared. *p. 40*

cardiovascular disease refers to disease that affects the heart or blood vessels. *p. 34*

chlamydia is a sexually transmitted bacterial infection that can be passed on through unprotected sex and can cause infertility. *p. 30*

chronic means persisting over a long time, such as a long-term disease or illness. *p. 25*

connectedness refers to the sense of belonging or attachment an individual feels towards people and places they are frequently in contact with. *p. 47*

dental dam a rectangular piece of latex that acts as a barrier between the mouth and genital area. *p. 46*

dynamic nature of health refers to the constant fluctuations that occur in our level of health. *p. 10*

heart disease, also called cardiovascular disease, is the term used for diseases of the heart and blood vessels. Common heart diseases include coronary heart disease (diseases of the blood vessels supplying the heart muscle), cerebrovascular disease (diseases of the blood vessels supplying the brain) and peripheral arterial disease (diseases of the blood vessels supplying the arms and legs). *p. 38*

human papillomavirus (HPV) is a common sexually transmitted infection in both males and females. While a majority of HPV infections clear within a year, a small proportion lead to abnormalities in the cells which can, over years, progress to cervical cancer. *p. 47*

illicit drugs are drugs that are illegal to use, possess, produce or sell. The most commonly used illicit drugs include cannabis, ecstasy and amphetamines. *p. 45*

life expectancy is the average number of years of life remaining to a person at a particular age, based on current death rates. *p. 16*

mental or **emotional health** is a state of well-being where we can realise our full potential, cope with the normal stresses of life, work productively and make a contribution to the community. *p. 7*

mental health disorders are a group of mental illnesses in which a person experiences disturbances of mood or thought that lead to difficulties functioning normally. These disorders include depression, anxiety disorders and schizophrenia. *p. 29*

morbidity is the incidence or level of illness or sickness in a given population. *p. 16*

mortality is the number of deaths in a given population from a particular cause and/or over a period of time. *p. 16*

obese is defined as a body mass index of 30 or over. *p. 40*

osteoporosis is a musculoskeletal condition in which there is deterioration in the bone structure, leading to an increased risk of bone fracture. *p. 34*

overweight is defined as a body mass index of 25 or over. *p. 40*

perception refers to the way something is seen or viewed by an individual or group. *p. 11*

physical health is the wellness of the body and the absence of chronic pain or discomfort. *p. 6*

protective behaviours are those health behaviours that are likely to enhance a person's level of health. *p. 32*

relative nature of health refers to how we judge our health compared to other people or other points of time in our life. *p. 9*

resilience is the capacity of individuals to deal with adversity and challenges in ways that make it possible for them to lead healthy and fulfilling lives. *p. 47*

risk behaviours are those health behaviours that have been found to contribute to the development of health problems or poorer levels of health. *p. 32*

sedentary refers to a lack of regular physical activity and spending a lot of time sitting or resting. *p. 40*

social construct a concept that recognises that people have different views based on their social circumstances and ways of seeing, interpreting, interrelating and interacting with their environment. *p. 17*

social health is our ability to interact with other people in an interdependent and cooperative way. *p. 7*

socioeconomic disadvantage refers to significant limitations to opportunity that can be experienced as a result of factors relating to social and economic circumstances, such as lower education, poorer education, unemployment, limited access to services, inadequate housing or lack of social networks. *p. 24*

socioeconomic status is a measure of an individual's place in society, based on their income, education, employment and other economic factors such as house or car ownership. *p. 18*

spiritual health relates to a sense of purpose and meaning in our life, and to feeling connected with others and society. *p. 7*

stereotype is a simplified and fixed image, opinion or concept to which people may feel expected to conform. *p. 16*

type 2 diabetes is the most common type of diabetes and is characterised by too little insulin being made or an inability to use insulin effectively. *p. 34*

underweight is defined as a body mass index less than 18.5. *p. 40*

TOPIC 2
What influences the health of individuals?

OVERVIEW

2.1 The determinants of health
2.2 The degree of control individuals can exert over their health
2.3 Health as a social construct
2.4 Topic review

OUTCOMES

In this topic students will:

- describe how an individual's health is determined by a range of factors (P3)
- evaluate aspects of health over which individuals can exert some control (P4)
- use a range of sources to draw conclusions about health and physical activity concepts. (P16)

Our ability to achieve and maintain good health is influenced by more than just the decisions we make about particular health behaviours and the lifestyle that we choose to lead. The differences between the health status of various groups of young people we learned about in topic 1 highlight that our health is influenced and determined by a range of factors. These factors, or determinants as they are commonly called, include factors relating to culture, the societies in which we live, economics and environmental conditions, along with factors relating to the individual. These factors rarely impact on individuals and communities in isolation. Rather, they are often linked, meaning that a range of determinants interact to have a positive or negative impact on health. A number of these determinants are outside the control of the individual, making it harder for people from particular groups within Australian society to exercise a high degree of control over their health and easily make changes to bring about improvements.

In this topic we learn about the various determinants of health in order to understand how they work together to influence the health and well-being of people. We also look at the degree to which these determinants can be modified to assess how much control individuals are likely to have over their health, both now and in the future. This assessment allows us to investigate differences between the health of particular individuals and population groups in Australia and explore reasons for these inequities.

on Resources

eLesson: Issues in youth health (eles-2921)

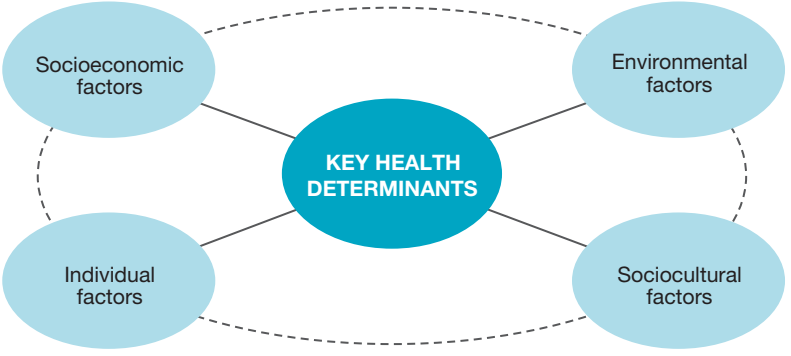
2.1 The determinants of health

It is now widely accepted that a person's health is determined by more than just genetics and the lifestyle choices that each person makes. Research has shown that the health of individuals and communities is affected by a broad range of factors relating to the community, environment and social context in which people live and work, along with the health behaviours that individuals adopt. The factors recognised as major influences on our health and well-being are generally referred to as determinants of health. **Health determinants** are defined as those factors that positively or negatively affect the health of individuals or communities, or put more simply, things that make people healthy or not. The key determinants of health are:

- individual factors, such as knowledge, skills, attitudes and genetics
- sociocultural factors; for example, family, peers, media, religion, culture
- socioeconomic factors, including employment, education and income
- environmental factors; for example, geographical location, access to health services and technology.

While each of these factors is going to be discussed individually in the following section, it is important to understand that they do not impact on people's health as isolated factors. Rather each determinant can be expected to have an influence on another. For example, living in an area with a high level of air pollution (environmental factor) is likely to be linked to a person's income (socioeconomic factor). Our health status is therefore the result of a complex interaction between the various health determinants.

FIGURE 2.1 A number of key determinants have a significant influence on the health of individuals and populations. These determinants are often interrelated.



2.1.1 Individual factors

Individual factors are those factors unique to each person that can determine their level of health. They include:

- the knowledge we have about health and the skills we possess that enable us to act in ways to promote better health
- the attitudes and values that we place on health and the importance of leading a healthy lifestyle
- genetic factors that increase the likelihood we may experience particular health problems.

Knowledge and skills

The knowledge and understandings that we develop about protective and risk health behaviours, and about products and people available to support good health have an important influence on our ability to act in ways that contribute to good health. When we compare the health of people with differing levels of education we find that those with lower levels of education are at greater risk of poor health, have higher rates of serious chronic health conditions and illness, and live shorter lives than those with higher levels of education. They are also more likely to perceive their health as fair or poor.

FIGURE 2.2 Health literacy provides people with greater access to health information and assists them to understand and use this information to make healthier choices.

Our knowledge about health comes from a variety of sources — parents, siblings, peers, teachers, the internet and the media all play a part in conveying information about health. Previous experience can also contribute to what we know and understand about particular health problems. Having knowledge does not mean that people are able or willing to make healthy choices. However, good health literacy will enable people to better access, understand and use information in ways that can promote or maintain good health. It also helps them to assess the accuracy and reliability of information they may find.

SNAPSHOT

Lack of sexual health education leads to unsafe behaviour

By Chloe Papas

Young people are the biggest contributors to increased rates of sexually transmitted infections across Western Australia.

A report recently published by the WA Health Department shows a significant spike in the number of sexually transmitted infection cases reported by young people in the state, and has led to calls for improved sex education.

The report highlights the notification rates of gonorrhoea in particular, with 54 per cent of cases reported by 15–24-year-olds.

A statement released by the department earlier this week illustrated that gonorrhoea reports doubled between 2011 and 2012 for the same age group.

Though high reporting rates are positive because more people are getting tested, the prevalence of sexually transmitted infections in the 15–24-year-old age group has led to questions about attitudes towards safe sex.

Youth Affairs Council of Western Australia CEO Craig Comrie says the issue comes down to a lack of education.

'For a long time, sexual health has remained this taboo issue, people are petrified of talking to young people about it.

'But the reality is, particularly with the concerning stats that are coming out from the department, if we don't start to have an open discussion with young people about this issue, we're just going to see the problem worsen.

'We're just not talking to young people about sexual health and healthy relationships.

'We really don't put prominence on young people's sexual health as opposed to other health aspects on their life — we put a lot of focus on physical health and well-being, a lot of focus on their mental health, but unfortunately we ignore sexual health.'

Family Planning Western Australia (FPWA) spokesperson Rebecca Smith says there a number of reasons why young people might engage in unsafe sexual behaviour.

'There's a peer pressure factor, drugs and alcohol are often involved which leads to their inability to make safe decisions.

'Lack of education, lack of knowledge about contraception, lack of knowledge about STIs and pregnancy — it can be a really varied combination.'

School-based education

Schools in Western Australia can choose whether to teach sexual education as part of their curriculum, and can also decide the extent to which it is implemented.

'Some schools have a very comprehensive sexual health education program, and young people are getting lots of sexual health knowledge, whereas some schools have none, so people are coming away with very little,' says Smith.

Though there is a national curriculum in place for sexual health education, there is no obligation for schools to implement it.

Organisations like FPWA offer sexual education training to schools and teachers across the state, but services are only taken up by those who request them.

The willingness of private religious schools to teach sexual education is another contributing factor to the extent of education across the state.

'We know that the majority of religious schools do absolutely no sexual health education and the ones that do, often it's a very clinical focus,' says Comrie.

'Though that [clinical] information is important, it isn't enough to equip young people with the information required to allow them to make positive decisions about their sexual health and behaviour.'

Other practitioners within the health and education sectors, including youth workers, counsellors and nurses, are generally not trained in youth sexual health and sexuality while at university or TAFE.

Comrie confirms that YACWA have partnered with one TAFE in WA to educate future youth workers in youth sexual issues.

Misconceptions

According to both Comrie and Smith, research shows that young people are highly likely to access information about sex through their peers.

Smith says that there are a number of common misconceptions that young people cite when accessing services through FPWA, including the belief that STIs cannot be contracted through oral sex, and that if a woman is taking birth control pills she is also protected against any sexually transmitted infections.

Judgemental and negative attitudes among adults can easily lead to a lack of positive education and communication, says Comrie.

'There's this attitude that if you talk to young people about sex early, then they're going to want to run out and go and have sex.

'But the evidence suggests that the complete opposite is the case, that if you actually empower young people and educate them, they're more likely to delay their first sexual experience.'

Sexual health campaigns through organisations and the health department often encourage young people to 'have the conversation' with partners — and Comrie says that the same message can be applied to education.

Source: ABC Radio Perth, www.abc.net.au/local/stories/2013/06/28/3791831.htm.

Inquiry

Developing knowledge and skills to improve health

Read the snapshot 'Lack of sexual health education leads to unsafe behaviour' and then complete the following.

1. What reasons are put forward in the article for the lack of education young people receive about sexual health?
2. How are knowledge and skills likely to empower young people to make positive decisions around sexual health?
3. Explain how the attitudes and judgements of adults can negatively affect young people's ability to access and gain accurate, reliable knowledge about sexual health.
4. Propose two strategies that would help strengthen young people's sexual health knowledge and skills.

The acquisition of skills related to decision making, problem solving, communicating, interacting and moving may also contribute to improved health. For example, having a wide range of movement skills provides people with the confidence to participate in sport and physical activity and try new things. Similarly, being able to effectively negotiate with others and resolve conflict can help maintain positive relationships. As with knowledge, having these skills does not ensure that people will always act in healthy ways. However, it does empower people and makes it easier for healthier choices to be made.

Attitudes

There is a strong link between knowledge and attitudes, with a person's level of knowledge likely to influence the attitudes they develop and the way they behave. For example, someone who has respectful attitudes towards women is less likely to be violent or excuse disrespectful and aggressive behaviour towards girls and women, and more likely to have positive, healthy relationships. The attitudes we hold are influenced by families, peers, education, the media, our culture and the communities in which we live. Our sense of **self-efficacy** also has an influence on our attitudes and whether we feel capable of making lifestyle changes that may improve our health.

People's attitudes towards certain health behaviours, their willingness to seek help to address health concerns and the value they place on positive health all play a part in determining someone's health. Research into the factors that affect young people's willingness to seek help for mental health issues has identified a number of key barriers to accessing help. These include feelings of embarrassment, a preference for managing problems without help, and concerns about opening up to people they do not know (for example, counsellors) who are potential sources of help. On the other hand, those who held positive attitudes towards health professionals are more likely to seek help. Knowledge about the type of help available and where this help could be found also served to encourage help-seeking behaviour.

FIGURE 2.3 Having good movement skills enables people to participate confidently in a range of physical activities.

Inquiry

Young people's attitudes towards health

1. Consider the attitudes young people may have in relation to *one* of the following health behaviours:
   (a) pressuring a partner into being sexually active
   (b) using a mobile phone while driving
   (c) seeking professional help to cope with personal problems
   (d) posting sexually explicit images online.
   (e) drinking energy drinks on a daily basis.
2. Discuss the possible immediate and/or long-term health outcomes of different attitudes regarding the chosen health behaviour.
3. Outline factors that may influence the attitudes young people develop around this health behaviour.

Changing circumstances, such as parental separation, or living through particular experiences (for example, a car crash) may also see our attitudes change, leading to corresponding changes in the way we behave.

FIGURE 2.4 Attitudes towards seeking professional help can affect a person's level of health.

Source: © headspace.

Genetics

Our potential to achieve a certain level of health may be significantly influenced by **genetics**. A number of genetic disorders, such as muscular dystrophy and cystic fibrosis, lead to chronic ill health and decreased life expectancy. These diseases are caused by genetic information passed on by parents at conception. Other disorders such as Down syndrome, which can affect physical development and intellectual functioning, are the result of chromosomal abnormalities that occur during pregnancy.

Genetics can also play an important role in a person's susceptibility to certain diseases or health problems. People with fair coloured skin, which is a genetically inherited trait, are at greater risk of developing skin cancer as their skin burns more easily and more quickly following exposure to the sun. Research has identified that diseases such as breast cancer, asthma, heart disease, diabetes and some mental illnesses have a genetic link, making those with a family history of these diseases more susceptible to developing the disease themselves.

The genetic information that we inherit can also positively influence our health as it can provide us with potential in terms of intellectual capacity, physical abilities and life expectancy. For example, hereditary factors have an effect on how fast we can run, how coordinated we are and how well suited we are for particular sports. Hereditary factors therefore have an influence on our sporting abilities and likelihood of successful participation.

FIGURE 2.5 Our skin type is an inherited trait, making certain groups more predisposed to skin cancer.

However, while genetics influence our health potential, there is no degree of certainty that we will inherit all of the health conditions of our parents or grandparents. Many genetic disorders are complex and do not follow a clear-cut pattern of inheritance. Lifestyle and environment also play a part, meaning that if people make positive adjustments to how they live they can reduce their risk of ill health and maximise their potential. Similarly, even though we may have inherited superior genes for both physical and intellectual growth and development, a poor physical and sociocultural environment can negatively affect our level of health. This reduces our potential.

2.1.2 Sociocultural factors

The communities in which we live and the groups to which we belong all have a significant influence on the values, attitudes and behaviours we adopt in relation to our health. These are referred to as **sociocultural factors**.

FIGURE 2.6 Masculinity can be associated with expectations of a particular body shape, which can have negative influences on health.

Our families, peer group, the media, religion and cultural background are the sociocultural factors that exert the biggest influence on our level of health. Each of these sociocultural factors plays a significant role in shaping our values, determining our knowledge and influencing our health behaviours through the expectations they create, the health behaviours they encourage and the cultural practices they support. Assumptions relating to how certain groups should look, think and behave (for example, males and females) can contribute to expectations of conformity that leads to risk taking. Those who are unwilling or unable to meet these expectations can feel a sense of alienation that is detrimental to well-being.

Family

Research has shown that a person's family and their home environment can significantly influence their health and well-being. Families are responsible for ensuring physical needs such as safe housing, food, clothing and medical requirements are met while also providing emotional support such as love and care. Research has shown that how a family functions is critical to the health and well-being of its members. Being part of a cohesive family acts to protect the health of children and young people, and helps them cope better when they experience stressors or tough times in their life. Children living in situations of violence, abuse or neglect are at risk of immediate physical injury and emotional distress and are likely to suffer adverse consequences on their long-term physical, emotional and social well-being.

FIGURE 2.7 Families play an important part in modelling good health practices.

Families play an important part in promoting good health and positively influencing members of the family to behave in ways that protect their health. For example, when, what and how much food is served and eaten are all behaviours that develop within the family unit. Families that serve three daily meals containing a wide variety of nutritious foods in the appropriate amounts not only ensure that nutritional requirements for healthy growth and development are met, but also instil in children the importance of healthy eating. Family expectations about the type of behaviour that is appropriate and acceptable are also an important factor. Research has found that children living in households where someone smokes are more likely to take up smoking themselves, particularly when their smoking is condoned or accepted by their parents.

Families are also an important source of information and support when people experience health-related problems. In addition to providing someone to talk to and seek advice from, families can also facilitate access to medical professionals and health services. Research indicates that people who lack social support from their family have higher rates of illness and death than those who are able to use their families as a source of knowledge and assistance.

SNAPSHOT

Why kids are inactive (and why it's not just their parents' fault)

By Cassie White

Australia is famous for its active outdoor lifestyle. So it might come as a surprise to find out the vast majority of children are not spending enough time being active.

Despite having top-notch parklands, facilities, sporting fields and cycle-ways, not even one in five Australian kids aged between five and 17 get anywhere near the recommended 60 minutes of physical activity a day.

There are so many reasons why kids need to be physically active. It improves fitness, helps with weight maintenance, strengthens muscles and bones and reduces their risk of heart disease and type 2 diabetes later in life.

Regular physical activity has also been found to help children be more confident, have better concentration, and to be better able to cope with stress and regulate their emotions.

We often blame parents, schools, government policy and excess screen time for kids' sedentary lifestyles. The latest report card on physical activity suggests each of these plays a role.

But Dr Natasha Schranz says our tendency to over-schedule children's time is part of the problem.

Dr Schranz, the report card's lead investigator, understands parents are keen to give their children as many opportunities as possible — dance classes, piano lessons or chess club. But this often means less free time to just play outside.

As a parent of two young girls, Dr Schranz appreciates the tension.

'But I'm mindful of the time I do schedule for them versus the time where we just walk the dog or head to the playground. The things that should just happen in everyday life.'

She points out that even when children take part in organised sports — such as cricket, soccer, hockey or netball — a lot of that time isn't actually spent being active. They spend a lot of time taking instruction or waiting their turn.

Also the activities they do in school and club sports are not always enough to ensure they develop the motor skills and movement patterns that are the building blocks of other movements. Without these patterns — running, jumping, leaping, galloping, skipping, catching, throwing and kicking — it makes it hard to build confidence with a whole range of physical activities.

'This is why we need to give kids time for unstructured rough and tumble play without rules, boundaries and scheduling by adults,' she says.

'It needs to be about them wanting to explore and try new things, rather than physical activity being something you have to schedule in.'

Time isn't on our side

But trying to work this free play into family life is not always that simple — as many busy parents would argue.

Magdalena Wahhab is a working mum with a six-year-old daughter. She's an avid gym-goer and organises as much for her daughter as she can, on top of school commitments.

But there are only so many hours in a day.

'Parents work such long hours; it's hard to accommodate all the kids' needs on top of cooking dinner and helping with homework,' she explains.

'My daughter does a few activities during the week, then we squeeze in as much as possible on weekends.

'But there just isn't enough time for all the fun, enjoyable things like playing with friends during the week.'

Plus, when you finally get ten minutes to yourself at night after dinner, homework, washing and preparing for the next day, 'sometimes it's easier to let them play on the iPad than jump on the bike'.

Dr Schranz agrees that life and parenthood is a constant juggle of priorities.

'So in my house, we prioritise the commute to and from school,' she says.

'Above everything else, we walk, ride or scoot there. It's free and something we have to do five days a week, back and forth.'

She says even if you don't live within a few kilometres from school, there are always options: park a few kilometres away and walk, or get off public transport a few stops earlier.

What about the bookworms?

While team sport may be a big part of many school kids' lives, there's also the reality that not all children enjoy team sports. Some kids are arty, others prefer to read, and some suffer body image issues.

Oftentimes these children fall through the cracks.

That's the case for Julie Boland's 14-year-old daughter.

'She was a great swimmer when she was younger, but now she's really tall for her age and is suffering with weight issues. It has really knocked her confidence,' she explains.

'She'd been trying out for school championships, but was being so badly bullied by kids because of her height.

'If you aren't the sports star at school you don't exist, so sometimes she'd just sit in her room.'

Without support from the school, Julie is doing everything she can to keep her teenager moving at home to build confidence and fitness.

'She's now doing personal training one to two times a week and I'm trying to encourage her to do classes with me in the morning,' she said.

'I do gardening jobs after work so I take her with me. She plays with the dogs or runs around with the babies to give the mums a break.

'But it has taken a long time for me to get her confidence up.'

At the end of the day, it takes a village to raise a child, Dr Schranz says. She and the other authors of the report say this 'physical inactivity pandemic' requires a coordinated response.

'It comes down to parents, teachers and schools to share the load in teaching kids these skills,' she said.

Cassie White is a Sydney-based personal trainer, yoga coach and health journalist.

Source: ABC News, www.abc.net.au/news/health/2017-03-07/kids-physical-activity/8328920.

Inquiry

The influence of families on health

Read the snapshot 'Why kids are inactive (and why it's not just their parents' fault)' and complete the following.

1. Describe how parents can influence their child's level of physical activity.
2. What factors make it hard for parents to provide their children with time to be active, particularly to have time for free play?
3. The article argues that unstructured play is important for the development of motor skills. What reasons are put forward for this argument. Do you agree?
4. Besides parents, identify the other sociocultural influences on physical activity mentioned in the article. Outline how these can also affect children's physical activity levels.

Peers

Peers also have a powerful influence on people's health choices and the type of behaviours they undertake. This influence may be beneficial to their level of health or can have a negative impact. Young people can be particularly influenced by the values, attitudes and behaviour of their peers as they seek to establish their identity and feel a sense of belonging. When peer groups share common interests and similar values it can be easier to make healthy choices. For example, being part of a peer group that enjoys being active and supports the participation of people regardless of their level of ability will help people feel comfortable and encourage them to join in sporting or recreational activities.

FIGURE 2.8 Peers can support and encourage individuals to make healthier choices.

Making healthy choices can be more difficult when the peer group is not supportive or when the values held by those in the group differ from those held by the individual. For example, it can be difficult to maintain a decision not to drink alcohol if you attend a party where everyone else is drinking and you are continually offered a drink or questioned about why you are not drinking.

Inquiry

Exploring the influence of family and peers

Consider the following lifestyle behaviours that can positively or negatively affect your health:

- participating in regular physical activity
- tobacco use
- eating a healthy diet
- using sun protection
- safe driving behaviour.

Explain how your family and peers have influenced your knowledge, values and attitudes in relation to each lifestyle behaviour. Determine the group that you believe has the greatest influence on your attitudes and behaviour and justify your choice. Discuss your findings with a classmate.

Media

The powerful influence that the media can have on a person's opinions, beliefs and habits makes it an important socio-cultural determinant of health. Electronic media such as the internet, television and movies, along with written forms of media such as newspapers and magazines, all play a significant role in disseminating information relating to health. For example, advertisements about skin cancer or stories on domestic violence seek to raise awareness and enhance people's understanding of health-related issues. It is crucial that any health-related information presented in the media is accurate, fair and balanced, as bias or inaccuracies can lead to misconceptions and confusion that can endanger someone's health.

FIGURE 2.9 Media images can have a significant influence on people's health values, attitudes and behaviours.

The choices relating to health that individuals make are significantly influenced by values and attitudes promoted through the media. For example, research has shown that exposure to pornographic material can influence a young person's thoughts and expectations within an intimate relationship such as what types of sexual activities they expect their partners to give or receive. Sexually explicit images can also impact on young people's adoption of unsafe sexual health practices such as engaging in casual sex or not using condoms. These images may reinforce gender stereotypes and can strengthen attitudes that support sexual violence and violence against women.

Images conveyed through the media can also have a significant impact on what is seen as normal behaviour and risk taking that may occur as a result. Images of males driving powerful vehicles at high speed, such as in car chase scenes, or increased advertising of alcohol in the lead up to New Year's Eve, Australia Day and major sporting events can encourage behaviours that may lead to immediate and long-term health harms and reinforce a belief that certain behaviours are acceptable and not a major concern. Similarly, the constant portrayal of images of women who are tanned, attractive and slim, and of men who are tall, tanned and muscular can contribute to beliefs about what is the ideal body shape. Pressure to conform to these stereotypes can have a considerable influence on people's self-image, their feelings about their appearance and the health behaviours they adopt in an effort to match these expectations.

The media can also assist to shift society's attitudes about particular health behaviours. Health promotion campaigns on television and radio, such as those about unsafe driving behaviours or binge drinking, are frequently used to not only raise awareness, but also to challenge people's beliefs about what is acceptable behaviour in an effort to improve health and reduce rates of mortality and morbidity.

FIGURE 2.10 A person's own body image can be influenced by media representations of an 'ideal' body shape.

SNAPSHOT

Social media can be bad for youth mental health, but there are ways it can help

By Jo Robinson, Eleanor Bailey, Sadhbh Byrne (University of Melbourne)

Young people spend a lot of time on social media. They're also more susceptible to peer pressure, low self-esteem and mental ill-health. A number of studies have found associations between increased social media use and depression, anxiety, sleep problems, eating concerns, and suicide risk.

Certain characteristics of social media may contribute to these negative effects.

Cyberbullying

Cyberbullying has been linked to depression, anxiety, social isolation, and suicide. Compared to 'traditional' forms of bullying, cyberbullying can be witnessed by a larger audience, the perpetrator can remain anonymous, and the victim may find it difficult to escape.

Social media platforms have taken steps to address cyberbullying (such as Facebook's 'bullying prevention hub'), and almost all social media content can be reported to site administrators. But many victims don't seek support, and research suggests 71 per cent of young people don't think social media platforms do enough to prevent cyberbullying.

Comparisons to unrealistic portrayals

A common social media activity is viewing others people's profiles. But these frequently portray edited versions of people's lives, such as only displaying images in which the person looks attractive or is seen enjoying themselves.

So young people may develop an impression other people's lives are preferable to their own.

This can be made worse by the social endorsement provided by the number of 'likes' a post might get. In one study, nearly one-fifth of respondents said they'd delete a post if it didn't receive enough 'likes'.

Suicide and self-harm content

The potential negative impact of social media on at-risk young people is receiving increasing attention. Risks identified include the potential for contagion or copycat events; sharing information about suicide methods; encouragement to engage in suicidal behaviour; and the normalisation of suicide-related behaviour as an acceptable coping mechanism.

Some benefits

There are also significant potential benefits social media can provide. It can create a sense of community, and facilitate the support from friends. It can encourage people to seek help and share information and resources. More frequent social media use has been associated with improved ability to share and understand the feelings of others.

The reach, cost-effectiveness and accessibility of social media means information, support, or treatment can reach people who might not otherwise have easy access. Clinical services are beginning to harness the benefits of social media to augment the care they provide. For example, colleagues at Orygen developed an online platform for clients and their families to augment face-to-face treatment. It has been trialled with promising results.

Monitoring language used in online posts might also enable tracking and detection of people who may be at risk.

For example, Facebook recently launched 'proactive detection' artificial intelligence technology that will scan all posts for patterns of suicidal thoughts, and when necessary send mental health resources to the user or their friends, or contact local first-responders.

But there are ethical implications, which include privacy and duty of care. Social media's rapidly evolving nature, reach and anonymity make rigorous evaluation of its risks and benefits challenging.

Chicken or egg?

Most studies examining social media and mental health aren't able to determine whether spending more time on social media leads to depression or anxiety, or if depressed or anxious young people spend more time on social media.

But the way social media is used is important. For example, active (compared to passive) social media use can be beneficial. Although browsing Instagram has been associated with increased depression, talking to others online increases life satisfaction.

And some individuals may be more susceptible to the negative aspects of social media than others. Research suggests personality traits and the level of envy felt towards others online influence whether one will be negatively impacted.

The pathways to mental illness are many and varied, and to suggest mental health problems can be attributed to social media alone would be an over-simplification. But we need to acknowledge the risks and platform administrators, parents, mental health organisations, schools and universities, and young people themselves have a role to play in minimising these risks.

It's unlikely social media use will decrease in the near future, so we need to manage the risks and harness the potential benefits to improve the mental health of our young people.

Source: The Conversation, 12 December 2017.

Inquiry

The impact of social media on health

Read the snapshot 'Social media can be bad for youth mental health, but there are ways it can help' and then complete the following.

1. Discuss the ways in which social media can have positive and negative influences on the mental health of young people.
2. To what extent do you agree with the ideas expressed in the article on the influence of social media?
3. What are two health issues that affect young people (besides mental health) that might be positively and/or negatively influenced by various forms of media?
4. Many people feel that social media has a more powerful influence on young people than any other form of media. Do you agree? Give reasons to support your opinion.
5. Analyse how individual factors may affect the level of influence that the media has on young people's health. Provide examples to support your answer.

Religion

Religious beliefs are another sociocultural factor that can influence people's health decisions and behaviours and therefore affect their level of health. Beliefs relating to food, sexual activity and drug use are examples of areas where people's religious faith can affect their lifestyle and choices. According to some religions people should not engage in sexual activity prior to marriage, so risks associated with sexual behaviour, such as sexually transmitted infections or unplanned or unwanted pregnancies, don't exist for those who practise these faiths. Certain religions, such as Islam, Seventh Day Adventism and Buddhism, forbid or discourage the consumption of alcohol, meaning that the risk of suffering health problems related to alcohol is reduced for people who adhere to these beliefs. Religious beliefs and practices around food can also restrict the eating of certain types of food, influence the way it is prepared, or affect eating patterns. The teachings of Seventh Day Adventists, which emphasise diet and health, require people of this faith to follow dietary restrictions that are believed to conform to Biblical guidelines. A vegetarian diet is recommended and followers are encouraged to eat wholegrain products rather than refined foods, limit fat consumption and drink large amounts of water. Adherence to these beliefs is likely to benefit physical health by reducing health risks associated with unhealthy eating such as obesity, cardiovascular disease, type II diabetes and some forms of cancer.

Having a strong religious faith can also benefit a person's spiritual health and well-being by adding meaning to their life, creating a sense of hope and optimism and providing support during times of adversity.

Religious beliefs and practices may also have a negative impact on the health of people. Some religions forbid same-sex relationships and actively oppose acceptance of different sexual identities. This lack of acceptance and support may alienate same-sex attracted people of these religious faiths, leading to feelings of guilt, shame, confusion and isolation.

Culture

A variety of different cultures exist within society: cultures related to gender (such as male culture), age (for example, youth culture), location (for example, beach culture) and ethnicity are some examples of the cultures present in our society. Each of these cultural groups holds particular values, beliefs and assumptions that strongly influence the behaviour of its members and can significantly determine their level of health.

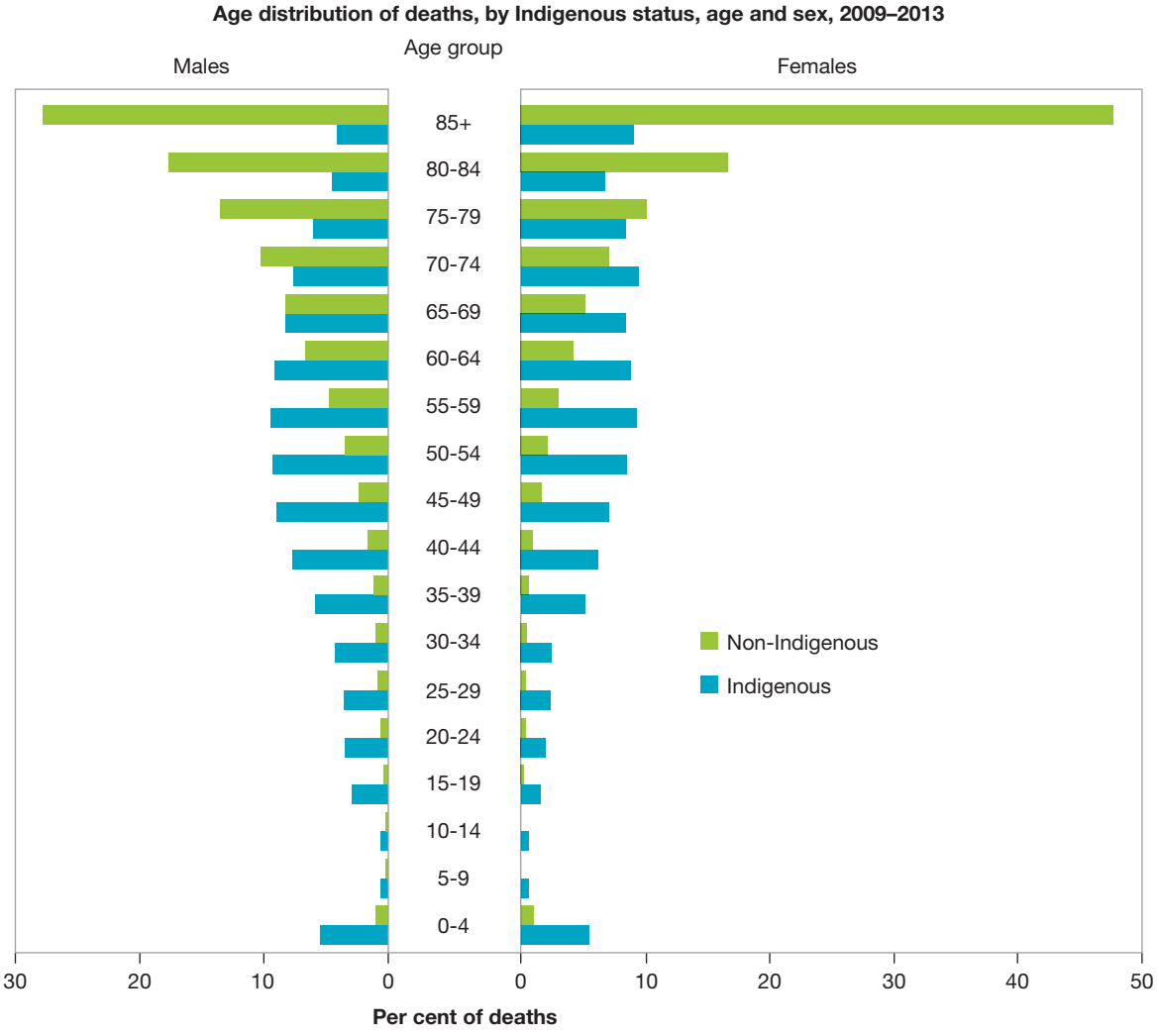
A person's ethnic origins and place of birth can have both a positive and negative influence on their health status. Certain cultures may have particular diets or eating traditions that benefit health. For example, a traditional Asian diet tends to be low fat and healthy, with large amounts of grain-based foods (such as rice and noodles) and vegetables consumed daily and only small amounts of red meat. This reduces the risks of heart disease, certain cancers and diabetes. Other attitudes and values may contribute to behaviours that place health at risk. The *NSW Schools Physical Activity and Nutrition Survey (SPANS) 2015* report found that students from an Asian cultural background were less likely to meet daily recommendations of physical activity, particularly girls, suggesting participation in physical activity may not be as encouraged and supported as it is among other cultural groups.

Language difficulties and cultural beliefs can create barriers that have a negative effect on health. Unfamiliarity with the Australian health-care system, a lack of fluency in English or cultural insensitivities can prevent or hinder migrants from accessing appropriate health care. Difficulties finding work due to limited experience, language difficulties or a lack of contacts can also see ethnicity linked to low socioeconomic status for some people who have migrated to Australia. This socioeconomic disadvantage tends to make it harder to achieve an optimal level of health. The health of some newly arrived migrants may be further affected by the hardships and trauma they have experienced prior to resettling in Australia. For example, many refugees may experience ongoing mental health issues as a result of violence and conflict they have witnessed or endured.

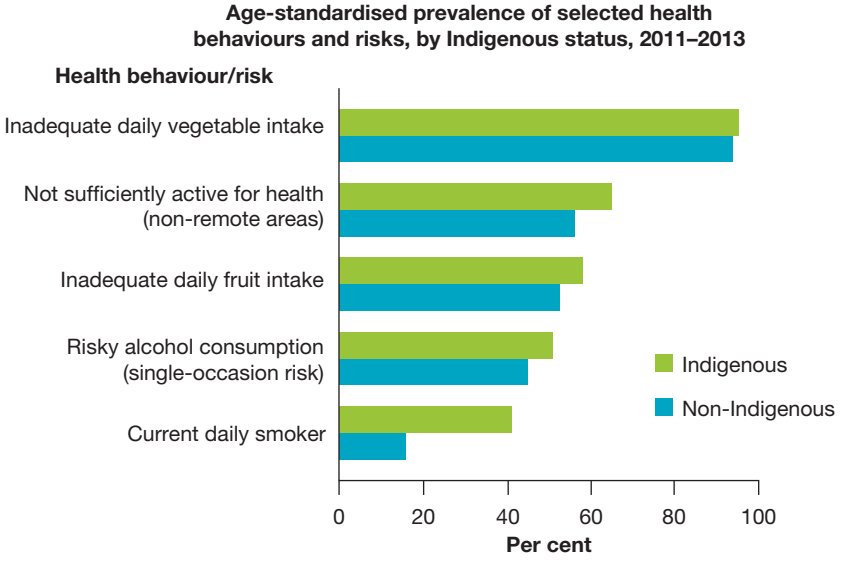
Being of Aboriginal or Torres Strait Islander descent also has a significant influence on health. Indigenous people experience much poorer health than other Australians. They have a much lower life expectancy, die at much younger ages and are more likely to have a lower quality of life as a result of experiencing ill health. Numerous factors relating to the living and social conditions of Indigenous people, along with significant levels of socioeconomic disadvantage and a reduced sense of control over their own lives, may help explain the poor health of Indigenous Australians.

Young people's attitudes and beliefs can be a significant determinant in the health risks they are likely to experience. As discussed in topic 1, injuries are the leading cause of hospitalisation and death of people aged 15–24 years, with transport accidents and intentional self-harm responsible for many of these deaths. A desire to be independent, challenge themselves, experiment, have fun and fit in, along with feelings of invincibility may see young people engage in numerous high risk behaviours, that increase the likelihood they will be injured, such as binge drinking, speeding and travelling in overloaded cars. Many of these things are considered to be rites of passage from childhood to adulthood by some parts of society, leading to assumptions about how young people will behave. These assumptions can contribute to the attitudes that young people develop and can place direct or indirect pressure on them to conform to these expectations.

FIGURE 2.11 Difference in health status and health behaviours of Indigenous and non-Indigenous people



Note: Data are for NSW, Qld, WA, SA and NT
Source: AIHW National Mortality Database



Source: Australian Institute of Health and Welfare.

SNAPSHOT

Australia's drinking problem the focus of Australian Medical Association summit in Canberra

By Justin Huntsdale

The Australian Medical Association (AMA) wants the federal government to acknowledge Australia has a drinking problem, and will call for cultural change at a national summit in Canberra today.

Australia's pride in its drinking culture is costing lives, harming unborn children, causing child neglect, fuelling domestic violence and giving the country a reputation it does not deserve, AMA president Associate Professor Brian Owler said.

The AMA will open the two-day National Alcohol Summit at the National Convention Centre in Canberra today.

Its president is calling on the federal government to lead the way in changing our behaviour.

'We need the government to acknowledge there is an issue around alcohol, and it's not all about personal responsibility,' Associate Professor Owler said.

'We need to shape our attitudes and culture to make sure we minimise people's harmful alcohol consumption.

'We're not against alcohol — we're not prohibitionists or wowsers — but we need to make sure our children's attitudes to alcohol are shaped properly.'

In Australia, there is a strong link between professional sport and alcohol advertising.

Both State of Origin rugby league teams are sponsored by beer companies, while advertising breaks during sporting events on television are dominated by alcohol promotion.

'Our sporting identities are often the heroes of children, and we need to make sure we transition away from the sporting codes relying on alcohol advertising,' Associate Professor Owler said.

'You begin at the top and we have a government whose responsibilities do include shaping society's culture and attitude around alcohol.

'It's [the alcohol industry] a powerful lobby group and they're very well resourced.'

He said Australia's drinking problem stretches further than the alcohol-fuelled violence reported in the news.

Domestic violence, spousal abuse and child neglect can all often be traced back to alcohol abuse.

'What we're doing today [at the summit] is giving a voice to people like victims who have been devastated by the consequences of alcohol,' Associate Professor Owler said.

'If we start this conversation on a national basis and get the government to acknowledge this as a responsibility, that's the first step.'

Australia has examined several measures to stop alcohol-related problems, including raising the cost of 'alcopops', forcing venues to close earlier and implementing lock-outs after a certain time.

There has also been talk of raising the legal drinking age to 21, as is the case in the United States.

'The discussion around raising the drinking age distracts our focus on changing our behaviour around alcohol, and it's not the best way to tackle the problem,' Associate Professor Owler said.

'It distracts from the way we're brought up around drinking — the culture in Australia is to drink as much as you can and we've learnt to pride ourselves on it.

'Australians are much more sophisticated than that and we need to break some traditions.'

Source: ABC Radio Canberra, www.abc.net.au/news/2014-10-28/ama-alcohol-summit/5847186.

Inquiry

Attitudes towards alcohol in Australia

Read the snapshot 'Australia's drinking problem the focus of Australian Medical Association summit in Canberra' and complete the following.

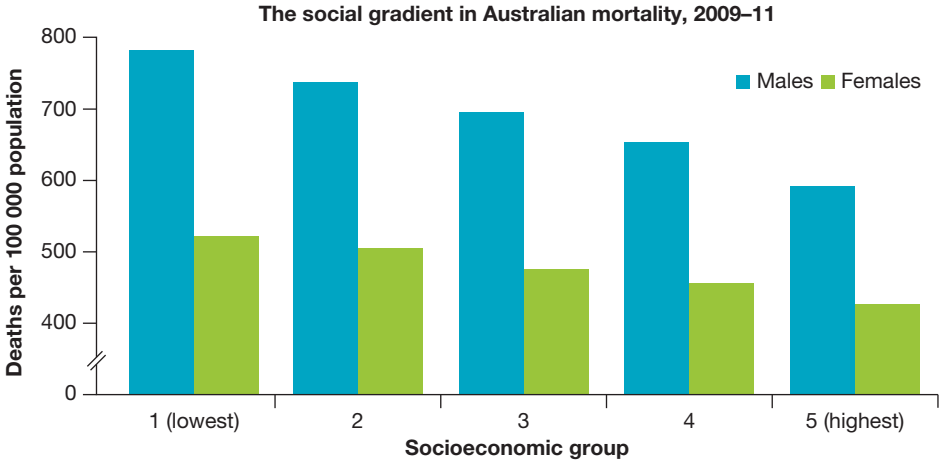
1. According to the Australian Medical Association (AMA), what is the culture around alcohol in Australia?
2. Describe the key health concerns raised by the AMA about Australia's drinking culture.
3. Sport is named as a contributing factor to cultural attitudes towards alcohol. Describe the role of sport in alcohol promotion and consumption.
4. Outline how ideas about mateship, masculinity and national celebrations (e.g. ANZAC Day) may also contribute to our attitudes towards alcohol.
5. Discuss the influence of other determinants (such as the media and geographic location) on patterns of alcohol consumption in Australia.
6. Do you agree with the AMA's assessment of Australia's drinking culture? Give reasons for your response.

2.1.3 Socioeconomic factors

The World Health Organization defines social determinants as 'the conditions in which people are born, grow, live, work and age'. Furthermore they state that these determinants, which are significantly influenced by the distribution of money, power and resources, are largely responsible for the health inequities that exist within and between countries. A person's socioeconomic status has a significant influence on the likelihood that they will be exposed to health risk factors, with increases in a person's income, education and occupation level tending to be accompanied by improvements in their health.

This pattern of variation in health status, where people who are less advantaged in terms of socioeconomic position have worse health (and shorter lives) than those who are more advantaged, generally follows a gradient, commonly referred to as the **social gradient in health**. Evidence of this can be seen in figure 2.12, showing the mortality rates of people in different socioeconomic groups, and in tables 2.1 and 2.2, which compare health risk factors and chronic illnesses according to socioeconomic position. This information demonstrates that health status tends to be higher as socioeconomic position improves.

FIGURE 2.12 The social gradient in Australia's mortality



Source: Australian Institute of Health and Welfare, *Australia's health 2016*, fig. 4.1.2, p. 135.

TABLE 2.1 Inequalities in selected chronic diseases

	Lowest socioeconomic group (per cent)	Highest socioeconomic group (per cent)	Rate ratio: lowest/highest socioeconomic group
Arthritis	19.7	12.1	1.6
Asthma	12.8	9.8	1.3
Back problems	18.9	15.9	1.2
Chronic kidney disease	13.5	8.3	1.6
Coronary heart disease	5.0	2.3	2.2
Diabetes	8.2	3.1	2.6
Lung cancer incidence	52 per 100 000	33 per 100 000	1.6
Mental and behavioural problems	21.5	15.0	1.4

(*Continued*)

TABLE 2.1 Inequalities in selected chronic diseases (*Continued*)

	Lowest socioeconomic group (per cent)	Highest socioeconomic group (per cent)	Rate ratio: lowest/highest socioeconomic group
Oral health rated as fail or poor	31.2	12.2	2.6
Stroke	1.1	0.5	2.2

Source: Australian Bureau of Statistics and Australian Institute of Health and Welfare, *Australia's health 2016*, table 5.1.2, p. 184

TABLE 2.2 Inequalities in selected risk factors

	Lowest socioeconomic group (per cent)	Highest socioeconomic group (per cent)	Rate ratio: lowest/highest socioeconomic group
Low birthweight	7.5	5.6	1.3
Daily smoking	20	6.7	3.0
Inactive or insufficiently active	76	56	1.4
Lifetime risky drinking	16.4	18.5	0.9
Overweight or obese	66	58	1.1
High blood pressure	26	21	1.2
Participation of women aged 20–69 in cervical screening	52	64	0.8

Source: Australian Bureau of Statistics and Australian Institute of Health and Welfare, *Australia's health 2016*, table 5.1.1, p. 184

Education, income and employment are the key socioeconomic factors where disadvantage (either in one area or a combination of areas) is likely to negatively influence a person's level of health.

Education

A person's level of education has a significant impact on their health. Education enables people to obtain stable employment, have a steady income, live in safe and secure housing, provide for their families and make informed decisions about health care and health behaviours. The education level of parents affects not only their own health but also has a significant impact on their children's health.

In addition to enhancing people's knowledge and skills, education also serves to develop within the individual a sense of **empowerment** over their lives. This in turn increases the likelihood they will take action to improve their health.

FIGURE 2.13 Engagement in school acts as a protective factor for young people's health.

Engagement in education also contributes to a sense of connectedness or belonging and provides young people with access to support if needed. On the other hand, school failure or leaving at an early age can make it more difficult to obtain employment, while also contributing to a sense of alienation and disconnection from society. Low levels of education, along with significant health problems such as mental health problems and substance abuse are commonly found in people who are imprisoned, highlighting the role that attaining an adequate level of education can play in supporting health.

Employment

Being able to secure satisfying, meaningful and regular employment is a protective factor for our health. Reports on the health of Australians have estimated that mortality rates are significantly higher for unemployed Australians than for those who are employed. Employment provides opportunities to be active, develop a positive sense of identity, interact with others and feel a sense of control over our lives, as well as ensuring a degree of financial security. Unemployment has been linked to stress, a loss of confidence, limited social contact, and feelings of depression and disempowerment, all of which significantly affect a person's emotional and social health. Rates of self-harm, attempted suicide and suicide have been found to be higher in people unable to find work, particularly following extended periods of unemployment, while higher incidence of cardiovascular disease and lung cancer have also been linked with unemployment.

The type of occupation a person has can also determine their health. Jobs involving manual labour, such as trades or transport jobs, have higher rates of injury and death than clerical, managerial or professional occupations. The latter group, however, may be less physically active at work as their job involves large amounts of time sitting doing computer-based work. Long working hours can contribute to stress, reduce the time available for physical activity and make it hard to find a work–life balance, all of which affect a person's health and well-being. Employment in certain jobs is also likely to result in exposure to high levels of pollution or increase the risk of coming into contact with harmful substances such as asbestos, chemicals or radiation.

Income

Those who have higher incomes have more money available to spend on products and services that provide health benefits, such as sporting or recreational activities, better quality food, private health insurance and alternative health services that can support good health. They have the freedom to choose from a greater range of options and the confidence of knowing they can afford whatever is needed to look after their health. This knowledge is likely to decrease stress and contribute to a sense of greater control over their life, which enhances psychological well-being.

FIGURE 2.14 Workplace injuries are more likely to occur in occupations involving physical labour and high risk environments.

Poverty, on the other hand, increases people's exposure to risk behaviours likely to harm their health while also restricting their access to health services and reducing their capacity to modify their lifestyle. It also decreases the likelihood that people who are the most disadvantaged will live in safe, secure housing that is of an adequate standard. Those experiencing financial hardship tend to live in overcrowded conditions in communities with high population density, fewer transport and recreational facilities and less support services available. These living conditions add to the health risks faced by low income groups and further restrict their opportunities to seek help with health problems.

SNAPSHOT

Medical costs forcing Australians to skip health care

By Rania Spooner

Australians are paying five times more than Britons for medical care, causing many people with chronic health conditions to forgo treatment because it's too expensive.

Nearly half of Australians living with depression, anxiety and other mental health conditions have skipped medication or therapy because of cost, according to a study by James Cook University and the NSW Bureau of Health Information.

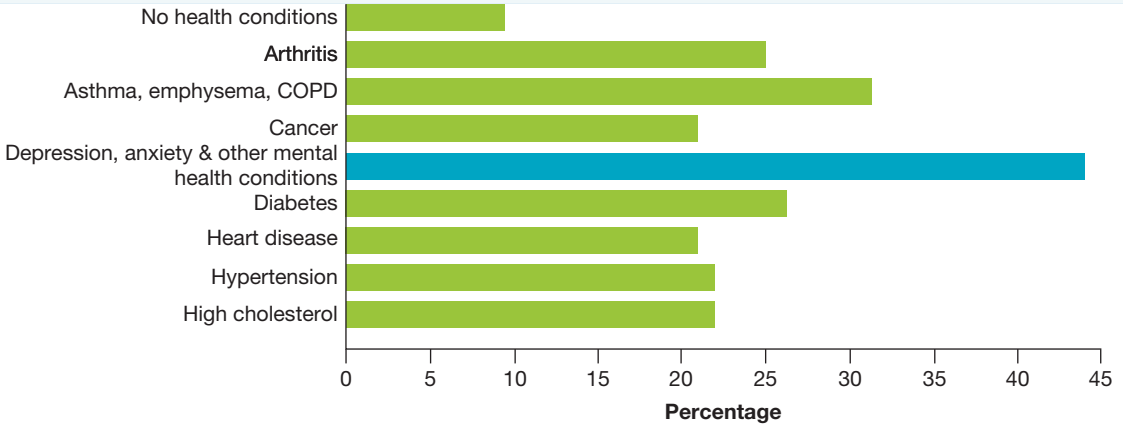
As had more than 30 per cent of those with asthma and emphysema, 27 per cent of those with diabetes, 25 per cent with arthritis and 20 per cent of cancer patients, according to the study recently published in the *Australian Journal of Primary Health*.

Asthmatic Stephanie Horan, 27, was clinically dead for 12 minutes after she stopped her medication for social reasons and suffered a near-catastrophic asthma attack as a teenager.

Now she knows she can't stop her medication and, depending on the severity of her symptoms, spends between $45 and $80 a month on medication, which does not include her GP, specialist appointments or machine upgrades.

'It is expensive but with anyone else who has a chronic condition it's your life,' she said. 'I'd hate to know they're risking their life because it's just too expensive ... to know somebody lost their life because they couldn't breathe because their medication was too expensive.'

FIGURE 2.15 Australians skipping treatment by condition



Source: Callander Emily J., Corscadden Lisa, Levesque Jean-Frederic 2016, 'Out-of-pocket healthcare expenditure and chronic disease — do Australians forgo care because of the cost?', *Australian Journal of Primary Health* 23, 15–22, https://doi.org/10.1071/PY16005.

Lead study researcher Emily Callander, a health economist from the Australian Institute of Tropical Health and Medicine, said the US was the only country of 11 studied that had more people skipping health care due to cost than Australians.

Her team analysed the results of the 2013 *Commonwealth Fund international health survey*, which interviewed a cross-section of people from each country studied, including 2200 Australians.

'In terms of skipping care we perform much worse than Canada and New Zealand, certainly the UK and Sweden,' Dr Callander said.

Australian households were spending an average US$1026 each year on out-of-pocket medical expenses, compared to $216 in the United Kingdom and US$1844 in the United States, the researchers found.

'We know within Australia and internationally that people with chronic diseases are most likely to have lower incomes so we're getting this compounding of disadvantage,' Dr Callander said.

Consumers Health Forum chief executive Leanne Wells said the study pointed to gaps in 'Australia's supposed universal health system'.

'It also highlights the other vicious circle: that those with chronic conditions are more likely to have lower incomes and less wealth because of the exacerbating effect of their condition and their ability to participate in the labour force,' she said.

'Such findings highlight the emergence of a two-tiered health system and the need for reforms so that quality primary care for chronically ill people is available to all regardless of their income.'

Asthma Australia chief executive Mark Brooke said how to get cheaper medication was the most common inquiry they received. He said anecdotally they were aware of parents skipping their medication in some cases to pay for their children's.

'We need to be able to ensure that medications are more affordable for all Australians,' he said.

Dr Stephen Carbone from beyondblue said: 'We have been aware that roughly 50 per cent of those with mental health conditions do not access treatment, but believed this was largely driven by stigma.'

The possibility that cost could be a barrier to care was 'a major issue that requires further investigation,' he said.

Source: *Sydney Morning Herald*, 4 August 2016.

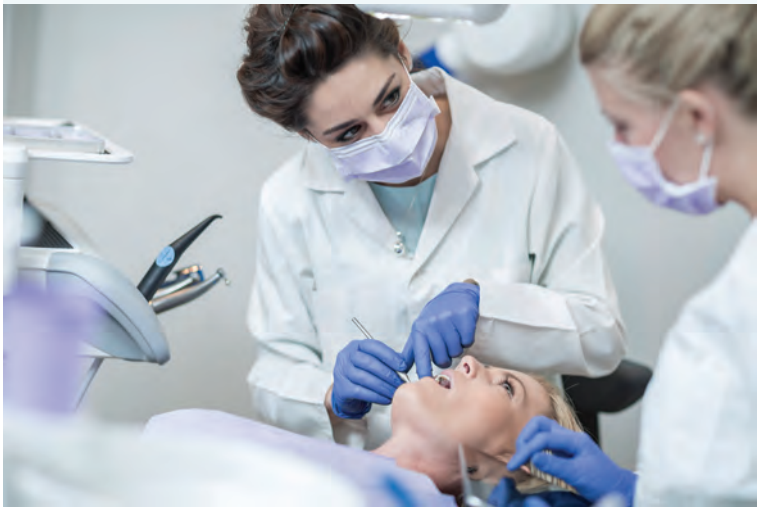
Inquiry

Impact of income on health

Read the snapshot 'Medical costs forcing Australians to skip health care' and then complete the following.

1. Summarise the key findings of the study undertaken by James Cook University and the NSW Bureau of Health Information.
2. Identify groups in Australia that are likely to experience the greatest difficulty in affording the costs of health care.
3. Describe the potential health impacts of high health-care costs on people who are financially disadvantaged.
4. The study found those with chronic illnesses were likely to have lower incomes. Provide reasons for why these two factors may be linked.
5. Explain three other ways in which having a low income is likely to make it harder to achieve good health.

FIGURE 2.16 The high cost of services not covered by Medicare can make it difficult for some people to receive treatment when needed.



The high cost of certain health-care services means that the quality of care received by people varies according to their socioeconomic status. The **Medicare** system was designed to ensure that all Australians receive a certain level of health care. However, not all services are covered under the scheme (for example, dental care for adults) and waiting lists for procedures considered non-essential are long. Having to endure ongoing pain can lead to significant emotional distress, a reduced capacity to go about daily life, increased levels of stress for family and restrictions on social life, as well as physical discomfort, all of which significantly influence health.

It is not simply poverty that is likely to harm a person's health. Being poor is often associated with negative stereotypes and images. For example, people who are homeless, long-term unemployed or suffering drug dependency issues are frequently labelled and looked at disapprovingly. The negative connotations that go along with experiencing poverty can also result in prejudice, discrimination and **social exclusion** that also work to influence a person's health.

When discussing socioeconomic factors, the areas of education, income and employment should be considered in combination as they are all closely linked. An individual's employment status is a major determinant of their income, while a person's level of education plays a key role in their chances of gaining regular and

rewarding employment. Furthermore the *Australia's health 2016* report noted that the social gradient can persist throughout life and extend into the next generation, meaning that many young people share the same level of advantage or disadvantage as their parents.

SNAPSHOT

New report paints bleak picture of life for Australians on the breadline

The Salvation Army is calling on both sides of politics to make poverty a key federal election issue after releasing disturbing new statistics on the level of poverty in Australia.

'The key findings of a horrific new report paint a bleak picture of what real life is like for Australians on the breadline,' says The Salvation Army's Territorial Communications and Fundraising Secretary, Major Bruce Harmer. 'We cannot keep putting a Band-Aid on disadvantage. We need serious funding to develop innovative solutions to the complex issues of entrenched poverty.'

Now in its sixth year, The *Salvation Army's Economic and Social Impact Survey* (ESIS) surveyed more than 1380 clients across Australia.

It found that a massive 66 per cent of clients living in private rental properties or paying off a mortgage experience extreme housing stress — using nearly two-thirds of their disposable income on housing/accommodation.

Nearly one in five are either homeless or living in temporary accommodation — of these almost one in three previously privately rented. 'What this tells us is that private rentals are not a secure form of housing for those living on the breadline,' says Major Harmer. 'One small change to an individual or family's income, or an unexpected bill or expense can lead to a tenancy being lost and a family becoming homeless.'

The 2017 ESIS report reveals family violence is the leading factor in housing transiency. In fact, respondents affected by family violence were most affected by extreme housing stress. 'We see very clearly from this research that many children are at significant risk of social exclusion because of generational poverty, unemployment and housing instability,' says Major Harmer. 'Having to move, sometimes numerous times a year, affects a child's schooling, their ability to make and maintain friendships and their confidence.'

The report reveals:

- Respondents affected by family violence were most affected by extreme housing stress. And family violence is the key reason why women (23 per cent) moved in the past 12 months.
- 46 per cent of respondents who moved due to family violence said their children had to change schools when their family moved.
- 44 per cent of people who were surveyed had moved house — on average — almost three (2.7) times in 12 months.
- Nearly one in five (16 per cent) are either homeless or living in temporary accommodation (one in three previously rented privately).
- 37 per cent of people responding who are homeless had experienced persistent homelessness for two years (16 per cent had moved six times in the past 12 months).
- Of the 1495 children, 54 per cent were affected by severe deprivation.
- Single parents with children are the worst affected when it comes to the cost of living — surviving off just $14.35 per day.
- Some clients — on income support — survive off just $17.14 a day after housing/accommodation is paid for.
- Six out of ten respondents cannot afford an internet connection for their child.
- One in five cannot afford medical treatment or prescribed medicine for their children and one in three cannot afford a yearly dental check-up for their child.

Major Harmer says, 'We need leadership and action from all levels of government. The results of this extensive survey of 1380 people are utterly shameful. It shows the real level of struggle taking place in our "lucky country".

'Now, more than ever, it's time for Australia to reclaim our great Aussie spirit — of neighbours who care for their neighbours. The Salvation Army is committed to working with all levels of government, the private sector and other service providers to develop innovative solutions to intergenerational poverty.

'Because when we walk beside people, it's for the long haul. We believe hope is for everyone.'

Source: Extract from Salvation Army Australian Eastern Territory, media release, 25 May 2016.

Inquiry

Impact of poverty on health

Read through the snapshot 'New report paints bleak picture of life for Australians on the breadline' and respond to the following questions to consider the impact of socioeconomic determinants on the health of current and future generations.

1. Describe how each of the following outcomes of poverty are likely to impact on a person's health:
   (a) lack of secure housing
   (b) regularly moving from one house to another
   (c) overcrowded housing
   (d) inability to afford basics such as a phone, television or electricity (and therefore heating)
   (e) inability to afford internet connection/devices for their children
   (f) inability to afford medical expenses.
2. (a) Predict how the low income experienced by people in the Salvation Army report could negatively influence the current and future educational achievement of their children.
   (b) Explain the potential impact of this on the future health opportunities of their children.
3. A significant number of people living in poverty are working. Give reasons why certain people may be experiencing extreme financial stress even when they are employed.

2.1.4 Environmental factors

Environmental factors are those things present in the environment in which people live and work that can affect their health in a positive or negative way. These factors may relate to aspects of the geographic location in which people live, such as the design of the built environment, the quality of the air, food and water available, and the climatic conditions they commonly experience. Clean air, a regular supply of safe drinking water and the consumption of food that is properly stored and prepared can all promote improved individual and public health, while well-designed communities can assist to create safe, harmonious communities. On the other hand, poor building design, increasing levels of pollution and changes in climatic conditions all contribute to poor health by increasing the number of risk factors that people face and making it more difficult to choose healthier options. Access to quality health services and fast, reliable technology also influence a person's level of health by making it easier to obtain accurate information about health issues and seek treatment and support when needed.

Geographic location

Studies into Australia's health have found that people who live in **rural** and **remote** parts of Australia have poorer health outcomes than people living in major cities. They have lower life expectancy, higher rates of illness and injury, and higher levels of health risk factors such as smoking, being physically inactive, drinking excessive amounts of alcohol and being overweight or obese. Differences that are apparent in the health status of people living in rural areas compared with those living in urban and regional areas are complex and likely to be closely linked to other determinants of health, including socioeconomic factors and sociocultural factors. However, a number of factors specific to rural and remote environments play significant roles in determining the health of people living in these areas.

People living in rural and remote areas often have to travel long distances for work, household-related purposes and socialising. This can place them at greater risk of injury due to the dangers involved in travelling on country roads, which include long distances, poor road quality and factors such as speed, fatigue from driving long distances and animals on the road. They are more likely to face harsh living and working conditions and experience severe climatic conditions such as extreme heat, drought and floods that have the potential to negatively affect both physical and emotional health. Injury, disease, emotional distress and financial hardship are some of the health risks that can result from experiencing these weather conditions. The remoteness of communities and the distances between people may make it harder to create or maintain social support

networks. The sense of isolation and the difficulties finding emotional support when geographically isolated may contribute to poor mental health and depression.

While most Indigenous Australians live in non-remote areas, they make up a significant proportion of the population living in rural and remote areas. The poorer level of health of the Indigenous population discussed earlier in this topic is one factor behind the higher rates of illness and death in country areas. A number of issues relating to the geographic location of Aboriginal people who live in remote areas are likely to negatively affect their health. In particular the provision of safe, adequate housing that is supplied with electricity, clean running water and adequate sewerage systems remains problematic in some remote Indigenous communities. Disease outbreaks can occur when water becomes contaminated with harmful bacteria and viruses. Overcrowding and a lack of clean drinking water or adequate sanitation can accentuate health risks, particularly for babies and young children, and place people from these communities at risk of infectious diseases and poorer levels of health than other Australians.

Living in cities and large built-up areas may also affect a person's level of health. High levels of air pollution are far more likely in major cities where there are more motor vehicles and industrial complexes. Poor air quality resulting from the production and release of poisonous emissions from vehicles and heavy industry increases the risk of respiratory infections, asthma, bronchitis and cardiovascular conditions. Smoke from bushfires and the burning of fossil fuels also decreases the air quality. People living in particular areas may face greater risks; for example, those living near major roads or industrial areas are likely to experience higher levels of air pollution, as well as more noise pollution and higher levels of traffic congestion.

FIGURE 2.17 Living in rural and remote communities has the potential to negatively affect physical, emotional and social health.

Traffic congestion can contribute to high levels of stress as motorists become frustrated and angry. It also increases the likelihood of road crashes. Spending long periods of time driving to and from work also decreases the time people have available to be physically active or to be with their families.

People who live in cities and regional areas in most states and territories in Australia are more likely to be supplied with **fluoridated tap water**. The Australian Institute of Health and Welfare estimates that 80 per cent of localities in major cities have water supplies with adequate fluoridation, compared with 30–40 per cent of locations in regional areas. This percentage declines further in more remote locations. Studies of oral health have highlighted the significant differences in the oral health of children living in major cities compared to regional and remote areas, with the number experiencing tooth decay, missing teeth and filled teeth being substantially higher in regional and remote areas.

The **built environment** of major cities and regional areas may also determine a person's health. The built environment refers to buildings and spaces that are constructed within communities. These include houses, shopping centres, public buildings, roads, railways, footpaths and recreational areas such as parks. Communities can promote health through careful planning and good design to ensure environments contain appropriate housing, transport infrastructure and facilities that encourage recreation and social interaction. The construction of cycleways and footpaths, along with the provision of adequate lighting, playgrounds, parks and other recreational facilities encourages physical and community activity. Adequate public transport also supports access to essential services, such as health care, while reducing the number of private vehicles on the road, thereby decreasing pollution levels, crashes and traffic congestion.

Inadequate or ill-conceived planning, however, can work to harm health by exposing people to dangers or discouraging behaviours that promote improved health. For example, the small size of newly released house blocks, along with the design of homes built on these blocks, is contributing to increasing rates of obesity because small backyard areas provide little space for children to play, while large indoor entertainment areas encourage passive activities such as playing computer games and watching giant-screen televisions. The location of industrial complexes has to be carefully considered to ensure residents are not harmed by increases in pollution, traffic volume and possible chemical leaks or accidents. The creation of high-density housing estates can play a part in the spread of infectious diseases, while overcrowding can also contribute to disputes, tension, social unrest and violence within the community.

FIGURE 2.18 Traffic congestion in major cities not only contributes to air pollution, it also increases the time people spend being sedentary.

Access to health services

The ability to access appropriate health care at times of need is an important factor in maintaining good health. However, certain groups can find it difficult to access services and support when required. People who are geographically isolated have poorer access to and use of health care and specialised treatment services than those in major cities and large regional centres. Services are more likely to be under-resourced or unavailable due to the difficulty of attracting and retaining health professionals in these areas. Those in remote areas particularly may rely on health care provided by the **Royal Flying Doctor Service** or other outreach services that visit communities on a rotational basis. They may also depend on medical support provided by phone or videoconferencing, particularly in emergencies. In these situations, people may be required to administer their own first aid or medical treatment under instruction, because of the time it takes for medical services to arrive.

FIGURE 2.19 Well-designed living spaces encourage physical activity and social interaction.

The range of health-care options in rural and remote areas is less than in urban areas. Access to preventative health services like screening programs and support groups is limited, and GPs may find it difficult to access training to update their knowledge or obtain new skills (such as counselling) to assist patients with mental health needs. Along with this, the lack of alternative health professionals, such as acupuncturists and chiropractors working in country areas, means that choices about health care can be restricted. Specialised treatment services are also limited, meaning that people may have to wait longer for health care or travel long distances to receive the necessary health care. Those with ongoing conditions may be required to be away from home for long periods of time while undergoing treatment, resulting in distress and financial hardship. While a strong sense of community in rural areas can help provide a network of support, the small size and closeness of these communities can lead to concerns about confidentiality and privacy when seeking health care. A fear that 'everyone will know', coupled with stigma associated with certain health conditions such as mental health or sexual health issues, can make people reluctant to seek help and treatment when needed.

SNAPSHOT

Rural health-care concerns highlighted in Royal Flying Doctor Service survey

By Anna Vidot

Rural and remote Australians remain deeply concerned about poor access to health care, and want the federal government to spend more to fix the problem.

That is the key finding from the latest Royal Flying Doctor Service (RFDS) research, released on Tuesday.

The RFDS surveyed more than 450 country Australians, and one-third nominated access to doctors and specialists as their single biggest health-care concern.

A third of respondents called for more government funding of services, particularly for mental health and preventative care.

RFDS chief executive Martin Laverty said it raised a question for governments as to whether policies aimed at bridging that gap had failed.

'We have an oversupply of doctors in this country; the problem is, the doctors are simply not all working in areas where they're most needed,' he said.

'It brings into question the success of repeated programs of Commonwealth governments to encourage doctors to work in remote and country Australia.

'The question for government is, are our incentives for doctors sending them to where they're most needed?'

Access to doctors in remote areas a challenge

The survey found encouraging news in other areas.

Two-thirds of respondents said they needed to travel for one hour or less to see their GP or another non-emergency medical professional.

But for Australians living in more remote places, a visit to the doctor could mean a 10-hour round trip or more.

RFDS chief medical officer in Queensland Abby Harwood said governments could do other things to improve their access to care beyond putting more bodies on the ground.

'There is a lot of telephone and email consultation going on between people out bush and their GPs, but that requires actually having a pre-existing relationship with a health-care provider who knows you,' she said.

'Technology such as video-conferencing is a fantastic opportunity, [but] currently the telecommunications infrastructure out in these areas is not quite sufficient to be able to do that reliably.'

GPs not paid by Medicare for teleconference consultations

Unlike specialists, who can bill Medicare for video-conferencing consultations with patients, GPs currently are not paid unless their patient attends a consultation in person.

Dr Harwood said that meant GPs who assisted remote patients over the phone or by teleconference were doing so on their own time and usually out of their own pocket.

'From my experience, most of us would just do it [for free] out of the service that we provide,' she said.

'At the moment it's either the health-care provider doing it for free, or the person accessing the GP is paying for it out of their pocket with no subsidy.

'When you consider the petrol bills, how much it costs in fuel to drive a 1000 kilometre round trip, a lot of them would rather pay out of their own pocket to do that [if the doctor is not already doing it for free].'

Dealing with issues before crisis point

Dr Harwood seconded the call for a greater focus on preventative care for rural and remote patients, who were too often only dealing with medical issues once they had reached crisis point.

She said changing that made medical and economic sense.

'[When there's a crisis] a patient then has to travel in and out of their regional centre or capital city, which obviously causes a lot of disruption and it's expensive,' she said.

'I don't think anyone has actually measured the full cost to Australia as a country, taking into account that social dislocation and the economic disruption when people need to leave their properties, leave their workplace.

'It's been proven over and over again that good primary health care, delivered to people out there on the ground, can often prevent those crises from happening.'

Significant boost in GP numbers 'in all areas'

Assistant Minister for Health David Gillespie, who has responsibility for regional health issues, is on leave.

But in a statement, a federal Department of Health spokeswoman said there had been a significant boost in GP numbers 'in all areas of Australia' over the past decade.

'A 2017 budget announcement included funding of $9.1 million over four years from 2017–18 to improve access to mental health treatment services for people in rural and regional communities,' the statement read.

'Currently, Medicare provides rebates for up to ten face-to-face consultations with registered psychologists, occupational therapists and social workers for eligible patients under the Better Access initiative.

'From 1 November 2017, changes to Medicare will take effect so that seven of the ten mental health consultations can be delivered through online channels [telehealth] for eligible patients, that is, those with clinically diagnosed mental disorders who are living in rural and remote locations.

'Relevant services can be delivered by clinical psychologists, registered psychologists, occupational therapists and social workers that meet the relevant registration requirements under Medicare.'

Source: ABC Rural, www.abc.net.au/news/2017-08-01/flying-doctor-service-survey-highlights-healthcare-concern/8763856.

Inquiry

Difficulties faced by those living in rural locations

Read the snapshot 'Rural health-care concerns highlighted in Royal Flying Doctor Service survey' and then complete the following.

1. Outline the key issues people living in rural and remote areas face in accessing health care.
2. The report highlighted the importance of patients having a pre-existing relationship with their GP. How will a pre-existing relationship between doctors and patients help provide good health care? Why may this relationship not exist as frequently for rural and remote Australians?
3. Describe the potential impact of poorer access to health care on the health of rural and remote Australians. Name specific illnesses they are more likely to experience.
4. Use the **Australia's Health 2016: Rural and remote health** weblink in the Resources tab to read the findings on the health of rural and remote Australians (section 5.11 of the report). Compare these findings to your answer to question 3.

Resources

Weblink: Royal Flying Doctor Service

Weblink: Australia's Health 2016: Rural and remote health

People living in major cities can also experience difficulties accessing health care, especially those who rely on the public health system. High demand, particularly in areas of population growth, can result in insufficient hospital beds being available or long periods waiting to be treated. For patients without private health insurance, the waiting lists for procedures considered non-essential (for example, knee replacements) may be lengthy, meaning they may experience ongoing pain and distress for some time before being operated on.

Access to technology

Increasing use of technology, such as computers, tablets, mobile phones and electronic games, has impacted significantly on people's health, particularly the health of young people. Studies have found that a large proportion of young people spend significant amounts of time involved in small screen recreation; that is, playing computer games, social networking, using the internet and watching TV shows and movies via streaming services. This regular use of technology often comes at the expense of physical activity. Excessive TV watching and small screen recreation tends to reduce the time available for physical activity and increase the time spent being sedentary. These prolonged periods of being inactive are associated with an increased risk of overweight and obesity.

Inquiry

Technology and my health

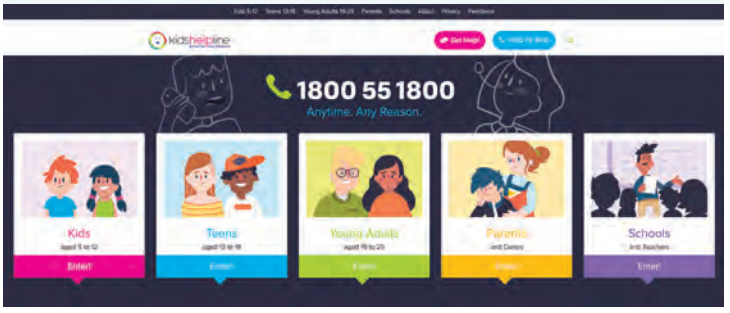
Australia's Physical Activity and Sedentary Behaviour Guidelines for Young People advise that no more than two hours a day should be spent using electronic media for entertainment. Calculate the amount of time you usually spend each day using small screen recreation and compare this to the guidelines. Use the results of this comparison to discuss the impact that your use of technology during leisure time could have on your health.

Advances in technology have helped address some problems associated with living in rural and remote areas, particularly the distance involved in accessing health services and the scarcity of health resources available. The increasing use of electronic devices and improved access to the internet has provided people in rural and remote areas with greater access to accurate health information that can support improvements in their knowledge and awareness of health issues. It has also helped medical professionals working in remote locations keep up to date with the latest research and advances, without having to leave their practice to attend training and professional development.

Texting, instant messaging and other internet-based communication platforms have reduced people's sense of isolation by allowing them to keep in touch easily and cheaply. This technology also allows doctors in remote locations to quickly and easily communicate with patients and consult with health-care providers in different locations, thereby reducing the time and travel needed to access health care. The development of scanners and digital imaging technology has also reduced the time people are required to spend away from their work and family. Images are sent to remote locations for interpretation, instead of the person having to stay in larger cities and towns while they are diagnosed.

Improvements in mobile phone and broadband coverage have also provided people in rural and remote areas with greater access to health services and reduced the time taken to get medical help. The Royal Flying Doctor Service of Australia reports that the remote consultations it provides are now primarily conducted via phone and video-conferencing rather than radio. The portable nature of mobiles means that medical assistance can be accessed faster in emergency situations.

FIGURE 2.20 The internet allows people to access help in a confidential and anonymous way.



Web-based services, such as eheadspace and ReachOut.com have also allowed people to access online health care and support when services may not be available in their local area, at any time of day or when people feel more comfortable maintaining their anonymity. Mobile phone apps are another technology based source of information and tools to support good health. The availability of these free, private services gives people a safe and confidential way of discussing issues affecting their health, accessing support and developing self-help strategies.

A number of difficulties still exist that limit or prevent the effective use of technology to support people's health. Lack of infrastructure, particularly in rural and remote areas, can restrict people's access to fast and reliable technology. The cost involved in purchasing a mobile phone, electronic device or personal computer and associated software and connection fees can be unaffordable for some people, particularly those who are most financially disadvantaged. Computer illiteracy and reduced access to support services such as technical support and repairs can also limit the usefulness of technology for those who live in rural and remote communities.

Climate change

Global warming and the depletion of the ozone layer could potentially bring about further health concerns in the future. A love of outdoor activities, particularly those based around water, coupled with already high levels of UV radiation in Australia is likely to see increasing incidence of sunburn as **ozone depletion** brings about further increases in UV radiation. Research has also predicted that rises in temperatures in the future will be accompanied by an increasing number of deaths from heat-related illnesses, with anywhere between 8000 and 15 000 people per year predicted to die by 2100 (Woodruff et al. 2005).

Tobacco smoke

Tobacco smoke is a form of environmental pollution that has a particular effect on people's health. Tobacco smoke can be inhaled from both the end of a burning cigarette and from the smoke exhaled by the person smoking. Commonly called passive smoking, the inhalation of this **environmental tobacco smoke** leads to numerous harmful health effects on people who are exposed to it, including increased risk of respiratory disease and cardiovascular disease, decreased lung function and increased incidence and severity of asthma attacks. Government legislation has banned smoking in most indoor buildings and areas such as pubs, restaurants, public transport and sporting venues, thereby reducing the risks people face from environmental tobacco smoke. However, smoking inside homes and cars can still place people at risk from passive smoking, with the health of babies and young children particularly affected.

FIGURE 2.21 Concerns about environmental tobacco smoke has led to smoking being banned in many public places.

Application

Impact of the determinants on people's health

Create a table like the one below.

Consider how each determinant can have a positive and/or negative influence on a person's health. Make a specific point about how each determinant can influence health, and support your point with a clear example.

An example has been provided for genetics to demonstrate the detail needed to ensure your information and examples are clear.

Determinants of health		Positive	Negative
Individual factors	Genetics	• Genes can provide people with potential in terms of their physical abilities and intellectual capacity. This can increase their chances of successful sporting participation and academic success (e.g. children of professional athletes often become good athletes themselves).	• Various genetic disorders can be passed on at birth. These can lead to chronic ill health and lower life expectancy (e.g. Down Syndrome and muscular dystrophy). • Certain diseases are genetically linked and can run in the family. This makes those with a family history of such diseases more likely to develop these diseases (e.g. heart disease, breast cancer, asthma and diabetes).

(*Continued*)

Determinants of health		Positive	Negative
	Attitudes		
	Knowledge and skills		
Sociocultural factors	Family		
	Peers		
	Media		
	Religion		
	Culture		
Sociocultural factors	Education		
	Employment		
	Income		
Environmental factors	Geographic location		
	Access to health services		
	Access to technology		

SNAPSHOT

GPs failing to help obese patients lose weight after mistaking low health literacy for laziness, new research finds

By David Taylor

GPs are failing to help obese Australians lose weight because they are mistaking low levels of health literacy with a lack of motivation, according to new research.

The University of New South Wales researchers found that one in five Australians simply do not understand how to lose weight and GPs need to do more in the battle against Australia's obesity epidemic.

But fitness experts argue it is unfair to target doctors who do not have the time to effectively treat many of the underlying problems of obesity.

The UNSW researchers examined how GPs and practice nurses managed overweight and obese patients with low health literacy in 20 practices in Sydney and Adelaide.

The study found only a few of the 61 health staff surveyed reported assessing a patient's health literacy.

Australians have trouble understanding how to lose weight

Around 14 million Australians are overweight or obese, according to Monash University, and Emily Jackson from Perth is one such person who struggled with weight loss for years.

After following an intensive training program, she now has a healthy body mass index.

'It's incredibly hard but after a few months of being really, really intensive with my eating and with my exercise, it's just become second nature,' Ms Jackson said.

Ms Jackson sought the help of a full-time trainer for her weight problem, rather than a general practitioner.

'GPs tend to strike me, or the ones that I see, they tend to strike me as not necessarily fit people,' Ms Jackson said.

'Yes, they have an understanding about nutrition but that's only a very small part of what goes into a weight loss journey.'

Academics say GPs have a responsibility to effectively communicate with people about how to lose weight.

'The real issue is in terms of effectively communicating what to do about it,' said Professor Mark Harris, the director of the Centre for Primary Health Care at the University of New South Wales.

He said many Australians who struggled with obesity often had trouble understanding how to effectively lose weight.

'It's more how to deliver it to a patient who perhaps is from a low educational background or ... they're from another language group,' he said.

Professor Harris said that around three in five Australians were not as aware as they could be about how they could effectively lose weight, and one in five Australians actually had low health literacy.

GPs don't have time to talk about weight loss

Fitness experts say tackling obesity is far too big a problem for GPs to fix.

Personal trainer Marnie Ross spends her days helping and educating people on how to be healthier.

'You've got your fast food restaurants all over the place, you've got chocolate bars at the counter when you're checking out, it's just in your face all the time,' Ms Ross said.

'So people that don't have that self-control and they have that addiction to food, [they] can grab-and-go anytime.'

Professor Harris argues that it is a medical problem and that it needs to be discussed in the clinic.

'The GP needs to ask patients what they've understood but not as a test of the patient but a test of the GP's ability to explain that,' Professor Harris said.

Ms Ross argues there is simply not enough time during a standard consultation with a GP to effectively discuss how to lose weight.

'If they only have a very short period of time to speak with a patient, you're not going to get results from that,' she said.

Professor Harris is currently assessing how the National Health and Medical Research Council guidelines can be best incorporated into GP practices.

Source: ABC News, www.abc.net.au/news/2015-07-31/australians-have-low-health-literacy-and-gps-must-lift-their-ga/6663192.

Application

The impact of health literacy on people's health and behaviours

Read the snapshot 'GPs failing to help obese patients lose weight after mistaking low health literacy for laziness, new research finds' and then complete the following.

1. Using examples from the article, explain how a combination of various determinants affect a person's ability to lose weight.
2. Which other determinants not mentioned in the article could also influence people's ability to lose weight? Using examples, explain how.
3. Doctors and personal trainers were two groups highlighted in the article who can help people wanting to lose weight. Which groups would find it harder to access their support? Give reasons why.

2.2 The degree of control individuals can exert over their health

Many of the health problems that are currently prevalent in Australia are linked to the decisions people make about their health and the lifestyle that they lead. However, a person's level of health is not solely determined by their individual choices. Nor does everyone have the same opportunity to easily make and carry out decisions that will improve their health. A range of social, economic, environmental and individual factors, which are often interrelated, all exert a considerable influence over the health choices we make and our chances of being healthy. People with economic, social and educational resources are in a better position to take action

to promote their health than those who do not have access to these resources. If we have power and status within our social situation, we feel a greater sense of control over our life so are more likely to take action to improve it. Therefore the degree of control that we are able to exert over our health depends on the degree to which we can control or modify these influences.

Not all Australians are able to exert the same degree of control over their health, which has resulted in **inequalities** arising in the health status of particular population groups. Those who experience considerable disadvantage, such as Aboriginal and Torres Strait Islanders, people from low socioeconomic groups and people living in rural and remote areas, find it hardest to exert any influence over the things that determine health, therefore they are likely to face the greatest difficulties looking after their health.

2.2.1 Modifiable and non-modifiable health determinants

Health determinants can be classified as modifiable or non-modifiable, depending on the degree to which they can be changed, influenced or controlled by the individual.

Modifiable health determinants

Modifiable health determinants are those determinants that can be changed or controlled so they have a different level of influence on our health. Our ability to modify particular determinants of health and change our health behaviours depends on the sense of control or empowerment we feel we have over our lives. Control over our health increases when we believe we can:

- acquire information
- make choices
- manage a situation that may be threatening
- use the skills we possess.

The mutual relationship between the individual and their social and economic circumstances is central to the control we are likely to exert over our health. Being in a position of *socioeconomic advantage* provides us access to physical and social resources such as education, money and health services that can make our life better. This access contributes to our sense of empowerment. People who feel in control of their lives are more likely to take control of their health. For some people, modifying the socioeconomic determinants that influence their health, such as education, employment and income, can be difficult. Their sense of empowerment and overall outlook on life can help them to overcome barriers created by their socioeconomic conditions and change their health behaviours.

One of the most important factors that allows us to take control of our health is our sense of *self-efficacy*. As explained, self-efficacy refers to our belief in our ability to bring about change. The stronger our self-efficacy, the greater our levels of perseverance and persistence and feelings of control. If we have low self-efficacy we are more likely to feel powerless and produce negative self-evaluations that can lead to lower self-esteem.

The *health knowledge and skills* that people possess is one area that can be modified to enable them to assert greater control over their health. Reliable and accurate information on issues such as how to prepare healthy meals, or ways to increase our level of activity is often available in places such as doctors' surgeries, local newspapers and on the internet.

Many health organisations offer information in the form of pamphlets, websites or public forums to enable people to improve their knowledge of particular health issues. For example, the Family Planning Association website contains a range of fact sheets on contraception, sexually transmitted infections and other sexual health matters. These organisations can also support the development of skills. For example, the Quitnow website offers information and suggestions on how to effectively quit smoking and provides various online tools and resources such as Quitcoach and My QuitBuddy app, and access to services such as the Quitline that support people wanting to stop smoking. The provision of this information and support can allow people to gain a deeper understanding of issues that may affect their health and develop strategies to enable them to be successful in quitting.

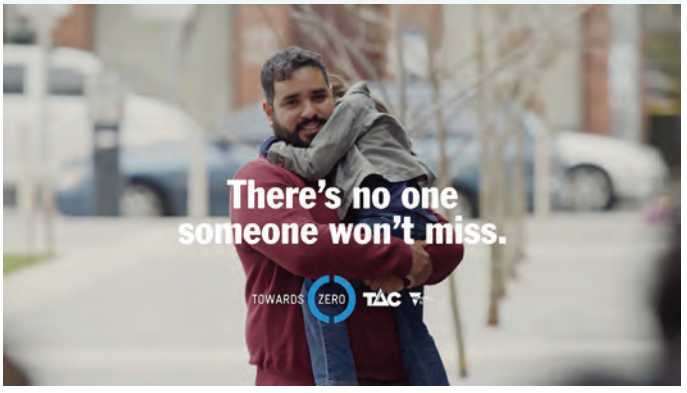
FIGURE 2.22 Websites developed by health organisations enable people to acquire knowledge and skills in order to modify their lifestyle and improve their health.

However, the degree to which people can improve their knowledge varies. Not everyone will have the literacy required to be able to understand the information available, or to determine which information is credible and reliable. Nor will everyone have the same level of access to this information. Groups who experience the most disadvantage, such as the long-term unemployed, homeless or some Indigenous people, are likely to find it most difficult to improve their health knowledge and skills due to their isolation from the community and their education level.

People also need to possess an *interest or desire* to improve their health knowledge and skills in order for this to occur. Health is not always the central consideration when people make decisions; it is just one of a range of factors. For many people, the long-term consideration of health often takes a very distant second place to the immediate demands and pressures of daily survival. Others may be unaware of the risks present in their environment or the harms linked to their current lifestyle, so are not looking to learn more about their health and how it can be improved. A variety of barriers therefore exist that hamper people's ability to change their knowledge and skills.

People's *attitudes* to health are another determinant that may be modified. Different experiences and events during our lifetime, such as being diagnosed with skin cancer or losing a friend in a road crash, may lead to a change in our health attitudes. Health promotion campaigns are a commonly used strategy that seek to change people's attitudes and challenge their beliefs. An example is the Towards Zero road safety campaign which aims to highlight the human element of the road toll, encourage road users to change how they think about road safety and remind drivers of their responsibilities when behind the wheel in order for the target of a zero road toll to be achieved.

FIGURE 2.23 Road safety campaigns seek to challenge unsafe attitudes and behaviours in order to reduce road injuries and fatalities.



Inquiry

Road safety

Explore the recent Towards Zero safety campaign that aims to challenge people's acceptance of road crashes and convey the human cost of the road toll. You may use the **Centre for Road Safety** and **Towards Zero** weblinks in the Resources tab to read about the campaign and watch video clips that are part of the campaign.

1. Identify the aims of the campaign.
2. Outline why the campaign was considered necessary.
3. Identify the determinants targeted in the campaign. Discuss how the campaign seeks to modify the influence of these determinants in order to reduce the road toll.
4. Do you think the campaign is likely to effectively modify the influence of these determinants? Give reasons for your opinion.

on Resources

Weblink: Centre for Road Safety
Weblink: Towards Zero

The likelihood that individuals will change their attitudes and thereby improve their health varies according to a number of factors. A person's self-efficacy has a significant influence on the likelihood of change occurring because it affects their beliefs about whether they are capable of behaving differently. For example, a person who thinks that they are hopeless at sport will find it difficult to increase their level of participation unless they believe that practice and ongoing involvement will help them improve.

An individual is also more likely to change their attitudes when they can recognise there are significant benefits from doing so. The support of others, particularly those closest to us, is another crucial factor in the likelihood of changes in attitude occurring. For example, someone who is overweight is more likely to seek to lose weight if others encourage and support them, and if they recognise how much healthier they will feel as a result.

A person's age may also affect their likelihood of changing attitudes. The need to feel that they 'fit in' or belong may make it difficult for young people to change their attitudes if these attitudes are markedly different from those of their peers. Attitudes and beliefs about health-related matters may also become more fixed as people age, making them reluctant to change their health behaviours.

Community attitudes, which are strongly influenced by particular aspects of society such as the media, religious beliefs and cultural expectations, are outside our direct control. However, we do have control over the extent to which we are influenced by those around us, such as our families and peers, and the extent to which we conform to stereotypes or expectations. We are able to hold different beliefs to those commonly held by our peers or by the community and we can choose to behave differently from others. We may also choose to challenge particular views, behaviours or decisions in an effort to change attitudes that may be limiting good health. For example, we could start a social media campaign to discourage online bullying and trolling, or advocate for a ban on excessively thin models featuring in magazines and fashion shows.

Attempting to challenge the attitudes, values and behaviours of families is particularly difficult for children and young people as it is often not appropriate for them to challenge the health-related decisions of their parents. It is also unlikely that they would have the confidence, assertiveness and communication skills necessary to do so or a sufficient level of knowledge to recognise possible concerns associated with particular attitudes and behaviours. As we become older it may become easier to challenge particular attitudes or make our own choices, independent of the beliefs or decisions of our families.

Non-modifiable health determinants

Non-modifiable health determinants are determinants that cannot be changed or altered. The only factors that might be seen as non-modifiable determinants of health are genetics or heredity and some environmental factors.

Genetics

The genetic material we receive from our parents can pass on certain health conditions, increase our susceptibility to particular illnesses or see us inherit characteristics that can affect our health. This genetic material cannot be altered, although tests for certain conditions such as Down syndrome can be performed prior to conception or during pregnancy. Progress in the treatment of particular genetic conditions has meant that people born with conditions that used to be life-threatening, such as haemophilia, can generally now lead healthy, normal lives. People with a family history of a particular illness such as breast cancer can also undergo monitoring, screening and surgery before any symptoms are detected in an effort to reduce the risk of cancer developing.

Environmental factors

Where and how people live is, in most cases, dictated by what people can afford, where they work and what facilities are provided for them in these places, meaning that environmental factors are largely non-modifiable. People who live in rural and remote areas have little control over the limited health services that are available, the sparse infrastructure, the occupational health hazards that are present, the social isolation that exists or the natural disasters that occur.

FIGURE 2.24 Individuals have little control over the level of pollution present in their local environment.

Similarly, people living in areas surrounded by heavy industry or high volumes of traffic have little control over the levels of air pollution that may be present in their environment. While it is possible for individuals to take precautions to reduce some risks, such as staying indoors when high levels of pollution are present, these measures do not remove long-term risks.

Individuals may also seek to modify aspects of their environment by lobbying governments for increased expenditure for health services or tighter controls on factory emissions. This is more likely to occur when people have high levels of knowledge and feel empowered to initiate change. However, the fact that poor environmental conditions generally exist in areas of lower socioeconomic status means that people may not have sufficient knowledge, skills and self-efficacy to take effective political action.

SNAPSHOT

Obesity and urban sprawl: Is life in the outer suburbs making us fatter, sicker?

By Sarah Collard

Australia's ever-expanding cities have been linked to weight gain and chronic illnesses, sparking calls for a more integrated approach to designing healthy neighbourhoods.

Researchers from Australian Catholic University's Institute for Health and Ageing examined how neighbourhoods could make healthier residents by focusing on everyday activities like heading to work and shopping.

They found people in outer suburban areas gained weight faster than those in inner-city neighbourhoods, and suggested it could be linked to a greater dependency on cars.

Experts are now calling for Australia to reconsider its urban development plan to build healthier, more active cities, with a focus on public transport and higher density living.

'We tracked more than 2000 adults living in urban and suburban areas of Adelaide and measured their waist circumference twice over four years,' lead researcher Takemi Sugiyama said.

'What we found was that weight gain was not evenly distributed.'

'Our daily behaviours, such as commuting to work and shopping, can contribute to obesity over time ... and people living in outer suburbs tend to rely on cars and are much more sedentary for these daily tasks.

'In contrast, people living in inner city areas appear to be more active, maybe because they have more transportation options and shops are closer.'

Promoting 'more active lifestyles'

Professor Sugiyama said governments, urban planners and health sectors needed to work together to create healthier neighbourhoods.

'It's about creating compact residential and commercial areas around transportation hubs to allow for more active lifestyles for residents,' he said.

'We have to start thinking about urban sprawl and the negative health impacts because it can have serious implications in the next decade.

'Obesity is going to increase if people live in outer suburbs, and obesity is a major risk factor for chronic conditions such as heart disease, diabetes and cancers.'

Better public transport needed

Creating reliable, fast and well-integrated public transport systems was one way to reduce Australia's stranglehold on cars, researchers said.

Cities in Japan and Europe actively encourage public transport and create suburbs and transport options to support active living.

'Tokyo is a good example of a very good transportation network — people don't need a car to get to places. And most European cities have good transport options, and some cities discourage car use through congestion surcharges,' Professor Sugiyama said.

'Obviously you need a reasonably dense population, but Australia does need to start thinking about urban sprawl and its negative health impacts.'

Source: ABC News, www.abc.net.au/news/2017-03-07/urban-sprawl-contributing-to-obesity-problem-study-suggests/8331548.

Inquiry

Modifying levels of physical activity

1. Use the information provided in the snapshot 'Obesity and urban sprawl: Is life in the outer suburbs making us fatter, sicker?' to discuss why it is more difficult for people in outer suburban areas to modify their physical activity levels compared to those in inner city areas.
2. Outline the role of government, urban planners and health sectors in helping to improve the health of communities.

SNAPSHOT

Climate change will widen the social and health gap

By Sharon Friel, Australian National University

Climate projections suggest that, thanks to human activity, we will likely see an increase in extreme weather events, disruptions to agriculture, loss of livelihoods and displacement of people.

While everyone will be affected, these climate impacts will exacerbate social and health inequities, depending on underlying economic, geographic, social and health status.

Recently there's been increasing attention on climate change and health, including calls from Australian scientists, led by Professor Peter Doherty, for the government to put climate change on the G20 agenda.

My research focuses on social inequality, and how that might exacerbate climate change's impact on health inequalities, including vulnerability to extreme weather and rising food prices. I presented some of the latest research on this topic at a recent Australian Academy of Science symposium on climate and health.

Inequities of man-made natural disasters

Low-lying cities and towns near coasts are facing increased risks from more frequent and more intense cyclones. These storms can generate storm surges causing flooding, direct injury and damage to infrastructure, including housing, water and sanitation systems.

Poorer households are usually at higher direct health risk due to weaker structures, less safe locations and building sites, and the weaker resilience of infrastructure in poorer cities and towns to withstand damage.

At the end of 2013, the Philippines were hit by devastating super typhoon Haiyan, which affected 16 million people. 6069 people were reported dead while 4.1 million people were displaced, with 1.1 million houses damaged or destroyed. While everyone was touched by the typhoon, large income inequalities meant that poorer people not only lived in poorer quality housing, they were also more likely to be living on cheaper land in vulnerable low-lying regions.

Poorer households also often lack the economic resources to evacuate in the face of climate-related disasters, or to rebuild. The flooding of New Orleans in 2005 gave a striking example of what can happen among socially disadvantaged communities. Elderly patients in homes and poor people could not evacuate in front of the storm because of lack of transport.

We see similar issues with heatwaves. Lower socioeconomic and minority ethnic groups are more likely to live and work in warmer neighbourhoods and in buildings that are poorly ventilated and absorb heat. This increases the risk of heat stress and heat deaths.

Poor neighbourhoods with weak infrastructure, buildings and unplanned developments with little green spaces are likely to be more exposed to high temperatures compared to more affluent neighbourhoods.

Impacts on agriculture

Our agricultural systems are also under threat. Increasing drought periods in Australia may challenge the viability of agriculture in some regions, and hence those communities that depend on primary production. This will affect people's income, stress levels and sense of hope.

In 2003 bushfires ravaged eastern Victoria, destroying more than 40 homes and killing thousands of cattle. But the bushfires exacerbated problems already present in the community, typical of other rural Australian communities. Economic and climate pressures on rural farming communities have created financial hardship, led to closures in local businesses, and young people moving away.

This has transformed the social landscape and support that is often present within rural communities. These factors we know have real implications for mental health and may increase risk of suicidal thoughts.

Climate change also exacerbates food insecurity. Modelling estimates suggest that between 2005 and 2007 there was a 33 per cent increase in the price of vegetables and a 43 per cent increase in fruit prices in Australia because of the drought and extreme weather events.

Rising food prices most affect the poor — as a proportion of total household expenditure, food makes up an average of around 19 per cent. But, with 12 per cent of Australians living below the poverty line, these average figures hide some of the food security difficulties many Australians face.

Climate pressures will widen the food gap between those able to maintain a healthy diet of fresh produce, fish, lean meat and so on, and those needing to find the cheapest sources of calories. Cheap calories are found in the most highly processed, long shelf-life products, containing hardened fats and bulk starches, preserved with sugar or salt.

Source: Extract from The Conversation, 15 August 2014.

Inquiry

Climate change and health

Read the snapshot 'Climate change will widen the social and health gap' and then complete the following.

1. Summarise how weather events exacerbated by climate change are predicted to affect health.
2. Explain why the health of Indigenous people and low socioeconomic groups is more at risk from climate change than that of high socioeconomic groups.
3. Discuss to what extent people are likely to have control over their health if the predictions of health experts prove to be correct.

2.2.2 Changing influence of determinants through different life stages

The level of influence that the various determinants have on our health will not always be the same. At different times in our lives certain determinants may have a greater or lesser influence on our health status and health decisions. Babies and young children have minimal direct control over the various determinants as they rely on their parents or caregivers to look after their health and wellbeing. Factors relating to their families such as their socioeconomic status and geographic location, along with the decisions made by their parents, will largely determine a child's health in their early years of life.

As we get older and start interacting with others beyond our immediate family, other sociocultural influences such as the media can start to have a significant influence on our health. Even at a young age the media is able to exert a powerful influence over things such as children's eating habits and choices. Concerns that advertising of fast food contributes to increased consumption of these foods has prompted debate about whether restrictions should be placed on advertising these products during children's television programs.

Celebrities such as models, movie stars and singers feature heavily in types of media popular among young people (for example, social networking sites like Instagram, Facebook and Snapchat), so their behaviour, attitudes and appearance can have a significant influence on the health-related values, decisions and behaviour of adolescents, although this influence may occur subconsciously. As we become older our health literacy skills and knowledge generally improve, assisting us to question the credibility and reliability of information and be more critical of media images. Life experiences may also see us increasingly question the information and messages communicated through the media, thus reducing the extent of its influence.

FIGURE 2.25 The media can have a powerful influence on the knowledge and attitudes that children develop.

Feeling a sense of belonging with their peers is important for a young person's identity and emotional well-being, so peers commonly have a strong influence on health during adolescence. Social pressures to behave in particular ways or to conform to certain expectations may lead some young people to experiment and take risks in relation to their health that can impact on their immediate and longer term well-being. For example, they may experiment with drugs, drive in a fast, dangerous manner, or participate in various sexual activities. Statistics regarding these behaviours show that the incidence and frequency of these behaviours decreases as people move through adulthood, suggesting a change in the influence of various determinants.

Application

Changing patterns of drug use at different life stages

Use the **National Drug Strategy household survey** weblink in the Resources tab to investigate changing patterns of drug use.

1. Investigate one of the following drugs:
   - tobacco
   - alcohol
   - ecstasy
   - cannabis

   You may also examine table 2.3 and figure 2.26 below showing a comparison of recent use of these drugs by different age groups.
2. Looking at the findings from the 2016 survey, identify the percentage of people in the different age groups who indicated they used tobacco daily, consumed alcohol at very high levels, or recently used cannabis or ecstasy. Present your findings as a line graph. Create separate line graphs to show use by males, females and all people.
3. Discuss how:
   (a) use of this drug may have been influenced by the various determinants
   (b) changes in the influence of these determinants may account for the patterns of use that are shown in your graph.

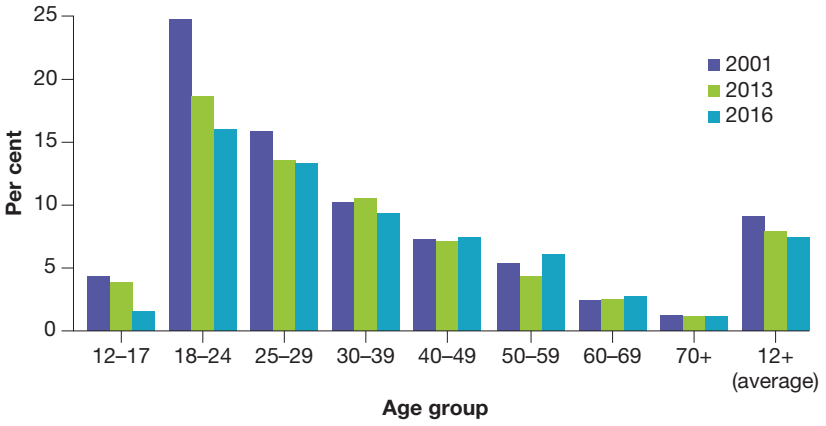
TABLE 2.3 Proportion and per cent change of people smoking daily, by age and sex, 2001, 2013 and 2016

	Males				Females			
Age group	2001	2013	2016	Per cent change since 2001	2001	2013	2016	Per cent change since 2001
12–17	n.a.	4.0	1.6	n.a.	n.a.	2.8	1.3	n.a.
18–24	24.5	14.0	12.3	–50 per cent	23.5	12.7	10.8	–54 per cent
25–29	30.9	17.3	19.3	–38 per cent	23.0	15.0	12.2	–47 per cent
30–39	26.9	17.1	17.0	–37 per cent	24.2	10.3	11.1	–54 per cent
40–49	23.4	17.9	19.1	–18 per cent	20.6	14.5	14.8	–28 per cent
50–59	20.1	16.7	14.4	–28 per cent	16.0	13.4	14.1	–12 per cent
60–69	12.7	12.9	11.5	–9.4 per cent	10.1	10.3	9.2	–8.9 per cent
70+	7.0	6.6	7.3	4.2 per cent	4.6	5.2	4.9	6.5 per cent
14+	20.9	14.5	13.8	–34 per cent	17.9	11.2	10.7	–40 per cent
18+	21.8	15.1	14.6	–33 per cent	18.3	11.6	11.2	–39 per cent

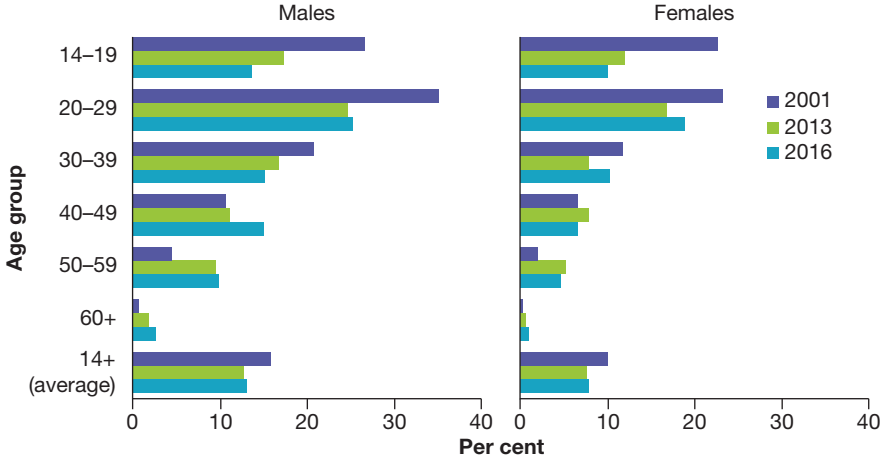
Note: The 2001 survey did not include 12–13-year-olds.
Source: Australian Institute of Health and Welfare, *National Drug Strategy household survey 2016: Detailed findings*, chapter 3, table T3.1, p. 22.

FIGURE 2.26 Changing patterns of drug use at different life stages

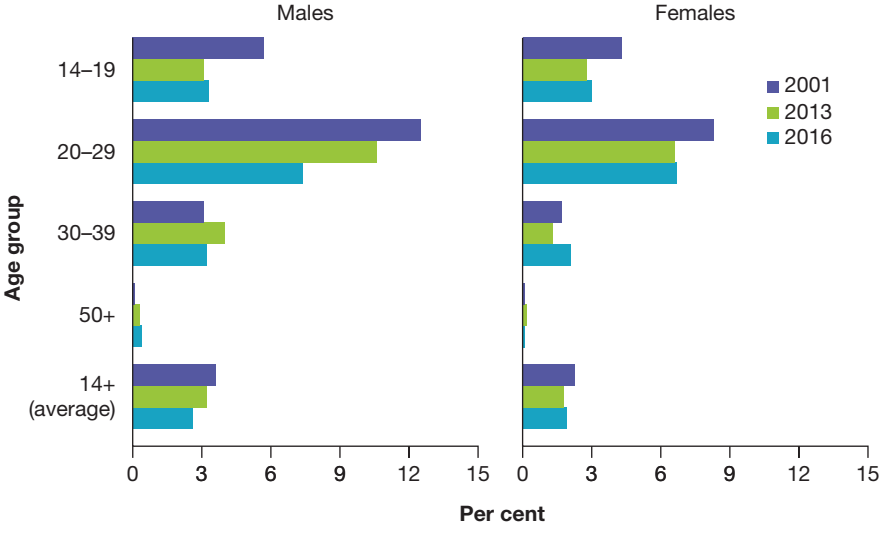
(a) Consumption of 11 or more standard drinks at least monthly, by age, people aged 12 or older, 2010–16 (%)



(b) Recent use of cannabis, by age and sex, 2001, 2013 and 2016 (%)



(c) Recent use of ecstasy, by age and sex, 2001, 2013 and 2016 (%)



Source: Australian Institute of Health and Welfare, *National Drug Strategy household survey 2016: Detailed finding,* pp. 41 (fig. 4.5), 62 (fig. 5.7) and 66 (fig. 5.9).

on Resources

Weblink: National Drug Strategy household survey

Changes in values and priorities may also play a role in the changing health attitudes, decisions and behaviours evident in these statistics. These changes may come about for a number of reasons, including:

- biological changes to the brain. Adolescence is a stage of life when brain development and reshaping continues to occur, affecting young people's decision making and behaviour. Recent research has shown that full brain development does not occur until the mid 20s. The prefrontal cortex, the section of the brain responsible for planning, complex problem-solving, weighing up consequences and making judgements, is the final part of the brain to develop. At the same time the area of the brain that seeks pleasure and reward, the nucleus accumbens, is well developed. This means that young people have a heightened need for thrills and excitement, resulting in risky, impulsive choices being made, particularly when these choices have a strong emotional reward such as peer acceptance. This research suggests that after the age of 25, when the prefrontal cortex has matured, people are less likely to participate in high-risk behaviours.
- greater emotional maturity and a stronger personal identity. During adolescence young people seek to establish identity and independence. As they clarify their personal beliefs and develop a stronger sense of who they are, young people may feel more comfortable asserting beliefs that are different from **social norms**.
- greater personal responsibilities. In adulthood people tend to take on financial responsibilities such as loans, mortgages, rent or car ownership that can change the lifestyle patterns and decisions of young people. They may also become involved in long-term, committed relationships and start their own families, which may bring about changes to their behaviour in relation to things such as tobacco smoking and speeding.

FIGURE 2.27 Changing priorities and responsibilities, such as raising a family, can modify our health decisions and attitudes.

- different social networks. The opportunity to mix with a variety of age groups and people from different backgrounds while working or studying may expose young people to different attitudes and values than those held by their peers and communities. This may also contribute to a change in their beliefs.

These various factors, either individually or in combination, may see a person modify their attitudes and their behaviour as they move through adolescence into adulthood.

Genetics may have an influence on a person's health at any point in their lives, depending on what characteristics or condition has been passed on from the parents. Certain inherited health problems, such as cystic fibrosis, may become apparent early in a child's development and start having a negative effect on their health. Other health problems linked to genetics, such as breast cancer or schizophrenia, may not have an effect on a person's health until some point during their adult life, if at all.

Geographic location may be a more significant determinant of health as we become older, especially for those located in rural and remote areas. This is because health services and personnel may need to be used more frequently, however accessing the appropriate services, particularly those involving specialised treatment, may be difficult for those living outside metropolitan regions.

CASE STUDY

Control of the determinants of health

Paul is a year 12 student who lives with his parents on a property in a small rural community in New South Wales. His two older brothers have left home and moved to larger centres to find work. They used to help Paul's family run the property but several years of drought have meant that the farm is generating little income. The family has been struggling financially as a result. This has placed a great deal of stress and strain on all members of the family.

Last year, Paul's father had a minor heart attack. The doctors said stress, along with excessive weight and a family history of heart disease, were the reasons for his father's heart attack.

Paul now helps his father as much as he can on weekends and when he gets home from school. This means he has less time for schoolwork, but he knows his father can't do it on his own and he feels a strong sense of responsibility to support his family.

Paul has thought about quitting school and working full-time on the property. He has stopped playing football for the school and on weekends so that he has more time available to help. It also helps save money as the cost of travelling to games and paying registration fees was adding to the family's financial stress.

Since Paul quit football he has put on some weight. He also feels isolated as he rarely gets to spend time with his mates since he quit sport. His parents encourage him to catch up with his friends but Paul feels so tired that he can't be bothered.

Application

Determining how much control we have over our health

Read the case study above and answer the following questions.

1. Explain the impact of the various determinants on Paul's health.
2. Identify the determinants impacting on Paul's health that are:
   (a) modifiable
   (b) non-modifiable.
3. Use your lists from question 2 to assess the degree of control that Paul has over his health.
4. Propose actions that Paul could take that would allow him to gain greater control over his health.
5. Think five years ahead into the future. Discuss whether the determinants are likely to have the same level of influence on Paul's health. Give reasons for your responses.

2.3 Health as a social construct

It is clear that people's ability to achieve good health varies according to:

- factors present within their environments, and
- the positive or negative impacts that these factors have on health.

The recognition that individuals do not have complete control over their own health has contributed to an acceptance that health is a **social construct**. In other words, a person's health behaviours and health status are significantly determined by factors relating to the social, physical and cultural environment in which they live.

Recognising health as a social construct helps us to explain why some individuals or groups experience better or worse health than others. It also allows us to understand why improving the health status of particular groups within the community can be a complex and prolonged process.

2.3.1 The interrelationship of determinants

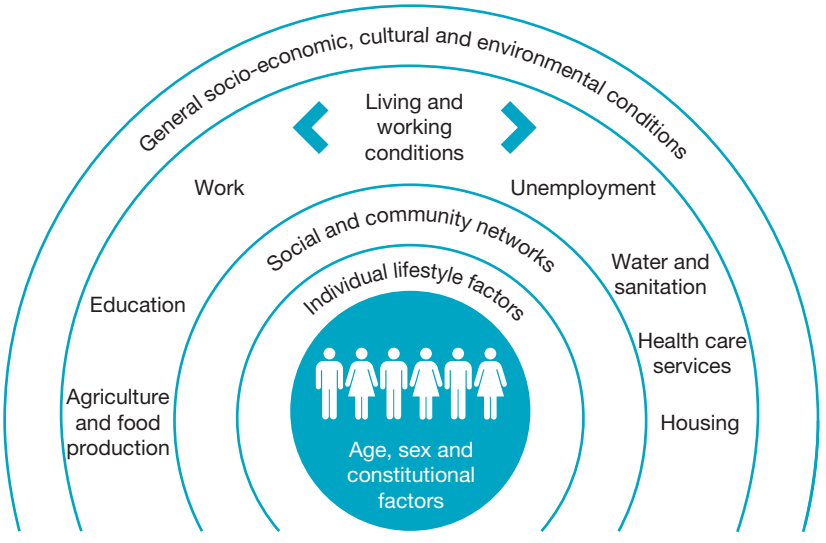
Viewing health as a social construct acknowledges that a variety of social, cultural, economic and environmental factors have a significant influence on an individual's health. It recognises that the impact of these factors on people's lifestyle and health behaviour does not occur in isolation, but in an interrelated way. The conceptual framework for determinants of health shown in figure 2.28 demonstrates how various socioeconomic, sociocultural and environmental conditions work inwardly to affect the health of individuals and communities.

Evidence showing how various determinants of health relate to and influence other determinants can be seen in the data that is regularly collected on the health status of Australians. These statistics show that groups that commonly suffer poorer levels of health often experience a higher number of negative health determinants in their lives. For example, Aboriginal and Torres Strait Islander peoples, who suffer much more ill health than other Australians, are most likely to:

- be in the most disadvantaged socioeconomic group
- have poorer levels of educational achievement
- have higher rates of unemployment
- work in lower paid occupations, where they experience less secure employment and lower levels of job satisfaction
- live and work in the most hazardous environments where they are exposed to higher levels of risk
- have greater difficulties accessing appropriate health services, resources and support
- have lower rates of home ownership and live in households and communities that have inadequate housing, are overcrowded, have poorer transport and lower levels of social cohesion
- have a lower sense of control, power and opportunity
- have more risk factors for ill health such as smoking, alcohol consumption, obesity and high blood pressure present in their lives.

Understanding the relationship between the various health determinants highlights the difficulties individuals can face trying to exercise control over their own health. It demonstrates the role that governments and communities need to play in addressing the broad range of social, cultural and economic factors that impact on people's health. It also emphasises the importance of collaborative and targeted approaches being taken by government agencies, non-government organisations and local communities in order to bring about significant and sustainable changes.

FIGURE 2.28 A framework for the determinants of health



Source: Dahlgren G. & Whitehead M. 1991, *Policies and Strategies to Promote Social Equity in Health*, Stockholm, Sweden: Institute for Futures Studies.

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

Health was previously seen as being solely an individual's responsibility, with each person expected to control and manage their own health by making good choices. Prescribing to this individual view of health meant that poor levels of health were the fault of the individual, through 'bad' choices, a lack of motivation, a lack of willpower or a combination of all three. However, this view of health failed to acknowledge that health is socially constructed.

Enjoying a good standard of health is a fundamental right of all Australians. As we have learned, not all the determinants that affect people's health can be easily modified by individuals to enable them to reach their health potential. This makes health more than just an individual responsibility. Governments and the communities in which we live both have a major responsibility to provide people with the opportunity to achieve the highest standard of health possible.

Bringing about improvements in people's health requires more than simply informing people of health risks and encouraging them to make better health choices. Having sufficient health knowledge does not mean that a person will automatically choose behaviours that will lead to better health because they know it will be good for them. For individuals to change their health decisions and behaviours, the social and environmental forces that impact on these decisions and behaviours must first change to make good health choices easy to make.

Addressing social, economic and environmental factors that contribute to poor health requires action from all levels of government, along with different community groups. This action needs to involve a range of sectors working together, including health, housing, employment, education and community services. It is only through this type of collective approach that the key social, economic and environmental determinants that affect health are likely to improve. These key principles were first acknowledged and agreed to with the signing of the Ottawa Charter for Health Promotion, which is discussed in topic 3.

SNAPSHOT

Understanding what really makes us sick

By Bianca Nogrady

The lifestyle choices you make, such as diet, exercise and smoking, have a huge impact on your health. Yet most of us know nothing of the social factors that drive these.

When it comes to healing the sick, we look to doctors. When it comes to preventing us from getting sick in the first place, many say we should look to governments.

That's because the vast majority of our biggest killers, such as heart disease, diabetes, cancer, lung disease and mental illness, are significantly affected by where we live, where we work, our income, our education, our socioeconomic status, and our lifestyle.

These are called the 'social determinants of health' and leading health experts say they impact on our health more than anything else. This is why governments are encouraged to fund preventive health measures and address social issues that affect our health, as well as funding medical research, hospital beds and GP visits.

Social determinants explain why life expectancy in Japan is double that of Sierra Leone, or why Indigenous Australians have a ten-year lower life expectancy than non-Indigenous Australians.

They explain why some chronic diseases and risk factors such as smoking are more common in rural areas than in urban areas; why changes to the minimum wage can have a dramatic downstream impact on health; why education is as important as health care when it comes to our risk of chronic disease; and why poverty kills.

Wealth determines health

'In Australia, wealth determines health,' says Martin Laverty, chair of the Social Determinants of Health Alliance.

'If you're in the lowest socioeconomic group, you will die 3.5 years earlier … than the highest socioeconomic group,' says Laverty, who is also CEO of the Royal Flying Doctor Service.

'More importantly, if you're in the lowest socioeconomic group, you will have upwards of three times the amount of avoidable chronic illness than if you're in the highest group.'

The World Health Organization defines social determinants of health as the conditions in which we are born, grow up, live, work and age, and these 'are shaped by the distribution of money, power and resources at global, national and local levels'.

These are factors such as income, employment status, access to education, access to health care, access to affordable housing, transport, stress, age, and disability.

'The common way of defining social determinants of health is in terms of those sort of system things like housing, employment, income,' says Dr Jennifer May, Clinical Dean of the Peel Clinical School at the University of Newcastle's Department of Rural Health.

'The other way that people sometimes define them is those personal social determinants around disempowerment and marginalisation and being part of a disadvantaged group,' May says.

Impact on risk factors

Social determinants affect your health by impacting on risk factors that can lead to chronic disease and poor health.

'People who are on lower incomes have higher rates of a whole lot of risk factors, be they tobacco, alcohol, substance abuse, obesity, those sorts of things,' she says.

'Poor housing impacts overcrowding, so we see a greater incidence of skin infections and greater impacts of mental health and substance abuse on individuals who live in overcrowded surroundings.'

'Lack of education, the number of people who finish year 10 for instance, impacts directly on health literacy but also would seem to be related to poorer health outcomes generally, so access to employment, et cetera.'

Not only do individual social determinants affect your health, they also interact and amplify each other.

Understanding poverty's impact

Take poverty, for example. Associate Professor Lyndall Strazdins says there is no question poverty is bad for your health and in ways you might not always realise. For instance, it often means people can't buy healthy foods, such as fresh fruit and vegetables. This in turn is associated with increased risk of diseases such as heart disease and some cancers.

'But one of the reasons people are poor is because they tend to have poor health to start with, so you've got a two-way relationship going on there,' says Strazdins, senior fellow at the National Centre for Epidemiology and Population Health, at the Australian National University.

'They feed into each other, so if you complicate or compromise people's health, then they're less able to be socially productive and participating.' This in turn means they are less able to work, and so this leads to continued poverty.

Poverty is also associated with increased rates of smoking, alcohol consumption, and drug dependence.

It is also linked to lower educational attainment, which in itself has devastating health consequences. Laverty cites one US study that found not finishing school had a greater impact on the risk of avoidable heart disease deaths than blood pressure, cholesterol and smoking combined.

Another resource that has a huge impact on our health is time. How many of us talk about being 'time poor', saying there are not enough hours in the day to shop and cook food, or exercise, or even take time to relax?

This is a very modern malaise that can have significant consequences for your health, Strazdins says.

'We give the message that you need to go and get fresh food and cook it more, and find time to exercise, without understanding that for some people that's a very difficult thing for them to do.'

It's also a resource whose shortage often goes hand-in-hand with poverty. It used to be thought that those who were income poor were time rich, but Strazdins says that idea is increasingly being challenged. In the US, where the minimum wage is lower than in Australia, many people are working full-time jobs on a wage that does not provide enough for individuals and families to live on, giving rise to the class of 'working poor'.

Living in rural areas

Where we live also has a major impact on our health, and evidence shows that living in remote or isolated settings puts many of us at a significant health disadvantage.

'There appears to be an additional risk conferred by rurality,' she says, pointing to data suggesting higher rates of smoking in rural communities, even when compared to disadvantaged urban communities. Indigenous Australians living in rural and remote areas are at an even greater health disadvantage than non-indigenous Australians.

Rural communities also have poorer access to health services. May says this has been linked with higher death rates from cancer.

But not all rural living is bad for your health. There appears to be a kind of 'sweet spot' where the disadvantages from rural living are balanced by the advantages of living outside city noise and pollution, and in a smaller, often more connected, community setting.

Bad place to be

Being on the bottom rung when it comes to social determinants of health is a bad place to be, and it can be very difficult to climb out of that trap. The solutions are far harder than treating the end results.

'What happens is we're all good at the Band-Aid end — the treatment end — and we're hopeless as a community about prevention, and looking at the social determinants is about prevention,' May says.

'How much better would it be if people did have adequate housing and access to education, and they weren't in the health system?'

But addressing social determinants of health is incredibly challenging because it steps away from health care, and instead requires changes to the fundamental structures of society, Strazdins says.

'Simply telling people to do more [exercise or healthy eating] is not going to make a difference,' she says.

'The feasibility of doing more is driven by something they don't have as much control over and here you need governments and business and policy all having to come together.'

Source: ABC Health & Wellbeing, www.abc.net.au/health/features/stories/2015/05/14/4235445.htm.

Application

Impact of social determinants of health

Read the snapshot 'Understanding what really makes us sick'. Use the information provided on the role of social determinants to explain why some groups of people have better or worse health than others. Be sure to use specific examples in your explanation to support the points you make.

Inquiry

How can the determinants of health explain different levels of health within the community?

1. Listed below are a series of characters. Copy the information about each character onto a separate card and display all these character cards in a straight line in the middle of a whiteboard or sheet of butcher's paper. Write the words 'excellent health' at one end of the whiteboard and 'very poor health' at the opposite end.
   - A 35-year-old female with a family history of breast cancer. She works as a doctor in a large inner city hospital.
   - A 26-year-old male refugee from Sudan who has recently received citizenship in Australia. He worked as a farmhand in his home country.
   - An 18-year-old male living at home with his mother and four younger brothers. He left school in year 10 and is currently unemployed.
   - A 50-year-old Aboriginal male who works as a professor at a large university.
   - A 25-year-old female who is a professional triathlete.
   - A 60-year-old farmer running a large cattle property with his two sons. The property is 200 kilometres from the nearest rural town.
   - A 30-year-old Muslim woman. She and her husband run a small business in the metropolitan area. They have three young children.
   - A 40-year-old Aboriginal male living in a remote Indigenous community. He works as a stockman on a nearby cattle property when work is available.
   - A 20-year-old male in his second year of university. His family lives in the country, but he moved to the city to study. He shares a house with three other young people and works part-time to pay his living expenses.
2. Read each of the following statements, then consider which characters would be able to answer 'yes' and which characters would answer 'no'. Every time a character answers 'yes', move their character card forward

on the continuum towards 'excellent health'. Every time a character would answer 'no' move their card back on the continuum towards 'very poor health'. When unsure, the character card should not move.
    - You can afford the cost of private health insurance.
    - You have a range of medical facilities easily available to you.
    - There are a range of facilities where you can be physically active in your local area.
    - You have a support network of family and friends who encourage you to be healthy.
    - You are likely to have good knowledge about the benefits of maintaining good health.
    - You are able to talk confidently to a medical professional about health concerns and understand information they give you.
    - You can afford regular dental checkups and to fix any associated dental problems.
    - You are able to access health information and support easily on the internet.
    - You are likely to see good health as important and understand strategies that can support or improve your own health.
    - You are encouraged to be physically active and you feel confident doing so.
3. When all questions have been considered, examine where the various characters have ended up.
4. Based on the activity, discuss as a class which individuals and groups have better or worse health than others. Explain how the determinants of health are likely to positively or negatively influence the health of various characters.

2.4 Topic review

2.4.1 Summary

- The major factors that influence an individual's health can be referred to as the determinants of health. These determinants include a number of individual, socioeconomic, sociocultural and environmental factors.
- An individual's health status can be positively or negatively affected to varying degrees by these determinants acting in various combinations.
- Individual factors that have a significant influence on health include genetics, knowledge and attitudes.
- Sociocultural factors such as family, peers, media, culture and religion can exert an influence on people's values, attitudes and knowledge about health, which can affect their lifestyle behaviours and health decisions.
- Differences in people's level of income, education and employment can lead to significant differences in the opportunities, choices and risks that affect their health. Groups in society that experience the greatest disadvantage are likely to experience the poorest levels of health.
- Geographic location can have an impact on a person's health by affecting their opportunities to make healthy choices, the risks they are exposed to and their access to adequate standards of housing, food and water. It can also influence their ability to quickly and easily access appropriate health care. Technology has helped overcome some barriers caused by geographic isolation.
- We may have little or no control over some of these determinants; for example, genetics and some environmental factors.
- Most health determinants are modifiable, that is, people can make changes to some factors that influence them to improve their health status. A person's level of self-efficacy, empowerment and attitude can contribute to the degree of control they exercise over their health
- The influence that various determinants can have on our health changes throughout our lifetime. This may lead to improvements in health or may contribute to the health risks people face.
- An individual view of health suggests that the individual is solely responsible for their health behaviour. This has limitations for changing individual motivations and behaviour as it blames the 'victim' rather than explaining the social and environmental determinants involved.

- Viewing health as a social construct enables us to recognise the interrelationship between the various determinants of health, and understand why some individuals and groups have better or worse health than others.

2.4.2 Questions

Revision

1. 'People's social and economic circumstances and environmental factors strongly affect their health.' **Evaluate** this statement. Does it provide a good explanation of how health is determined? (P3) (4 marks)
2. Research has shown that people in the most socioeconomically disadvantaged groups were more likely to smoke, eat less fruit and vegetables and be inactive than those in less socioeconomically disadvantaged groups. **Discuss** why these risk behaviours are more likely to be prevalent among people living in poor socioeconomic circumstances. (P3, P16) (5 marks)
3. Using relevant examples, **explain** how sociocultural factors such as family, peers, media, religion and cultural background can have a positive or negative influence on a person's level of health. (P3) (5 marks)
4. **Outline** how living in geographically remote areas can affect a person's level of health. (P3) (3 marks)
5. Using relevant examples, **discuss** the interrelationship of the various determinants of health. **Explain** the possible impact this interaction could have upon people's ability to effectively manage their own health. (P3, P4) (6 marks)
6. **Identify** aspects of health that an individual is able to exert some control over. **Explain** how this can be done. (P4) (4 marks)
7. A person who is overweight is told by people that it is their own fault because they lack willpower and are too lazy to exercise. Challenge these comments by **analysing** the determinants of health that influence people's activity levels and eating behaviours that are difficult for them to control. (P3, P4) (6 marks)
8. **Discuss** how and why the determinants of health can explain differences in the health status of two distinctly different social groups; for example, people born in Australia and people born overseas; Indigenous and non-Indigenous people; people of high and low socioeconomic status. (P3) (6 marks)

Extension

1. Research has shown that a large number of young people with serious mental health problems do not access professional help. **Analyse** how the various determinants of health may impact on the likelihood that a young person will access support to help with mental health problems. (8 marks)
2. *Australia's health 2016* found significant differences in the mortality rates of Indigenous and non-Indigenous people as shown in figure 2.11. Critically **analyse** the impact of the various determinants on the health of Indigenous Australians to explain the significant gap that is evident between their health and the health of non-Indigenous Australians. In your response, highlight how various determinants are interrelated. (8 marks)

Note: For an explanation of the key words used in the revision questions above, see Appendix 2, page 400.

on Resources

Interactivity: Revision quiz: auto-marked version (int-7254)

Interactivity: Missing word interactive quiz (int-7253)

Digital doc: Revision quiz (doc-26269)

2.4.3 Key terms

built environment refers to buildings and spaces that are constructed within communities. *p. 80*

empowerment for individuals means that they are aware of the choices they have, they can make decisions without relying on others or expecting others to make decisions for them and they can act in various situations in daily life to protect themselves and promote their health. *p. 74*

environmental factors are those things present in the environment in which people live and work that can affect their health in a positive or negative way. *p. 79*

environmental tobacco smoke is the smoke that comes from the burning end of a cigarette and the smoke exhaled by smokers. It is also referred to as second-hand smoke and passive smoking. *p. 85*

fluoridated tap water is the controlled addition of fluoride to public drinking water to reduce tooth decay. *p. 80*

genetics refers to characteristics, features or hereditary diseases that are genetically linked and are passed on within a family. *p. 62*

health determinants are the individual, socioeconomic, sociocultural and environmental factors that can have a positive or negative influence on the health of individuals or populations. *p. 58*

individual factors are those factors unique to each person that can determine their level of health. *p. 59*

inequality is the unequal distribution of illness or conditions throughout the population. *p. 88*

medicare is Australia's government-funded health scheme that subsidises the cost of medical services for all Australians. *p. 77*

modifiable health determinants are those determinants that can be changed or controlled so they have a different level of influence on our health. *p. 88*

non-modifiable health determinants are determinants that cannot be changed or altered. *p. 91*

ozone depletion refers to the decline in the ozone layer present in the atmosphere that shields the Earth from harmful levels of ultraviolet radiation. *p. 85*

remote areas have a population of less than 5000. *p. 79*

royal Flying Doctor Service provides aeromedical emergency and general health care to people living in rural and remote areas of Australia. *p. 81*

rural areas are defined by the Australian Bureau of Statistics as having populations between 5000 and 99 000. *p. 79*

self-efficacy is our belief in our ability to be able to carry out a particular task. *p. 61*

social construct of health recognises that people have different views of health based on their social circumstances and ways of seeing, interpreting, interrelating and interacting with their environment. *p. 99*

social exclusion occurs when someone is denied resources, rights and services and is unable to participate in normal relationships and activities that are available to the majority of people in society. *p. 77*

social gradient in health is a term used to describe the global phenomenon whereby people who are less advantaged in terms of socioeconomic position have worse health (and shorter lives) than those who are more advantaged. *p. 73*

social norms describe the behaviours, beliefs and values that are expected or seen as acceptable within different social groups. *p. 97*

sociocultural factors relate to the society in which people live and the cultural practices and expectations that exist within these communities. *p. 99*

TOPIC 3
What strategies help to promote the health of individuals?

OVERVIEW

3.1 What is health promotion?
3.2 Responsibility for health promotion
3.3 Health promotion approaches and strategies
3.4 The Ottawa Charter as an effective health promotion framework
3.5 Principles of social justice
3.6 Topic review

OUTCOMES

In this topic students will:

- describe factors that contribute to effective health promotion (P5)
- propose actions that can improve and maintain an individual's health (P6)
- form opinions about health-promoting actions based on a critical examination of relevant information (P15)
- use a range of sources to draw conclusions about health and physical activity concepts. (P16)

Health is the result of a complex interaction of people's personal health behaviours and a range of social, economic, cultural and environmental determinants that exist in the society in which they live. These wider social and cultural factors can shape or limit an individual's decision making, affect power relations, and can determine the amount of control an individual has over his or her health.

For some people, these factors are conducive to good health; that is:

- they have acquired the knowledge, understanding and means to make positive health decisions
- they live and work in environments that support them in making health-promoting choices.

Others may be influenced by factors that prevent them making good health decisions or limit their ability to easily make choices that will promote better health. For example, they may have poor nutrition due to lack of money, poor availability of nutritious foods in their local area or lack of knowledge of how to cook healthy meals.

It is now widely accepted that, in order to improve the health and well-being of individuals and reduce the burden of preventable diseases, health services need to consider not only factors related to the individual, but also factors relating to the broader community, environment and social context in which people live. If individual behaviour change is to occur it needs to be supported by a variety of social, cultural, economic and political changes to our environment.

In this topic, we look at strategies that can assist to promote the health of individuals and consider who is responsible for promoting better health for individuals. We examine how the Ottawa Charter provides a framework for health promotion that addresses the social determinants of health and explore successful health promotion initiatives based on the action areas of the Ottawa Charter. We will also learn about principles of social justice and identify strategies that have applied these principles to improve people's health.

3.1 What is health promotion?

Health promotion aims to achieve better health for everyone. It is the process of preventing ill health and advancing the health of individuals and the community through planned interventions.

The World Health Organization defines health promotion as 'the process of enabling people to increase control over their health and improve their health'. This definition underpins a global approach to health promotion initiated by the World Health Organization. In 1986 this definition was incorporated in a document known as the **Ottawa Charter for Health Promotion** that was developed as part of the first International Conference for Health Promotion.

The Ottawa Charter outlines essential actions for effective health promotion and is based on the understanding that health is socially determined. It recognises the importance of a broad range of approaches to health promotion that assist people to gain greater control over their health and improve their health outcomes. These approaches need to:

- focus on the prevention of ill health, not just on treating illness
- provide resources and opportunities for individuals and groups to achieve positive health
- include school and community health education
- include resources to support healthy living and working environments
- ideally, provide equal access to health and physical activity resources for everyone
- include legislation, policies and economic conditions to protect people from harm.

Health promotion therefore is more than teaching people the importance of good health or promoting lifestyle behaviours that reduce the chance of diseases developing in later life. It involves:

- recognising the social, economic, behavioural, environmental and lifestyle factors that contribute to the lifestyle-related health problems that are currently prevalent
- seeking to address these factors in order to support behavioural change.

Without the provision of systems that help create supportive environments and promote improvements in people's health behaviours, significant improvements in the health of individuals and populations will not occur. The following summary lists the various systems that enable supportive environments to be created.

1. *Government legislation and regulations*. Some laws, such as laws restricting the use of hand-held mobile phones when driving, guard our health and well-being. Similarly, regulations control how things are done and ensure that certain standards are maintained to protect health; for example, food safety regulations ensure food is handled and stored hygienically and correctly.
2. *Physical supports*. These include the provision of services and facilities that promote and protect good health (for example, shaded playgrounds and breast screening services) as well as those that treat health concerns (for example, hospitals, surgeries and community health centres).
3. *Economic supports*. Governments must allocate sufficient money to support health and welfare programs and enable them to function effectively.
4. *Social supports*. These include health personnel and community groups who are trained and equipped to assist in health care, such as doctors, dietitians, counsellors, support groups and social workers.
5. *Educational supports*. These include traditional health education programs in schools, as well as information, education and advice provided in other settings; for example, via websites or through public health campaigns
6. *Organisational supports*. This involves policies, programs and practices being established in large organisations such as schools or workplaces to support the creation of health-promoting environments.

A combination of these support systems, rather than any single factor such as advertising, is most effective in bringing about behavioural changes needed to improve our health.

FIGURE 3.1 Some laws are designed to guard our health and well-being by limiting risk-taking behaviours.

Research has also shown that effective health promotion must involve the community at all levels. People must feel that they are a part of the system, and that an improvement in their attitudes and practices will be an improvement for everyone.

FIGURE 3.2 Smoking bans in public places are an example of a health promotion strategy that aims to create supportive environments.

Inquiry

What is health promotion?

In groups, recall and list any health promotion strategies or initiatives that have been introduced to address the following health concerns:

- tobacco smoking
- binge drinking
- depression
- road injuries
- skin cancer
- overweight/obesity.

Share your group's responses with the class.

3.2 Responsibility for health promotion

A wide range of people and groups have responsibility for promoting better health. These include:

- individuals
- community groups and schools
- non-government organisations
- various levels of government
- international organisations.

For health promotion to be effective, a coordinated approach by all people and organisations involved is needed to successfully plan, develop and deliver initiatives that address identified areas of concern.

FIGURE 3.3 A wide range of people, groups and organisations are responsible for health promotion.

3.2.1 Individuals

Individuals play a key role in promoting their own health, because personal behaviour is the major determining factor of health status. Good health can be promoted by making choices that enhance personal health and leading a healthy lifestyle. However, the living conditions of some people limit their ability to easily make healthy choices and prevent them from taking control of their health, leaving them vulnerable to illness and disease.

For health promotion to be effective, individuals need to be empowered. Individual **empowerment** refers to an individual's ability to make decisions about, or have personal control over their life. We need to be encouraged to participate in improving our level of health. This is best achieved when we are:

- provided with accurate and relevant health information that is easily accessed and understood
- given the opportunity to be involved in decision making about our own and our community's health
- encouraged to work with a wide range of health professionals, knowing that our opinions will be taken into account
- given the opportunity to develop personal skills that will aid us to adopt or maintain positive health behaviours
- provided with social and economic supports that will encourage a healthy lifestyle.

A diverse range of individuals working in health-related areas are able to work alongside people in ways that support them to develop greater control over their own health and bring about improvements. These include people traditionally involved in health professions such as:

- general practitioners
- dietitians
- counsellors
- dentists
- health workers
- community nurses.

Health professionals are able to increase people's awareness of health risk behaviours and provide them with information on healthier lifestyles. They can assist individuals to develop skills that can help them to modify these behaviours or recognise health problems in their early stages. For example, doctors can teach women how to perform regular breast self-examinations or help clients to quit smoking. They can also work with patients to determine how to effectively use the health services available to support positive health choices.

The understanding that health is socially determined has led to a broader range of individuals becoming involved in promoting better health for individuals, including:

- health educators
- social workers
- urban planners
- community workers
- environmental health officers.

These professionals also have roles to play in encouraging individual behavioural change, providing resources to support healthy living and working environments, and focusing on the prevention of ill health.

FIGURE 3.4 Health-care professionals are only one element in the support system needed to improve people's health.

Inquiry

Health professionals in your community

1. Use the **headspace** weblink in the Resources tab to learn about the health professionals who work in headspace centres.
   Locate your local headspace centre. Once you have located it, look for the heading 'Services'. Use this link to research the health professionals who work in the centre or are linked to it and the services they provide. Write a summary of your findings.

CASE STUDY

An individual's role in promoting their health

Tamara is 22 years old and working full time. She completed year 12 and then obtained a Certificate III in Financial Services through TAFE. This helped Tamara to find a job in the city at one of the large banks. Tamara still lives at home with her family, which includes her mother, father and younger sister. They are all very close and regularly eat dinner together at home. In the past Tamara had problems with anxiety, so she attended counselling sessions where she learned self-help skills such as meditation, journal writing and exercise, which she continues to use regularly. She trains at a local gym two afternoons a week and plays in lunchtime sporting competitions organised by her work once a week. Tamara also uses public transport to get to work each day, walking to and from the bus stop. She makes a salad each day to take for lunch, both to save money and to ensure that she is eating plenty of vegetables and grains. Tamara avoids drinking alcohol during the week and usually has only two or three glasses of wine when out to dinner with friends. She does not smoke or use illicit drugs, nor do any of her family or close friends.

Inquiry

An individual's role in promoting their health

Read the case study about Tamara and answer the following questions.

1. Describe the role Tamara plays in looking after her own health.
2. Outline the factors in Tamara's life that support her ability to make positive health choices.

Health professionals also have a role in working in *partnership* with the community to set health priorities to address areas of concern within the community. They are able to:

- **advocate** on behalf of particular groups for social intervention or increased funding to support improved health
- generate community support for health promotion strategies
- work collaboratively as part of community groups to implement actions that address identified local health concerns.

on Resources

Weblink: headspace

3.2.2 Community groups and schools

Schools play an important role in health promotion. Childhood and adolescence are stages of life when attitudes towards health and health behaviours are still forming, providing schools with an opportunity to have a positive impact on young people's values and beliefs.

FIGURE 3.5 Positive health messages can be instilled in students through classroom learning, playground activities and extracurricular activities.

Schools are responsible for delivering health and physical education programs that assist young people to develop the knowledge and understandings needed to make positive health choices. They provide opportunities for young people to develop skills needed to participate confidently in physical activity and manage their own health, while also promoting the value of regular activity and good health. Development of these fundamental movement skills at a young age increases the likelihood that they will be lifelong participants in physical activity and helps form lifestyle habits that will benefit health, both now and in the future. Schools also equip students with skills to improve their health literacy by teaching them how to access and critically evaluate health information, products and services. This empowers people to take greater control of their health.

School policies and practices have the potential to reinforce classroom messages and further promote good health practices among young people. Examples include the following:

- sun safety policies. These aim to promote practices that reduce exposure to harmful UV rays by scheduling outdoor activities at times when UV radiation is lower, providing shaded outdoor areas, having 'no hat, no play' rules and supplying 15+ sunscreen to students when participating in outdoor activities.
- the New South Wales Healthy School Canteen Strategy. This strategy seeks to increase the availability of healthy food and drink options in school canteens so it is easy to choose foods that support the Australian Dietary Guidelines for Children and Adolescents.

- anti-bullying policies. These reaffirm students' rights to feel safe and outline procedures for identifying, reporting and dealing with bullying behaviours.
- the provision of play equipment for students to use during lunchtimes. This encourages physical activity.

These policies and procedures aim to reduce the harms students may face, while also sending clear positive messages to encourage health-promoting behaviours.

Schools are also commonly used to conduct health promotion initiatives targeted at young people. These health promotion initiatives can be developed and implemented in a variety of ways. For example, they could be:

- developed and coordinated by external organisations such as the Heart Foundation's Jump Rope for Heart or the National Association for Prevention of Child Abuse and Neglect's Love Bites program
- formal partnerships between educational organisations and peak health bodies that design evidence-based strategies to address youth health issues. Examples include the national mental health initiative for secondary schools, MindMatters.
- initiated and managed by education departments; for example, the Premier's Sporting Challenge
- coordinated by other government departments or government-funded bodies. Examples include NSW Health which is responsible for administering the NSW School Vaccination program and the Trauma Service Westmead Hospital which coordinates the bstreetsmart initiative.

Individual schools may choose to initiate projects to address identified local health issues, either on their own or in partnership with other government or non-government organisations. The Health Promoting Schools framework provides a model for schools and outside agencies to use when developing school-based initiatives. Developed in line with the principles of the World Health Organization, the framework highlights the importance of not only teaching students about health-related issues, but also making changes to the school's policies, organisation and practices to promote better health. It also highlights the importance of partnerships between the school and parents, local health services and the community in general. Building these partnerships enables schools to:

- utilise available resources and expertise
- actively involve parents in decision making, and
- support parents and caregivers to make changes that will improve the health of children and young people.

CASE STUDY

University students embrace SALSA program

For the 12th consecutive year, the Students as LifeStyle Activists (SALSA) program is being rolled out in high schools across western Sydney.

Volunteer university students take part in a SALSA workshop that equips them to train year 10 students to coach and motivate year 8 students, empowering them to make healthy lifestyle choices in a fun and informative way.

Western Sydney Local Health District Primary Health Care Education and Research Unit Associate Professor Smita Shah said at a time when western Sydney is experiencing a diabetes epidemic, the SALSA program's ability to influence so many young people is crucial.

FIGURE 3.6 Participants in the Students as LifeStyle Activists (SALSA) program

'Already this year, we've held three SALSA educator workshops, with more than 90 university students involved,' she said.

'We are excited to continue our strong association with the University of Sydney, Western Sydney University and welcome our new partners, the University of Notre Dame and the University of New South Wales.'

The trained university students will team up with one of 28 high schools in western Sydney who have enrolled in the program.

SALSA recruit and Parramatta resident Melissa Wehbe got involved in the program because she was interested in public health and the lessons were very clear and condensed.

'I completed the training in April and have educated a group of year 10 students from Erskine Park High School,' the 21-year-old said.

'The year 10s will then teach the year 8 students about healthy nutrition.

'We hope the year 8 students will take this information home and share it with their families.'

SALSA's effectiveness is recognised outside western Sydney, with demand for the program spreading across greater Sydney, nationally and internationally.

'Initiatives that change the attitudes, eating behaviours and exercise habits of secondary students are rare, but SALSA actually works,' Smita said.

'It is critical that collaborative action is taken to improve the lifestyle behaviours of young people.'

Source: www.wslhd.health.nsw.gov.au/News/2016/University-students-embrace-SALSA-program, 14 June 2016.

Inquiry

Collaborative partnership between schools and local health districts

Read the case study about the Students as LifeStyle Activists (SALSA) program and complete the following. You can also watch a video clip and read more about the program using the **Students as LifeStyle Advocates** weblink in the Resources tab.

1. Identify the health issues that led to the development of the SALSA program.
2. Outline how the SALSA program aims to promote better health behaviours and choices by young people.
3. Describe the roles and responsibilities of the following groups in delivering the SALSA program in schools:
   (a) Western Sydney Local Health District
   (b) university students
   (c) year 10 students.
4. Discuss the importance of school-based programs in the promotion of health, both now and in the future.

Application

Health promotion in your school

Work in small groups to identify two or three health promotion initiatives that have been implemented in your school.

1. For each initiative, identify:
   (a) the health issue/s it seeks to address
   (b) the people or groups who play a key role in the organisation and implementation of the initiative and describe their role/s and responsibilities.
2. Discuss your ideas as a class.

Community-based groups such as migrant support groups, neighbourhood groups or young mothers' support groups can often play an important role in health promotion through their close relationship with particular population groups. They are often well placed to develop projects that meet community needs or adapt programs to take into account particular barriers that may otherwise limit their effectiveness. For example, a

migrant women's support group seeking to promote increased levels of physical activity among females from non-English-speaking backgrounds may implement a program of physical activity that

- allows women to be active within their own cultural group
- overcomes language and transport barriers
- recognises cultural sensitivities relating to activity.

As with schools, community groups may also work in partnership with other organisations to support health promotion initiatives and tailor the initiatives to particular groups and/or local needs.

on Resources

Weblink: Students as Lifestyle Advocates

3.2.3 Non-government organisations

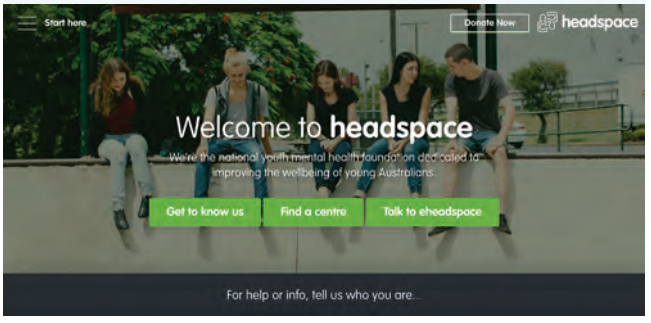
Non-government organisations (NGOs) are non-profit making organisations that operate at local, national, or international levels. They are funded from a variety of sources, including public donations, fundraising and government grants. While they may receive government funding, their work is not controlled or limited by government policy or legislation.

Non-government organisations generally focus on a specific issue or ailment. The Heart Foundation, the Cancer Council, Asthma Australia, Family Planning NSW and the Inspire Foundation are examples of NGOs that play a significant role in health promotion in Australia. Use the **NGO** weblinks in the Resources tab to find out more information about these examples of NGOs.

Non-government organisations undertake a number of roles in health promotion relating to their particular issue. These include:

- conducting activities designed to raise public awareness, such as the White Ribbon Australia's White Ribbon Day to raise awareness of men's violence against women
- providing educational programs and resources to develop skills and promote positive health choices and behaviours. For example, the Black Dog Institute has developed a range of school resources that aim to increase young people's understanding of mental health, build resilience and improve mental health literacy.

FIGURE 3.7 headspace is an example of an NGO with roles in health promotion and support.



Source: © headspace

- providing accurate and up-to-date information. For example, Family Planning NSW provides fact sheets, a confidential online and phone talkline and resources in various languages to ensure everybody has access to quality reproductive and sexual health information.
- funding and conducting research into prevention and treatment of a particular disease; for example, cardiovascular disease
- providing support services and counselling to people affected by the disease, their families and carers. The Cancer Council offers a range of help services including a telephone information and support service, online discussion sites such as blogs, forums and online support groups to connect with others affected by cancer, and peer support programs.
- advocacy. Many NGOs make submissions or representations to government on a range of issues related to their health concern in an effort to bring about changes to reduce the prevalence of the disease or improve standards of care. For example, the Cancer Council, Diabetes Australia and the Heart Foundation of Australia have jointly put forward a series of recommendations for governments,

schools and non-government organisations such as sport centres to reduce the sale and availability of sugary drinks in order to tackle obesity.

Inquiry

Health promotion projects by NGOs

Kids Helpline and Youthsafe are examples of NGOs. Use the **Kids Helpline** and **Youthsafe** weblinks in the Resources tab. Click on the 'About' tab on their webpages to research the health promotion work undertaken by both organisations. Use the information you find to complete the following.

1. Describe the role of each of these organisations in promoting better health for young people.
2. Outline some of the projects and initiatives that each organisation has instigated in an effort to improve the health of adolescents.

on Resources

- **Weblink:** NGO — Family Planning NSW
- **Weblink:** NGO — The Heart Foundation
- **Weblink:** NGO — Cancer Council Australia
- **Weblink:** NGO — Asthma Australia
- **Weblink:** NGO — The Inspire Foundation
- **Weblink:** Kids Helpline
- **Weblink:** Youthsafe

3.2.4 Government

All levels of government share a degree of responsibility for promoting better health within their community. The nature and scope of the health promotion initiatives they undertake vary considerably due to differences in priorities, allocated funding and resources available.

Commonwealth Government

The Commonwealth Government is responsible for:

- planning and forming national health policies and strategies
- identifying priority areas for action and coordinating health promotion campaigns to ensure national health priorities are addressed in an effective and efficient way
- giving direction to state health policy making and influencing its delivery
- allocating funding for health promotion, special projects and research to state and local government groups as well as NGOs
- introducing regulations and legislation to ensure the maintenance of health.

Inquiry

The Commonwealth Government's health promotion responsibilities

Draw up a table like the one below. For each area of responsibility, brainstorm and fill in examples that demonstrate how the Commonwealth Government fulfils its health promotion responsibilities.

Areas of responsibility	Examples
1. Formulating national health policies and strategies	
2. Coordinating national health campaigns	
3. Directing state policies	
4. Allocating funding	
5. Regulations/legislation	

The Commonwealth Government is responsible for formulating and overseeing long-term programs and strategies that address Australia's health priorities. These programs seek to reduce the risk factors for chronic diseases suffered by many Australians in order to improve the general well-being of the nation and lessen the burden of chronic poor health. Examples of these programs (use the weblinks to find out more) include:

- **Quitnow — National Tobacco Campaign**
- **National Drugs Campaign — National Drug Strategy 2017–2026**
- **Health Star Rating campaign**
- **Healthy Weight Guide**
- **Girls Make Your Move.**

National programs often involve a collaborative partnership between federal and state governments and can also be supported by industry and other organisations with an interest in promoting good health. Organisations such as the Cancer Council, the Heart Foundation and the Australian Medical Association are some of the groups that have collaborated on the National Tobacco Campaign. Research is used to inform the strategies developed and evaluation is undertaken to measure their effectiveness and determine changes in knowledge, behaviour and attitudes that may have taken place.

The Commonwealth Government is also responsible for allocating the funding and developing systems to ensure all Australians have access to affordable, high-quality health-care services that are convenient. A variety of strategies are needed to adequately cater for the health-care needs of Australians living in vastly different geographic locations and support them to improve their health and prevent illness.

SNAPSHOT

$100m funding boost for school mental health programs and headspace centres

By medical reporter Sophie Scott and Justine Kearney

Young Australians seeking help for depression and anxiety will get further assistance with an injection of more than $100 million into school mental health programs and a range of new headspace centres.

Health Minister Greg Hunt said the initiatives would help schools and communities to support the wellbeing and mental health of Australian kids and respond to personal and community challenges.

'We know that around four million Australians experience a mental health condition every year,' he said.

'People of all ages can be affected, either directly themselves or because someone close to them might be suffering and even young children can be deeply affected.

'Programs for beyondblue, headspace, Orygin and Kids Helpline and Reach Out and others are all about ensuring that we provide assistance before the problems emerge and when they do emerge there are avenues for treatment and avenues for people to seek emergency help.'

More than $45 million of the funding injection will go to beyondblue for its integrated school-based Mental Health in Education initiative.

It is a new national program to encourage good mental health and well-being practices for Australian children from early learning centres to the end of secondary school.

It will give school principals, parents and carers across the education spectrum access to a range of face-to-face or online mental health programs.

The aim of the mental health in education program is to give parents and educators the tools to recognise the signs of mental health challenges and deal with them before the symptoms become acute.

Teachers will be trained to identify early warning signs and where to access help.

The program is currently being developed and will be launched in August 2018.

New early intervention centres

More headspace centres will be set up across Australia, with a funding boost of $30 million.

These centres, developed by psychiatrist Professor Patrick McGorry, provide early intervention mental health services for people aged 12–25, as well as work and study support, and alcohol and drug services.

One in four young people have experienced a mental health issue in the past 12 months — a higher prevalence than all other age groups.

Kids Helpline, ReachOut, Suicide Callback Service and QLife will receive almost $2 million over two years for telephone, webchat and online mental health help.

'The extension of funding announced for these key child and youth mental health initiatives will provide a stable funding base for the great work done by these organisations,' Mr Hunt said.
Source: ABC News, www.abc.net.au/news/2018-01-08/more-dollars-for-kids-mental-health/9310172.

Inquiry

The Commonwealth Government's role in promoting better health

Read the snapshot '$100m funding boost for school mental health programs and headspace centres' and complete the following.

1. Outline the programs and services set to receive additional funding from the Commonwealth Government and describe how they will support young people's mental health.
2. Describe the roles and responsibilities of the following people and groups in promoting youth mental health:
   (a) individuals (young people, parents, individual teachers)
   (b) schools
   (c) non-government organisations such as beyondblue and ReachOut
   (d) the Commonwealth Government.
3. Justify why the Commonwealth Government is best placed to lead and coordinate various mental health initiatives to support young Australians

Resources

- **Weblink:** Quitnow — National Tobacco Campaign
- **Weblink:** National Drugs Campaign — National Drug Strategy 2017–2026
- **Weblink:** Health Star Rating campaign
- **Weblink:** Healthy Weight Guide
- **Weblink:** Girls Make Your Move

State government

State governments have the primary responsibility for planning and delivering specific health promotion and disease prevention programs. These programs may be funded by Commonwealth grants, jointly funded by the federal and state government, or funded solely by the state itself. Each state has a department of health that includes health promotion personnel who develop and run health promotion programs.

The New South Wales Department of Health (NSW Health) is divided into local health districts, along with two specialist networks that are each allocated funds to implement health promotion initiatives that support identified state and local needs. The diversity of communities that exists across New South Wales highlights the importance of giving these services the responsibility of developing programs that cater for the needs of the population group in their area.

Inquiry

Make Healthy Normal campaign

Use the **Make Healthy Normal** weblink in the Resources tab to explore the campaign launched by NSW Health and then complete the following activities.

1. Outline the purpose of the campaign.
2. Describe the resources and information available on the campaign website to help people lead a healthier lifestyle.
3. Explain how these resources and tools aim to help people exercise greater control over their own health.

4. Find the 'healthy programs' link to explore initiatives that form part of the government strategy to tackle overweight and obesity. After looking at several of these initiatives, describe the role played by state governments in health promotion.

States are also responsible for planning and forming health policies and legislation that aim to reduce health risks, decrease the incidence of major health problems and promote better health for all. State laws around smoking in public places and certain outdoor public areas (such as spectator areas at sports grounds), pool fencing laws, opening hours of licensed premises, drink driving, vehicle and passenger restrictions for P1 and P2 licence holders, and WorkCover requirements are examples of legislation introduced at state level aimed at promoting health and reducing injury.

on Resources

Weblink: Make Healthy Normal

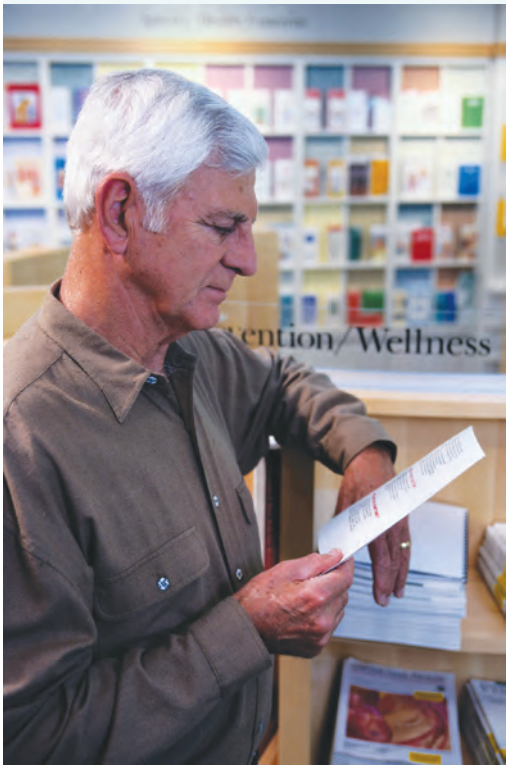
Local governments

Local governments are given specific health roles for helping to implement state-controlled programs and monitor compliance with state legislation at a community level. For example, they ensure swimming pools are fenced and are responsible for carrying out inspections to ensure compliance with food handling, storage and preparation regulations by businesses selling food.

However, a recent trend has seen local councils participating in a broader range of health promotion programs. For example, they have been responsible for developing lifestyle events and programs using community infrastructure and facilities, such as creating community gardens and holding 'come and try' workshops in local parks and halls. Such programs seek to address local issues and strengthen community involvement in actions that target these issues.

It has become increasingly common for local councils to participate in activities as part of campaigns that are developed by other levels of government or organisations; for example, World No Tobacco Day or the Cancer Council's Australia's Biggest Morning Tea. Councils can also apply for grants to develop and run their own health strategies to promote healthier lifestyles. These strategies often see local people involved in determining the priorities for local action and may target particular groups in the community; for example, the elderly or cultural groups.

FIGURE 3.8 Local government libraries and medical centres play an important role in providing health information.



Local governments are responsible for undertaking long-term environmental planning. This means they play a significant role in promoting opportunities for people to be physically active within their communities and creating environments that support positive health behaviours. Zoning regulations and land use policies can ensure healthy urban design principles are incorporated into local plans. These principles include:

- provision of open public spaces such as parks and play areas
- introduction of measures to slow or ban traffic from areas with large numbers of pedestrian activity

- construction and maintenance of well-lit walking and cycling tracks
- installation of safe play equipment, shaded recreational space and outdoor fitness stations in local parks.

Local governments are also used as avenues for the dissemination of health promotion messages and information. Council libraries can be used to display promotional material and distribute brochures and leaflets related to health, while council staff and websites can inform residents of upcoming health promotion events and activities in the local area. Local public libraries are currently used to provide accessible drug information to communities throughout New South Wales. The drug info@your library initiative provides public libraries across the state with easy-to-read information about various drugs via web resources, regularly updated book collections and free pamphlets. Council may also provide venues for support groups to meet and education programs to be conducted.

3.2.5 International organisations

The **World Health Organization** (WHO) is one of the major international organisations responsible for health promotion. Established in 1948, WHO is a specialised agency of the United Nations (UN) that serves as the coordinating authority on international public health issues. Its membership consists of all UN member countries that accept WHO's constitution and approved other countries.

FIGURE 3.9 The World Health Organization is a specialised agency of the United Nations that is concerned with international public health.

WHO undertakes a number of key responsibilities in the global promotion of better health for the citizens of all countries. These include:

- providing leadership on health issues causing significant worldwide concern and establishing partnerships that will bring about the changes necessary to improve the health of all people, particularly those belonging to disadvantaged and vulnerable groups and populations. For example, in 2011 WHO was responsible for developing the Global Vaccine Action Plan in an effort to prevent millions of deaths by ensuring more equitable access to existing vaccines for people in all communities across the world.
- working collaboratively with governments, NGOs and other agencies to support countries to establish and implement appropriate health promotion strategies and programs in order to bring about the highest attainable standard of health for all people
- setting international health standards for elements that are essential for promoting good health; for example, to completely eliminate the practice of open defecation by 2025
- producing reports that can be used to measure improvements in worldwide health issues and identify areas for further health promotion; for example, global estimates of violence against women
- influencing research priorities and disseminating information produced by research to drive evidence-based change to health-related policies and practices
- provide frameworks for countries to follow to develop effective health promotion strategies, such as the Ottawa Charter.

Application

Responding to global health issues

Watch the video at the **WHO: Guardian of health** weblink in the Resources tab and then complete the following.

1. Describe the World Health Organization's key roles and responsibilities in promoting health across the world.
2. The WHO been described as being 'the guardian of health'. Discuss what this phrase means and why an international organisation is considered necessary to take on this role in addition to individual governments.

The philosophy, structures and principles that guide the WHO's work have been instrumental in shifting the way that governments and organisations throughout the world approach health promotion. They have advocated for approaches that not only empower individuals and communities, but also recognise the underlying social, economic and environmental determinants of health. This has resulted in a greater understanding of the importance of actions directed towards changing social, environmental and economic conditions to alleviate their impact on public and individual health.

In 1986 the WHO was responsible for organising the First International Conference on Health Promotion. This conference saw the production and acceptance of the Ottawa Charter for Health Promotion — an action plan for all nations to implement in order to achieve health for all by 2000 (see Appendix 1, page xxx).

The basic principles of the Ottawa Charter continue to provide the framework that underpins health promotion strategies developed at all levels of government in Australia (this is discussed further in section 3.4). Subsequent conferences have reiterated and built upon the principles outlined in the Ottawa Charter, including the Helsinki Statement on Health in All Policies that was issued at the 8th Global Conference on Health Promotion coordinated by the WHO in 2013.

on Resources

Weblink: WHO: Guardians of health

3.3 Health promotion approaches and strategies

Traditional approaches to health promotion have tended to focus on specific diseases, illnesses and injury prevention and have centred on medical intervention to cure or prevent ill health. Contemporary approaches to health promotion now recognise health as a social construct and acknowledge the significant role played by underlying social, environmental and economic determinants such as employment, income, level of education, geographic location and cultural beliefs in the level of health achieved by individuals or population groups. Research has shown that effective health promotion requires a range of approaches and strategies to address the many factors that determine the health of individuals and populations and to bring about long-term improvements. These approaches include:

- lifestyle and behavioural approaches
- preventative medical approaches
- public health approaches.

Furthermore it must involve the community at all levels, so that people feel engaged in decisions that aim to bring about change and empowered to improve their health.

3.3.1 Lifestyle and behavioural approaches

A **lifestyle approach** to health promotion is based on the premise that the major causes of morbidity and mortality within Australia are diseases resulting from poor lifestyle behaviour choices. It assumes that the provision of relevant information and skills will enable people to adopt a healthy lifestyle and thereby improve

their health. This approach is directed at improving risk factors related to individual behaviour, such as poor eating habits, physical inactivity, smoking, unsafe sexual activity and drug and alcohol abuse. A lifestyle approach to health promotion emphasises the role an individual plays in improving their own health status. Health promotion programs that use this approach target people at the individual or population level in an effort to change their behavioural choices. Health education programs, **social marketing** campaigns, the promotion of self-help or self-care practices and public policies are strategies that are commonly used under this approach to support healthy lifestyles.

Examples of health promotion programs that work within this model include:

- web-based help services such as ReachOut that seek to enhance young people's health knowledge and skills to support and improve their mental health and well-being
- physical activity initiatives such as the Good Sports program targeting school-aged children that aim to increase levels of regular physical activity and reduce sedentary behaviour
- quit smoking campaigns and strategies that encourage people to stop smoking or persuade them to remain smoke free
- road safety campaigns that challenge people's attitudes towards unsafe driving behaviours such as speeding.

FIGURE 3.10 The inclusion of health warnings on cigarette packets are an example of a behavioural approach to health promotion.

Source: © Commonwealth of Australia

SNAPSHOT

Reality hits hard at bstreetsmart

Below is what you will hear at bstreetsmart — an event that could go by the bland description of 'road safety program' but is so, so much more.

You'll hear 26 000 kids goofing around with their mates, snapping selfies and talking through road safety ads playing on giant screens above them.

You'll hear whoops of approval for NSW Premier Gladys Berejiklian and a kind of ambivalent applause for almost everyone else.

As the lights go down, you'll hear squealing tyres, mashing metal and a loud bang.

And then you'll hear 26 000 students stunned into silence as the lights come up to reveal a motorbike that has spun out from under its moaning driver, a deep gash in his leg; a crying girl, trapped and bloody in the front seat of a small silver car; a driver uninjured and in shock, asking panicked questions and willing everyone to be okay.

And you'll see one motionless body on the concrete, blood pooling gently around it. Her name, in this simulation, is Grace. She has been thrown through the windscreen of the car and killed.

There were 384 people killed on NSW Roads in 2016, up 34 from 2015. The number of P-plate drivers killed, and the number of fatalities involving P-plate drivers, also increased. Deaths in the 17–25 age group increased significantly.

P-platers make up eight per cent of all driver licence holders, yet their crashes account for 15 per cent of all fatalities on NSW roads.

bstreetsmart is aimed at bringing those numbers down by bringing year 11 and 12 students up close and personal with the confronting reality of an accident.

In this case, the young driver has been drinking — not heavily, but drinking nonetheless. Grace has taken off her seatbelt. She's shown the driver a picture on her phone, distracting him from the road.

Her friend is now trapped and bleeding, pleading for help.

Over an hour or so, students see the grim reality of an accident: a P-plater first on the scene, police, ambulance and fire and rescue arriving one by one, some bracing the girl in the car into position to prevent further injuries, others helping the biker, others covering Grace's body with a sheet that will soon be stained red with blood. They will hear the hydraulics behind the Jaws of Life as they cut through the side of the car.

And they'll hear blame.

'See that — that's what you did,' the actor playing the enraged P-plater yells at the driver, who still seems too shocked to take it all in.

This is not a 30-second television commercial. Students are seeing how long it takes to deal with a crash scene, the care it demands, the mess and blood and emotion.

Then we see what happens next.

The female passenger is taken to emergency, then to intensive care, and faces a long and difficult recovery.

The driver is charged with dangerous driving causing death and two counts of dangerous driving causing injury. He has returned a mid-range alcohol reading, and is charged for that as well.

The court sentences him to three years in prison, and his licence is disqualified for five years.

His record means there are jobs he will never be able to do.

Grace's heart has stopped beating so she can't donate her organs. She can, however, donate tissue.

Her body is taken to the mortuary and put in a cold room. Her family will see their daughter one last time — when they identify her.

As Westmead's Dr Ken Harrison says: 'It's all really sad. There are no winners.'

It's something Tristan Kennedy knows all too well. He was riding his trail bike with his friend Dwayne when they were hit by a truck. He spent 14 months in the Westmead brain injury unit, learning to walk, eat and drink again. Dwayne was killed.

'A silly decision may change lives forever,' he said at the event. 'Be safe, wear a helmet and don't drive crazy. Don't do this to your family or friends.'

Alyssa Hartup also suffered serious injuries in a car accident.

'I lost a lot of friends,' she told the kids at bstreetsmart. 'You find out who your true friends are.

'I want to prevent anything like this happening to you guys.

'It's okay to be late to a party — your life won't fall apart.'

bstreetsmart was co-founded by Westmead trauma nurses Stephanie Wilson and Julie Seggie. More than 145 000 NSW high school students have gone through the potentially life-saving program since it began in 2005.

Source: http://thepulse.org.au/2017/08/17/reality-hits-hard-at-bstreetsmart.

SNAPSHOT

Younger drivers: Digital learner driver log book apps

Learner drivers can now choose from one of three new apps to record their driving hours and submit log books. The apps provide learner and supervising drivers with similar features to the paper log book, including information on safe driving practices.

It is illegal for learner drivers to use any function of a mobile phone while driving. All of the apps let you 'set and forget' by starting the app while you're safely parked out of the line of traffic, then put your phone away while you're driving. The apps will record your drive in the background.

Beating the odds

Younger drivers face many challenges when learning the complex task of driving a vehicle. With their inexperience, they also face a higher risk of danger. Despite making up only about 15 per cent of all licence holders, younger drivers represent almost a quarter of annual road fatalities.

The *Safer Drivers Course* helps learner drivers identify risks on the roads. Speed management, hazard awareness and safe following distances are some of the strategies in the course's theoretical and practical sessions, which earn learner drivers 20 hours of log-book credit.

Licence conditions explains the Graduated Licensing Scheme process, as well as some of the restrictions that apply to learner and P-plate drivers.

Our *P1/P2 vehicle search* lets provisional drivers find the types of cars that they are allowed to drive.

The *Restricted P1 Provisional* licence pilot allows learner drivers in selected areas west of the Newell Highway to drive to work, education and medical related appointments.

Learners in these areas can apply for a Restricted P1 licence after they have finished 50 hours of on-road supervised driving (including at least 10 hours of night driving).

A *zero alcohol limit* applies to all learner and provisional licence drivers. L and P platers must not consume any alcohol before driving.

Source: Edited extract from NSW Centre for Road Safety, http://roadsafety.transport.nsw.gov.au/stayingsafe/drivers/youngdrivers/index.html#, updated 21 November 2017. © State of New South Wales Transport for NSW

Inquiry

Effectiveness of behavioural approaches aimed at young people

Read about two initiatives or interventions that have been developed and introduced to address concerns about the number of road crashes involving young people. You can use the two snapshots provided or the **Blue Datto** and **Road Safety Education** weblinks in the Resources tab to choose the strategies you will examine.

After reading about the initiatives, respond to the following.

1. Describe what is involved in the two initiatives you have examined and how each seeks to reduce the number of road crashes involving young drivers.
2. Assess the effectiveness of the two initiatives in changing the driving behaviour of young people. Be sure to support your arguments with examples.
3. Propose other strategies or actions that could be taken to promote safer driving by young people.

Resources

Weblink: Blue Datto
Weblink: Road Safety Education

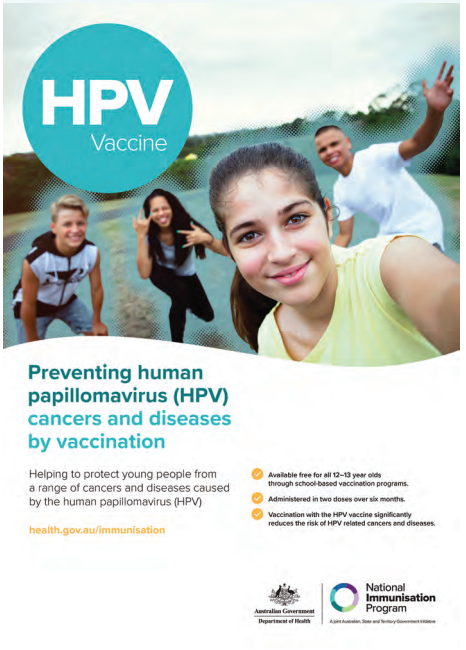
3.3.2 Preventative medical approaches

Preventative medical approaches are based on a more traditional approach to health promotion. These approaches centre around medical personnel such as doctors, community nurses and other health professionals working with individuals or populations. These practitioners work to identify physiological risk factors within these individuals or groups such as high blood pressure, abnormal cell growth or lack of immunisation. Medication or medical interventions are then used to eliminate or treat these risk factors. A preventative medical approach focuses on both disease prevention and the treatment of illness and their symptoms to limit their potential impact on a person's health.

Health-promoting strategies used as part of a preventative medical approach can occur at the primary, secondary and tertiary stages.

- Actions taken at a primary prevention stage aim to prevent an illness ever occurring. Childhood immunisation programs that vaccinate children against diseases such as polio, whooping cough, hepatitis B and human papillomavirus (HPV) are one example of a primary prevention strategy.
- Secondary level prevention programs try to reduce the likelihood that a disease will develop, particularly in people identified as being in high-risk groups. In incidences where a disease is detected these strategies also aim to slow its spread. Examples of secondary prevention strategies include monitoring blood pressure and cholesterol levels of those at risk of heart disease, free mammograms for women aged over 50, regular Pap smears for women who are sexually active and the prescription of antibiotics for someone diagnosed with a sexually transmitted infection.
- Tertiary prevention strategies seek to prevent chronic ill health occurring through the use of effective rehabilitation that stops a disease recurring once it has been diagnosed and treated. For example, an asthma management plan will be developed by a GP for a person diagnosed with asthma to assist them to manage the condition and a rehabilitation program will be devised for a person involved in a serious road accident to support their long-term recovery.

FIGURE 3.11 The National HPV Vaccination Program fact sheet



Inquiry

Preventative medical approaches to cervical cancer

Read the student poster on the National HPV Vaccination Program in figure 3.11 and complete the following.

1. Explain:
   (a) who the program is for and where it is administered
   (b) why it is an example of a preventative medical approach to health promotion.
2. Vaccinations do not prevent all forms of cervical cancer, meaning that cervical screening tests (Pap smears) are still needed by women when they turn 25. Argue whether immunising young people against HPV is an effective health promotion strategy. Give reasons to support your arguments.

3.3.3 Public health approaches

Public health approaches are a more recent trend in health promotion. They have been significantly influenced by the policies and philosophies of the World Health Organization. These approaches take a more holistic approach to health and recognise the role played by factors outside the control of the individual and the immediate health system.

Public health approaches go beyond a medical approach of achieving health through the cure and eradication of illness, to trying to foster better health within a broader social and economic context. These strategies seek to address the broad underlying social and environmental determinants that contribute to poor health (such as access to affordable and nutritious food; safe and secure housing; sufficient income; steady and meaningful employment; social isolation; access to transport; geographic location; levels of education) and create healthier environments that support people to make positive health choices. The approach therefore advocates for a broader range of people from various health and welfare related areas, such as social workers,

urban planners and educators, to be involved in developing and implementing health-promoting initiatives to create healthier environments.

A public health approach to health promotion also encourages individuals and communities to be actively involved in determining their health priorities and developing and implementing health promotion strategies that meet these needs. In this way it seeks to empower individuals and population groups to enable them to exercise control over their health and work collaboratively with health professionals to improve their level of health.

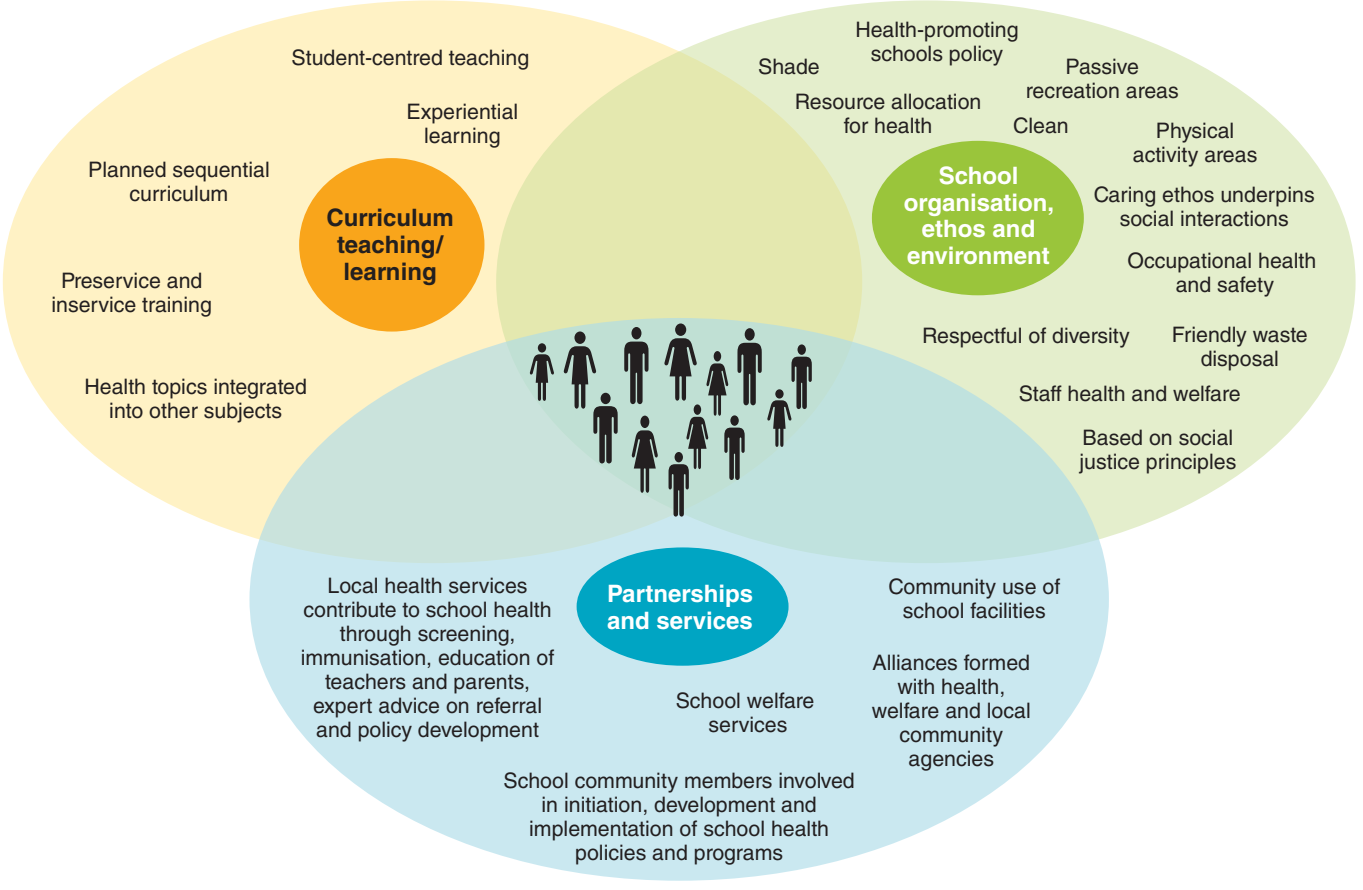
Examples of health promotion programs that use a public health approach include those in health-promoting schools and health-promoting workplaces.

Health-promoting schools

Schools that take a broad, coordinated, whole-of-school approach to the health and well-being of all members of their school community are considered to be **health-promoting schools**. Based on a research-based framework, health-promoting schools regard the health of their students and those in the school community as a high priority. They set out to positively influence the health of students by creating, promoting and supporting healthy practices and environments across the school setting. This involves implementing health-promoting strategies through three interrelated areas:

1. the curriculum
2. school organisation, ethos and environment
3. partnerships with families and the local community.

FIGURE 3.12 Health Promoting Schools framework



The national mental health initiative for secondary schools, MindMatters, is an example of a program that uses a whole school approach based on the Health Promoting Schools framework.

The program provides schools with:

- a range of professional learning and online resources to help teachers develop the knowledge and skills to recognise and support students to get help when needed
- opportunities for reflecting on student resilience, connectedness and empowerment, and exploring strategies and programs that are likely to increase engagement and support students' sense of belonging
- material to review school practices in relation to issues affecting mental health and support changes to policies, structures, practices and curriculum to promote and protect mental health
- information on ways to identify, consult and involve parents, external agencies and other relevant community members in the promotion of mental health.

SNAPSHOT

What is Live Life Well @ School?

Live Life Well @ School is a collaborative initiative between NSW Ministry of Health, the NSW Department of Education, Catholic and independent school sectors. It is supported in NSW primary schools to promote healthy eating and physical activity to students. The program aims to:

- get more students, more active, more often
- focus on healthy eating habits.

Live Life Well @ School assists schools to:

- develop whole school strategies that support physical activity and healthy eating
- improve the teaching of nutrition and physical education through a focus on PDHPE programs
- foster community partnerships that promote and support whole-of-school strategies
- provide opportunities for more students to be more active, more often.

FIGURE 3.13 *Live Life Well @ School* aims to promote greater activity and healthy eating habits among students.

All NSW primary schools are eligible and encouraged to participate.

Local Health Districts provide ongoing support to Live Life Well @ School trained schools via site visits, phone calls and email follow ups. Local Health Districts:

- assist schools to develop an action plan
- support schools to develop a whole school approach to nutrition and physical activity
- assist in the development of community focused nutrition and physical activity strategies
- provide schools with information about upcoming community events that promote healthy eating and physical activity
- provide access to teaching resources.

Source: www.healthykids.nsw.gov.au/teachers-childcare/live-life-well-@-school.aspx. Reproduced by permission, NSW Health and NSW Education © 2018.

Inquiry

Health-promoting schools

Read the snapshot on the Live Life Well @ School initiative and then complete the following. (You may also use the **Live Life Well @ School** weblink in the Resources tab to learn more about the program.)

1. Outline the purpose of the Live Life Well @ School initiative.

2. Describe how the Health Promoting Schools framework has been used in the design of the Live Life Well @ School initiative.
3. Using examples, explain why this initiative is an example of a public health approach to health promotion.
4. Research the activities that have been developed by schools as part of the Live Life Well @ School initiative. You can do this by searching the Live Life Well @ School website where you will find case studies describing activities implemented by individual schools. Draw your own diagram of the Health Promoting Schools framework. Using appropriate headings, write the various activities undertaken by your chosen schools as part of the Live Life Well @ School initiative.
5. Propose ways that high schools could promote increased physical activity and healthier eating habits among secondary students.

Health-promoting workplaces

Workplace health promotion strategies are defined as joint efforts undertaken by employers, employees and the wider community to improve the health and well-being of workers. A **health-promoting workplace** recognises that a healthy workforce can benefit both employers and employees by improving morale, reducing stress, decreasing staff turnover, reducing absenteeism and increasing productivity. Improvements in the health of workers may be achieved by making changes to the workplace and general working environment, encouraging workers to participate in activities that aim to enhance their health and well-being, and supporting personal development. The impact that non-work related factors in the general environment, such as family welfare, home and commuting conditions, may have on the health of workers is also recognised. Strategies such as flexible working conditions may be implemented in health-promoting workplaces to reduce the effect of these factors on the overall well-being of employees.

The programs developed by health-promoting workplaces are related to more than work health and safety measures. A variety of initiatives may be established for workers and management to voluntarily participate in to promote better health and well-being. These could include strategies such as fitness and physical activity programs, provision of workplace counselling, free vaccinations for hepatitis B or influenza, workplace massage sessions, health information seminars, establishment of healthy canteens in workplaces and on-site provision of weight loss or quit smoking programs. Decisions relating to the type of programs that are developed and how they are implemented should be negotiated between employees, management and unions, with the involvement of health professionals and services being sought when required.

SNAPSHOT

King & Wood Mallesons

This law firm employs over 1500 workers worldwide and decided to introduce a workplace health program to improve staff retention and engagement by offering its time-pressured lawyers comprehensive onsite workplace health activities such as health expos.

The challenge

The demanding workload placed upon lawyers led King & Wood Mallesons to implement a program with the motto 'relax, revive and refresh.' Mallesons' Health & Wellbeing program was launched in 2001.

King & Wood Mallesons' workplace health program aims to:

- provide staff with easy access to health services, information and screenings
- encourage staff to keep fit and to maximise their wellbeing
- improve staff retention and engagement.

'Providing initiatives onsite is a great way for time-pressured lawyers to be tested for health issues that they would have otherwise had difficulty in finding time to attend to' said King & Wood Mallesons' Wellbeing Manager.

King & Wood Mallesons' strategy for implementing their workplace health program

Raising awareness of health issues

The Health & Wellbeing team looks for innovative ways to increase awareness and participation in health-related activities. New activities are introduced regularly, and prizes are often offered as a way to encourage people to participate. Emails are a simple and cost effective way to communicate and the intranet is an excellent way to provide easy access to useful information and links. The Wellbeing Manager at King & Wood Mallesons has found that a simple email is a good way to get key messages across, particularly to staff that do not take the time to attend events.

Seminars are popular and are held every second month on a range of topics. Lunch is provided to encourage staff to attend.

Health checks and screening

Health Expos are run in all Australian centres. Medical practitioners, alternative health therapists and nutritionists provide free consultations and testing in areas such as blood pressure, cholesterol, diabetes, bone density testing, iridology, reflexology, massage, posture, back care, osteopathy and podiatry.

Gym membership and onsite classes

King & Wood Mallesons encourages staff to be physically active and offers all staff free gym membership. This is particularly important in an environment where staff spend long periods sitting at their desks each day. Onsite yoga, Pilates, physio, massage, reflexology and weight management classes are also offered in some centres. King & Wood Mallesons believes the money spent on gym memberships is a good investment as it is highly valued by staff.

Benefits

Attendance and participation continues to increase, with attendance recorded and monitored at all events. Anecdotally, the program has translated to improved staff engagement and retention.

Resilience@Law

This program is a collaboration between Mallesons, Allens Arthur Robinson, Blake Dawson, Clayton Utz, Freehills and The College of Law. This initiative raises awareness and understanding of the impact of stress, depression and anxiety across the legal profession. The 2011 beyondblue annual report noted lawyers are more aware of mental health issues than they were as a group in 2009.

About us …

King & Wood Mallesons is a law firm that operates in Australia, China, Japan, Hong Kong, the USA and the UK. They have around 1600 staff and partners in Australia.

Source: www.healthyworkers.gov.au/internet/hwi/publishing.nsf/Content/mallesons-casestudy.

Inquiry

Government initiatives to support health-promoting workplaces

Both the Commonwealth and NSW governments have introduced web-based initiatives to help employers create healthier workplaces: **Healthy Workers Initiative** (Commonwealth Government) and **Get Healthy at Work** (NSW government). Use the weblinks in the Resources tab to find out more about one of these initiatives and then complete the following.

1. Describe the information and resources provided on one initiative's website to support the creation of a health-promoting workplace.
2. Identify the key health behaviours employers are encouraged to address through one of the initiatives. Do you think there are other health issues that employers should also help employees to address? Give reasons to support your ideas.
3. Explain the benefits of creating a healthier workplace.
4. Read the case study in the snapshot on King & Wood Mallesons to investigate the health-promoting strategies introduced at one workplace. Describe what the workplace has done to help improve the health of its employees and the benefits of these activities.

Application

Strategies to improve young people's health

Imagine that you and your classmates have been invited to attend a National Summit on Young People's Health. The purpose is to develop a range of strategies to improve the health of young Australians.

1. Prepare for the summit as follows.
   (a) Identify the key health issues that young people currently face.
   (b) Divide the class into small groups of 3–4 people and allocate each group one of the health issues identified.
2. Each group is to complete the following activities for their allocated health issue:
   (a) Identify health-promoting strategies that have been used or are currently being implemented to address the issue by schools, governments, non-government organisations and/or community groups or organisations.
   (b) Determine which of these strategies should continue because of their effectiveness. Give reasons to justify the strategies you select to continue.
   (c) Propose other actions that could be implemented to bring about improvements in young people's health.
   (d) Identify people or groups that would be involved in implementing or supporting these strategies and outline their roles.
   (e) Outline the intended outcomes of your proposed actions.
3. Conduct the summit as a class where every group shares their ideas and proposals.
4. At the conclusion, evaluate the different strategies that were suggested by all groups to address their allocated health issue.
5. Explain two actions that were suggested that you believe would result in significant improvements in young people's health. Give reasons to justify your choice of these two actions.

on Resources

- **Weblink:** Live Life Well @ School
- **Weblink:** Get Healthy at Work
- **Weblink:** Healthy Workers

3.4 The Ottawa Charter as an effective health promotion framework

In 1977, the World Health Organization (WHO) recognised that governments across the world should be working towards attaining a level of health for all citizens that would enable them to lead socially and economically productive lives by 2000. This became known as a global 'Health For All' strategy. To help achieve this goal, a document called the Ottawa Charter for Health Promotion was developed in 1986 in Ottawa, Canada, which outlined five areas of action to achieve health for all (see Appendix 1, pages XXXXX). The charter is significant because it gave direction to health promotion through clear definitions, action plans and positive involvement. It represented a fundamental shift in how health promotion and health in general was viewed. Agreement to the principles of the Ottawa Charter saw countries across the world recognise health as a positive pursuit and adopt the public health approach as a new way of approaching health promotion. A summary of the charter's main points is given in figure 3.14.

Despite being developed in 1986 the five action areas of the Ottawa Charter are still regarded as essential to any effective health promotion worldwide. They are based on the understanding that health is socially determined and encourage health professionals and governments not only to educate people about health

matters, but also to change the environments in which people live and to involve the community in projects to improve health.

The Ottawa Charter for Health Promotion identified the following prerequisites for health.

- The basic necessities for health are peace, shelter, education, food, income, a stable ecosystem, sustainable resources, social justice and equity.
- Health is a positive concept emphasising social and personal resources, as well as physical capabilities.
- All people should be able to achieve their health potential through the provision of equal opportunities and resources.
- All sectors within the community are responsible for health promotion — health, social and economic sectors, governments, industry, local authorities, media and voluntary organisations.

FIGURE 3.14 Important points from the 1986 Ottawa Charter for Health Promotion

Health promotion is:
the process of enabling people to increase control over and improve their health.

The prerequisites for health improvement are:
peace, shelter, food, education, income, stable ecosystem, sustainable resources, social justice and equity.

The charter advocates that:
good health is important for social, economic and personal development and is an important dimension of quality of life.

This will enable us to:
share opportunities and resources to allow all to achieve their fullest health potential.

We must mediate and:
involve all people in health promotion and health care. Different groups in society (e.g. governments), too, must mediate for the pursuit of health.

Health promotion action means:

1. *Building a public health policy* — e.g. legislation for better health, healthier goods and services, more enjoyable environments.
2. *Creating supportive environments* — encouragement of reciprocal maintenance; that is, take care of one another and the environment.
3. *Strengthening community action* — such as encouraging self-help, social support and participation in health-related matters.
4. *Developing personal skills* — by providing information and enhancing life skills, leading to greater control over one's own health.
5. *Re-orienting health services* — the health sector must look beyond providing clinical and curative services and look to health promotion that addresses the total needs of the individual as a whole person.

For the future:

1. *Commitment to health promotion* — the conference encouraged all participants to actively address health promotion issues in their own countries.
2. *Call for international action* — the conference called on WHO and all international organisations to help with health promotion so that Health for All by the Year 2000 would become a reality.

Source: The Ottawa Charter for Health Promotion from the 1st International Conference on Health Promotion, Ottawa, 21 November 1986 ©World Health Organisation, http://www.who.int/healthpromotion/conferences/ previous/ottawa/en/index3.html.

In order to achieve these ideals, the Ottawa Charter recognised that there are five essential actions to improve health and create greater equality in health:

1. developing personal skills
2. creating supportive environments
3. strengthening community actions
4. reorienting health services
5. building healthy public policy.

Application

The Ottawa Charter

The Ottawa Charter has had considerable influence on the understandings of health promotion that have developed in Australia, the approaches that have been adopted and the people or organisations that have involved themselves in these approaches.

1. Draw up a table like the one below.

The prevailing ideas/values about health promotion and health in general *before* the Ottawa Charter	The ideas and principles that underpinned the Ottawa Charter and reframed thinking about health promotion
•	•
•	•
•	•
•	•
•	•
•	•

2. Read through the following statements. For each one, identify the period of time when the statement represented the prevailing ideas about health and health promotion (that is, before the introduction of the Ottawa Charter and after it). Place each statement in the appropriate column in your table.
   (a) Is the responsibility of a range of people — various levels of governments, industry, media, non-government organisations
   (b) Is primarily about disease prevention
   (c) Requires a broad range of strategies to be used that reach well beyond health care
   (d) Improvements in health are the responsibility of individuals
   (e) Recognised the importance of active participation by people to affect their own health and the broader determinants that influenced it
   (f) Is the sole responsibility of the health-care sector
   (g) Seeks to promote health by empowering individuals and communities to take actions to prevent poor health
   (h) Is about individuals being told what to do by doctors and other health professionals
   (i) Involves a holistic approach
   (j) Health is a positive pursuit
   (k) Acknowledges that health is socially determined
   (l) Is the same as health education
3. Now use this information to write a paragraph describing the historical significance of the Ottawa Charter. You may want to start your paragraph with the sentences below:
   The Ottawa Charter represented a fundamental shift in how health promotion and health in general was viewed. Prior to the Ottawa Charter, health promotion was …

3.4.1 Developing personal skills

Personal and social development occurs through the provision of information, education for health and the enhancement of life skills. This improved knowledge helps to increase options in exercising control over our own health, our environments and in making choices that will promote health. Knowledge and skills (such as problem solving, planning, decision making, communicating and goal setting) can be developed in schools, workplaces, health services, via media campaigns, websites and online apps, and in other community settings. The knowledge and skills gained through these sources helps to enhance our health by making us feel more responsible, empowered and self-confident. We will then have a greater capacity to respond to changes and adjustments that occur in our lives.

Examples of actions that seek to develop personal skills include:

- mandatory Health and Physical Education curriculum from kindergarten to year 10
- media campaigns on the harmful consequences of drug use
- teaching people ways to prepare healthier meals
- providing online information about how to quit smoking
- educating girls and women about how to perform breast self-examinations.

3.4.2 Creating supportive environments

This action area focuses on the places where people live, work and play and on increasing people's ability within these settings to make health-promoting choices. It is concerned with creating social and physical environments that allow healthy choices to be easy choices. It involves providing structures, systems and resources that remove or reduce threats to health and allow people to live and work in places that are safe and promote positive health behaviours.

All levels of governments, the media, communities, sports clubs, workplaces, health services, schools, unions and families are key groups who have a responsibility to create supportive environments. Examples of actions that help to create supportive environments include:

- sporting venues providing areas that are alcohol free
- manufacturing vehicles that run on unleaded E10 fuel
- creating 40 km/h zones around schools
- providing counsellors in schools
- establishing healthy canteens in schools
- local councils building recreational facilities such as cycleways and walking tracks
- Quitline support and information being made available in numerous languages.

FIGURE 3.15 Providing shared cycle and pedestrian paths is one way that governments can create supportive environments.

3.4.3 Strengthening community actions

The focus of this area is the empowerment of communities to identify and implement actions to address their health concerns. This could include opening lines of communication so people within the community can express concerns, giving them representation on organisational committees, providing community groups

with planning tools and giving them information to access funding and expertise. If communities can work together to set health priorities, make decisions, plan strategies and implement them, they will have greater ownership and control of the health promotion processes. Groups within the community that may seek to develop initiatives to address particular local issues include schools, workplaces, local governments, community health centres, self-help groups, Indigenous elders and community leaders, and cultural support agencies.

Examples of programs and initiatives that aim to strengthen community action include:

- participation in the NSW Healthy Town Challenge
- local R U OK? Day events
- Live Life Well @ School programs
- Family Drug Support meetings
- Men's Sheds
- local Driver Reviver stations
- projects developed and implemented by Aboriginal Medical Services.

3.4.4 Reorienting health services

The focus and delivery of health services has moved away from an emphasis on the more traditional aspects of health: diagnosis, treatment and rehabilitation. The **reorientation** of health services seeks to prevent ill health occurring, help people to attain the highest level of health possible and support overall well-being. It takes a more holistic approach that focuses on the whole person, rather than just the problem they may present with when seeking treatment. Reorienting health services requires a change in attitude and the organisation of health services, and stronger attention to research and professional training. To support a shift from the traditional approach to health care provided by health services such as GPs and hospitals, this action area has also involved broadening the places where health services can be provided. The use of schools and mobile health clinics, for example, to deliver vaccinations and health checks are two ways that health services have moved in a health promotion direction.

Examples of the reorientation of health services include:

- the Heart Foundation working with schools to implement the Jump Rope for Heart program
- provision of free mammograms for women aged 50–74 years by BreastScreen NSW
- providing health professionals with training and resources to support patients to quit smoking (for example, NSW Quitline Referral Form)
- increasing funding for research and health promotion
- NSW Health working in partnership with schools to deliver free school-based vaccination programs
- implementing the National Bowel Cancer Screening Program
- delivering Advanced Training in Suicide Prevention to GPs in order to increase their capacity to identify and support people in distress.

3.4.5 Building healthy public policy

This relates to ensuring that decisions made at all levels of government work towards health improvement. It goes beyond the health sector and involves more than providing hospitals and medical policies. It includes legislation, policies and strategies, taxation and organisational change in areas such as recreation, welfare, transport, education and housing. This coordinated action helps to make healthier choices the easier choices in our working and living environments.

Some examples of healthy public policy include:

- increasing the tax excise on cigarettes and other tobacco products twice a year
- legislation relating to unsafe driving behaviours such as driving under the influence of alcohol and using mobile phones when driving

FIGURE 3.16 Work, health and safety laws aim to minimise risks in potentially hazardous work environments.

- laws requiring certain retail food outlets to display the kilojoule content of foods on their menus at the point of sale
- work health and safety regulations
- government policies related to sun safety in schools
- legislation requiring plain packaging of tobacco products.

Inquiry

Effective health promotion

Investigate and prepare a report on a successful health promotion initiative, either on a national scale or at your local community level. You may wish to use the weblinks provided in the Resources tab to investigate the **Finish with the Right Stuff program** or the **8700 kJ consumer education campaign**, or research another health promotion of your choice. Use the following questions to structure your report.

1. Describe the aims of the health promotion initiative.
2. Explain:
   (a) how the five action areas of the Ottawa Charter have been addressed in this initiative
   (b) why this has contributed to its success.

on Resources

Weblink: Finish with the Right Stuff program
Weblink: 8700 kJ consumer education campaign

The Ottawa Charter action areas are central to developing effective health promotion initiatives and programs that bring about positive health outcomes for individuals and the community. One example of how the Ottawa Charter has contributed to improvements in health outcomes is the reduction in road fatalities in Australia. Road-related deaths have fallen from 3800 in 1970 to less than 1200 in 2014 (*Australia's health 2016*). Table 3.1 shows some of the recent road safety measures that have been implemented and how these measures support the five action areas of the Ottawa Charter.

TABLE 3.1 Using the Ottawa Charter to reduce the incidence of road-related injuries

Action area of the Ottawa Charter	Examples of actions or strategies used
Developing personal skills 	• Media campaigns that seek to increase knowledge of the risks faced by drivers/motor cyclists and provide practical strategies to help manage risks (e.g. *Ride to Live* campaign, *Don't trust your tired self* campaign) • Availability of Safer Drivers Course to help L-plate drivers develop their driving and hazard perception skills in preparation for driving unsupervised • Increasing the amount of logged driving time for L drivers to 120 hours in order to increase their driving experience and improve their driving knowledge and skills before going for their licence • Road safety education in schools as part of PDHPE lessons • Providing instructional workshops for parents as supervisors of learner drivers to help them to teach their children the skills and experience they need to be safe on the road • Government advertisements showing the consequences of unsafe driving behaviour (e.g. the *Slow Down* TV advertisement and *Don't Rush* radio and online TV advertisement)
Creating supportive environments 	• Installation of speed bumps in high traffic areas • 40-kilometre speed limits around schools • Construction of cycle lanes and cycle ways that separate cyclists from traffic • Installation of fixed speed cameras in areas of high crash risk • Construction of pedestrian bridges across major roads • Improvements to road infrastructure such as building divided roads and installing safety barriers and rumble strips on highways • The *Towards Zero* campaign, which aims to build a culture of shared responsibility among road users to encourage safer choices when driving
Strengthening community actions 	• Rest areas/Driver Reviver stations with free coffee/tea, set up and run by community based organisations to help combat fatigue • School P&Cs/local community groups lobbying for stop signs/speed bumps/ pedestrian overpasses in local community • Local councils running free Helping Learner Drivers become Safer Drivers workshops for those who supervise learner drivers • The Community Road Safety Grants Program, which allows community groups across NSW the opportunity to develop and deliver local projects to increase road safety awareness and support safer road use
Reorienting health services 	• Research undertaken at Crashlab, which is owned and funded by the NSW government to evaluate vehicle safety • bstreetsmart program for years 10–12 students organised and run by Trauma Service at Westmead Hospital

(*Continued*)

TABLE 3.1 Using the Ottawa Charter to reduce the incidence of road-related injuries (*Continued*)

Action area of the Ottawa Charter	Examples of actions or strategies used
Building healthy public policy 	• Development of the Road Safety Strategy 2012–2021 by the NSW government • Enforcement of speed limits and increases in penalties for driving offences such as speeding and drink driving • Restrictions on speed limits for learner and provisional licence holders • Laws relating to blood alcohol concentration (BAC) limits, including zero BAC for all learners and provisional licence holders • Laws restricting mobile phone use, including banning Learner, P1 and P2 licence holders from using a mobile phone at any time when driving or riding • Laws restricting P1 drivers under 25 years from driving with more than one passenger between the hours of 11 pm and 5am • School zone speed limits • Double demerit points during holiday periods • Fines for not wearing bicycle helmets • Laws requiring cars to be at least one metre from cyclists when overtaking

Inquiry

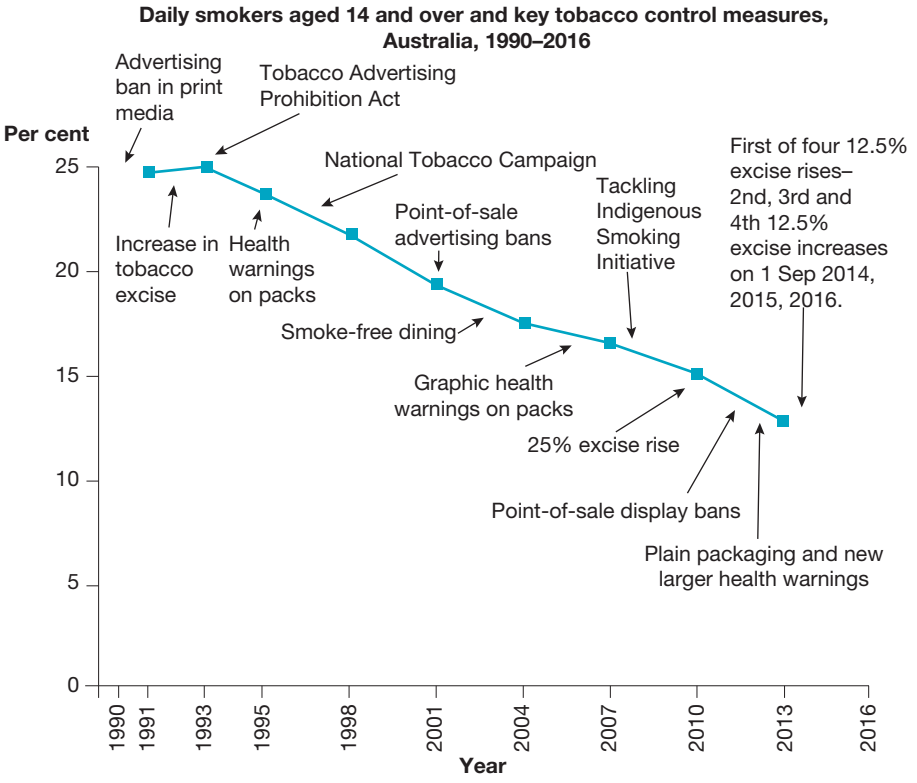
The Ottawa Charter and road injuries

1. Review the actions and strategies listed in table 3.1 that have been implemented to reduce the number and severity of road injuries. Explain how the action areas of the Ottawa Charter and the various strategies within each area have contributed to positive health outcomes for the following groups:
   (a) young drivers
   (b) primary-school-aged children
   (c) cyclists.
2. Suggest other initiatives implemented in the last five years that have contributed to a reduction in road injuries. Identify which action area of the Ottawa Charter they fit within.

Another health issue that has been successfully addressed using the health promotion framework outlined by the Ottawa Charter is tobacco use. The implementation of a wide range of strategies and initiatives has contributed to a steady reduction in tobacco smoking in Australia, with rates of daily smoking falling from 24 per cent in 1991 to 13 per cent in 2013 (*Australia's health 2016*). Australia's first national campaign, the National Tobacco Campaign, was launched in 1997, and since then the Commonwealth Government has formulated successive National Tobacco Strategies (National Tobacco Strategy 2004 –2009 and National Tobacco Strategy 2012–2018) to provide a policy framework for the Australian Government and state and territory governments to work together and in collaboration with non-government agencies to improve health outcomes by reducing the uptake of smoking, supporting smokers to quit and minimising the risk of smoking to non-smokers. Some of the tobacco control measures introduced in Australia during the past 26 years are shown in figure 3.17.

The continuing decline in the use of tobacco clearly demonstrates the effectiveness of health promotion based on the action areas of the Ottawa Charter.

FIGURE 3.17 The introduction of tobacco control measures and the incidence of smoking in Australia



Source: Australian Institute of Health and Welfare, *Australia's health 2016*, fig. 6.1.1, p. 257.

Inquiry

Exploring the use of the action areas of the Ottawa Charter to reduce tobacco use

1. (a) Work in small groups to list strategies and initiatives that have been implemented to reduce the use of tobacco. The measures shown in figure 3.17 can be used to start your list. You may also want to use the **Quitnow** or **iCanQuit** weblinks in the Resources tab to look at current strategies to support people wanting to quit.
   (b) Use the list of strategies and initiatives you produce to complete a table similar to table 3.1 to show how each of the five action areas of the Ottawa Charter has been addressed in order to achieve positive health outcomes by reducing tobacco use.
   (c) Share your table with the class and compare which action area of the Ottawa Charter you have placed the different strategies into.
2. Explain how each of these strategies would help to reduce the use of tobacco and the harms caused by tobacco.

on Resources

Weblink: Quitnow
Weblink: iCanQuit

3.5 Principles of social justice

The adoption of principles of **social justice** is fundamental to effective health promotion. These principles seek to ensure that individuals and groups identified as being the most disadvantaged (and therefore most likely to experience poor health) are provided with sufficient resources and support to empower them to improve their health. On occasions this can see significantly more resources being allocated to particular groups compared to the general population in an effort to narrow the gap that exists and improve the health of the whole population. Agreement with social justice principles requires a valuing of diversity, the provision of equal opportunities to maintain equity and the creation of supportive environments to promote better health.

3.5.1 Equity

Equity means taking action to achieve fairness. In health, this is done by allocating resources and entitlements, including power, fairly across the population. The needs of individuals and populations have to be carefully considered to ensure all individuals within society have access to the same opportunities for achieving optimal health. People experiencing extreme disadvantage such as those suffering poor health, living in poverty or in remote locations need to be allocated more resources if their health outcomes are to change. In other words, people who are disadvantaged may need to be treated differently to be treated equally.

FIGURE 3.18 The principles of social justice include the need to make health services equal for all groups in the population.

3.5.2 Diversity

Australia is an extremely diverse nation, not only in terms of our multicultural populations but also in terms of the varying social 'markers'; for example, age, gender, sexuality, socioeconomic status, geographic location and levels of educational achievement. These social 'markers' require attention to make things fair and just, so that the inequalities and injustices in relation to health are questioned and challenged and inclusiveness is promoted.

In order to raise the levels of health currently experienced by the whole population and to narrow the gap between advantaged and disadvantaged groups in Australia, it is important that health promotion strategies recognise and acknowledge the **diversity** that exists within society. This assists to tailor strategies that better cater for the particular needs of different groups. For example, initiatives targeted at people living in rural locations need to be designed and delivered in different ways from those developed for urban residents. Providing people from particular groups with a voice in determining their own health needs and actively involving them in planning is one way of ensuring the appropriateness of programs.

Sensitivity to a person's cultural background and beliefs is an important component of effective health promotion. Language barriers, misconceptions, lack of cultural awareness, perceived prejudices, feeling stigmatised, and unfamiliarity with health support services can all limit people's ability or willingness to access information and support. The development of culturally appropriate resources, the provision of health promotion material in languages other than English and the involvement of health workers from specific cultural backgrounds in the planning and delivery of initiatives are examples of ways of demonstrating that diversity is valued.

FIGURE 3.19 Health needs and issues differ in Australia's culturally diverse communities.

3.5.3 Supportive environments

The social environment in which a person lives or works has a significant influence on that person's level of health and their ability to be able to make changes to improve their health. Good health is achieved in environments that:

- have a regular supply of safe water and nutritious food and are relatively free of pollution
- have an adequate supply of basic necessities such as clothing, shelter and transport
- provide opportunities for recreation and variety in daily living
- provide people with an opportunity to live in safe, affordable and secure housing
- are relatively free of violence
- cause less stress
- are relatively free of factors that contribute to a sense of isolation and alienation, such as discrimination, stigmatisation and unemployment
- have low levels of poverty
- provide safe, meaningful and interesting work.

Strategies that aim to promote better health need to address the social, cultural, physical and economic factors present in people's lives in order to create environments that are supportive of health. For example, a person who works a long distance from home in a sedentary job, with no public transport available to them and few exercise facilities in their local area may find it difficult to regularly participate in physical activity. The environment in which they live and work creates barriers that make it harder for them to choose to be active. Changes in work practices, a wider range of transport and employment options, and improved local facilities are needed to create an environment that is more supportive of their health.

SNAPSHOT

Health Minister opens Inala Centre of Excellence in Indigenous Health

Health Minister Lawrence Springborg has officially opened a new $7 million Centre of Excellence in Indigenous Health at Inala, ensuring better access to health services for the Aboriginal and Torres Strait Islander community.

The Southern Queensland Centre of Excellence for Aboriginal and Torres Strait Islander Primary Health Care, which is located in the Metro South Health region, is already improving Indigenous health outcomes.

'This new facility enhances the capacity of the existing Inala Indigenous Health Service, dramatically increasing the range of health services provided to the Indigenous community,' Mr Springborg said.

'The original Inala Indigenous Health Service opened in 1995 with only 12 patients. It now currently services about 8000 patients who attend 20 000 doctor consultations each year — a remarkable achievement, and one the staff and local community can be proud of.

'About 20 000 people identify as being of Aboriginal or Torres Strait Islander origin in the southern region of Brisbane and Logan, and research has proven that a culturally appropriate primary care service run by Indigenous staff improves Indigenous health outcomes.'

Mr Springborg confirmed the Department of Health would also fund stage two of the centre, which now provides onsite specialist services including cardiology (heart), endocrinology (diabetes, thyroid health), ophthalmology, hepatology (liver health) and paediatrics.

'It also provides heart health support services such as diabetes education, dietetics, social work, psychology, as well as GP services. These are all supported by Indigenous Health Workers who support the clients in the clinic and in the community,' he said.

'An additional $10.5 million has been allocated by the Queensland Government for stage two of the project, which will, very importantly, co-locate research, as well as other disciplines such as dental services and allied health, on the same campus.

'This extra funding enables the centre to become a research and teaching hub for the next generation of doctors, nurses, dentists and allied health professionals. It will also develop a research agenda focusing on Indigenous chronic disease, maternity and child health.'

Dr Richard Ashby, Chief Executive, Metro South Health said the new centre was being led by a nationally recognised leader in Indigenous health, Associate Professor Noel Hayman.

'This centre is the vision of Professor Noel Hayman, who was Queensland's first Indigenous doctor and who helped establish the original Inala Indigenous Health Service. He was also a national finalist for Australian of the Year in 2011 for his work in Indigenous health, and we are delighted to benefit from his leadership, experience and vision,' Dr Ashby said.

'The centre is currently staffed by ten GPs, 14 nurses, a psychologist, a range of visiting specialists and an allied health team including a social worker and dietitian.

'This outstanding team of clinicians work together to provide culturally appropriate services in essential areas such as child health, chronic disease and immunisation — and will also provide specialist training for health science students in Indigenous health.

'We expect the Centre of Excellence will have a significant impact on Indigenous health not only locally, but across Queensland through teaching, training and research.

'This is another demonstration of the determination of Metro South Health to work with the Government to close the gap in Indigenous health.'

Source: Media statement, http://statements.qld.gov.au/Statement/2013/7/19/health-minister-opens-inala-centre-of-excellence-in-indigenous-health.

Inquiry

Applying social justice principles to promote Indigenous health

Read the snapshot 'Health Minister opens Inala Centre of Excellence in Indigenous Health'. You may also want to listen to a podcast about the centre to deepen your understanding by using the **Brisbane Indigenous Health Service closing the gap** weblink in the Resources tab.

Now complete the following activities with a partner.

1. Write the three principles of social justice as headings.
2. Identify where the principles of social justice are evident in the development of the Inala Centre of Excellence in Indigenous Health.
3. Share your ideas with another pair and discuss.
4. Explain why you think applying the principles of social justice has contributed to positive health outcomes and effective health promotion in this community.

In some cases government legislation or policies may be required to bring about changes to environments so they better support good health. Government legislation that bans smoking in restaurants, government buildings, pubs, clubs and transport services; laws around speeding in school zones; laws around pool fencing; policies around healthy school canteens; and work health and safety laws are all examples of government actions that assist in the creation of environments that promote improved health outcomes.

Incorporating principles of social justice in health promotion initiatives does not inevitably mean improvements in health will take place. The allocation of additional resources and support to particular individuals or groups does not necessarily result in equity in terms of health outcomes, nor does the design of supportive environments guarantee lifestyle changes. People may continue to engage in health risk behaviours that negatively affect their health. Following these principles does, however, provide all Australians with the opportunity to exercise greater control over their own level of health in order to bring about improvements.

Inquiry

Applying social justice principles

1. Use the **Quitnow** weblink in the Resources tab to explore the Quitnow website. This website, which is part of the National Tobacco Campaign, aims to provide information and support to assist people to quit smoking.
2. Identify strategies used as part of the campaign that demonstrate an application of the principles of social justice. Indicate the particular social justice principle addressed by each strategy you identify.
3. Research another health promotion initiative mentioned in this topic (for example, Make Healthy Normal or headspace). Identify strategies within these initiatives where social justice principles have been applied.
4. Report your findings to the class.

Resources

Weblink: Brisbane Indigenous Health Service closing the gap
Weblink: Quitnow

3.6 Topic review

3.6.1 Summary

- Health promotion is the process of enabling individuals to increase control over their health and improve their health.
- Health promotion aims to improve the social, economic, cultural, environmental and behavioural conditions that people live in to ensure they support health-promoting choices.
- Various individuals, groups and organisations, along with all levels of government, play a role in helping to promote good health.
- Individuals have some responsibility for promoting their own health by making positive healthy choices. Individually initiated behaviour change is more likely to occur when people feel empowered and supported.
- Health professionals can assist to empower people to make healthy choices by providing them with information and supporting them to develop skills that will benefit their health.
- Schools and community organisations are common settings for health promotion activities as they share a close relationship with the local community and can target local health priorities.

- Non-government organisations focus on a specific health problem. They promote health by increasing awareness, undertaking research, fund raising, providing support services and lobbying.
- All levels of government share a responsibility for promoting health improvements by providing the funding, strategic leadership, infrastructure and personnel needed to create supportive environments.
- The World Health Organization acts as a coordinating authority on global health issues.
- The philosophy, principles and structures of the World Health Organization guide government approaches to health promotion.
- There are three main approaches to health promotion: a lifestyle approach, a preventative medical approach and a public health approach.
- A lifestyle approach focuses on addressing lifestyle behaviours that contribute to disease and poor health.
- A preventative medical approach centres on using medical interventions and treatments to eliminate or reduce health risks.
- A public health approach is a more holistic approach that recognises the need to address the social and economic factors that influence people's ability to control their own health.
- The public health approach involves a collaborative approach to health promotion whereby communities, government, health professionals and other agencies work together to improve health.
- The Ottawa Charter provides an effective framework for health promotion initiatives to be modelled upon.
- There are five action areas of the Ottawa Charter: developing personal skills; creating supportive environments; strengthening community action; reorienting health services; and building healthy public policy.
- Acceptance and application of social justice principles is essential for effective health promotion.

3.6.2 Questions

Revision

1. Using examples, **outline** what is involved in health promotion. (P5) (3 marks)
2. **Describe** the roles and responsibilities that the following people have in health promotion:
   (a) health professionals
   (b) non-government organisations
   (c) governments
   (d) World Health Organization. (P5) (5 marks)
3. **Explain** the roles played by the different levels of government in health promotion and discuss how their roles are interrelated. (P5) (4 marks)
4. **Explain** why a collaborative approach towards health promotion by individuals, communities, organisations and governments is highly effective in bringing about improvements in health. (P5) (4 marks)
5. **Describe** the three different approaches to health promotion. Provide examples of each approach that seek to address health issues affecting young people. (P6, P15) (5 marks)
6. **Describe** the role that the Ottawa Charter has played in changing the approaches taken to promoting better health in Australia. (P5, P15) (4 marks)
7. **Identify** the five action areas of the Ottawa Charter and explain how each contributes to the promotion of health. (P5) (5 marks)
8. Choose one area of concern in relation to young people's health. **Explain**, using examples, how a supportive environment could contribute to more positive health outcomes for young people in relation to this issue. (P6, P15) (4 marks)
9. **Describe** a health-promoting strategy that addresses the issues of equity and diversity. (P6) (4 marks)
10. **Explain** why the application of the principles of social justice to health promotion initiatives is more likely to bring about improvements in people's health. (P15) (5 marks)

Extension

1. Imagine you are the Federal Minister for Health. **Propose** a health promotion initiative you would implement to address a current health issue facing young people. Be sure to **demonstrate** how your health promotion initiative incorporates the five action areas of the Ottawa Charter and how you have applied the principles of social justice principles. (P6, P15) (10 marks)
2. **Evaluate** the effectiveness of the three approaches to health promotion in improving the health of young people. (P15, P16) (8 marks)

Note: For an explanation of the key words used in the revision questions above, see Appendix 2, page 400.

on Resources

Interactivity: Revision quiz: auto-marked version (int-7256)
Interactivity: Missing word interactive quiz (int-7255)
Digital doc: Revision quiz (doc-26270)

3.6.3 Key terms

advocate means to encourage support for a particular cause, issue or group. *p. 112*
diversity is variety, or difference, between individuals and groups of people. *p. 140*
empowerment for individuals means that they are aware of the choices they have, they can make decisions without relying on others or expecting others to make decisions for them, and they can act in various situations in daily life to protect themselves and promote their health. *p. 110*
equity is the allocation of resources according to the needs of individuals and populations, the goal being to achieve equality of outcomes. *p. 139*
health promotion involves activities that are aimed at enabling people to increase control over their health, to improve their health and prevent illness. *p. 107*
health-promoting schools are schools where all members of the school community work together to promote and protect the health of students through the curriculum, the creation of a safe and supportive school environment, and the establishment of partnerships with parents, health services and the wider community to support improvements in student health. *p. 126*
health-promoting workplaces are those where workplace policies, practices and activities are developed and implemented to improve the health and well-being of all workers. *p. 128*
lifestyle approach to health promotion aims to reduce or prevent the incidence of risk behaviours that contribute to poor health. *p. 121*
non-government organisations (NGOs) are organisations that focus on a specific disease or health issue. *p. 115*
Ottawa Charter for Health Promotion is a document (see Appendix 1, pages 396) that represents a global approach to health promotion by the World Health Organization. It aims to enable people to increase control over their health. It outlines prerequisites for health and essential actions for health promotion. *p. 107*
preventative medical approaches are those that use medical treatments or interventions to promote health. *p. 124*
public health approach to health promotion involves establishing programs, policies and services that create environments that support health. *p. 125*
reorientation means adjusting the direction or focus of a service to create a fresh approach. *p. 134*
social justice is a value that favours the reduction or elimination of inequity, the promotion of inclusiveness of diversity and the establishment of environments that are supportive of all people. *p. 139*

social marketing refers to the use of marketing techniques to improve health and well-being by changing attitudes and behaviour in relation to a particular product or issue. *p. 122*

World Health Organization is a specialised agency of the United Nations that acts as the coordinating authority on international public health issues. It provides leadership on global health issues, helps countries address public health concerns, monitors disease outbreaks, assesses the performance of health systems around the world and promotes health research. *p. 120*

TOPIC 4
Body systems and movement

OVERVIEW

4.1 Skeletal system
4.2 Muscular system
4.3 Respiratory system
4.4 Circulatory system
4.5 Topic review

OUTCOMES

In this topic students will:

- explain how body systems influence the way the body moves (P7)
- utilise a range of sources to draw conclusions about health and physical activity concepts (P16)
- analyse factors influencing movement and patterns of participation (P17)
- value the technical and aesthetic qualities of and participation in physical activity. (V&A)

4.1 Skeletal system

The human skeleton has 206 bones.

The arrangement of these bones enables five main functions including:

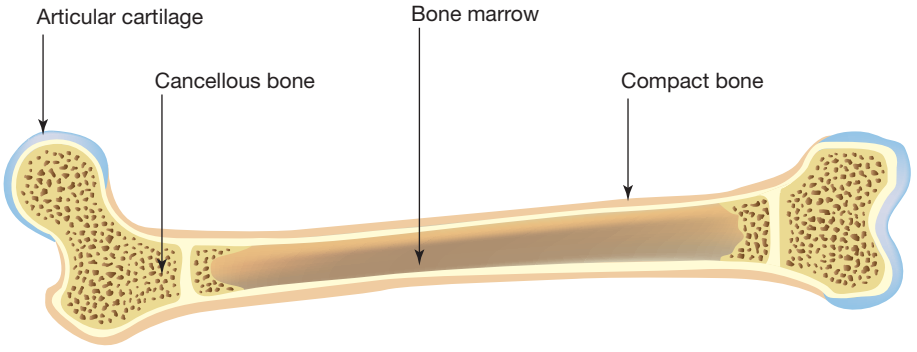
- support for the body, giving it shape, form and posture
- protection of vital organs and soft tissue
- assistance in body movement by providing the attachment for muscles and being able to serve as levers
- manufacture of blood cells in the marrow cavities
- provision of a storehouse for essential minerals such as calcium and phosphorus.

Bones range in shape and size, a feature that allows them to perform specialised functions. The main types are **long bones**, **short bones** and **flat bones**. Long and short bones function as levers or to transfer forces. Flat bones usually provide protection for vital organs.

The outer part of bone consists of dense, strong compact bone tissue and forms the actual shaft of long bones. At the extremities or ends of long bones, there is a criss-cross network of spongy bone tissue called **cancellous bone** which is strong but light and able to withstand stress (see figure 4.1). This is the area that flares out to articulate (meet) with adjacent bones, forming joints. The centre cavity of the bone and the spaces of the spongy bone are filled with **bone marrow** which contains blood vessels, fat and blood-forming tissue.

On the articular surface (the area where bones meet) of the compact bone is a softer but highly resilient material called **articular cartilage**. This prevents jarring and allows the bones to move freely on each other.

FIGURE 4.1 The structure of a long bone

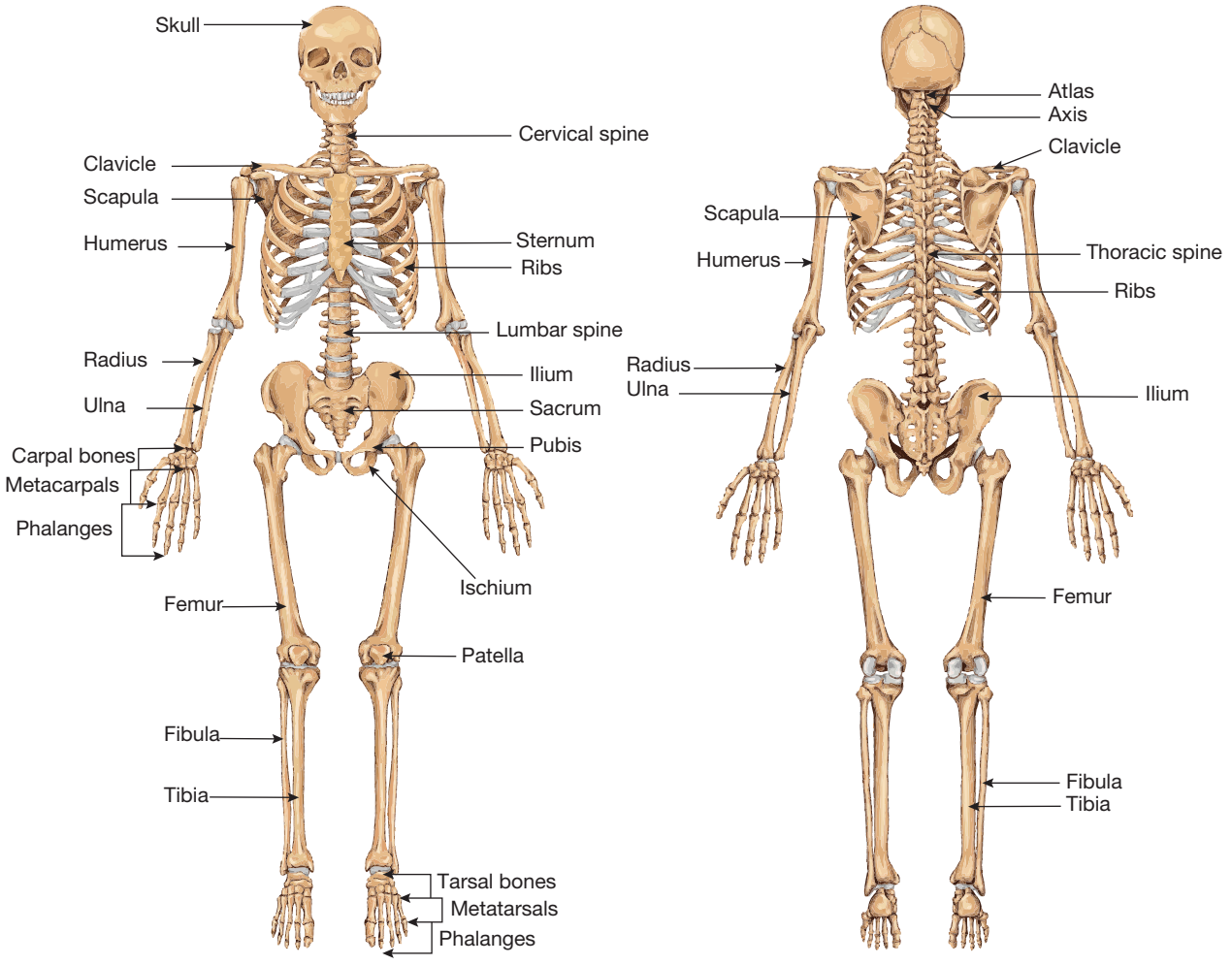


The major bones of the human body are shown in figure 4.2. Not all the bones identified in this figure are involved in movement. For example, the skull comprises many bones, but their role is to protect vital brain tissue rather than assist movement. Our focus in this topic is on the bones that comprise and surround joints, establishing connecting structures that enable movement.

Bones provide structure to the body in the same way that a frame gives structure to a house. Bones move only because muscles pull them, often rapidly, through specific positions, enabling activities such as throwing, kicking, running and swimming. During movement, large long bones move considerably while others move marginally or not at all as they anchor joint structures. It is still important to be familiar with all bones that surround a joint so you fully understand how that structure functions during movement.

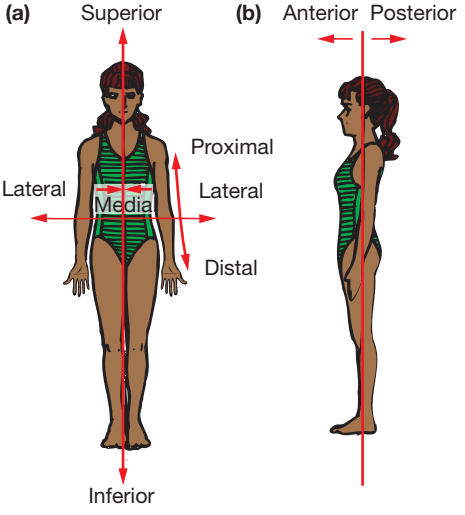
An anatomical reference system called *directional terms* is used to identify the location of bones. The starting point assumes that the body is in the anatomical position; that is, a reference position where the subject is standing erect, facing front on and with palms facing forward (see figure 4.3(a)). From here, we can locate a bone by saying where it is relative to another part of the body. For example, in anatomical terms, superior means ‘towards the head’. For location purposes we might say that the chest is superior to the hips or the knee is superior to the foot. Anatomical terms as they apply to locating body parts are shown in figure 4.3.

FIGURE 4.2 Major skeletal bones from the anterior and posterior of the body



1. *Superior* — towards the head; for example, the chest is superior to the hips
2. *Inferior* — towards the feet; for example, the foot is inferior to the leg
3. *Anterior* — towards the front; for example, the breast is on the anterior chest wall (see figure 4.3(b))
4. *Posterior* — towards the back; for example, the backbone is posterior to the heart (see figure 4.3(b))
5. *Medial* — towards the midline of the body; for example, the big toe is on the medial side of the foot
6. *Lateral* — towards the side of the body; for example, the little toe is on the lateral side of the foot
7. *Proximal* — towards the body's mass; for example, the shoulder is proximal to the elbow
8. *Distal* — away from the body's mass; for example, the elbow is distal to the shoulder.

FIGURE 4.3 The (a) anatomical and (b) anterior and posterior positions



4.1.1 Major bones involved in movement

The major bones involved in movement are as follows.

- *Clavicle (collar bone)*. This is a long bone that provides attachment between the shoulder girdle and the vertebral column. It gives greater mobility to the shoulder joint when movement is taking place, such as throwing a softball.
- *Scapula (shoulder blade)*. This is a large, triangular flat bone. The scapula/clavicle structure allows the arm to attach to the trunk portion of the skeleton. Many muscles involved in movement attach to this bone.
- *Humerus*. This is the major long bone in the upper arm joining the shoulder to the elbow. It can move in most directions and even rotate within the shoulder joint, as might be required for bowling in cricket.
- *Radius*. This long bone is found on the thumb side of the forearm. It works with the ulna in providing structure to the forearm and allowing it to rotate on the elbow joint. Muscles work on and around the radius and ulna rotating the palm of the hand, as might be required during freestyle swimming or providing topspin to a table tennis ball.
- *Ulna*. This is the longer bone of the forearm, found on the little finger side.
- *Carpals, metacarpals* and *phalanges*. These are the bones of the wrist and fingers. Carpals are short bones; metacarpals and phalanges are long. Collectively they provide structure to the hand allowing it to perform important fine motor movements such as catching, holding a bat, flicking as part of a throw, spinning a ball and squeezing.

FIGURE 4.4 Bones of the upper limb

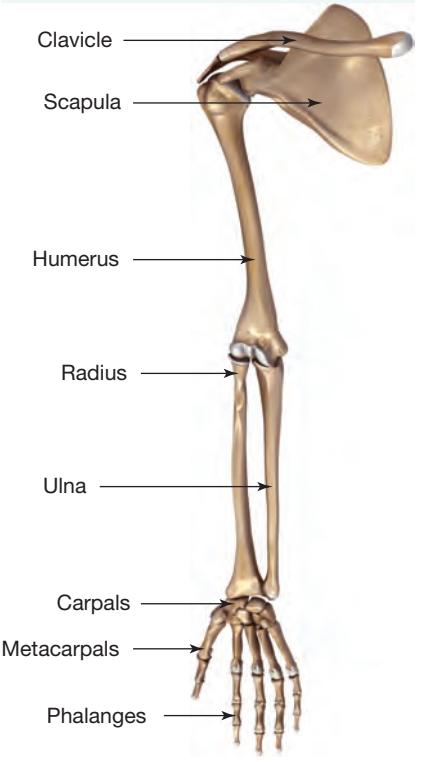


FIGURE 4.5 Detailed view of the scapula and clavicle

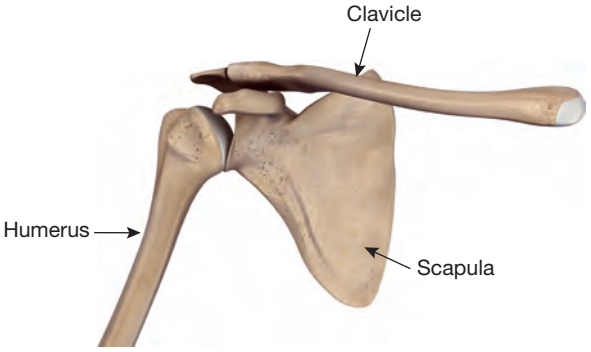
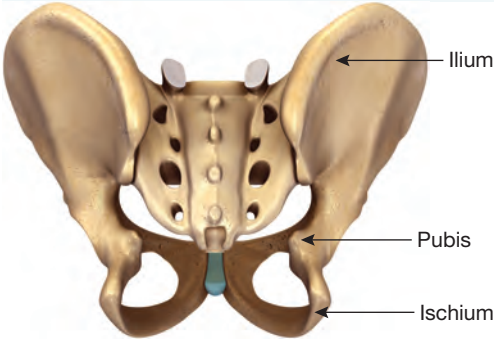


FIGURE 4.6 Bones of the pelvis

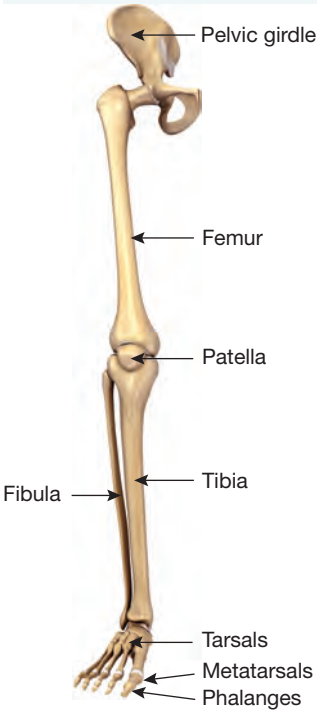


- *Pelvic girdle*. The pelvis comprises a number of bones and provides the base of support necessary for the weight of the upper body. While not directly contributing to movements such as kicking, it is important because it also allows for the attachment of the lower limbs and muscles of the leg and lower back. The pelvic girdle allows less movement than the shoulder girdle because the supporting ligaments are short and strong. The hip joint where the femur (thigh bone) attaches is deep, adding to the stability of the structure.

- *Femur* (thighbone). The femur is the longest and strongest bone in the body, having the capability to support up to 30 times the weight of an adult. The bone is covered by large muscles that extend from the pelvic girdle to the shin, enabling many movements such as running and kicking.
- *Patella* (kneecap) is a small, flat triangular bone whose main role is to provide protection to the knee.
- *Tibia* or shinbone is the larger of two long bones that form the lower leg. It bears most of the body weight and of course is involved in all movements of the lower body, such as running, kicking and swimming.
- *Fibula* is a slender long bone that lies parallel with and on the lateral side of the tibia. It works with the tibia in providing support and stability to the lower leg while allowing slight rotation from the knee joint.
- *Tarsals, metatarsals* and *phalanges* comprise the bones of the foot. Tarsals are short bones; metatarsals and phalanges are long. They work as a unit providing a structure that enables leg movements including walking, running, balancing, hopping and kicking.

Use the **Skeletal system** weblink in the Resources tab to help you review the skeletal system.

FIGURE 4.7 Bones of the lower limb



Application

The skeletal system and its role in movement

Equipment

Textbook, diagram of a skeleton, an anatomical model of the skeleton, a skeletal chart, blank labels

Procedure

1. Refer to the text about the major bones of the body and to figure 4.2. Using a diagram of the skeleton, label the major bones involved in movement.
2. Work in pairs, rotating the role of performer and analyst during the following activities. As one student slowly performs each action, the other should identify the bones involved in the movement and establish the role played by each bone; for example, support, transfer of load.
   (a) Throwing a javelin
   (b) Kicking a football
   (c) Paddling a canoe
   (d) Bowling in cricket
   (e) Shooting in netball
   (f) Swinging a golf club

on Resources

Weblink: Skeletal system
Interactivity: Major bones of the skeletal system (int-6616)

4.1.2 Structure and function of synovial joints

A joint is a junction of two or more bones and is commonly referred to as an *articulation*. There are three types of joint — immovable or fibrous, slightiy movable or cartilaginous, and freely movable or synovial.

An **immovable** or **fibrous joint** is a joint where no movement is possible. Examples of this type of joint include the bones of the cranium, which are fused in lines called sutures. A **slightly movable** or **cartilaginous joint** is a joint that permits limited movement. Examples of this joint exist in the vertebral column, where fibrous cartilage between discs allows a limited range of movement. A **freely movable** or **synovial joint** is one that allows maximum movement. Most joints in the body are synovial joints; for example, the hip joint.

FIGURE 4.8 The sutures in the skull are an example of an immovable or fibrous joint.

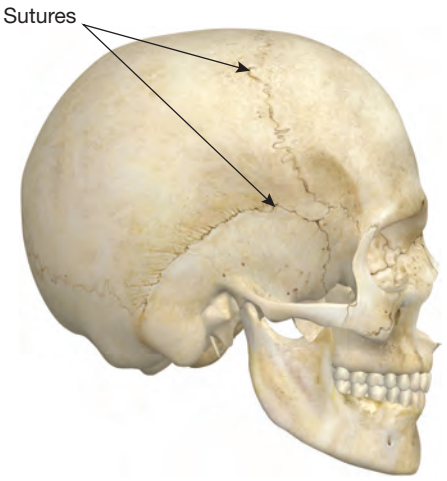
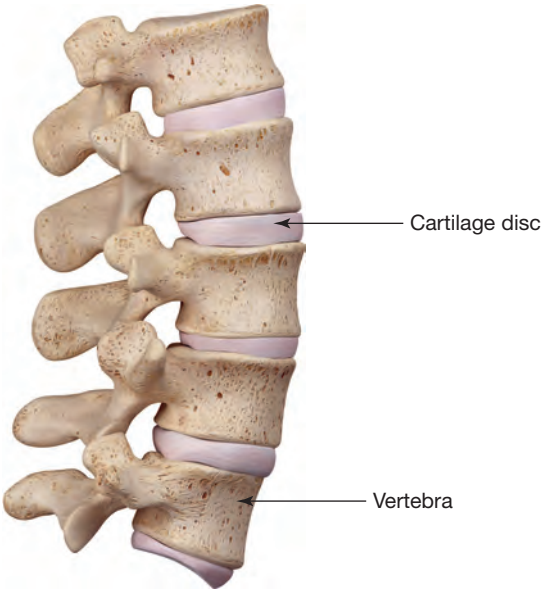


FIGURE 4.9 Example of a slightly movable/ cartilaginous joint



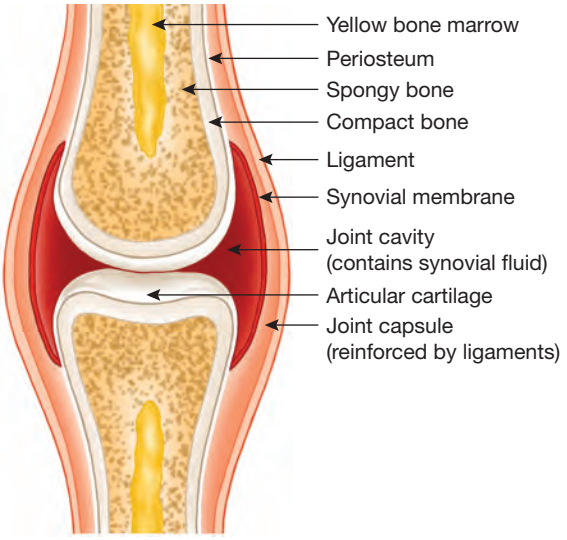
The knee joint is a typical synovial joint. Although its structure is complex, its features are typical of that of synovial joints throughout the body. The most important structures in synovial joints are tendons, ligaments, cartilage and synovial fluid.

Ligaments

Ligaments are well-defined, fibrous bands that connect the articulating bones. They are designed to assist the joint capsule to maintain stability in the joint by restraining excessive movement, but can also control the degree and direction of movement that occurs.

Ligaments are relatively inelastic structures that may become permanently lengthened when stretched excessively. This can occur in injury to the joint and may lead to some joint instability.

FIGURE 4.10 Basic structure of a freely movable or synovial joint



Tendons

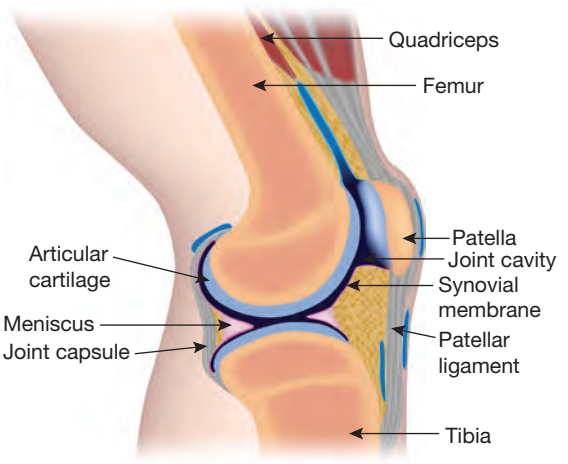
Tendons are tough, inelastic cords of tissue that attach muscle to bone. Joints are further strengthened by muscle tendons that extend across the joint and assist ligaments to hold the joint closed.

Synovial fluid

Synovial fluid acts as a lubricant, keeping the joint well oiled and the moving surfaces apart. As no two joint surfaces fit together perfectly, synovial fluid forms a fluid cushion between them. It also provides nutrition for the cartilage and carries away waste products.

The amount of synovial fluid produced depends on the amount and type of physical activity of the joint. When the articular cartilage is under pressure — that is, during movement — fluid is 'pumped' into the joint space. The viscosity (stickiness) of the fluid can also vary, with the synovial fluid becoming more viscous with decreases in temperature. This may be the reason for joint stiffness in cold weather.

FIGURE 4.11 The knee joint



Hyaline cartilage

While synovial fluid acts as a cushion between the articulating surfaces of the bones, they are also covered with a layer of smooth, shiny cartilage that allows the bones to move freely over each other. Hyaline cartilage has a limited blood supply but receives nourishment via the synovial fluid. This cartilage is thicker in the leg joints, where there is greater weight bearing.

Application

Observing synovial joints in action

Equipment

Textbook, model of skeletal system

1. In pairs, observe the anatomical model, giving particular attention to the joints. If possible, gently manipulate major joints while noting the structure of bones that articulate at the joint.
2. Copy and complete the table below.
3. Use the information you have gathered to discuss the relationship between the types of bone (long, short, flat) and movement allowable at each joint.

Joint name	Joint type	Articulating bones	Movement allowable
Shoulder			
Elbow			
Wrist			
Hip			
Knee			
Ankle			

Inquiry

The role of joints in movement

1. The human skeletal system is remarkable in that it allows us to perform a very wide range of movements. Discuss how the various joint structures allow us to run quickly, throw a shot-put and perform a somersault in gymnastics.
2. Investigate the effect of osteoarthritis on movement.

Application

Synovial joints

The weblinks **joints** and **synovial joint anatomy** in the Resources tab provide videos useful for revising the synovial joint section.

on Resources

Weblink: Joints
Weblink: Synovial joint anatomy

4.1.3 Joint actions

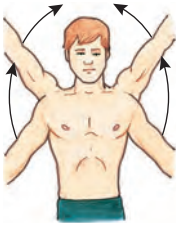
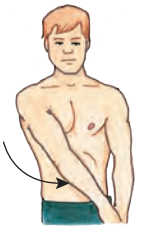
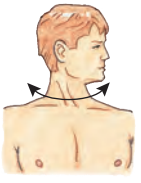
The numerous joints of the body, together with the muscles around these joints, allow us to perform a remarkable range of twisting, turning and rotating movements. Physiologists use specific terminology to describe those movements, which are called joint actions. An example is flexion which refers to the action of two bones coming closer together, as happens when we bend the elbow. In this action, the radius and ulna are drawn closer to the humerus. The types of joint actions are summarised in table 4.1.

TABLE 4.1 Types of joint actions

Joint action	Definition	Example	
Flexion	Decrease in the angle of the joint	Bending the elbow or knee	

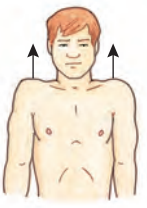
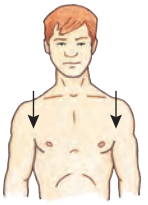
(*Continued*)

TABLE 4.1 Types of joint actions (*Continued*)

Joint action	Definition	Example	
Extension	Increase in the angle of the joint	Straightening the elbow or knee	
Abduction	Movement of a body part away from the midline of the body	Lifting arm out to side (*out* phase of star jump)	
Adduction	Movement of a body part back towards the midline of the body	Returning arm into body or towards midline of the body	
Circumduction	Movement of the end of the bone in a circular motion	Drawing a circle in the air with straight arm	
Rotation	Movement of a body part around a central axis	Turning head from side to side	
Pronation	Rotation of the hand so that the thumb moves in towards the body	Palm facing down	

(*Continued*)

TABLE 4.1 Types of joint actions (*Continued*)

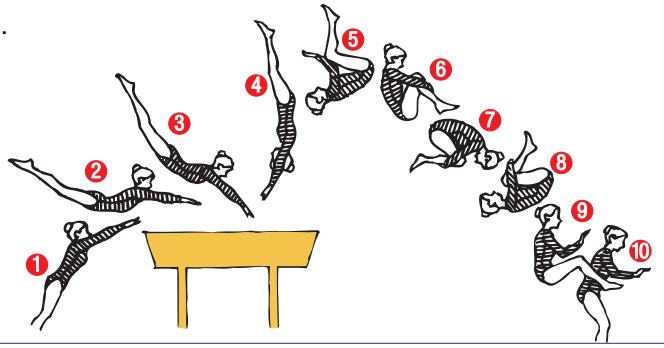
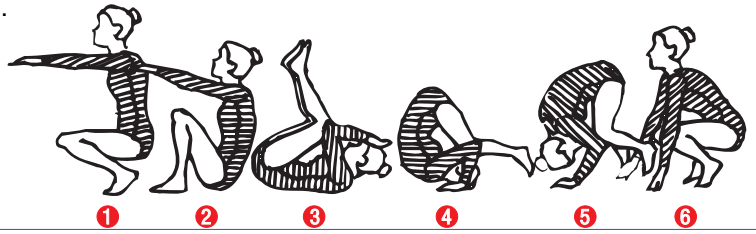
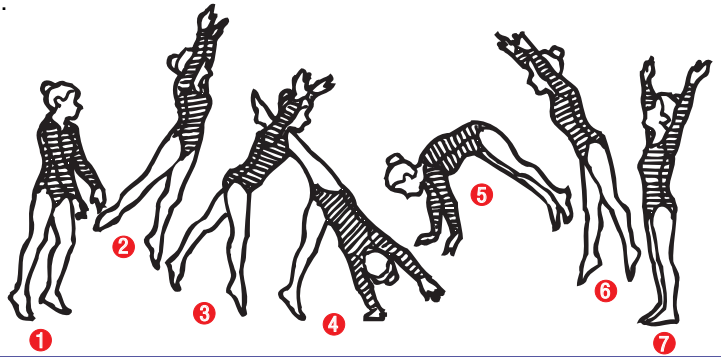
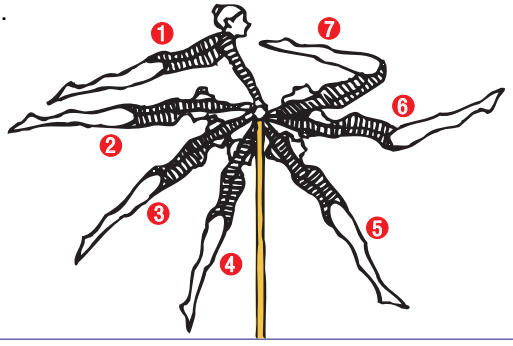
Joint action	Definition	Example	
Supination	Rotation of the hand so that the thumb moves away from the body	Palm facing up	
Eversion	Movement of the sole of the foot away from the midline	Twisting ankle out	
Inversion	Movement of the sole of the foot towards the midline	Twisting ankle in	
Dorsi flexion	Decrease in the angle of the joint between the foot and lower leg	Raising toes upwards	
Plantar flexion	Increase in the angle of the joint between the foot and the lower leg	Pointing toes to the ground	
Elevation	Movement of the shoulders towards the head	Shrugging shoulders	
Depression	Movement of the shoulders away from the head	Returning shoulders to normal position	

Inquiry

Identifying joint action

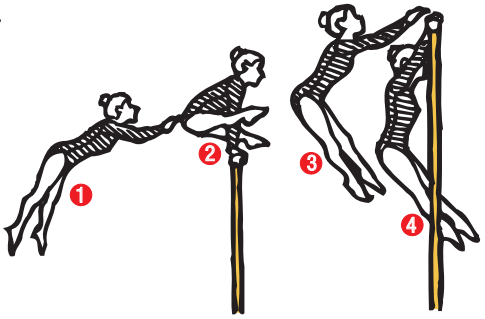
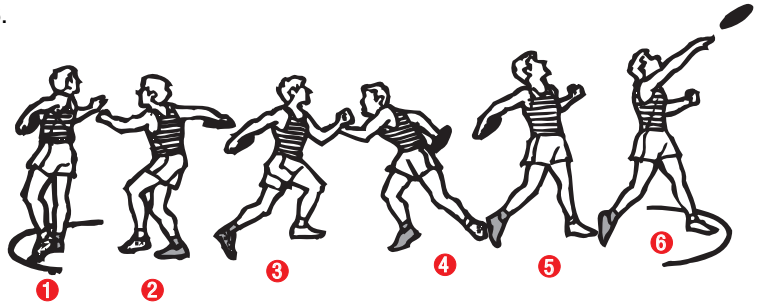
Closely examine the illustrations in table 4.2. Indicate the type of movement taking place at the specified joint.

TABLE 4.2 Joints involved in movements

Movement	Joint
1. 	Knees (points 4–6) Knees (9–10) Hips (4–6) Hips (9–10) Neck (3–6)
2. 	Neck (2–4) Elbows (2–4) Feet at point 1 Feet at 3
3. 	Hips (5–7) Arms (1–2) Feet (6–7)
4. 	Hips (5–7) Arms (1–2)

(*Continued*)

TABLE 4.2 Joints involved in movements (*Continued*)

Movement	Joint
5. 	Hips (1–2) Hips (2–4)
6. 	Hips (1–6) Left knee (2–6) Neck (1–4) Right foot (4–5)

Application

Joint actions

Work in pairs. One person names a specific joint action and the other person performs an example of the movement. Continue until all joint actions have been explored, then change roles.

Inquiry

Joint actions in a sport or activity

Identify each of the joint actions in a particular sport or activity. Suggest how knowledge of joint structures could improve efficiency of movement and lessen the risk of injury. Watch the video **Joint movements** in the Resources tab to learn more about different types of joint movement.

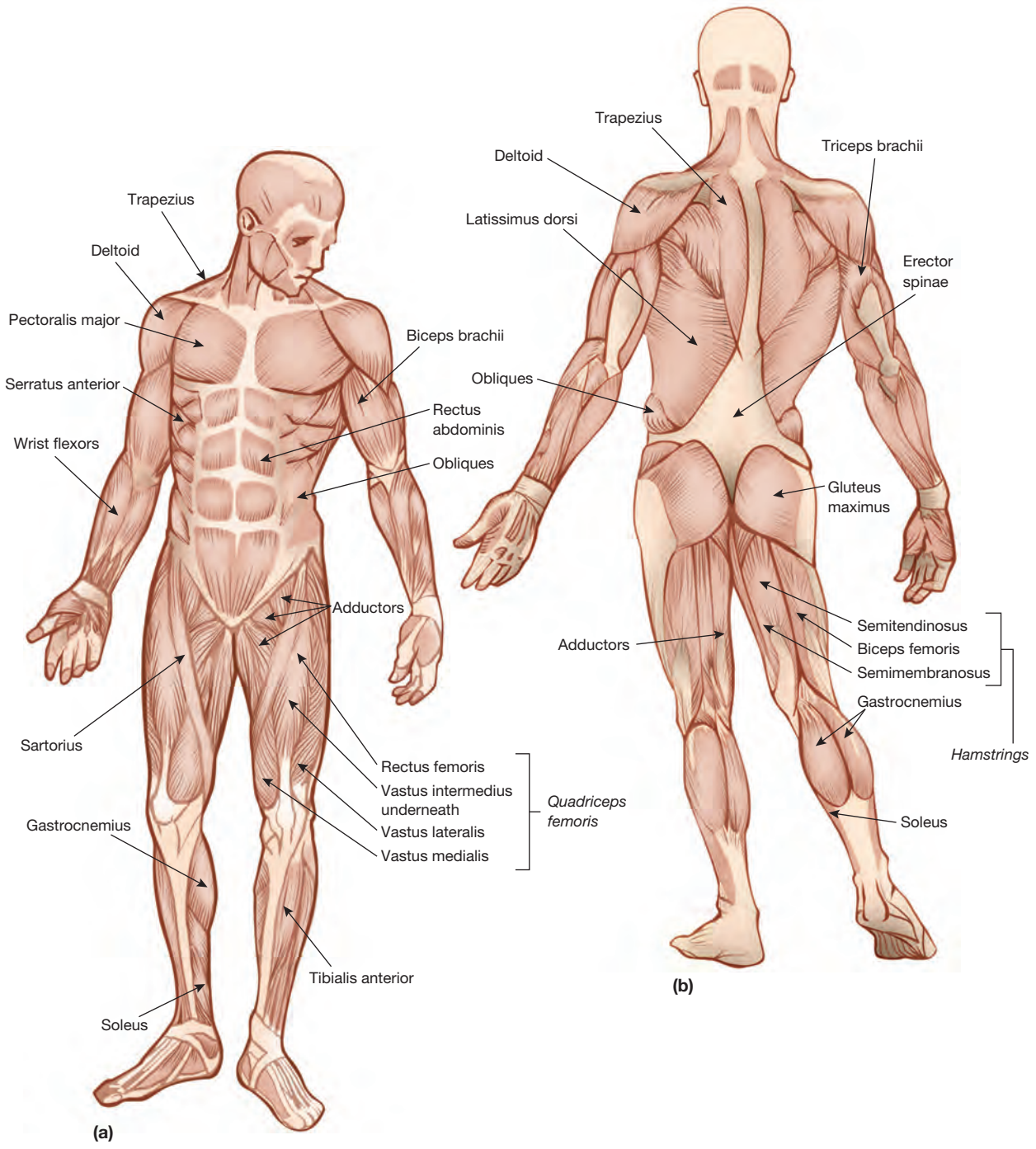
on Resources

eLesson: Joint movements (eles-2578)

4.2 Muscular system

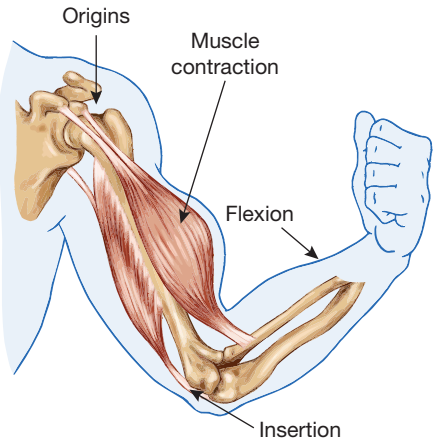
There are more than 600 muscles in the body and they are all attached to bones. The role of muscles is to contract. When they contract, we move. Muscles are unable to push to enable movement. Instead they shorten, causing joint movement, then relax as opposing muscles pull the joint back into position. The major muscles of the body are shown in figure 4.12.

FIGURE 4.12 Muscles of the human body: **(a)** anterior view and **(b)** posterior view



To locate muscles, it is important to establish the **origin** and **insertion** of the muscle. The origin of the muscle is usually attached directly or indirectly to the bone via a tendon. The attachment of the muscle is usually by a tendon at the movable end, which tends to be away from the body's main mass. When the muscle contracts it causes movement. This is called muscle **action**.

FIGURE 4.13 The origin, insertion and action of the biceps brachii

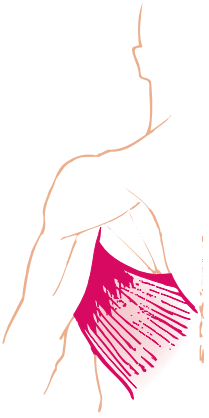
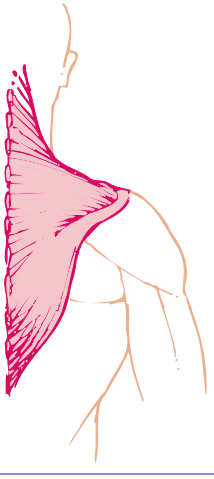


4.2.1 Major muscles involved in movement

The identification and location of the major muscle groups is summarised in table 4.3.

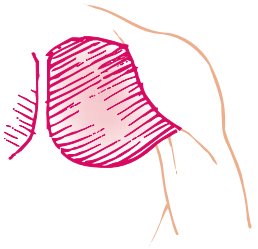
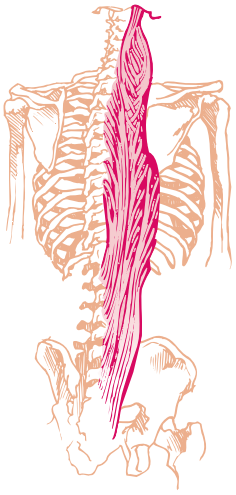
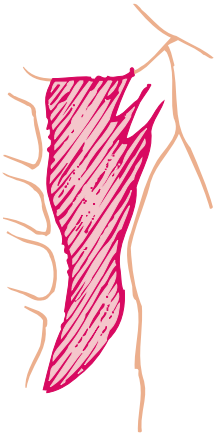
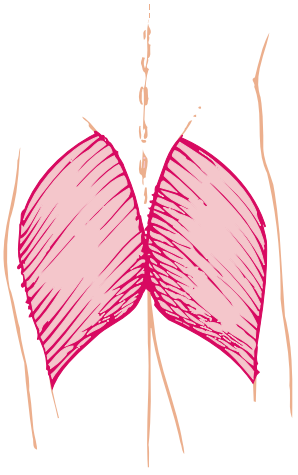
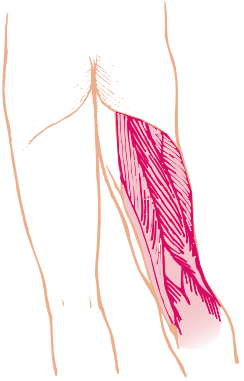
Palpation is a term that means feeling a muscle or muscle group. Most of the muscles shown in table 4.3 are superficial muscles because they are just underneath the skin surface and can be palpated. It is often easier to palpate a muscle if we move it a little.

TABLE 4.3 Location of major muscles and their actions

Muscle	Origin, insertion, action	Muscle	Origin, insertion, action
Upper limb Deltoid 	Origin: scapula, clavicle Insertion: humerus Action: abduction of arm	**Trunk** Latissimus dorsi 	Origin: spine: T6–L5 vertebrae, iliac crest Insertion: humerus (proximal end) Action: adduction, extension and rotation of arm
Biceps brachii 	Origin: humerus, scapula Insertion: radius Action: flexion of arm and forearm, supination of forearm	Trapezius 	Origin: base of skull, C7–T5 vertebrae Insertion: scapula (upper surface), clavicle Action: adduction of scapula, elevation of shoulders

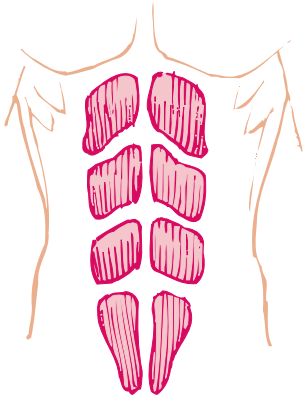
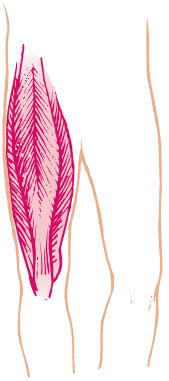
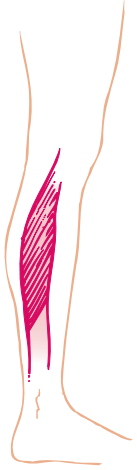
(*Continued*)

TABLE 4.3 Location of major muscles and their actions (*Continued*)

Muscle	Origin, insertion, action	Muscle	Origin, insertion, action
Triceps 	Origin: scapula, humerus Insertion: ulna (proximal end) Action: extension of arm and forearm	Pectorals 	Origin: sternum, clavicle Insertion: head of humerus Action: flexion and adduction of arm
Erector spinae (sacrospinalis) 	Origin: base of skull Insertion: sacrum Action: extension of back (trunk)	External obliques 	Origin: lower 8 ribs Insertion: iliac crest Action: flexion and rotation of trunk
Gluteus maximus 	Origin: posterior surface of pelvis, sacrum Insertion: femur Action: extension and abduction of thigh	**Lower limb** Hamstrings 	Origin: ischium, femur Insertion: tibia, head of fibula Action: extension of thigh, flexion of lower leg

(*Continued*)

TABLE 4.3 Location of major muscles and their actions (*Continued*)

Muscle	Origin, insertion, action	Muscle	Origin, insertion, action
Rectus abdominis 	Origin: crest of pubis Insertion: ribs 5, 6, 7 Action: flexion of trunk	Quadriceps 	Origin: iliac crest, femur Insertion: tibia (proximal end), patella Action: flexion of hip, extension of lower leg
Gastrocnemius 	Origin: femur (distal end) Insertion: heel bone (posterior) Action: knee flexion, plantar flexion of foot	Tibialis anterior 	Origin: tibia Insertion: ankle, tarsal, metatarsal Action: dorsiflexion and inversion of foot
Soleus 	Origin: tibia and fibula Insertion: heel bone (posterior) Action: plantar flexion of foot		

Application

Identifying muscle groups and their role in movement

The **Major muscle groups in the body** weblink in the Resources tab is a useful resource review muscle names and their involvement in movement.

Application

Palpating muscles

Working in pairs, palpate as many muscles as is convenient. Try to identify place of origin, belly (main part) of the muscle and point of insertion. Change roles after each muscle palpation.

Inquiry

Muscle palpation and identification

1. Which five muscles were easiest to palpate?
2. Which muscles were most difficult to palpate?
3. Why is palpation difficult with some muscles?
4. Examine the action of each muscle that you were able to palpate. Identify how that muscle influences the way we move by describing a movement caused by the contraction of the muscle.
5. Discuss the importance of the strength of tendons in 'collecting' muscle fibres and joining them to a bone.

on Resources

Weblink: Major muscle groups in the body
Interactivity: Muscles (int-6623)

4.2.2 Muscle relationship

In producing a particular movement, a muscle performs one of three roles. It can act as an agonist, antagonist or stabiliser (or fixator).

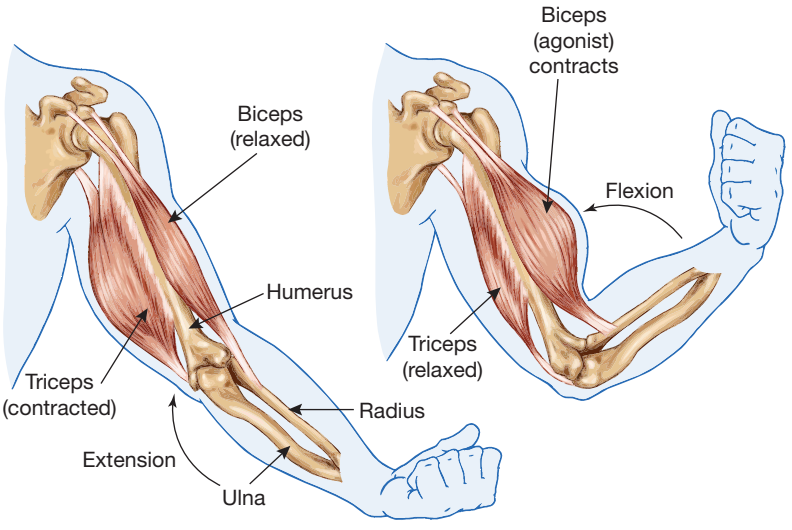
Agonist

An *agonist* or prime mover is the muscle causing the major action. There are agonists for all movable joints and usually more than one is involved in a particular joint movement.

Antagonist

An *antagonist* is a muscle that must relax and lengthen to allow the agonist

FIGURE 4.14 The changing roles of muscles — straightening and bending the arm



to contract, thus helping to control an action. The agonist works as a pair with the antagonist muscle. The two roles are interchangeable depending on the direction of the movement.

Antagonists cause an opposite action to that caused by the agonist. For example, figure 4.14 shows that:

- in bending the elbow, the flexor (biceps) is the agonist while the extensor (triceps) is the antagonist, relaxing for flexion to occur
- in straightening the elbow, the extensor (triceps) is the agonist while the flexor (biceps) is the antagonist.

Similarly, abductors and adductors are generally antagonistic to each other.

Stabiliser

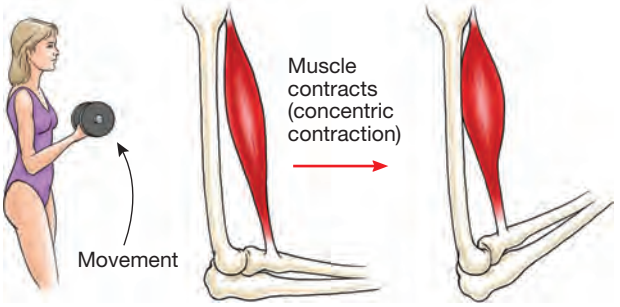
Stabiliser or fixator muscles act at a joint to stabilise it, giving the muscles a fixed base. The muscle shortens very little during its contraction, causing minimal movement. This permits the action to be carried out correctly and allows other joints to work more effectively. For example, in a dynamic movement such as throwing, while some shoulder muscles serve to propel the object, others act as stabilisers to allow the efficient working of the elbow joint and to reduce the possibility of damage to the joints.

4.2.3 Types of muscle contraction

When a muscle is stimulated, it contracts. This may happen in a number of ways. There are three principal types of muscle contraction — **concentric**, **eccentric** and **isometric**. Both concentric and eccentric contractions are isotonic contractions (also called dynamic contractions) because the length of the muscle will change; that is, it will become shorter or longer. In contrast, an isometric contraction is a form of static contraction where length is unchanged despite application of tension.

Examples of concentric contractions are the contraction of the rectus abdominis to raise the trunk during a sit-up, or the biceps contracting to lift a weight, as shown in figure 4.15.

FIGURE 4.15 An example of a concentric contraction. The biceps shortens to lift the weight.



Examples of eccentric contractions are the rectus abdominis extending to gradually lower the trunk during the downward action of a sit-up, or the biceps muscle fibres lengthening as the weight is returned to its original position, as shown in figure 4.16.

FIGURE 4.16 An example of an eccentric contraction. The biceps lengthens to lower the weight.

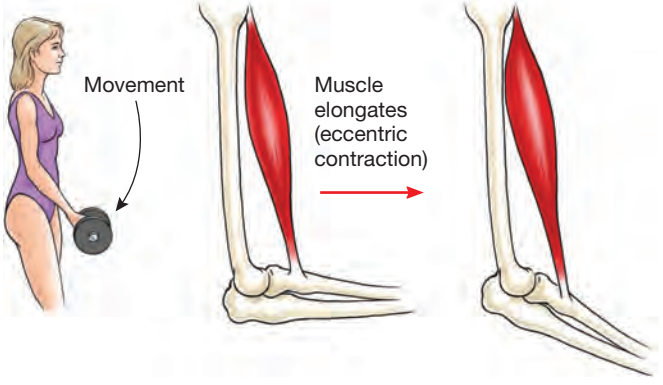
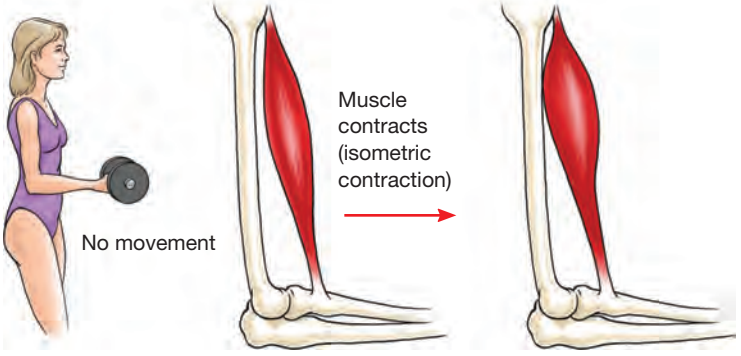


FIGURE 4.17 Isometric muscle contractions are important in rock climbing and many other physical activities and sports.

FIGURE 4.18 An example of an isometric contraction. When the weight is held, the muscles generate force and the length of the muscle (isometric) remains the same.



Isometric contractions are commonly seen in attempted movements where a resistance cannot be overcome. Examples are a weight-lifter trying to lift a weight that cannot be moved, or a person pushing against a wall. In each case, the effort is being made, but the muscle length does not change because the resistance is too great.

Application

Joints and movement

Following is a list of common sporting movements. Working in pairs, have one person imitate each of the actions:

- arm action while taking a shot in basketball
- wrist action while taking a shot in netball
- arm action during an overarm throw
- knee action during a vertical jump
- foot action during the take-off in a long jump.

Observe each action closely and then copy and complete the following table.

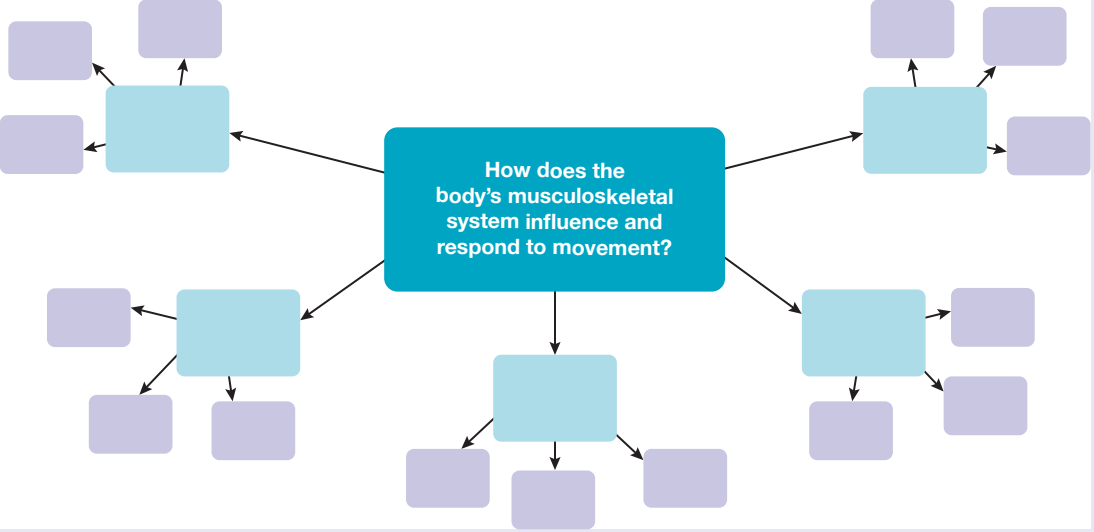
Movement	Bones involved	Muscles and their roles	Joint action	Type of contraction
Arm action — basketball shot				
Wrist action — netball shot				
Arm action — overarm throw				
Knee action — vertical jump				
Foot action — long jump take-off				

Inquiry

Anatomical structures and movement

Copy and complete a mind map similar to figure 4.19, to respond to the question: 'How does the body's musculoskeletal system influence and respond to movement?'

FIGURE 4.19 Sample mind map



4.3 Respiratory system

4.3.1 Structure and function

Every cell in our body needs a constant supply of oxygen (O_2) and food to maintain life and to keep the body operating effectively. But how does oxygen get from the atmosphere to the muscles and other body tissues? How is carbon dioxide (CO_2) removed from the body? What causes us to breathe? What is lung capacity and how does it influence our physical performance? These are the types of questions that can arise when we consider the system through which the human body takes up oxygen and removes carbon dioxide in the process known as **respiration**.

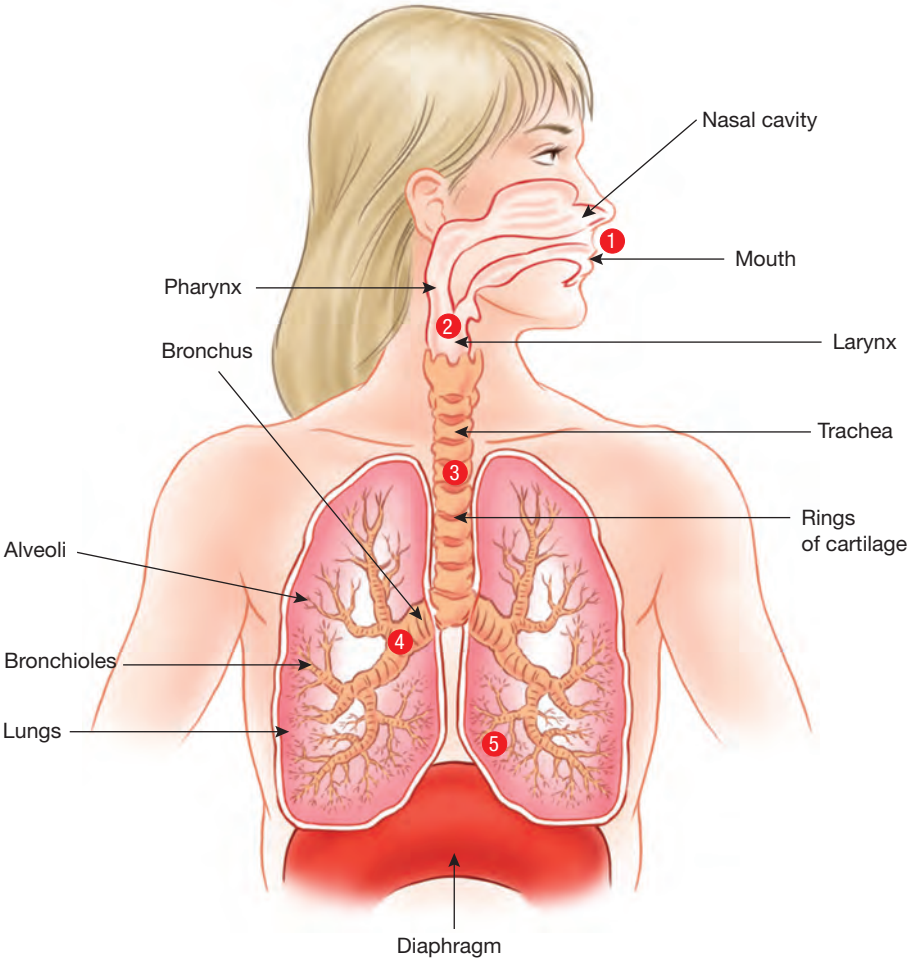
Respiration is a process that occurs in practically all living cells. It uses oxygen as a vital ingredient to free energy from food and can be characterised by the following equation:

Glucose (from food) + **Oxygen** (O_2 breathed in) ⇒ **Carbon dioxide** (CO_2 breathed out) + **Energy** + **Water**

This process is made possible through the respiratory system that facilitates the exchange of gases between the air we breathe and our blood. The respiratory system acts to bring about this essential exchange of gases (CO_2 and O_2) through breathing; the movement of air in and out of the lungs. The lungs and the air passages that ventilate them make up the basic system.

The passage of air from the nose to the lungs can be followed in figure 4.20.

FIGURE 4.20 The respiratory system



1. Air containing oxygen from the atmosphere enters the body either through the nose or the mouth. When entering through the nose it passes through the nasal cavities and is warmed, moistened and filtered of any foreign material.
2. The pharynx or throat serves as a common passage for air to the trachea (windpipe) or food to the oesophagus. It leads from the nasal cavity to the larynx (voice box) located at the beginning of the trachea.
3. The trachea is a hollow tube strengthened and kept open by rings of cartilage. After entering the chest cavity or thorax, the trachea divides into a right and a left bronchus (bronchial tube), which lead to the right and left lungs respectively.
4. The inner lining of the air passages produces mucus that catches and holds dirt and germs. It is also covered with microscopic hairs (cilia) that remove dirt, irritants and mucus through steady, rhythmic movements.
5. The lungs consist of two bag-like organs, one situated on each side of the heart. They are enclosed in the thoracic cavity by the ribs at the sides, the sternum at the front, the vertebral column at the back

and the diaphragm (a dome-shaped muscle) at the base. The light, soft, lung tissue is compressed and folded and, like a sponge, is composed of tiny air pockets (see figure 4.21)

The right and left bronchi that deliver air to the lungs divide into a number of branches or bronchioles within each lung. These bronchioles branch many times, eventually terminating in clusters of tiny air sacs called *alveoli* (singular — alveolus). The walls of the alveoli are extremely thin, with a network of capillaries (tiny vessels carrying blood) surrounding each like a string bag (see figure 4.22). This is where oxygen from the air we breathe is exchanged for carbon dioxide from our bloodstream.

FIGURE 4.21 Human lungs are made up of bronchi, bronchioles and alveoli.

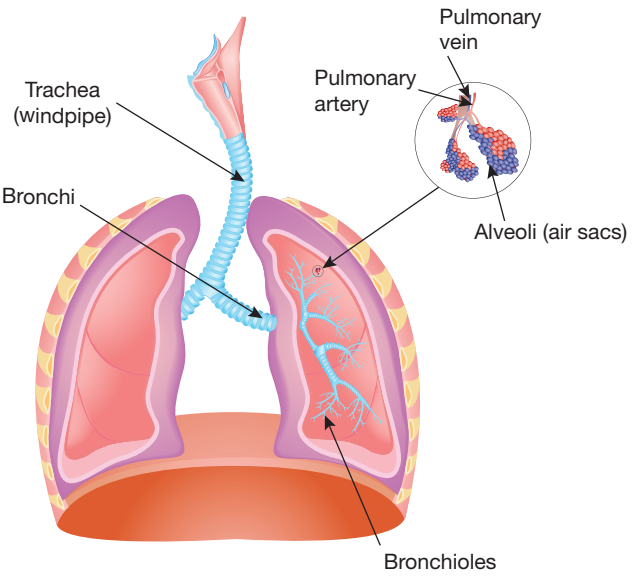
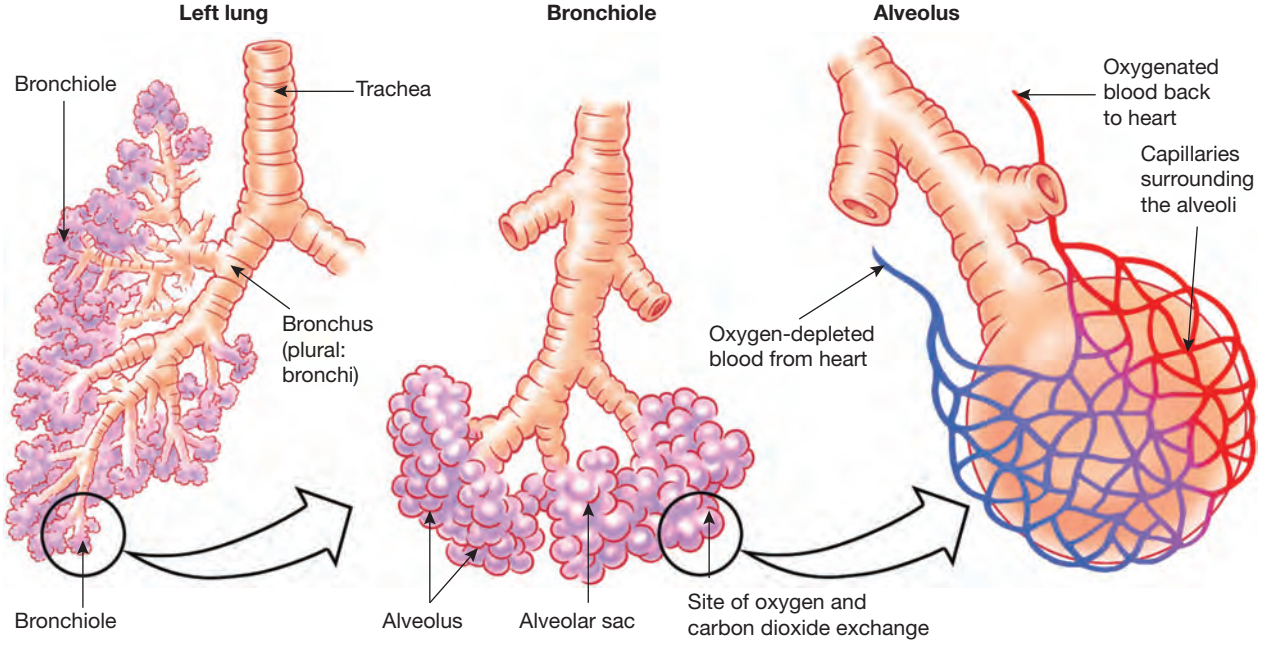


FIGURE 4.22 Air enters the lungs through the bronchi. The air moves into the bronchioles, then enters the microscopic air sacs called alveoli.



4.3.2 Lung function

Breathing is the process by which air is moved in and out of the lungs. It is controlled automatically by the brain and involves two phases: inspiration and expiration. **Inspiration** is air movement from the atmosphere into the lungs; breathing in. **Expiration** is air movement from the lungs to the atmosphere; breathing out.

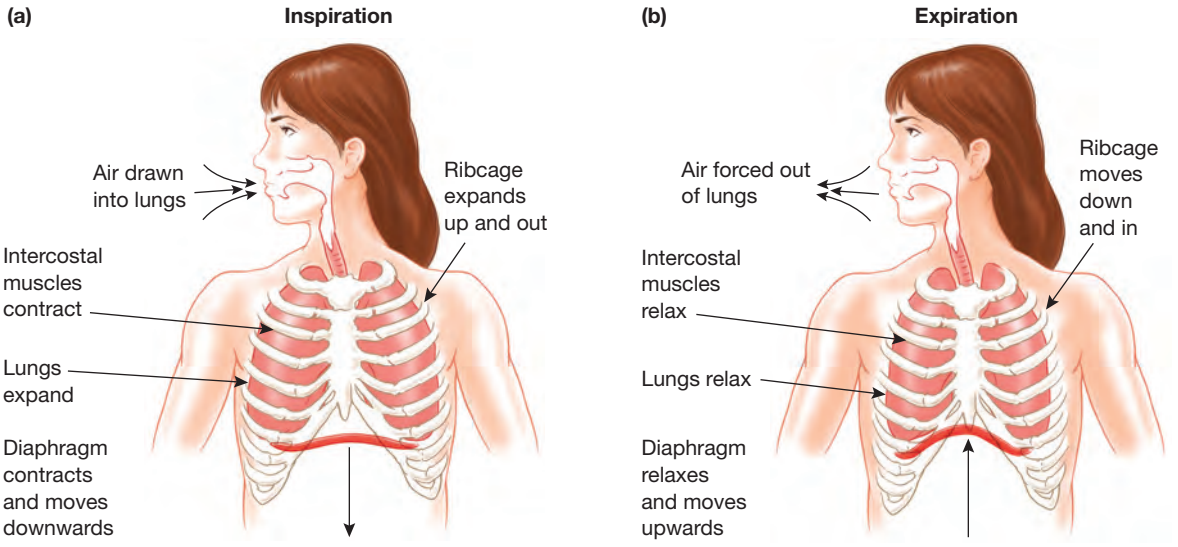
Inspiration and expiration

During inspiration, the diaphragm contracts and flattens as the external intercostal muscles (between the ribs) lift the ribs outwards and upwards (see figure 4.23(a)). This movement increases the volume of the chest

cavity and pulls the walls of the lungs outwards, which in turn decreases the air pressure within the lungs. In response to this, air from outside the body rushes into the lungs through the air passages.

During expiration, the diaphragm relaxes and moves upwards as the internal intercostal muscles allow the ribs and other structures to return to their resting position (see figure 4.23(b)). The volume of the chest cavity is therefore decreased, which increases the air pressure inside the lungs. Air is consequently forced out to make the pressures inside and outside the lungs about equal.

FIGURE 4.23 **(a)** Inspiration and **(b)** expiration of the lungs



Under normal resting conditions we breathe at a rate of approximately 12 to 18 breaths per minute. This rate can increase with physical activity, excitement or elevated body temperature. It also changes with age, being higher in babies and young children.

Inquiry

Inspiration and expiration

Watch a short video of how inspiration and expiration function using either the **Respiratory system** weblink in the Resources tab or another online video.

1. Describe what happens during inspiration and expiration.
2. How does inspiration and expiration respond to sudden changes in exercise intensity?

on Resources

Weblink: Respiratory system

4.3.3 The exchange of gases

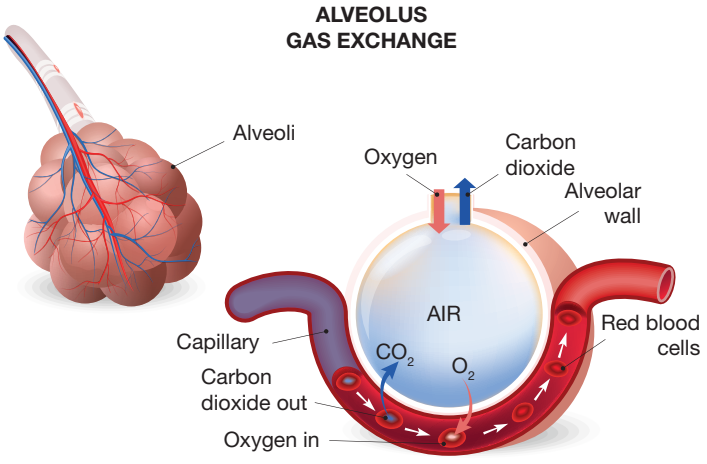
During inspiration, the alveoli are supplied with fresh air that is high in oxygen content and low in carbon dioxide. On the other hand, blood in the capillaries arriving at the alveoli is low in oxygen and high in carbon dioxide content, as shown in table 4.4. The different concentrations of oxygen and carbon dioxide between the blood and the air result in a pressure difference.

TABLE 4.4 The composition of inspired and expired air by percentage at rest

Gas	Inhaled air (per cent)	Exhaled air (per cent)
Oxygen (O_2)	20.93	16.4
Carbon dioxide (CO_2)	0.03	4.1
Nitrogen (N) and other gases	79.04	79.5

Gases such as oxygen and carbon dioxide move from areas of high concentration or pressure to areas of low concentration or pressure. Oxygen, therefore, moves from the air in the alveoli across the alveolar–capillary wall into the blood, where it attaches itself to haemoglobin in the red blood cells. At the same time, carbon dioxide is unloaded from the blood into the alveoli across the alveolar–capillary wall to be breathed out. This two-way diffusion is known as the exchange of gases (or gaseous exchange) and is diagrammatically represented in figure 4.24.

FIGURE 4.24 As blood goes past an alveolus, the blood gives up carbon dioxide and picks up oxygen. These gases move in and out by diffusion through the thin alveolar walls.



Exchange of gases, using the same principle, occurs between blood in the capillaries of the arterial system and the cells of the body; for example, the muscle cells. Here, oxygen is unloaded to the cells while carbon dioxide resulting from cell metabolism is given up to the blood. Blood that is high in carbon dioxide content (deoxygenated blood) is carried back to the lungs where it unloads carbon dioxide.

Inquiry

The exchange of gases

Use the **What do the lungs do?** weblink in the Resources tab to watch a video about how the gaseous exchange process takes place.

Use the information in this section to help describe how the exchange of gases takes place in the lungs.

Inquiry

What happens to your lungs when you exercise?

Watch a video about what happens to your lungs when you exercise, using either the **Exercise and lung function** weblink in the Resources tab or search online.

1. How is air forced in and out of the lungs?
2. How do the lungs benefit from exercise?

on Resources

Weblink: What do the lungs do?
Weblink: Exercise and lung function

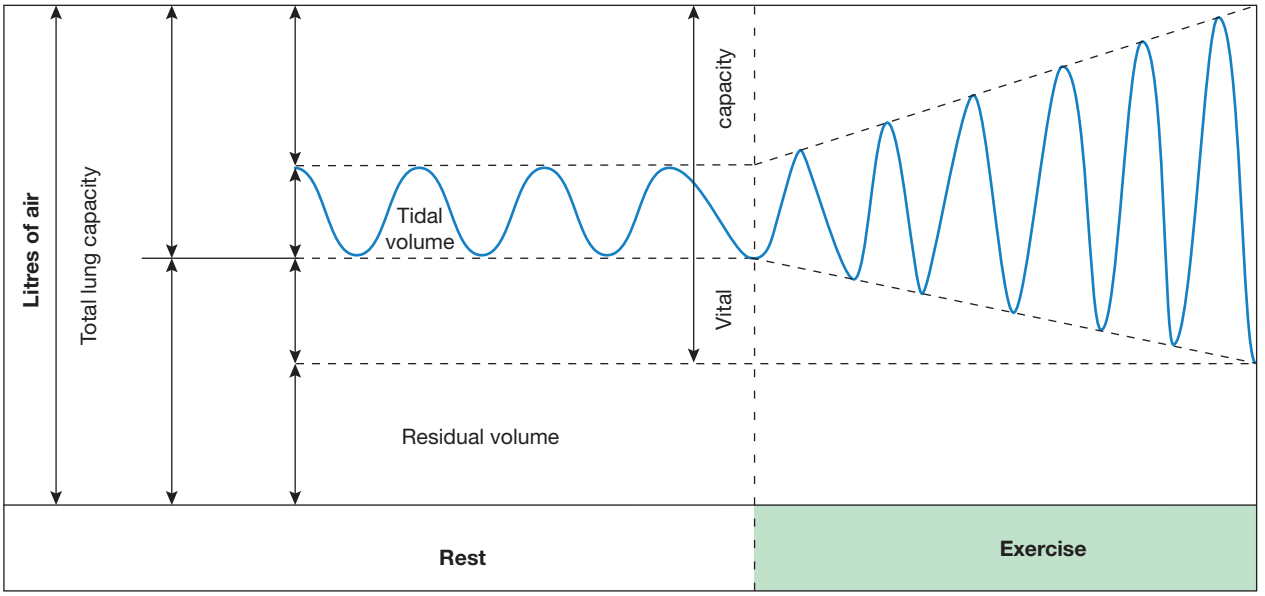
4.3.4 Effect of physical activity on respiration

During physical activity, the body's higher demand for oxygen triggers a response from our respiratory system. Increased rates of breathing combine with increased volumes of air moving in and out of the lungs, to deliver more oxygen to the blood and remove wastes. At the same time, blood flow to the lungs has been increased as a result of the circulatory system's own response to the exercise (discussed in subtopic 4.4).

Physical activity brings about a number of immediate adjustments in the working of the respiratory system.

1. The rate and depth of breathing often increase moderately, even before the exercise begins, as the body's nervous activity is increased in anticipation of the exercise. Just the thought of a jog can increase our demand for oxygen!
2. Once exercise starts, the rate and depth of breathing increase rapidly. This is thought to be related to stimulation of the sensory receptors in the body's joints as a result of the movement. Further increases during the exercise result mainly from increased concentrations of carbon dioxide in the blood, which triggers greater respiratory activity.
3. The increases in the rate (frequency) and depth (tidal volume or TV) of breathing provide greater ventilation and occur, generally, in proportion to increases in the exercise effort (workload on the body). Refer to figure 4.25.

FIGURE 4.25 Changes in lung volume and rate of ventilation from rest to exercise



Application

Lung function and physical activity

Equipment

Stopwatch, recording sheets

This application aims to measure changes in lung function between rest and exercise. Work in pairs, as recorder and subject.

(a) The subject should rest while the recorder counts the subject's number of breaths per minute and records the information.
(b) The subject should then run 100 metres as quickly as possible. The recorder records the subject's breathing rate during the minute following the run.
(c) Finally, the subject should run steadily for four to five minutes, then have their breathing rate monitored for one minute.

Inquiry

How does physical activity affect my rate of breathing?

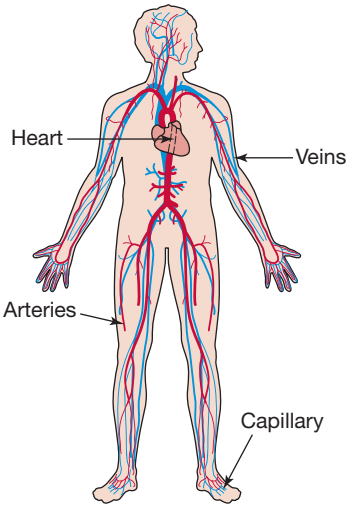
1. Compare the number of breaths recorded for each test in the preceding application and indicate any differences.
2. Did you notice any difference in the depth of breathing between rest and physical activity? If so, suggest why this might occur.
3. Discuss the effects of physical activity on breathing rate. Why do you think this change occurs?
4. Which type of exercise (short burst or longer distance) had the greater effect on breathing rate? Suggest reasons for your answer.
5. Use the internet or a reputable source to explore the effects of asthma on lung function. Suggest how asthma can be improved by certain exercise programs.

4.4 Circulatory system

The continual and fresh supply of oxygen and food that the tissues of the body require is provided by the blood. Blood flows constantly around the body from the heart, to the cells, and then returns to the heart. This is called *circulation*. The various structures through which the blood flows all belong to the **circulatory system**, which is also referred to as the **cardiovascular system** (cardio — relating to the heart; and vascular — relating to the blood vessels); see figure 4.26. This transport system delivers oxygen and nutrients to all parts of the body and removes carbon dioxide and wastes. It consists of:

- blood
- the heart
- blood vessels — arteries, capillaries and veins.

FIGURE 4.26 The circulatory system



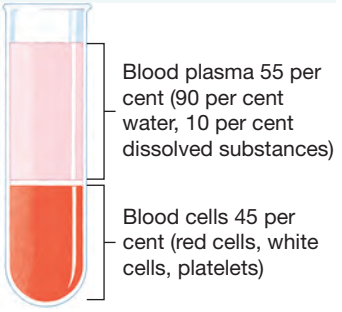
4.4.1 Components of blood

Blood is a complex fluid circulated by the pumping action of the heart. It nourishes every cell of the body. An average sized person contains about five litres of blood. Blood's main functions include:

- transportation of oxygen and nutrients to the tissues and removal of carbon dioxide and wastes
- protection of the body via the immune system and by clotting to prevent blood loss
- regulation of the body's temperature and the fluid content of the body's tissues.

Blood consists of a liquid component (55 per cent of blood volume) called **plasma** and a solid component (45 per cent of blood volume) made up of red and white blood cells and platelets (see figure 4.27).

FIGURE 4.27 Components of blood



Plasma

Plasma is a straw-coloured liquid mainly consisting of water (about 90 per cent). Substances such as plasma proteins, nutrients, hormones, mineral salts and wastes are dissolved in the plasma and are necessary for the nourishment and functioning of tissues. Much of the carbon dioxide and very small amounts of oxygen are also carried in a dissolved state in plasma.

Water is a significant component of the circulatory system and controls body heat through sweating. When we work hard, the blood transfers excess heat generated by the body to the surface of the skin to be lost. If sweating is extreme, excessive loss of water from plasma and tissues can decrease blood volume, making frequent hydration (replacement of water) necessary.

Red blood cells

Red blood cells are formed in bone marrow. Their main role is to carry oxygen and carbon dioxide around the body. They contain iron and a protein called haemoglobin. Haemoglobin readily combines with oxygen and carries it from the lungs to the cells. Red blood cells outnumber white blood cells by about 700 to one.

Red blood cells have a flat disc shape that provides a large surface area for taking up oxygen. About two million red blood cells are destroyed and replaced every second. They live for only about four months.

On average, men have 16 grams of haemoglobin per 100 millilitres of blood (as a percentage of blood volume), while women average 14 grams per 100 millilitres of blood. Women, therefore, have lower levels of haemoglobin and a slightly lessened ability to carry oxygen in the blood.

Inquiry

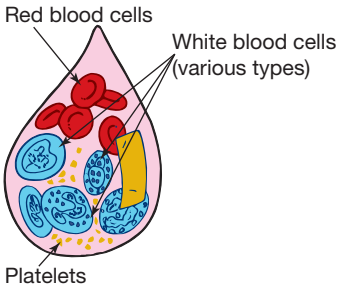
Anaemia

Discuss how being anaemic could affect physical performance. You can find more information about this condition by following the **Anaemia** weblink in the Resources tab.

White blood cells

White blood cells are formed in the bone marrow and lymph nodes. They provide the body with a mobile protection system against disease. These cells can change shape and move against the blood flow to areas of infection or disease.

FIGURE 4.28 The structure of blood cells and platelets



The two most common types of white blood cells are phagocytes, which engulf foreign material and harmful bacteria, and lymphocytes, which produce antibodies to fight disease. Diseases such as HIV/AIDS, which suppress the activity of the immune system, do so by disrupting the normal functioning of the white blood cells.

Platelets

Platelets are tiny structures made from bone marrow cells that have no nucleus. They help to produce clotting substances that are important in preventing blood loss when a blood vessel is damaged.

Resources

Weblink: Anaemia

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

Heart

The heart is a muscular pump that contracts rhythmically, providing the force to keep the blood circulating throughout the body. It is slightly larger than a clenched fist and is the shape of a large pear. The heart lies in the chest cavity between the lungs and above the diaphragm, and is protected by the ribs and sternum.

The heart beats an average of 70 times per minute at rest. This amounts to more than 100 000 beats per day. In one day the heart pumps approximately 12 000 litres of blood, which is enough to fill a small road tanker.

A muscle wall divides the heart into a right and left side. Each side consists of two chambers:

- *atria* — the upper, thin-walled chambers that receive blood coming back to the heart
- *ventricles* — the lower, thick-walled chambers that pump blood from the heart to the body.

A system of four one-way valves allows blood to flow in only one direction through the heart; that is, from the atria to the ventricles (the atrioventricular valves) and from the ventricles into the main arteries taking blood away from the heart (the arterial valves).

FIGURE 4.29 Position of the heart

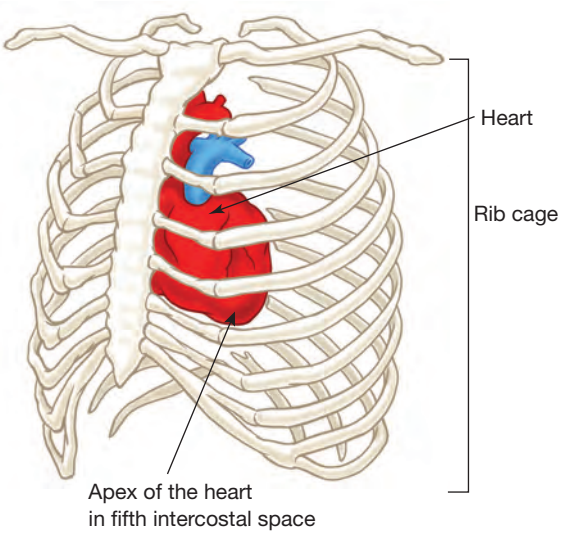
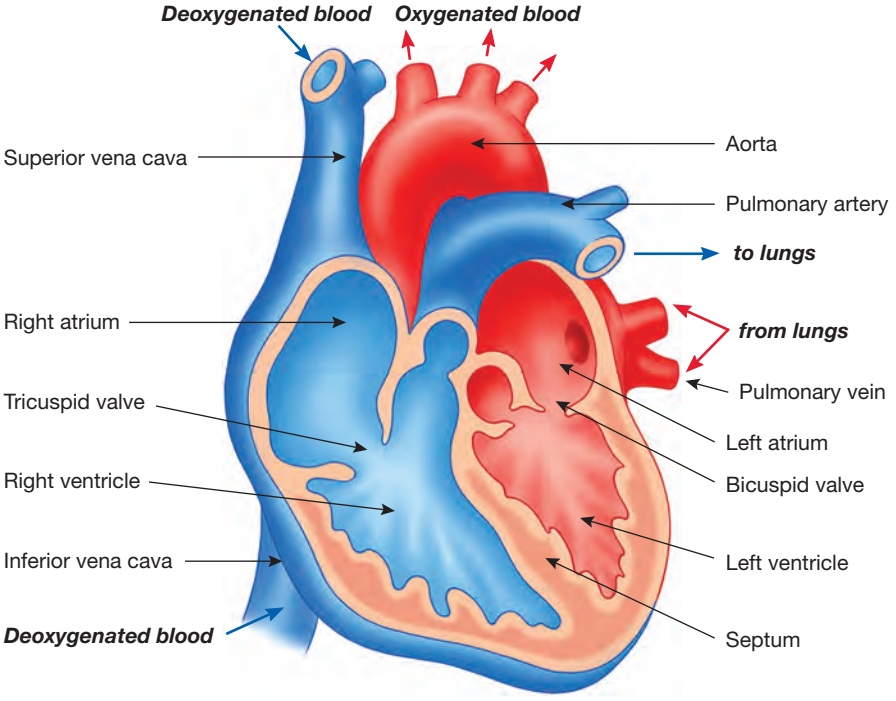


FIGURE 4.30 Deoxygenated blood (blue) is pumped to the lungs. There, after receiving oxygen, it turns reddish and returns to the heart to be pumped through the body.



Action of the heart

The heart is able to receive blood from the veins and pump it to the lungs and the body through a rhythmic contraction and relaxation process called the cardiac cycle. The cardiac cycle consists of the:

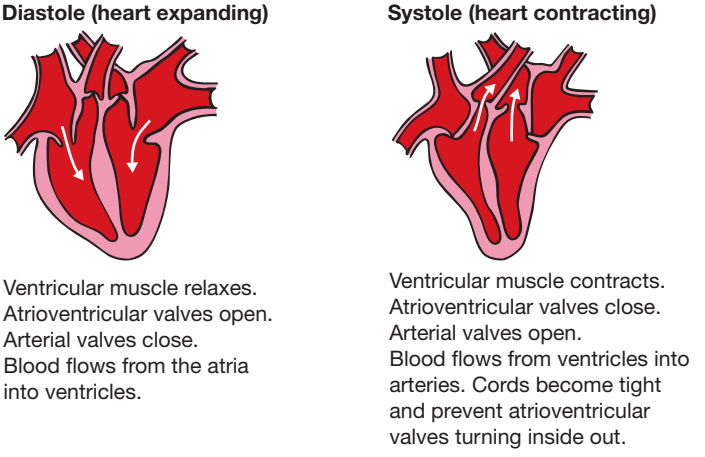
- *diastole* (relaxation or filling) phase. The muscles of both the atria and ventricles relax. Blood returning from the lungs and all parts of the body flows in to fill both the atria and ventricles in preparation for systole (contraction).
- *systole* (contraction or pumping) phase. The atria contract first to further fill the ventricles. The ventricles then contract and push blood under pressure to the lungs and all parts of the body. As they contract, the rising pressure in the ventricles closes the atrioventricular valves (between the atrium and the ventricle) and opens the valves in the arteries leaving the heart (the aorta and the pulmonary artery).

Heartbeat

The heart is made to contract or beat regularly by small electrical impulses initiated and sent out from the cardiac conduction system located in the walls of the heart.

The heartbeat is heard as a two-stage 'lub-dub' sound. An initial low pressure sound is caused by the atrioventricular valves closing. This occurs at the beginning of the ventricular contraction (systole) after blood has filled the ventricles. The high pressure sound that follows is caused by the valves closing at the exits to the heart, and occurs after blood has been pushed from the ventricles at the end of the systole phase. Unusual heart sounds can mean that the valves may not be working properly.

FIGURE 4.31 The action of the heart during the two phases, diastole and systole



Each time the ventricles contract (that is, the heart beats), a wave of blood under pressure travels through the arteries, expanding and contracting the arterial walls. This pressure wave is called a pulse. It reflects the fluctuating pressure of blood in the arteries with each heartbeat. The pulse can be felt at various points where an artery lies near the skin surface, in particular the radial pulse at the base of the thumb and the carotid pulse at the side of the neck.

Blood supply to the heart

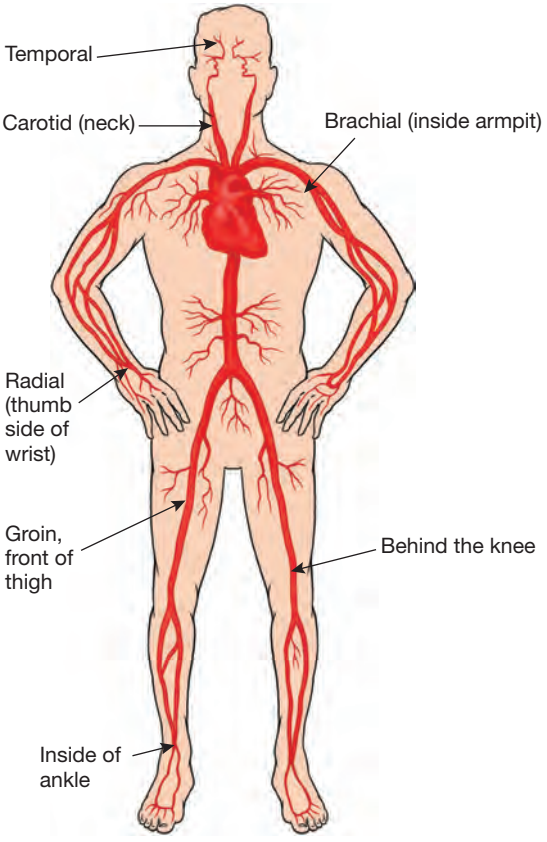
The heart (cardiac muscle) itself requires a rich supply of blood and oxygen to enable it to contract repeatedly. It receives this through its own system of cardiac blood vessels that branch off the aorta and spread extensively over the heart wall (myocardium). This is called the *coronary circulation*. The heart muscle has a very high demand for blood (particularly during exercise) and extracts more than 75 per cent of the oxygen delivered to it both at rest and during exercise.

During exercise when the heart's extra demands for oxygen must be met, coronary circulation accounts for up to approximately 10 per cent of the total blood volume leaving the left ventricle, compared to approximately three per cent at rest.

Arteries

Arteries are blood vessels that carry blood away from the heart (see figure 4.32). They have thick, strong, elastic walls containing smooth muscle to withstand the pressure of the blood forced through them.

FIGURE 4.32 The arteries deliver oxygen-rich blood to tissues of the body.



The blood pumped under pressure from the left ventricle passes through the aorta (the largest artery) and throughout the body. At the same time, blood from the right ventricle passes through the pulmonary artery to the lungs where it collects oxygen and then returns to the heart. These large exit arteries branch into smaller arteries that eventually divide into tiny branches called arterioles. Arterioles in turn divide into microscopic vessels (capillaries).

FIGURE 4.33 An artery has a thick, elastic wall, covering layers of smooth muscle.

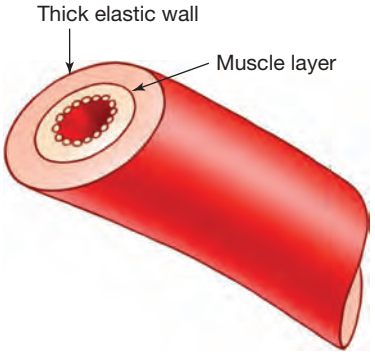
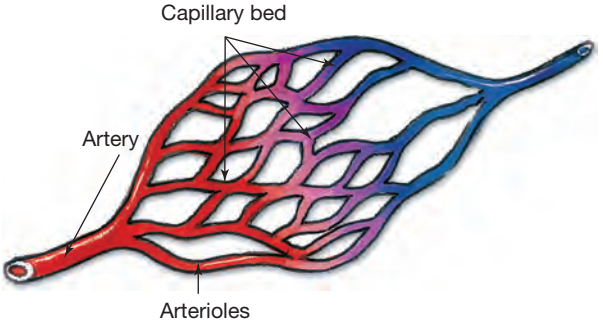


FIGURE 4.34 Arteries branch into arterioles, which divide into capillaries.



Capillaries

The **capillaries** are the smallest of all blood vessels. They function to exchange oxygen and nutrients for waste. They are a link between the arterioles and the veins. They rejoin to form tiny veins called venules.

In active tissue such as the muscles and brain, the capillary network is particularly dense with much branching of very fine structured vessels. This provides a large surface area for the exchange of materials between the blood and the fluid surrounding the cells (interstitial fluid).

Capillary walls are extremely thin, consisting of a single layer of flattened cells. These walls allow oxygen, nutrients and hormones from the blood to pass easily through to the interstitial fluid, then into the cells of the body's tissues. The blood pressure (due to the pumping action of the heart) helps to force fluid out of the capillaries.

Meanwhile, carbon dioxide and cell wastes are received back into the capillaries. This diffusion of oxygen and other nutrients from the capillaries into the cells and carbon dioxide and wastes from the cells into the capillaries is known as *capillary exchange* (see figure 4.36).

FIGURE 4.35 A capillary has a very thin wall that allows oxygen and nutrients to pass into the cells and carbon dioxide to move from the cells to the blood.

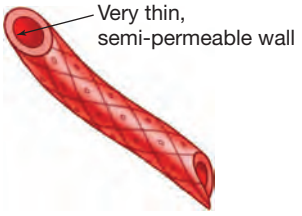
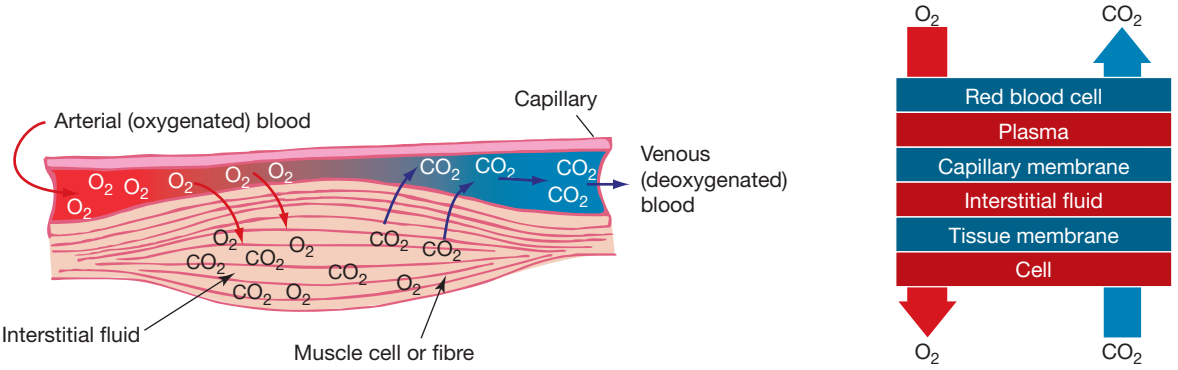


FIGURE 4.36 Capillary exchange at the muscle cell

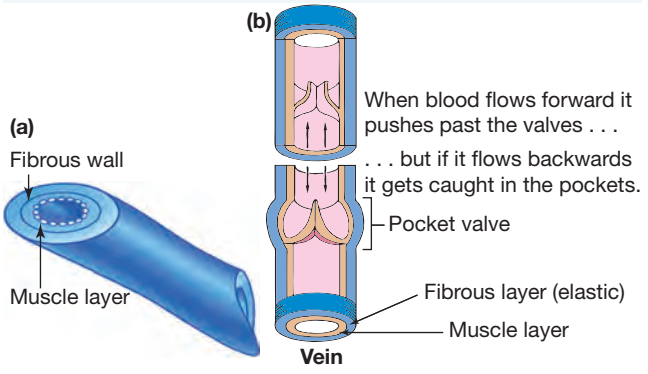


Veins

The venules collect deoxygenated (low oxygen content) blood from the capillaries and transfer it to the **veins**. Veins carry deoxygenated blood from the body tissues back to the right atrium.

As pressure in the veins is low, blood flows mainly against gravity (blood flow in the veins above the heart is, however, assisted by gravity). The walls of veins are thinner than those of arteries, with greater 'give' to allow the blood to move more easily. Valves at regular intervals in the veins prevent the backflow of blood during periods when blood pressure changes (see figure 4.37).

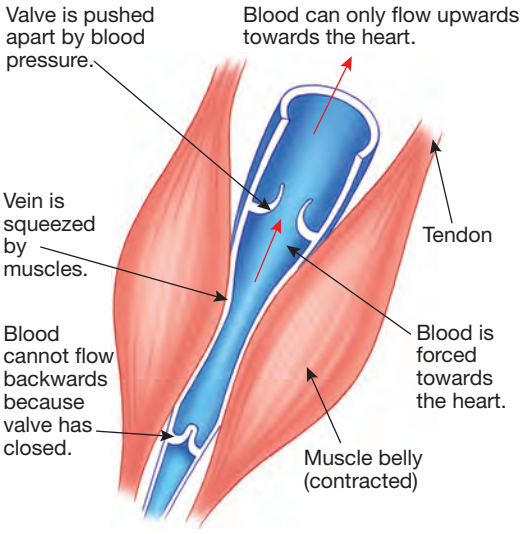
FIGURE 4.37 **(a)** The wall of a vein is less elastic and thinner than that of an artery. **(b)** Valves in the veins prevent the backflow of blood.



Pressure changes created by the pumping action of the heart stimulate blood flow in the veins and help to draw blood into it during diastole (relaxation phase). The return of blood from the body back to the heart (venous return) is further assisted by rhythmic muscle contractions in nearby active muscles (muscle pump) which compress the veins (see figure 4.38). It is also assisted by surges of pressure in adjacent arteries pushing against the veins.

If we stop exercising suddenly or stand still for long periods, the muscle pump will not work. Blood pooling (sitting) then occurs in the large veins of the legs because of the effect of gravity. This can result in a drop in blood pressure, insufficient blood flow to the brain and possible fainting. This pooling of blood has implications for the cool down period after strenuous exercise. Rather than stop the exercise immediately, it is recommended that the activity is gradually tapered off with lower intensity exercise and maintained until the heart rate returns to a steady state. This allows blood from the extremities to be returned to the heart and lungs for re-oxygenating. It also promotes the disposal of waste products such as lactic acid.

FIGURE 4.38 The contracting muscles squeeze the vein, forcing the blood against gravity towards the heart.



on Resources

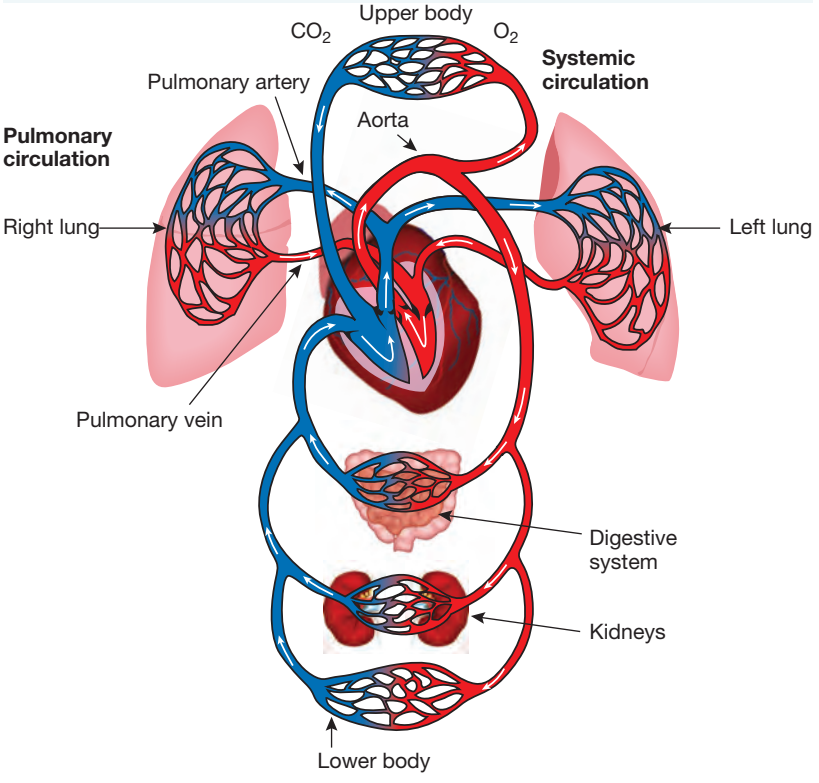
eLesson: How your heart works (eles-2581)

4.4.3 Pulmonary and systemic circulation

Both sides of the heart work together like two pumps with overlapping circuits. The right side receives venous blood that is low in oxygen content (deoxygenated) from all parts of the body and pumps it to the lungs. The closed circuit of blood to and from the lungs is the **pulmonary circulation**.

The left side of the heart receives blood high in oxygen content (oxygenated) from the lungs and pumps it around the body. This circuit to and from the body is called **systemic circulation**.

FIGURE 4.39 The circulation of blood: pulmonary and systemic



Inquiry

The circulatory system in action

How do the circulatory and respiratory systems function together?

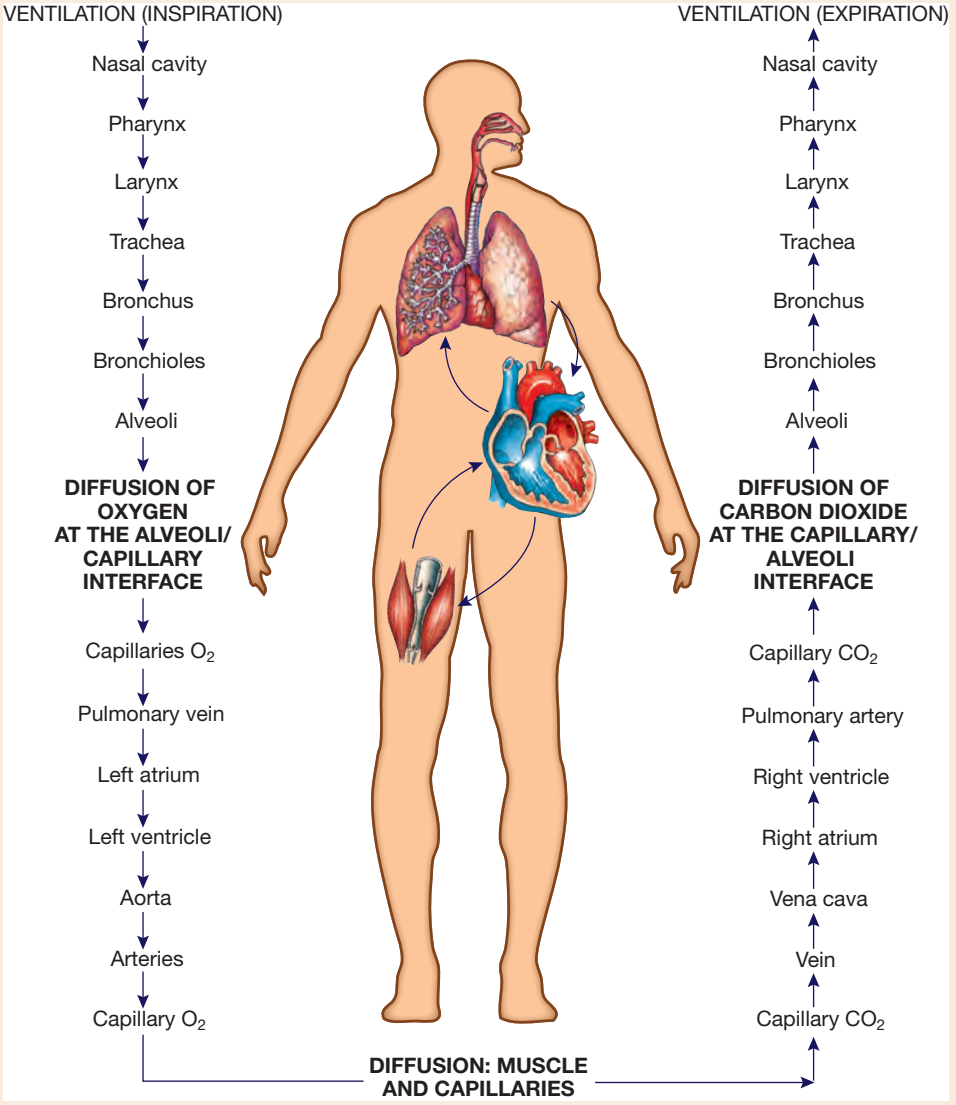
Use the **Circulation system in action** weblink in the Resources tab to learn more.

Application

Circulatory system and movement performance

Examine figure 4.40 representing the body's cardiovascular and respiratory system. You may also refer to the **Circulation of blood throughout the body** eLesson in the Resources tab. Imagine you are a drop of blood. Describe your passage through the entire circulatory system, beginning with entry into the right atrium. How would the oxygen level vary on reaching the capillaries, pulmonary artery, pulmonary vein and arota?

FIGURE 4.40 Interaction of the respiratory and cardiovascular systems



Resources

Weblink: Circulation system in action
eLesson: Circulation of blood throughout the body (eles-0452)

4.4.4 Blood pressure

What is blood pressure?

The term blood pressure refers to the force exerted by blood on the walls of the blood vessels. The flow and pressure of blood in the arteries rises with each contraction of the heart and falls when it relaxes and refills. Blood pressure has two phases — **systolic** and **diastolic**.

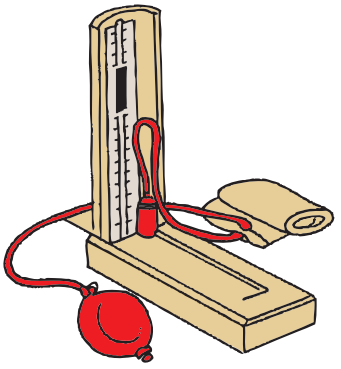
Blood pressure generally reflects the quantity of blood being pushed out of the heart (cardiac output) and the ease or difficulty that blood encounters in passing through the arteries (resistance to flow). It is determined by:

- *cardiac output.* Any increase in cardiac output results in an increase in blood pressure.
- *volume of blood in circulation.* If blood volume increases because of increased water retention, such as when salt intake is high, blood pressure increases. During blood loss, such as during a haemorrhage, blood pressure falls.
- *resistance to blood flow.* If the viscosity (stickiness) of the blood is increased, such as during dehydration, resistance increases. The diameter of the blood vessels also affects blood flow through the vessels. With narrowing of the vessels (for example, in atherosclerosis), resistance to blood flow is increased. The elasticity of the arterial walls acts to maintain blood flow. As deposits build up on the walls, the arteries become less elastic and harder (arteriosclerosis), thereby making it more difficult for blood to flow. Any increase in the resistance to blood flow consequently causes elevated blood pressure.
- *venous return.* Since this affects cardiac output, it also affects blood pressure.

Blood pressure can be recorded with a **sphygmomanometer** and is measured in millimetres of mercury (mm.Hg) (see figure 4.41). It is expressed as a fraction that represents systolic pressure over diastolic pressure (for example, $\frac{120}{80}$). When blood pressure is recorded in a relaxed healthy person, 'normal' systolic pressure is in the range of 100 mm.Hg to 130 mm.Hg, with 'normal' diastolic pressure being 60 mm.Hg to 80 mm.Hg (see figure 4.42).

Blood pressure varies in response to posture (lying or standing), breathing, emotion, exercise and sleep. Temporary rises due to excitement, stress or physical exertion are quite natural and blood pressure returns to normal with rest. Under normal conditions, it provides valuable information about how well the circulatory system is operating.

FIGURE 4.41 A sphygmomanometer

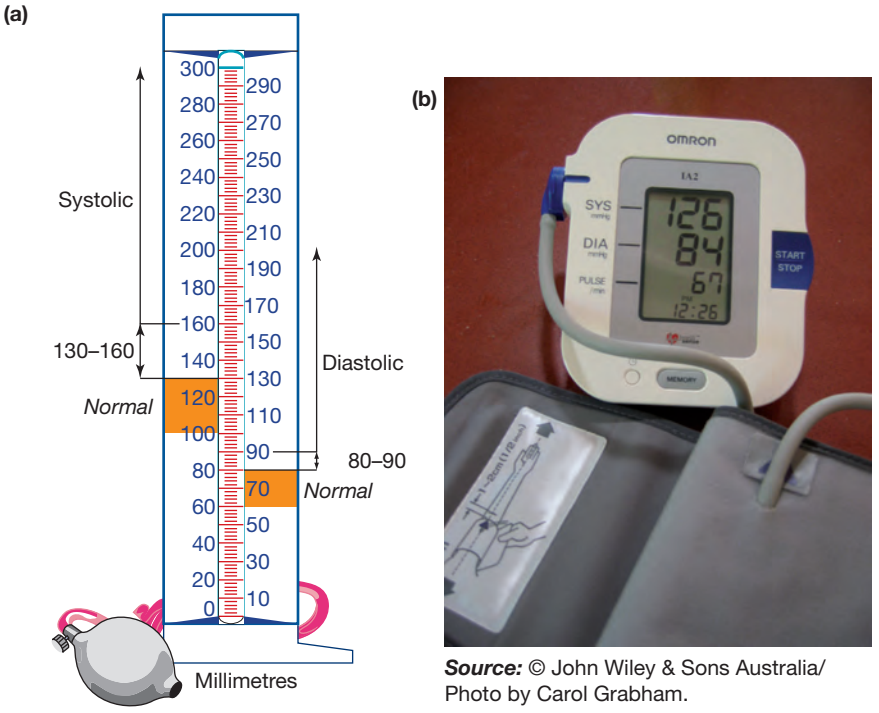


Measuring blood pressure

When measuring blood pressure with a sphygmomanometer, an inflatable cuff is attached to a gauge that records the pressure in the cuff. The cuff is firmly wrapped around the upper arm above the elbow and is inflated with a hand pump. This squeezes the artery under the cuff until the blood flow stops. The diaphragm of a stethoscope is placed over the artery just below the cuff at the elbow joint (inside of the arm). The cuff pressure is carefully released while watching the slowly falling mercury in the gauge. Two distinct sounds are heard — one representing the peak of blood pressure and the other representing the lowest pressure within the artery.

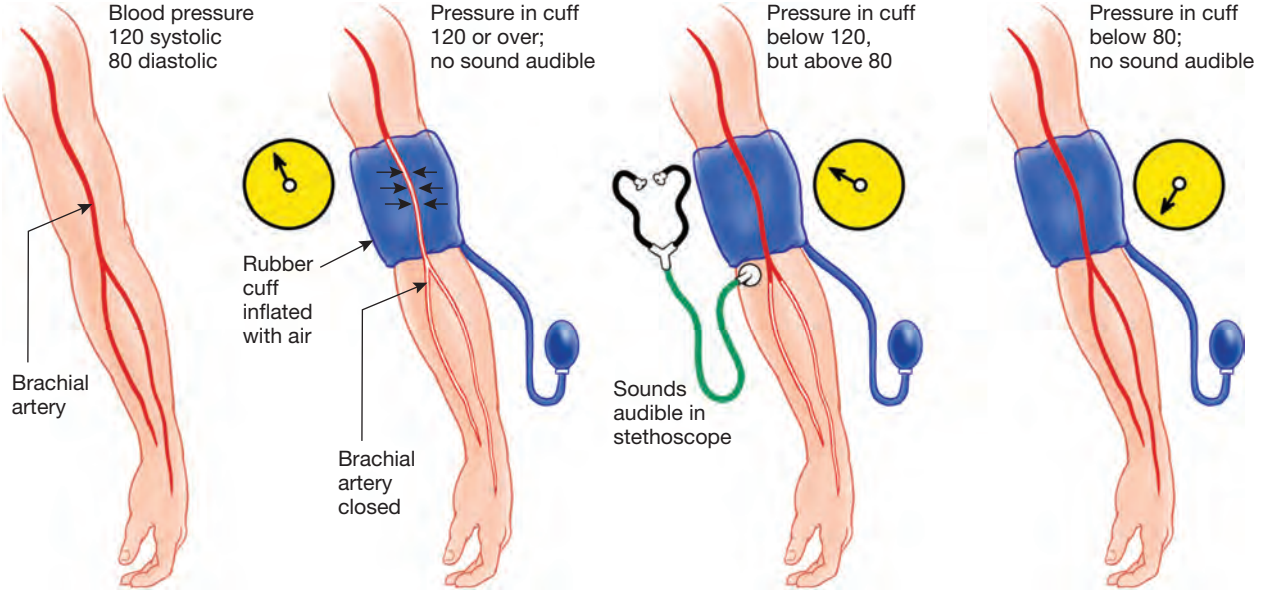
With each heartbeat, as small amounts of blood return to the artery past the obstruction (the cuff) a thudding sound is heard. The position of the mercury in the gauge is noted as the first sounds are heard. This reading represents the systolic blood pressure.

FIGURE 4.42 **(a)** A mercury gauge showing normal readings. The pressures above 130–160 systolic and 80–90 diastolic should be judged as being high only after the patient's age, current treatment and other risk factors have been considered. **(b)** Blood pressure reading using an electronic blood pressure machine



Source: © John Wiley & Sons Australia/ Photo by Carol Grabham.

FIGURE 4.43 Measuring blood pressure with a sphygmomanometer



Air continues to be released from the cuff until there is no obstruction to the blood flow in the artery and the thudding sounds can no longer be heard. The position of the mercury in the gauge is noted when the sounds disappear. This reading represents the diastolic blood pressure.

Application

Measuring blood pressure

Equipment

Sphygmomanometer

Work in pairs or threes. Using the sphygmomanometer and the procedures outlined in the text, measure the blood pressure of a subject in your group. You will need to inflate the cuff to approximately 160 mm/Hg. Ensure the ear plugs of the stethoscope completely seal the ear passage and prevent outside interference.

Inquiry

Analysing blood pressure readings

1. Examine the systolic and diastolic values obtained in the application above. Are they within the normal range? If not, suggest why.
2. Discuss the difficulties that you experienced in taking the measurement. How could these affect the reading?
3. Use the internet to conduct a search on blood pressure. Find the meaning of hypertension and suggest reasons why so many people have this condition. Why is hypertension called a 'silent killer' and what can be done about the condition?

Application

Blood pressure changes with exercise

Aim

To observe changes in blood pressure with changes in exercise intensity.

Equipment

Sphygmomanometers, stopwatches, bicycle ergometers

If a bicycle ergometer is not available, a 30–40 centimetre step-up bench can be used. Initially, the subject can step up and down at a moderate rate (about 24 steps per minute) for the duration of one minute. One step consists of four beats (up left, up right, down left, down right). The workload can be increased for step three by stepping up and down rapidly (about 36 steps per minute).

Procedure

Work in groups of two or three.

1. Using the method described on pages 34–6, calculate blood pressure while the subject is sitting in a chair. Allow the subject to sit for several minutes before taking the blood pressure reading.
2. The subject should now work on a bicycle ergometer at a workload of 300 kp.m/min for one minute. Be ready to establish blood pressure 15 seconds before the finish. Pump the cuff up to past 250 mm/Hg. Stop the test. Measure blood pressure and record the reading in table 4.5.
3. The subject now works at a workload of 900 kp.m/min on the ergometer for one minute. Using the same method as in step two, measure blood pressure immediately the exercise finishes. Record the reading in the table.
4. Wait one minute for recovery. Measure blood pressure again and record the reading.

TABLE 4.5 Blood pressure readings

Workload	Systolic pressure	Diastolic pressure
Rest		
300 kp.m/min		
900 kp.m/min		
Recovery		

Inquiry

Examining changes in blood pressure

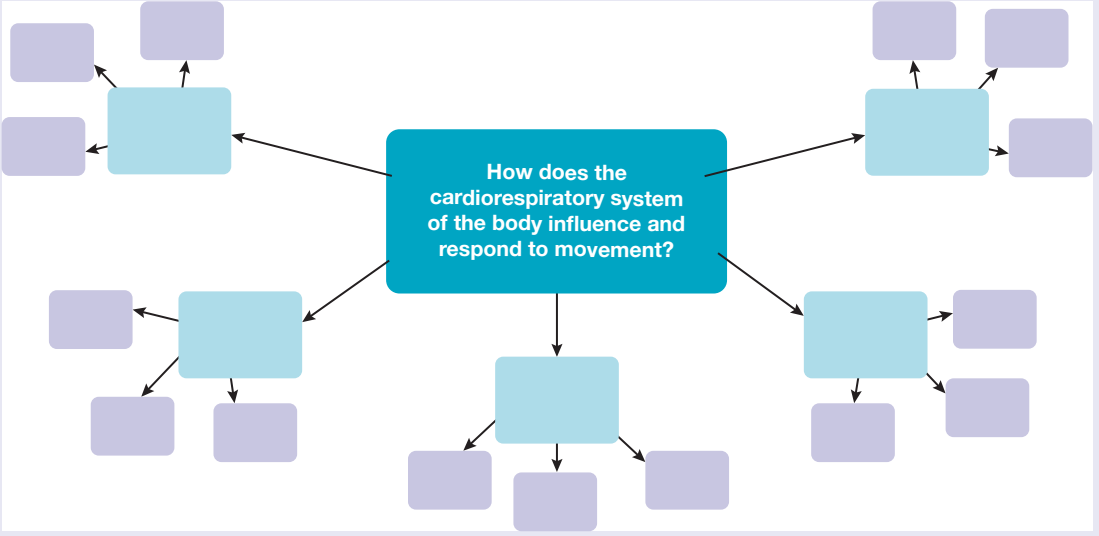
1. What does the systolic blood pressure reading represent?
2. What does the diastolic blood pressure reading represent?
3. What was the effect of moderate exercise (300 kp.m/min) on blood pressure?
4. What was the effect of strenuous exercise (900 kp.m/min) on blood pressure? What accounts for this difference?
5. Why do the results for the different workloads vary? Explain with reference to both systolic and diastolic blood pressures.
6. Which blood pressure measurement is nearest to resting levels during recovery? Explain why.

Inquiry

The cardiorespiratory system and movement

Copy and complete a mind map similar to figure 4.44, to respond to the question:

FIGURE 4.44 Sample mind map



4.5 Topic review

4.5.1 Summary

- The body has 206 bones of varying shapes and sizes. They provide important functions such as protecting vital organs and enabling movement.
- Bones involved in movement are usually long, meeting at joints such as the knee and elbow joints. Muscles surrounding these joints pull on bones making many different types of movement possible.
- Joints are places where two or more bones meet. Some joints allow more movement than others. Synovial joints allow maximum movement.
- The knee joint is a typical synovial joint. It contains important structures including tendons, ligaments, cartilage and synovial fluid.
- Synovial joint movements can be described in terms of flexion, extension, abduction, adduction, inversion, eversion, rotation, circumduction, pronation, supination, dorsiflexion and plantar flexion.
- Muscles enable us to move. There are more than 600 muscles in the body. The most important muscles that enable us to move include the deltoid, biceps brachii, triceps, latissimus dorsi, trapezius, pectorals, erector spinae (sacrospinalis), gluteus maximus, hamstrings, quadriceps, gastrocnemius, soleus, tibialis anterior, rectus abdominis and external obliques.
- Muscles perform roles according to the movement required. They can act as agonists (prime movers), antagonists (the lengthening muscle on the opposing side), or stabilisers (muscles that fix a joint while other actions are occurring). During movements such as running, the roles are constantly being reversed.
- The types of muscle contraction are concentric, eccentric and isometric. In a concentric contraction, the muscle shortens while under tension; in an eccentric contraction it lengthens while under tension and, in an isometric contraction, there is no change in length despite the muscle being under tension.
- The major components of the respiratory system include the bronchi, bronchioles, lungs and alveoli. The alveoli are microscopic sacs surrounded by capillaries. It is here that oxygen is exchanged for carbon dioxide.
- Inspiration and expiration are automatic processes controlled by the contraction of the diaphragm and intercostal muscles.
- The immediate effect of exercise on the lungs is to increase the rate and depth of breathing. This provides more oxygen to blood that is being moved rapidly around the body.
- The role of circulation is to transport oxygen and nutrients to the body's cells, carry hormones to target sites and collect carbon dioxide and waste.
- Blood consists of plasma and formed elements consisting of red and white cells, as well as platelets.
- The heart is a pump consisting of four chambers. The right chambers receive blood from the body and pump it to the lungs. The left chambers receive blood from the lungs and pump it to the body.
- Arteries and arterioles deliver blood to capillaries where oxygen exchange takes place. Venules and veins return the deoxygenated blood to the heart.
- Pulmonary circulation refers to the circulation of blood from the heart to the lungs and back to the heart again. Systemic circulation is circulation from the heart to the body tissues and back to the heart.
- Blood pressure refers to the force exerted by the blood on the walls of the blood vessels. Blood pressure is measured using a sphygmomanometer. It indicates peak pressure, when blood is forced into the arteries (systolic pressure) and lowest pressure (diastolic pressure), when the heart is filling.

4.5.2 Questions

Revision

1. **Identify** the location and type of the major bones involved in movement. (P7) (3 marks)
2. Using the knee joint as an example, **discuss** the role of ligaments, tendons, cartilage and synovial fluid. How do these structures assist movement? (P7) (5 marks)
3. Using an example, **outline** the difference between each of the following joint actions — flexion and extension, inversion and eversion, pronation and supination, rotation and circumduction, dorsiflexion and plantar flexion, adduction and abduction. (P7) (5 marks)
4. For each of the following movement descriptions, give an example of a sporting movement or activity that **demonstrates** the movement.
   (a) flexion at the knee
   (b) flexion at the elbow
   (c) abduction of the leg
   (d) dorsiflexion of the ankle
   (e) wrist flexion (P7) (5 marks)
5. (a) **Describe** the joint action of each of the following muscles — deltoid, trapezius, biceps brachii, quadriceps, soleus and latissimus dorsi. (6 marks)
   (b) **Describe** a movement from any sport or activity where the action of each of the listed muscles can be observed in the movement. (P7) (6 marks)
6. Using an example, **discuss** the role of agonists and antagonists in movement. (P7) (4 marks)
7. Using exercises from weight-training programs as examples, **outline** the difference between concentric, eccentric and isometric contractions. (P7) (3 marks)
8. Use a diagram to indicate the major components of the lungs. Briefly **state** the function of each component. (P7) (4 marks)
9. **Describe** the process of inspiration and expiration. What is its function in making body movement possible? (P7) (5 marks)
10. Using a diagram, **describe** how the exchange of gases takes place in the lungs. (P7) (5 marks)
11. (a) **Identify** and **discuss** the functions of the various components of blood. (4 marks)
    (b) Which component is most important in enabling a person to move? Why? (P7) (2 marks)
12. Use a diagram to **describe** how the heart pumps blood. Indicate the direction of blood flow through the heart. **Discuss** the importance of the heart in transporting blood around the body. (P7) (5 marks)
13. **Outline** the difference between coronary, pulmonary and systemic circulation. How could a narrowing or blockage in any part of these systems affect our health? (P16) (3 marks)
14. Consider the following facts and **propose** a reason for each.
    (a) The wall of the left ventricle is thicker and more muscular than the right ventricle.
    (b) Arteries have thicker and more muscular walls than veins.
    (c) Capillary walls are extremely thin.
    (d) Veins contain valves. (P16) (4 marks)
15. Briefly **describe** how the respiratory and circulatory systems coordinate the supply and transport of oxygen to the cells and removal of carbon dioxide from the blood. **Discuss** the importance of this process to physical performance. (P7) (5 marks)
16. What is blood pressure and how is it measured? (P7) (2 marks)
17. **Discuss** the importance of blood pressure to health. (P16) (3 marks)
18. 'It is obvious that the higher the blood pressure, the harder the heart must work.' **Discuss** this statement with particular reference to
    (a) the effect of high blood pressure on the heart itself
    (b) the effect of high blood pressure on the blood vessels. (P16) (4 marks)

Extension

1. Locate two pieces of soft wood approximately 2 centimetres × 4 centimetres that are each 20 centimetres long. Join the two pieces at one end using a small hinge. Use your model to **demonstrate** the following movements to the class:
   (a) flexion (b) extension
   (c) abduction (d) adduction
   (e) dorsiflexion (f) plantar flexion.

Using two drawing pins, attach a thick elastic band to both pieces to simulate a muscle.
Use your model to **demonstrate**
(g) muscle origin
(h) muscle insertion
(i) a concentric contraction
(j) an eccentric contraction
(k) an isotonic contraction
(l) an isometric contraction.

Using more bands and tissue paper, **demonstrate** the role of tendons, ligaments and cartilage in a joint. **Discuss** how forces such as tackles can easily damage the joint. (P7, P16) (10 marks)

2. How can exercise improve lung function? Use the weblinks **Respiration 3D Medical Animation** (a summary of lung structure, function and exchange of gases) and **Can exercise improve lung function?** (a video) in the Resources tab to help you answer this question: (P7, P10, P16) (5 marks)

Note: For an explanation of the key words used in the revision questions above, see Appendix 2, page xxx.

on Resources

Weblink: Respiration 3D Medical Animation
Weblink: Can exercise improve lung function?
Interactivity: Revision quiz: auto-marked version (int-7237)
Interactivity: Missing word interactive quiz (int-7238)
Digital doc: Revision quiz (doc-26261)

4.5.3 Key terms

The muscle **action** refers to movement made at the joint when the muscle contracts. *p. 164*

Arteries are blood vessels that carry blood away from the heart. *p. 179*

Articular cartilage is a firm, smooth, flexible connective tissue that covers the end of bones where they form joints. *p. 152*

Bone marrow is a soft, fatty vascular tissue in which blood cells are made, located in the interior cavities of bones. *p. 152*

Cancellous bone is the spongy or porous inner structure of bone that often contains and protects bone marrow. *p.152*

Capillaries are the smallest of all blood vessels. They function to exchange oxygen and nutrients for waste. *p. 180*

The **circulatory** or **cardiovascular system** is a network that distributes blood containing oxygen and nutrients and collects wastes. It comprises the heart, arteries, blood and veins. *p. 176*

A **concentric** contraction is the most common type of muscular contraction. During this contraction, the muscle shortens, causing movement at the joint. *p. 168*

Diastolic pressure is the minimum or lowest pressure recorded when the heart is relaxing and filling (diastole). *p. 184*

An **eccentric** contraction occurs when the muscle lengthens while under tension. The action often happens with the assistance of gravity. *p. 168*

Expiration is air movement from the lungs to the atmosphere; breathing out. *p.168*

Flat bones have a broad surface and serve as places of attachment for muscles and to protect vital organs. *p. 152*

A **freely movable** or **synovial joint** is one that allows maximum movement. Most joints in the body are synovial joints; for example, the hip joint. *p.152*

An **immovable** or **fibrous joint** is a joint where no movement is possible. Examples of this type of joint include the bones of the cranium, which are fused in lines called sutures. *p.152*

The **insertion** of a muscle is the point of attachment at the movable end. This end tends to be away from the body's main mass. *p. 164*

Inspiration is air movement from the atmosphere into the lungs; breathing in. *p. 172*

An **isometric** contraction occurs when the muscle fibres are activated and develop force, but the muscle length does not change; that is, movement does not occur. *p. 168*

Long bones are longer than they are wide and they function as levers. *p. 152*

origin the muscle's point of attachment to the more stationary bone is called its origin. In most cases, this point is nearer the trunk. *p.160*

Plasma is a straw-coloured liquid mainly consisting of water (about 90 per cent). *p. 177*

Platelets are fragments of cells found in blood and are responsible for clotting. *p. 177*

Pulmonary circulation is the flow of blood from the heart to the lungs and back to the heart. *p. 182*

Respiration is the process by which the body takes in oxygen and removes carbon dioxide. *p. 170*

Short bones have a short axis and are found in small spaces such as the wrist. They serve to transfer forces. *p. 152*

A **slightly movable** or **cartilaginous joint** is a joint that permits limited movement. Examples of this joint exist in the vertebral column, where fibrous cartilage between discs allows a limited range of movement. *p.152*

A **sphygmomanometer** is an instrument used to measure blood pressure. *p. 184*

Systemic circulation is the flow of blood from the heart to body tissue and back to the heart. *p. 182*

Systolic pressure is the highest (peak) pressure recorded when blood is forced into the arteries during contraction of the left ventricle (systole). *p. 184*

Veins carry deoxygenated blood from the body tissues back to the right atrium. Pulmonary veins from the lungs differ in that they carry oxygenated blood to the left atrium. *p. 181*

TOPIC 5
Physical fitness, training and movement efficiency

OVERVIEW

5.1 Health-related components of physical fitness
5.2 Skill-related components of physical fitness
5.3 Aerobic and anaerobic training
5.4 Immediate physiological responses to training
5.5 Topic review

OUTCOMES

In this topic students will:

- explain how body structures influence the way the body moves (P7)
- describe the components of physical fitness and explain how they are monitored (P8)
- plan for participation in physical activity to satisfy a range of individual needs (P10)
- assess and monitor physical fitness levels and physical activity patterns. (P11)

5.1 Health-related components of physical fitness

Physical fitness is important in establishing and maintaining total body health. Physical fitness has a number of essential components, all of which contribute to total body fitness. Some fitness components have a direct impact on health. A variation in one or a number of these components can significantly affect our total health and well-being.

Health-related fitness components include:

- cardiorespiratory endurance
- muscular strength
- muscular endurance
- flexibility
- body composition.

Other fitness components relate more specifically to skills required for sports performance. These include:

- power
- speed
- agility
- coordination
- balance
- reaction time.

A brief overview of components of fitness together with tests that can be used to measure these components can be viewed in table 5.1. There is a range of well recognised tests available to measure each of the components. The tests listed below are easy to administer in most school environments and include norms or averages relevant to your age group.

TABLE 5.1 Components of fitness overview

	Component	Definition	Suitable tests
Health-related components	Cardiorespiratory endurance	The ability of the working muscles to take up and use oxygen	Bicycle ergometry The multistage fitness test The yo-yo intermittent recovery test
	Muscular strength	The ability to exert force against a resistance	Handgrip dynamometer test
	Muscular endurance	The ability of the muscles to endure physical work for extended periods of time	The one-minute sit-up test
	Flexibility	The range of motion about a joint	Sit and reach test
	Body composition	The percentage of fat as opposed to lean body mass in a human being	Body fat measurements using skin fold callipers
Skill-related components	Power	The ability to combine strength and speed in an explosive action	Vertical jump
	Speed	The ability to perform body movements quickly	The 50 m sprint test
	Agility	The ability to move the body from one position and direction to another with speed and precision	Illinois agility run test
	Coordination	The ability to harmonise the messages from the senses with parts of the body to produce movements that are smooth, skilful and well controlled	The stick flip test
	Balance	The ability to maintain equilibrium while either stationary or moving	Balance board test
	Reaction time	The time taken to respond to a stimulus	The ruler drop test

An improvement in health-related fitness components improves personal health and lifestyle, including lowering the risk of **hypokinetic disease**. Hypokinetic disease includes such conditions as:

- heart disease
- obesity
- high blood pressure
- insomnia
- diabetes
- depression.

Health-related fitness components respond positively to physical exercise. For example, exercise can help us lose weight, improve muscle tone and assist in the prevention of lower back pain. However, exercise should not be considered in isolation. Other factors such as heredity, environment and nutrition, together with lifestyle practices such as drug use and stress management, play an important role in contributing to total body health.

FIGURE 5.1 Cardiorespiratory endurance is important in the performance of aerobic activity.

5.1.1 Cardiorespiratory endurance

Cardiorespiratory endurance refers to the ability of the working muscles to take up and use the oxygen that has been breathed in during exercise and transferred to muscle cells. It is by far the most important health-related fitness component. It is commonly referred to as aerobic power. The word aerobic means 'with oxygen', suggesting that this system is powered by oxygen, which is readily available in the cells and breaks down the body's fuels, producing energy.

The importance of cardiorespiratory endurance is evident in endurance events such as cycling, triathlons and marathons. A well-trained cardiorespiratory system ensures:

- the delivery of adequate quantities of blood (high cardiac output)
- a functional ventilation system (respiratory system)
- a good transport system (circulatory system) to ensure efficient and speedy delivery of oxygen and nutrients to the cells.

Application

A laboratory test of cardiorespiratory endurance — bicycle ergometry

Use the **Cycle ergometry** weblink in the Resources tab to watch a video of the test

Equipment

Bicycle ergometers, stopwatches, Repco calculator, weighing scales, heart rate measuring device (stethoscope/exersentry/pulse rate meter or others)

Procedure

To perform this test, the subject should exercise at a workload (WL) that will raise the heart rate (HR) to a level anywhere between 120 and 170 beats per minute (bpm) where it will 'settle down' (will not fluctuate). This should happen after about two to three minutes of exercise. If the HR fails to make 120 bpm, the WL (resistance or stress applied) must be increased. Similarly, if the HR is above 170 bpm the WL must be decreased.

Adjustments to WL can be made any time, but a period of established HR to a specific WL must follow for about three to four minutes. HR must level out between 120–170 bpm, otherwise the test will be invalid. This is because researchers have established linear values between HR and WL within these ranges. Outside these ranges, the values are inaccurate.

1. Form groups of three. The first person is the subject, the second person checks HR, the third person records HR and WL. The subject should not have exercised strenuously for two hours prior to the test.
2. Weigh the subject and record their weight.
3. Adjust saddle height of the bike if necessary. The knee should be almost fully extended when the pedal is at the bottom of its circle.
4. Attach the HR measuring device. Be sure contact is firm. The HR may well be higher than anticipated due to anxiety. If taking it manually be sure that you can feel the pulse.
5. The suggested workload is 600 kp.m for boys and 450 kp.m for girls. Begin pedalling and start the stopwatch. HR and WL must be recorded every minute, using table 5.2.

TABLE 5.2 Record of aerobic power using bicycle ergometer

Test characteristics	Minute	Workload (kp.m)	Heart rate (bpm)
HR 116–128	1		
	2		
Adjust WL if necessary	3		
	4		
HR settling down	5		
	6		
HR settled	7		
	8		
Recovery	9		
	10		

6. After one minute, HR should be between 116–128 bpm. After three minutes, HR must start to settle down to between 120–170 bpm. If the value is much lower than 120 bpm and settling down, increase the workload. If much higher than 170 bpm, the workload must be decreased.
7. Continue the test for seven minutes, recording HR and WL every minute. Continue for an extra minute or two if HR fails to 'settle down'; that is, be within a couple of beats of the previous reading.
8. To obtain a final result, average the sixth and seventh minute HR and note the WL.
9. To assess aerobic capacity, using the Repco calculator, line up age with body weight, then HR and WL and read aerobic power in mL/kg/min. Alternatively, go to the **Astrand cycle test** weblink in the Resources tab and use the online calculator.
10. See table 5.3 to establish your rating of aerobic fitness.

TABLE 5.3 Maximal oxygen uptake (VO_2 max.) norms for men and women 18–35 (mL/kg/min)

	Age (years)			
	Males		Females	
Rating	18–25	26–35	18–25	26–35
Excellent	> 60	> 56	> 56	> 52
Good	52–60	49–56	47–56	45–52
Above average	47–51	43–48	42–46	39–44
Average	42–46	40–42	38–41	35–38
Below average	37–41	35–39	33–37	31–34
Poor	30–36	30–34	28–32	26–30
Very poor	< 30	< 30	< 28	< 26

Source: Topend Sports.

Resources

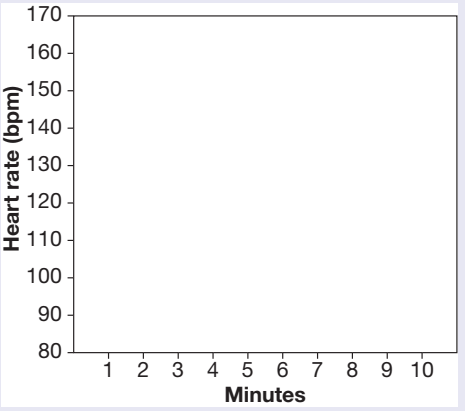
Weblink: Cycle ergometry
Weblink: Astrand cycle test
Interactivity: Astrand cycle test calculator (int-6814)

Inquiry

My cardiorespiratory fitness level using bicycle ergometry

1. What is oxygen uptake?
2. What is meant by a test of maximal aerobic power?
3. What is a submaximal test?
4. Why do we test fitness levels using submaximal tests?
5. What are the possible disadvantages of using bicycle ergometry?
6. Copy and complete the graph (figure 5.2) for yourself as a subject by plotting your heart rate for each minute of exercise. Indicate where your heart rate levelled out.
7. What was your rating?
8. Were you satisfied with this rating? Why or why not?
9. Design a simple fitness program aimed at improving your aerobic power.

FIGURE 5.2 Graph of heart rate



Application

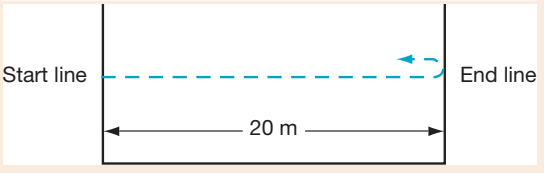
A field test of cardiorespiratory endurance — the multistage fitness test

Equipment

Beep test audio, firm surface with two lines marked 20 metres apart

Procedure

FIGURE 5.3 Lines for multistage fitness test



1. Form a group of no more than 10 subjects to one supervisor.
2. Divide the group into two. Half the group is to perform the test while the remaining half observes and records the results.
3. Use a general purpose warm-up including leg stretching exercises before commencing this test.
4. The subjects in group one should move to the start line and listen to the introductory remarks on the audio, which will tell them when to start and how to judge pace.
5. Subjects begin by walking to the end line, aiming to reach it on the 'beep'. Both feet must cross the line. They then turn and walk back aiming to reach the start line on the next 'beep'. Gradually the tempo is increased necessitating a jog and then a run to reach the other line by the sound of the 'beep'. When subjects fail to stay in time with the 'beep' they are given a warning. Failure to catch up or a second warning means the subject must stop the test.

6. Recorders should note the level at which their subject was unable to continue the test. Record the level and note the oxygen uptake in table 5.3.
7. Relate the oxygen uptake level to the aerobic capacity rating in table 5.3 to establish the rating for your cardiorespiratory endurance.

Inquiry

My cardiorespiratory fitness level using the multistage fitness test

1. What was your rating for the cardiorespiratory endurance test? If you have completed another of the tests of aerobic capacity, how did your readings compare? Were there any factors that limited your performance?
2. What was your heart rate and breathing rate at the end of the test? Describe how your legs felt during the last few shuttles and immediately following completion of the test. Can you suggest why you felt this way?
3. Discuss the advantages and disadvantages of this test for use in a team training situation.

on Resources

Weblink: Beep test audio
Interactivity: Multi-stage VO_2 calculator (int-6808)

Application

An aerobic field test — the yo-yo intermittent recovery test level 1 (YYIR1)

While similar to the beep test, yo-yo intermittent tests were originally developed for soccer players but they are suitable as tests of aerobic power in a range of sports such as basketball, touch football and tennis where short, high-intensity work is often followed by short recovery periods.

This test has several variations, but YYIR1 specifically focuses on an individual's ability to perform high-intensity aerobic work. The YYIR1 begins at 10 kilometres per hour and is a good starting point for students whereas YYIR2 is designed for elite athletes, the difference being the elevated beginning speed of 13 kilometres per hour.

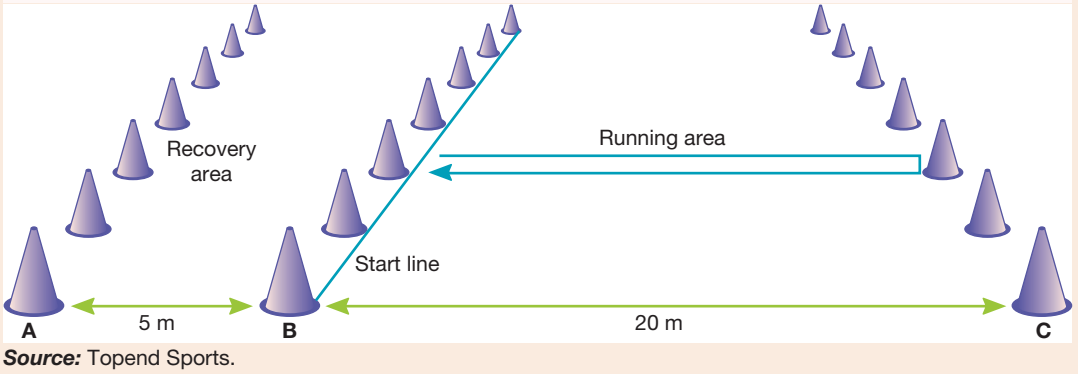
Equipment

A 30-metre measuring tape, markers or cones, phone or MP3 player with YYIR1 audio, an officiator, recording sheets

Procedure

1. On a level area such as a playing field or gymnasium, set rows of markers 20 metres apart and then add an additional row 5 metres back from the start line as shown in figure 5.4.

FIGURE 5.4 Set up for the yo-yo intermittent recovery test



Source: Topend Sports.

2. Divide the group into two. Half the class performs the test while the other half observes and records the results.
3. Subjects in group 1 move to the start line (B) and wait until instructed to run in accordance with the audio.
4. On the start sound, subjects move towards line C arriving just before the beep. They then turn around and jog back to line B and begin a 10-second recovery period. During recovery, subjects walk or jog to line A and then back to B, arriving just before the beep. On the beep, they repeat the run/recovery shuttle again.
5. When a subject fails to make it back to the B line in accordance with the audio, they are given one warning. On a second failure, the subject must retire and the score is recorded as the last 2 x 20-metre interval achieved. The recorder notes this and establishes the total metres covered by the subject.
6. VO_2 max is predicted using the formula: YYIRT1 distance (metres) x 0.0084 + 36.4. See table 5.3 for norms
7. Establish your yo-yo test rating using tables 5.4 and 5.5.

TABLE 5.4 Yo-yo test norms

Level 1 norms for adult men and women

	Males		Females	
Rating	Metres	Level	Metres	Level
Elite	> 2400	> 20.0	> 1600	> 17.5
Excellent	2000–2400	18.7–20.0	1280–1600	16.5–17.5
Good	1520–2000	17.3–18.7	1000–1280	15.6–16.5
Average	1000–1520	15.6–17.3	680–1000	14.6–15.6
Below average	520–1000	14.2–15.6	320–680	13.1–14.6
Very poor	< 520	< 14.2	< 320	< 13.1

Level 2 norms for adult men and women

	Males		Females	
Rating	Metres	Level	Metres	Level
Elite	> 1280	> 16.5	> 800	> 15.1
Excellent	1000–1280	15.6–16.5	720–800	14.7–15.1
Good	720–1000	14.7–15.6	480–720	14.1–14.7
Average	480–720	14.1–14.7	360–480	13.2–14.1
Below average	280–480	12.3–14.1	160–360	11.2–13.2
Very poor	< 280	< 12.3	< 160	< 11.2

Source: Topend Sports.

TABLE 5.5 Yo-yo test norms for various sports according to the AIS

Sport	Sex	Age	Mean level
Netball — national	Female	U17	15.7
Soccer — national	Male	U17	20.6
Basketball — state	Female	U17	15.6
Basketball — state	Male	U17	16.2

Inquiry

My aerobic fitness level as measured by Yo-Yo IRT1

1. If you have performed any of the other tests of aerobic power, how did your results compare?
2. The test is very similar to the beep test with the exception of the short recovery following each interval. Why is an enforced recovery period an important part of the test?
3. How difficult was it to begin running again following recovery?
4. This test is now use extensively with soccer and AFL players. Why do you think this might be a preferred test?

on Resources

Interactivity: Yo-yo test calculator (int-6809)

5.1.2 Muscular strength

Body requirements of **muscular strength** vary between sport, activity and general living. There is considerable variation in strength requirements within particular sports, with some playing positions requiring more strength than others. Strength is particularly important in activities such as weight-lifting and gymnastics, and games such as rugby. High levels of overall body strength improve performance and reduce the risk of injury.

When we increase our strength, there is also an increase in the size of the muscle. This is referred to as **muscular hypertrophy**.

FIGURE 5.5 Muscular strength improves performance and reduces the risk of injury.

Application

Determining muscular strength using the hand dynamometer test

Equipment

Hand dynamometer

Procedure

1. Pick up the dynamometer and push the arrow back to zero.
2. Let your arm hang vertically with the dynamometer comfortably gripped in the hand.
3. Gradually lift the dynamometer to shoulder height, squeezing the grip as hard as you can with the arm extended.
4. Read the result and record it in table 5.6. Repeat with the left hand.
5. Allow three tests on each hand, and record the best. Determine your rating, using table 5.7.

FIGURE 5.6 Position for grip strength test

TABLE 5.6 Results for muscular strength using a hand dynamometer

	Result (kg)	Rating
Right		
Left		
Best		

TABLE 5.7 Handgrip strength norms and ratings (kilograms)

Rating	Males aged 16–17 years	Males aged 18–39 years	Females aged 16–17 years	Females aged 18–39 years
Excellent	41 or more	54 or more	31 or more	39 or more
Good	36–40	50–53	29–30	36–38
Average	34–35	47–49	27–28	33–35
Fair	32–33	43–46	22–26	30–32
Poor	31 or less	42 or less	21 or less	29 or less

Source: Adapted from Leelarthaepin, B 1992, *Assessment of physical fitness: a practical approach,* Biomediscience Services, New South Wales.

Inquiry

Activity, training and muscular strength

1. Is strength important in the type of sport or activity in which you participate?
2. Were you satisfied with your muscular strength rating? Why?
3. Do you feel this test reflected your overall body strength? Explain.
4. Do you use strength training to complement your sport or activity? Explain the strength training program you use.
5. What type of contraction was performed in the application above?
6. Why is adequate strength important in daily life?
7. As a class, discuss any differences between the strength results of girls and boys in this application.

5.1.3 Muscular endurance

Muscular endurance is the ability of the muscles to endure physical work for extended periods of time without undue fatigue. The development of muscular endurance is very important in activities where contraction of the same muscle or group of muscles is repeated for periods of time without rest. It is a measure of the ability of the muscle to contract repeatedly over a period of time, thereby delaying the onset of fatigue.

FIGURE 5.7 Muscular endurance is important in activities where the same muscle group is involved in repetitive movements.

Muscular endurance is local in that it is specific to a muscle or a group of muscles. It depends on the condition of the muscle that is performing the repeated contractions; for example, the rectus abdominis during continuous sit-ups. Muscular endurance is improved by programs that focus on maximum repetitions with low to moderate levels of resistance.

Muscular endurance is important in activities such as cycling, cross-country running, skiing, sports carnivals, bushwalking and rowing. In each of these activities, specific muscle groups must contract repeatedly to perform the skill. If the muscle group tires, the ability to continue to perform the skill is adversely affected.

Application

Measuring muscular endurance using the one-minute sit-up test

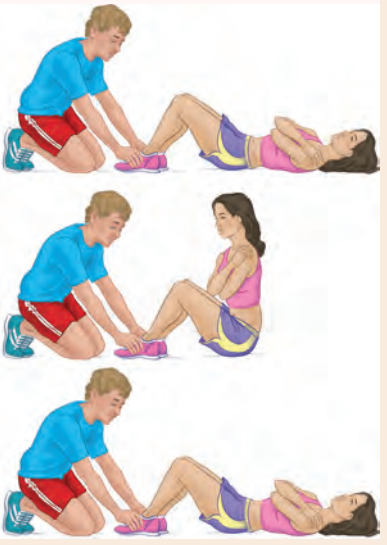
Equipment

Stopwatch, recording sheet

Procedure

1. Work in pairs. Nominate who will be the first subject and who will be the first counter.
2. The subject should lie on the floor with knees bent and feet flat on the floor. Arms are folded across the chest. Palms are open and rest on the front of the shoulders. Elbows are close together. The counter should hold their partner's feet firmly on the floor. The angle at the knees should not be less than 60°. In the sit-up, the trunk is raised and the elbows brought to a position between the knees. The body then returns to the floor. The total movement counts for one sit-up.
3. Have a number of practices to warm up and ensure the technique is correct. Disallow any sit-ups performed incorrectly.
4. Perform the test, counting the number of correctly executed sit-ups in one minute.
5. Change roles and repeat the process.

FIGURE 5.8 Sit-up test



6. Determine the rating for each person, using table 5.8.

TABLE 5.8 Abdominal muscle endurance ratings (number of sit-ups completed in 60 seconds)

Rating	Males aged 15–19 years	Females aged 15–19 years
Excellent	48 or more	42 or more
Good	42–47	36–41
Average	38–41	32–35
Fair	33–37	27–31
Poor	32 or fewer	26 or fewer

Source: Adapted from Nieman 1993.

Inquiry

Activity and muscular endurance

1. Are you satisfied with your rating in the sit-up test?
2. What problems did you incur with this type of test?
3. How can you improve muscular endurance?
4. In what type of activities would you expect to see a relationship between muscular endurance and cardiovascular endurance?
5. List five sports where a significant amount of muscular endurance is essential for a good performance.
6. What activities in our normal lifestyle require muscular endurance?

5.1.4 Flexibility

Flexibility is the range of motion about a joint or the ease of joint movement. Maintenance of joint flexibility not only helps sport performance, but contributes significantly to quality of life. Flexibility is joint specific; that is, the level of flexibility found in one joint will not necessarily be uniform throughout the body. In other words, a person who is quite flexible in the shoulders may not be quite as flexible in other joints throughout the body.

FIGURE 5.9 Improved flexibility allows us to participate in a greater range of activity with less discomfort and less chance of injury.

Flexibility is an important health-related fitness component because it directly affects personal health and athletic performance, both now and in the future. For example, it is known that muscle length decreases with age, progressively decreasing our range of movement. Routine flexibility programs delay and restrict the effects of this process. Flexibility is improved by safe stretching programs which, in addition to increasing mobility, also:

- help prevent injury
- improve posture
- improve blood circulation
- decrease the chance of lower back pain later in life
- strengthen the muscle if combined with **isometric exercises**.

Application

Measuring flexibility using the sit-and-reach test

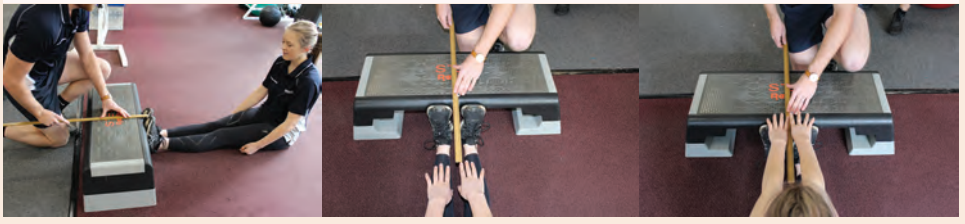
Equipment

Sit-and-reach measuring device, box for mounting (or box and ruler)

Procedure

1. Divide into pairs. Sit on the floor with legs stretched out straight ahead. Shoes should be removed.
2. The soles of the feet are placed flat against the box/bench. Both knees should be locked and pressed flat to the floor — the tester may assist by holding them down.
3. With the palms facing downwards, and the hands on top of each other or side by side, the subject reaches forward along the measuring line as far as possible. Ensure that the hands remain at the same level, not one reaching further forward than the other.
4. The subject reaches out and holds that position for at least one or two seconds while the distance is recorded. Make sure there are no jerky movements.

FIGURE 5.10 Sit-and-reach test for flexibility



Source: Kirsty Walsh.

5. The best of three attempts should be recorded.
6. Determine the rating for each person, using table 5.9.

TABLE 5.9 Sit-and-reach test norms

	Men (cm)	Women (cm)
Super	> +27	> +30
Excellent	+17 to +27	+21 to +30
Good	+6 to +16	+11 to +20
Average	0 to +5	+1 to +10
Fair	–8 to –1	–7 to 0
Poor	–20 to –9	–15 to –8
Very poor	< –20	< –15

Inquiry

Activity and flexibility

1. List three sports or activities that take up a lot of your recreational or training time (for example, surfing).
2. List three joints that undergo a full range of motion in performing the skills associated with the sports or activities listed in question one (for example, the shoulder joint).

3. Do you think your flexibility rating is good enough to avoid injury considering the demands made on your joints?
4. How would additional flexibility be an advantage?
5. Why is flexibility important in all sport and game situations?

5.1.5 Body composition

Body composition refers to the percentage of fat as opposed to lean body mass in a human being. It is an important health-related component because it takes account of the level of storage fuel required for muscle activity. Having too little or too much storage fuel (fat) can significantly affect health and physical performance.

FIGURE 5.11 Exercise patterns and eating habits largely determine our body composition.

All people need a certain amount of body fat. This is called *essential fat* and surrounds vital organs such as kidneys, heart, muscle, liver and nerves. Absence of fat in these areas would lead to chronic health problems because fat in these regions helps to protect, insulate and absorb shock to these organs. Additional fat is called storage fat and it too has an important role, mainly as a source of stored energy. Storage fat is used for fuel during times of rest and sleep and in extended exercise of more than an hour or so, when our supplies of **blood glucose** are exhausted.

Lean body mass is often called fat-free mass and comprises all of the body's non-fat tissue, including bone, muscle, organs and connective tissue. While the characteristics of body tissue are genetically determined, the size of the muscle can change with the use of resistance training (weight training) programs.

Body composition can be changed by diet and exercise. For example, a lifestyle that combines regular high activity and resistance training with a well-balanced, but not excessive, food intake will result in a significant decrease in body fat and improved body tone. The recommended amount of body fat as a percentage of body composition is 15 to 20 per cent for men and 20 to 25 per cent for women.

Application

Determining body composition using skinfold callipers

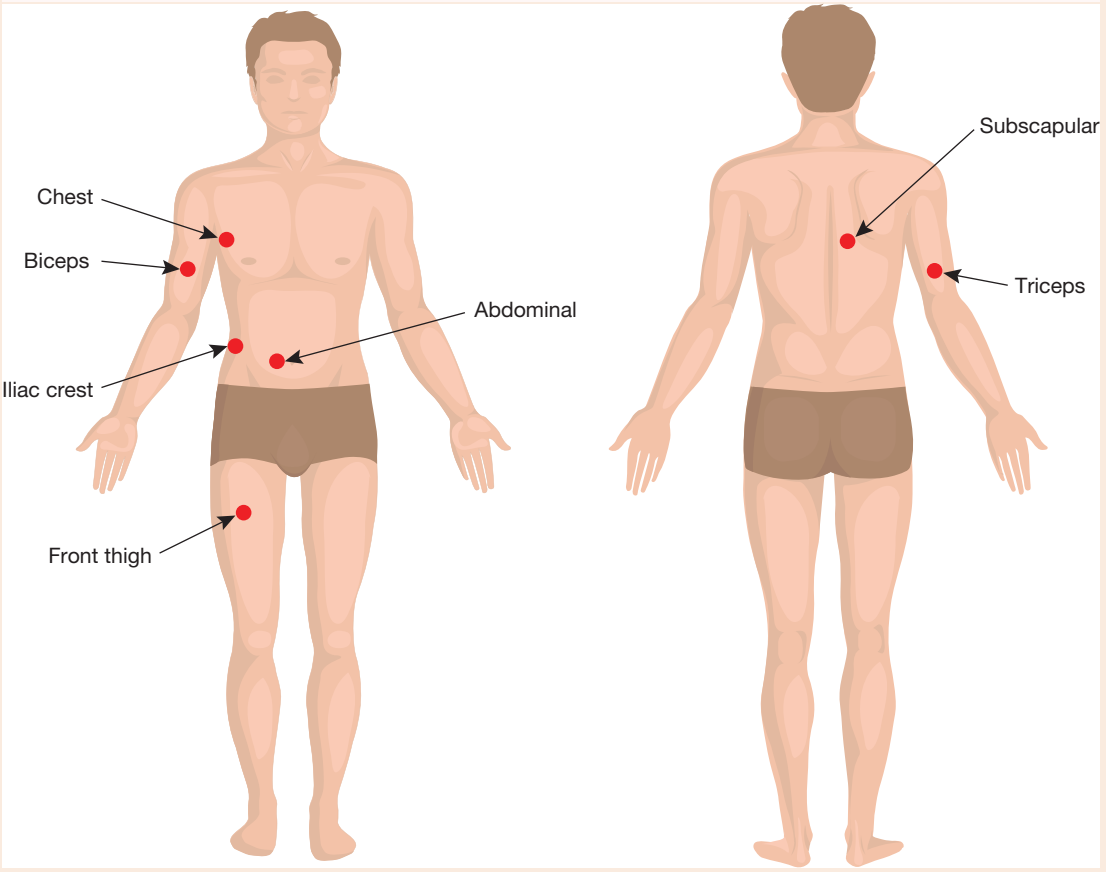
Equipment

Skin fold callipers or slide measure, recording sheets

Procedure

There are seven sites on the body at which body fat is measured using callipers (see figure 5.12). While testers may use many different combinations of skinfold site measurements, the triceps and subscapular sites are the most commonly used for young people and have been selected for this test.

FIGURE 5.12 The sites for skinfold measurements



For this test, subjects should wear T-shirts and relax while measurements are being taken. Flexing the muscles does not decrease the amount of fat, it simply makes measurement more difficult.

1. Divide into pairs, threes or fours, depending on the number of callipers available.
2. Take the callipers in the preferred hand (usually the right) and practise opening the arms of the instrument. Repeat until you can do this both comfortably and smoothly. If using a slide measure, practise pushing the slide and letting it come back.
3. Take a vertical (that is, skinfold will be up and down) skinfold measurement at the two sites — (i) triceps, (ii) subscapular.
   (a) The triceps is located on the back of the arm halfway between the elbow and shoulder. The vertical skinfold should be taken from the middle of the triceps muscle (see figure 5.13).
   (b) Push your arm up your back and the shoulder blade (scapula) will protrude. Locate this bone and then have the subject drop the arm. Take a vertical skinfold approximately two centimetres below the bottom tip of the bone (subscapular — see figure 5.14).
4. The first subject should stand and let his/her arms hang loosely.
5. With callipers in the preferred hand, the assistant gently pinches the skin between their index finger and thumb using the other hand. Then, slide off the muscle that can be felt underneath and gently hold the skinfold. Place the callipers over the fold and let the arms of the calliper close in (see figures 5.13 and 5.14).

FIGURE 5.13 Skinfold test on the triceps

Source: © John Wiley & SonsAustralia/ Photo by Jo Patterson.

FIGURE 5.14 Skinfold test on the subscapular

Source: © John Wiley & Sons Australia/ Photo by Jo Patterson.

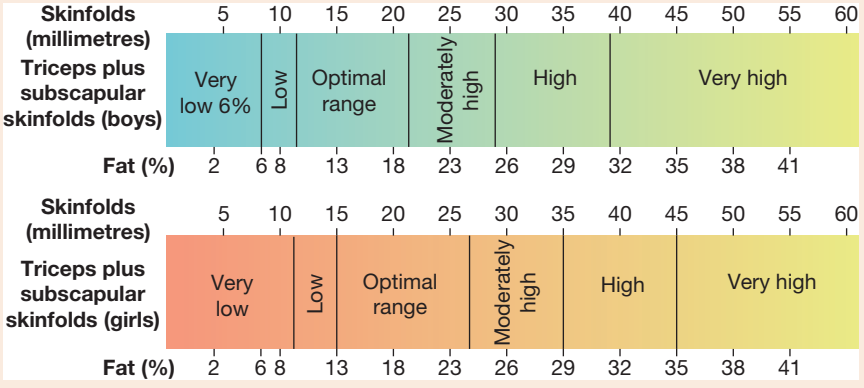
6. The assistant then reads the skinfold measurement. The callipers should not be left on for too long as fat cells will compress, causing inaccuracies.
7. Callipers should be removed and the pinch of skin gently relaxed.
8. Repeat the measurement twice. If two readings are the same, record the reading. If all are different, record the mean (average) reading in table 5.10.

TABLE 5.10 Measurement of body fat

Site	Measurement (mm)
Triceps	
Subscapular	

9. Repeat for each subject.
10. Refer to figure 5.15 to obtain the predicted percentage body fat and a rating for this figure.

FIGURE 5.15 Predicted percentage body fat and body fat standards using triceps and subscapular skinfold sites for 6–17-year-olds



Source: Adapted from *Journal of Physical Education, Recreation and Dance*, vol. 58, no. 9, p. 99.

Inquiry

Evaluating body composition

1. What percentage of body fat should you aim for?
2. How can a desirable amount of body fat be achieved and maintained?
3. What are the advantages of having a desirable percentage of body fat?
4. What problems could be incurred in calculating percentage of body fat using the skinfold measurement method?

5.2 Skill-related components of physical fitness

Skill-related components of physical fitness do not impact specifically on health but are important in the performance of activities, games and recreational pursuits. An improvement in skill-related components improves performance in activities that utilise that skill. For example, effective rebounding in basketball requires an ability to jump high. The fitness component required to jump high is leg power.

FIGURE 5.16 Power is important in activities that require explosive movements.

5.2.1 Power

Muscular power is the ability to combine strength and speed in an explosive action. It is determined by the amount of work per unit of time. People who are strong are not necessarily powerful.

The amount of power relative to the amount of strength varies according to the type of activity. *Speed-dominated* power is power generated through a greater emphasis on speed and is essential in activities such as sprinting and throwing. *Strength-dominated* power is power generated through a greater emphasis on strength. It is important in activities such as weight-lifting and throwing the shot or javelin. Effective programs aim to develop the required amounts of strength and power in each individual according to the needs of the sport.

Application

Measuring muscular power using the vertical jump test

Equipment

Vertical jump board or tape measures attached to wall

Procedure

1. Divide into pairs. One person is the subject and the other is the recorder.
2. The subject should dip their middle finger in chalk dust, face the wall, extend both hands upwards and make a mark. Record the height of the mark in centimetres.
3. The subject should then turn sideways to the wall, spread their feet, take a deep squat and jump vertically (see figure 5.17). No feet movements are allowable in preparation for the jump.

4. At the height of the jump, the subject should mark the wall adjacent to the tape. Record the difference between the first and second marks.
5. Allow three jumps and record the best.
6. The subject and recorder should now change roles and repeat steps 2–5.
7. Take the best jump for each person and determine their power rating using table 5.11 and compare it with the norms in table 5.12.

FIGURE 5.17 Vertical jump test

Source: © John Wiley & Sons Australia/ Photos by Jo Patterson.

TABLE 5.11 Ratings for the vertical jump test (centimetres)

Rating	Males aged 15–17 years	Males aged 18–34 years	Females aged 15–17 years	Females aged 18–34 years
Excellent	59 or more	62 or more	39 or more	32 or more
Good	48–58	48–61	33–38	25–31
Average	30–47	33–47	20–32	15–24
Fair	13–29	20–32	8–19	5–14
Poor	12 or less	19 or less	7 or less	4 or less

TABLE 5.12 AIS norms for the vertical jump test

Sport	Sex	Age	Mean score
Netball — national	Female	U17	44 cm
AFL	Male	Approx. 18	60 cm
Basketball — state	Female	U17	48 cm
Basketball — state	Male	U17	62 cm
Cricket — national	Female	Open	44 cm
Cricket — national	Male	U19	56 cm

Inquiry

Evaluating muscular power

1. Were you satisfied with your muscular power rating in the previous application? Why or why not?
2. How might you increase your power to improve your performance in a re-test of the vertical jump?
3. List three movements in your preferred sport or activity for which power is essential; for example, jumping in basketball.
4. Is your power sufficient to be able to perform these movements as well as you would like?
5. In what aspects of daily life is power an advantage?

5.2.2 Speed

Because it is largely an innate quality determined by fibre type, **speed** is not as responsive to training as other fitness components such as cardiorespiratory endurance, strength and power. This explains why some people naturally appear to be 'quick' while others, no matter how much they train, do not make significant gains.

Sprinters still need to train to improve speed. However, while some improvements will be made as a result of increased power, considerable changes result from improvements in technique, including reaction time at the start, form, alignment, balance and the utilisation of energy for a powerful finish.

Application

Measuring speed using the 50-metre sprint test

Equipment

Tape measures, stopwatches

Procedure

1. Measure a 50-metre straight on flat ground.
2. Divide into pairs. Choose who will be the first runner and who will be the first timer.
3. Have a general warm-up with emphasis on leg stretches.
4. Practise 'on the mark', 'set', 'go', allowing about two seconds between 'set' and 'go'.
5. Practise starting the stopwatch on the 'go' movement; that is, the first movement forward. As sight is quicker than sound, this will give a more accurate reading.
6. The starters should now go to the starting line and the timers to the finish line.
7. Start the runners and time them over the distance.
8. Allow three runs and select the best time.
9. The subjects and recorders should change over and repeat steps four to eight.
10. Take the best time for each person and determine their speed rating using table 5.13.

TABLE 5.13 Ratings for the 50-metre sprint test (seconds)

Rating	Males aged 16–17 years	Females aged 16–17 years
Excellent	Under 7.1	Under 8.0
Good	7.1–7.3	8.0–8.4
Average	7.4–7.8	8.5–8.9
Fair	7.9–8.2	9.0–9.3
Poor	Over 8.3	Over 9.4

Source: Adapted from Wright 1997.

Inquiry

Evaluating speed

1. Why is speed an advantage in sport?
2. Were you satisfied with your rating in the application above? Why or why not?
3. How could you improve your speed?
4. List three sports that you play or have played that involve use of speed. How important is speed to good performance in these sports?
5. Where might speed be important in normal life?

5.2.3 Agility

Agility is the ability to move the body from one position and direction to another with speed and precision. It combines a number of fitness components including balance, coordination and speed. Because agility comprises a number of components, any test that measures agility will be performed at speed and will reflect a degree of balance and coordination. Improved fitness in any one of these aspects subsequently improves agility and the ability to resist fatigue. Elements or aspects of any agility training program should include the ability to be aware of, and control, body parts and to recognise patterns of skills and react or respond quickly to stimuli. Drills to improve footwork and to start and change direction will also be beneficial in developing agility.

Activities that require a high degree of agility include skiing, most team games and ice skating. Field hockey and soccer, for example, are multi-directional sports, both requiring quick changes of direction and fast acceleration or deceleration. An agile player is able to respond quickly to an opposing player, making agility equally as or even more important than speed.

FIGURE 5.18 Agility is the ability to move with speed and precision.

Application

Testing agility using the Illinois agility run test

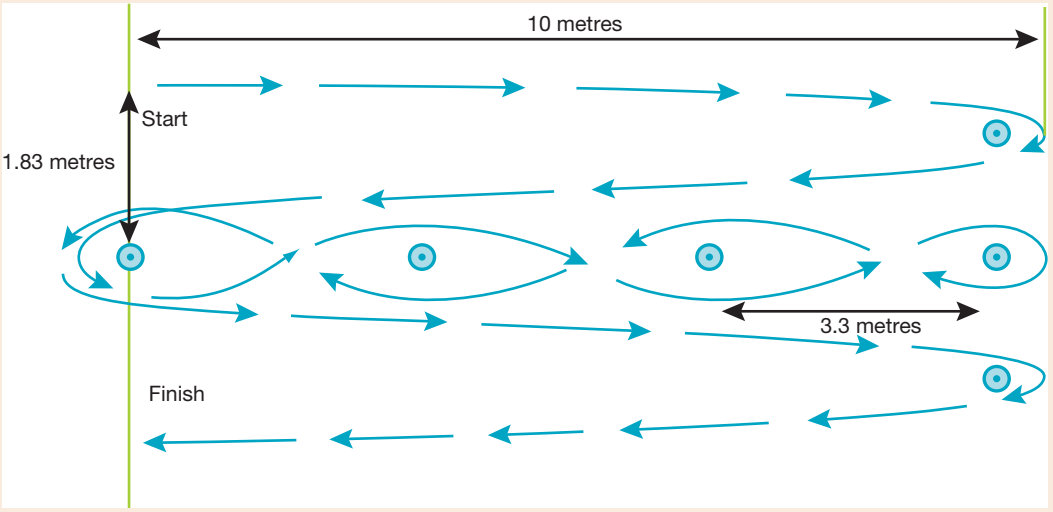
Equipment

Tape measure, six markers (chairs or witches' hats), stopwatches, recording sheets

Procedure

1. On a football field or suitable flat surface, mark two parallel lines 10 metres apart. Place four witches' hats 3.3 metres apart as per figure 5.19. Place two witches' hats 1.83 metres each side of the first line marker.
2. Divide into pairs. One person is to complete the course and the other is to time and record the results. Ensure that you warm up and stretch before completing the course.
3. The first subject from each pair must lie face down flat on the ground in a push-up position just behind the line at the start.
4. On the instruction 'go', the first subject runs to the end line and back, then in and out of the markers, to the end line again, then back to the finish (see figure 5.19).
5. During the run, each end line must be crossed. The marker cannot be jumped or knocked.

FIGURE 5.19 Field for agility test



6. The second subject records the time for completion of the course.
7. Allow two attempts, with recovery time between each. Then repeat the test for the second subject.
8. Check your agility rating, using table 5.14.

TABLE 5.14 Agility rating

Rating	Boys 16–17 years	Girls 16–17 years
Excellent	<15.2	<17.0
Very good	16.1–15.2	17.9–17.0
Average	18.1–16.2	21.7–18.0
Poor	18.3–18.2	23.0–21.8
Very poor	>18.3	>23.0

Inquiry

Evaluating agility

1. Why do you think the test in the previous application may or may not be a good test of agility?
2. What other components of fitness will contribute to a good agility score?
3. Write a list of activities that you could use to improve your agility.
4. Are you satisfied with your rating?
   (a) If not, what do you believe contributed to this performance?
   (b) If so, to what do you attribute your success?
5. List five activities in daily life where agility is essential.
6. List five sports or activities in which above average levels of agility are essential.

5.2.4 Coordination

Coordination requires good interaction between the brain and the muscles, resulting in efficient body movement. Coordination is important in games, in movements that require throwing and activities such as dancing. It is not a specific skill such as power or speed. Rather, we see it in the way a motor skill is executed. Performers whom we consider to be skilled, such as professional tennis players, exhibit excellent coordination. This contributes to the aesthetic quality of movement.

People who are well coordinated acquire new movements readily. As a result, they adapt quickly to learning new sports and activities. Well-coordinated players are less prone to accidents and injury when involved in physical activity.

FIGURE 5.20 Good coordination helps us to learn new motor skills quickly.

Application

Determining coordination using the flip-stick test

Equipment

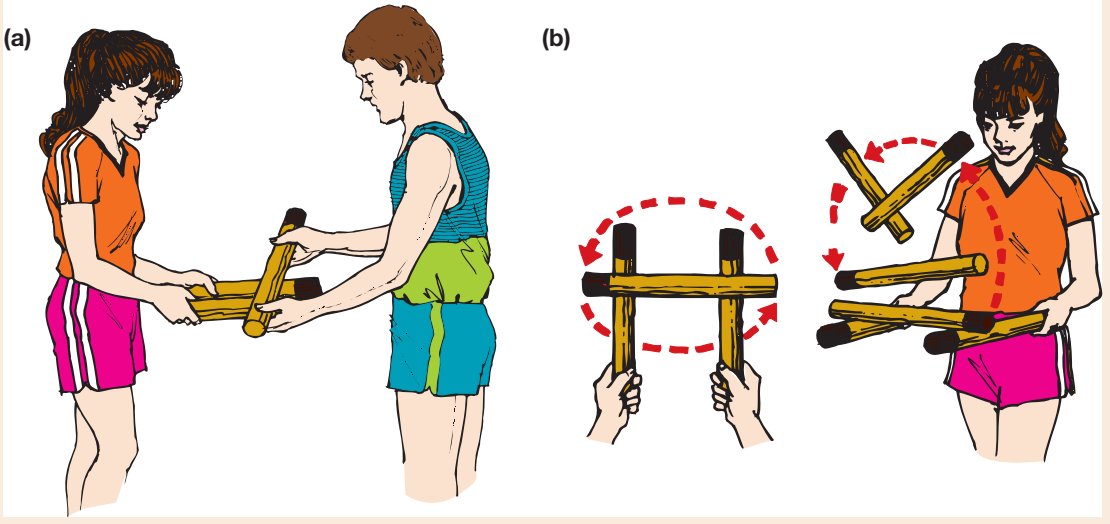
Sticks (three per person per test), approximately 60 centimetres long, two centimetres in diameter and painted at one end

Procedure

The half-flip stick test

1. Work in pairs.
2. The first subject holds a stick in each hand at waist level so that the sticks are horizontal.
3. The second person places the third stick across the two hand-held sticks (figure 5.21(a)).
4. The first subject attempts to flip the stick so that it turns one half of a rotation and lands again balanced on the two hand-held sticks (figure 5.21(b)).

FIGURE 5.21 **(a)** Setting up the half-flip stick test; **(b)** flipping the sticks



5. Allow three practice attempts.
6. In the test, the subject should attempt five half-flips. One point is scored for each successful attempt. The flip is unsuccessful if the stick is not flipped through the half rotation or is dropped.
7. Record the results of this test in table 5.15.
8. Repeat the test for the second subject.

TABLE 5.15 Record of flip test

Test 1	half flip	No. of successes from five attempts × one point: _____ × 1 = _____
Test 2	full flip	No. of successes from five attempts × two points: _____ × 2 = _____

The full-flip stick test

1. Repeat steps one, two and three of the half-flip stick test.
2. In this second test, a full flip is attempted. The stick must go through a full rotation and land balanced across the other two sticks (see figure 5.22).
3. Allow three practice attempts. Attempt five full flips and award two points for each successful attempt. Record your results.
4. Repeat the test for the second subject.
5. Tally your results for the two tests and find your coordination rating, using table 5.16.

FIGURE 5.22 Full-flip stick test

TABLE 5.16 Stick test rating

Classification	Boys	Girls
Excellent	14–15 points	13–15 points
Very good	11–13 points	10–12 points
Fair	5–10 points	4–9 points
Poor	3–4 points	2–3 points
Very poor	0–2 points	0–1 point

Inquiry

Evaluating coordination

1. Why do you think the stick test may or may not be a good test of coordination?
2. What other fitness components (for example, speed) may have contributed to your score?
3. In what way did you benefit (or not benefit) from the pre-test practice?
4. What is the relationship between practice and improved coordination?
5. List five sports or activities where coordination is important.
6. In what aspects of daily living is coordination important?

5.2.5 Balance

Balance is our ability to maintain equilibrium. It depends on our ability to blend what we see and feel with our balance mechanisms, which are located in the inner ear.

There are two types of balance: *static* and *dynamic*. Static balance means maintaining equilibrium while the body is stationary. Dynamic balance means maintaining equilibrium while the body is moving.

We use balancing skills virtually every moment of our lives. For instance, we are balancing while walking and running. However, in some situations, a higher degree of balance is required for the proper execution of the skill. The gymnast performing a handstand, the ballerina on her toes and the skier all need exceptional balance to execute their sporting skills.

FIGURE 5.23 Balance is the ability to maintain equilibrium while standing or moving.

Balance can be improved by practice. As a person learns to control their centre of gravity both when moving (as in running) and with a narrow base of support (as in a pirouette or handstand), balance improves. When the centre of gravity falls outside the base of support with stationary activities, balance is lost.

Application

Static balance

Equipment

Stopwatch, recording sheet

Procedure

1. Divide into pairs, one to perform the test and the other to time, judge and record the attempt.
2. The first subject removes his/her shoes and stands erect on a flat surface with hands on head.
3. One foot is then lifted and placed behind the calf of the other leg. At this point, the stopwatch starts.
4. The stopwatch is stopped when one or more of the events below occur:
   - the time on one leg exceeds 20 seconds
   - the foot comes away from the calf of the other leg
   - the hands come away from the head
   - the supporting foot changes position on the floor
   - the subject jumps.
5. Allow one minute's practice. Then record the best of three attempts on the right leg followed by the best of three attempts on the left leg. Record the total time.
6. Repeat the test for the second subject.
7. Go to the **Static balance** weblink in the Resources tab for information on static balance ratings.

Inquiry

Evaluating balance

1. What is the difference between static and dynamic balance?
2. Were you satisfied with your ratings in the two balance applications?
3. What problems did you have in trying to maintain balance in each of the tests?
4. Describe an activity in your daily life where balance is essential.
5. List three skills from a sport or activity that you participate in or have participated in that require a degree of balance.

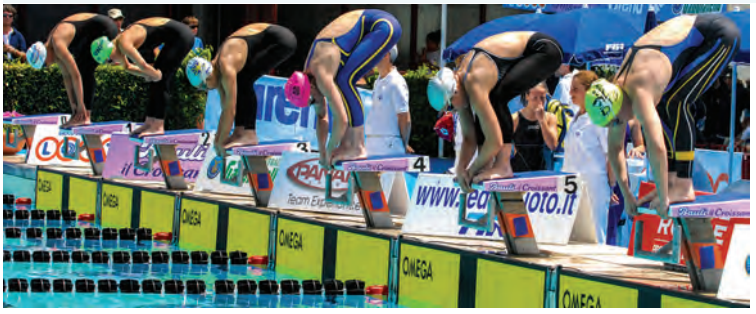
on Resources

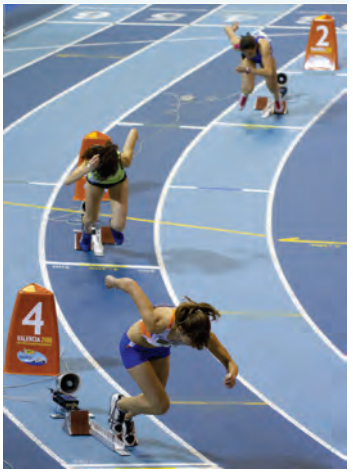
Weblink: Static balance

5.2.6 Reaction time

Reaction time is the time taken to respond to a stimulus. It is very important in sports such as sprinting, shooting and swimming. The stimulus could be a sound such as a starter's gun, a movement, or a target fired into the air. In each case, there is a period of time between the mind realising the presence of the stimulus and the body making the appropriate response.

FIGURE 5.24 Reaction time is the time taken to respond to a stimulus.





The time taken between stimulus and response is called reaction time. It will vary from one person to another. Reaction time can be improved with practice and concentration. The average reaction time in human beings is 170 milliseconds. Successful athletes in sprint events will probably have faster reaction times due to practice.

Interestingly, Usain Bolt, the fastest human being ever recorded, has a longer reaction time to the starter's gun than many of his competitors. In the Rio Olympic 100m sprint final, his reaction time was 0.115 of a second, which was the second slowest reaction time for competitors in that race. He eventually won the race in 9.81 seconds. This suggests that if he could reduce his reaction time, he may be able to run even faster than his current world record speeds.

Application

Determining reaction time — vision and hearing

TEST ONE

Equipment

One 1-metre ruler, desk and chair, recording sheets

Procedure

1. Divide into pairs. Nominate one person as the subject and the other to conduct the experiment and record the result.
2. The subject sits at the desk and places his or her preferred forearm across the desk so that the hand extends beyond the edge of the desk. Fingers and thumb point away and have a gap between them, approximately two centimetres wide.

3. The recorder stands beside the subject's hands and suspends the ruler just beyond the far edge of the desk. The bottom edge of the ruler should be level with the thumb and index finger of the subject.
4. After the recorder says 'ready', the ruler is dropped.
5. The subject should try to catch the ruler. The score is read in centimetres and is the point at which the thumb and index finger grasp the ruler.
6. Allow three trials prior to testing. Then record three attempts and use the average value for assessment.
7. Repeat the test for the second subject.
8. Use table 5.17 to determine your reaction time rating.

TABLE 5.17 Reaction time rating

Classification	Ruler reading (cm)
Excellent	<7.5
Very good	7.5–15.9
Satisfactory	15.9–20.4
Fair	20.4–28.0
Poor	>28

TEST TWO

Equipment

As for test one

Procedure

As for test one. However, this time the subject's eyes are closed and the test is performed once for each hand. The recorder should say 'ready' and then 'go' within a period of 10 seconds.

TEST THREE

Equipment

As for test one

Procedure

As for test one. However, this time the subject's finger and thumb are placed just against the side of the ruler with absolutely no pressure on the ruler itself. The recorder drops the ruler as in test one, and the subject responds when the movement is felt.

TEST FOUR

Equipment

As for test one, with the addition of an extra 1-metre ruler

Procedure

As for test one. However, this time the subject's eyes are closed, both arms are extended and he/she responds to the words 'right' or 'left', describing which ruler is to be dropped. The subject has to interpret these data and respond by reacting with the correct hand.

Inquiry

Evaluating reaction time

1. What is reaction time? How did your reaction time vary from one test to another?
2. List three sporting events where reaction time is important.
3. Describe three situations in your daily life where reaction time is important.
4. How can you improve your reaction time?
5. Why is reaction time important?

6. Good reaction time can play a significant part in avoiding car accidents. What may be the effect of the following conditions on reaction time:
   - a small amount of alcohol (say 0.04 per cent)?
   - a large amount of alcohol (say 0.10 per cent)?
   - a lack of sleep?
   - influenza?
   - caffeine?
7. Discuss the apparent fine line between anticipation and reaction time. In athletics, for example, any reaction from the blocks faster than 0.1 seconds is regarded as a false start.

Inquiry

Fitness test comparisons

Use the **Fitness tests** weblink in the Resources tab to find more information about fitness tests.

Scroll to *Tests for fitness components*. Open the link to each of the recognised tests and input your own results in the assessment area. Was your assessment much the same as those you calculated yourself? If there was considerable variation, explain why this might occur.

Resources

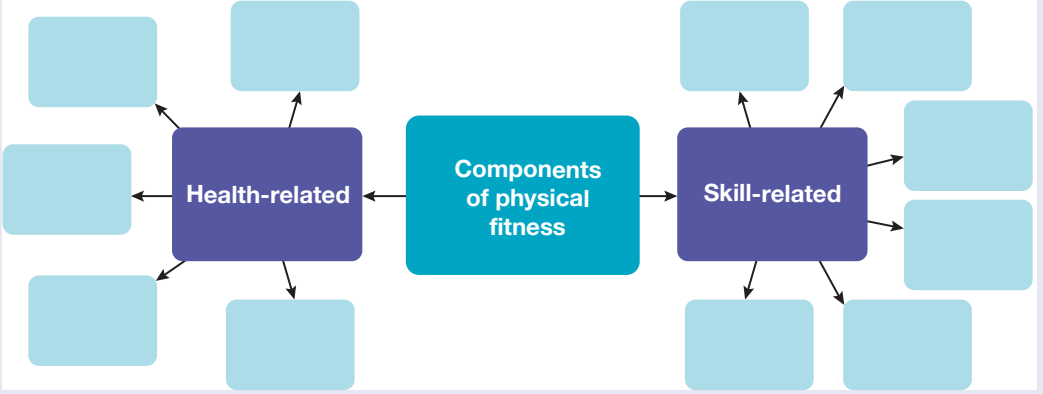
Weblink: Fitness tests

Inquiry

Fitness components

1. Summarise what you have learned about the components of physical fitness by copying and completing a web diagram similar to the one in figure 5.25.
2. For each component of physical fitness, give an example illustrating how it applies to a particular physical activity or sport.

FIGURE 5.25 Web diagram for the components of physical fitness



Application

Compiling my physical fitness profile

Equipment

Results and classification of each physical fitness component tested in the applications on pages xxx-xxx, recording sheet (figure 5.26; a downloadable Word version of the **Recording sheet** is provided as a digital document in the Resources tab).

FIGURE 5.26 Recording sheet

Physical fitness profile

Name ..... Chosen sport .....

	Very low/ very poor	Low/poor	Medium/average	High/very good	Very high/excellent
HEALTH-RELATED FITNESS					
Cardiorespiratory endurance					
Bicycle ergometry					
Multistage fitness					
Muscular strength					
Hand dynamometer					
Muscular endurance					
Sit-up test					
Flexibility					
Sit and reach					
Body composition					
Body fat percentage					
SKILL-RELATED FITNESS					
Power					
Vertical jump test					
Speed					
Sprint test					
Agility					
Agility test					
Coordination					
Stick test					
Balance					
Static balance					
Dynamic balance					
Reaction time					
Reaction time test					

Procedure

1. In red pen, place a circle in the appropriate column on the recording sheet that best indicates your rating for each of the physical fitness tests. Join the circles, thus plotting a graph.
2. Using another coloured pen, assess your chosen sport or activity and graph the fitness requirements for it from the information you have learned in this topic.
3. Compare the two graphs and answer the questions in the following inquiry.

on Resources

Digital doc: Recording sheet (doc-26431)

Inquiry

My physical fitness profile

1. (a) Which fitness components fall below the requirements of your chosen sport or activity?
   (b) Which fitness components for which you tested were better than the basic fitness requirements for your chosen sport or activity?
2. Analyse the differences (if any) between the two graphs. What do you think this profile is attempting to show?
3. Design a program to:
   (a) maintain the fitness components that meet the requirements of your sport or activity
   (b) improve those areas that fell below the requirements of your chosen sport or activity.

Inquiry

Fitness as a predictor of performance

Use the following table to assist you in examining the question: 'To what degree is fitness a predictor of performance?'

The fitness components are listed in the left column and a range of activities are listed in the centre column. Examine each of the listed activities and identify the amount of each fitness component that you believe to be necessary for movement efficiency (smoothness/aesthetically pleasing/coordinated) and good performance.

Your answer in the right column will include your selection of the most important fitness components for each activity and an analysis of why each component has been selected.

Fitness components	Activity	Your analysis
Cardiorespiratory endurance	Surfing	
Muscular strength		
Muscular endurance	Marathon running	
Flexibility		
Body composition	Weight lifting	
Power		
Speed	High jumping	
Agility		
Coordination	Sprinting	
Balance		
Reaction time	Basketball — guard	

Inquiry

The purpose and benefits of testing physical fitness

Use the ranking chart below to explore the benefits of testing physical fitness. Ten benefits are listed below. Rank the benefits by writing them in the column on the left. Use the right column to explain each benefit and justify its ranking.

Benefits

- predict future performance
- place in appropriate training group
- indicate strengths
- indicate weaknesses
- identify special talents
- monitor progress
- measure improvement
- training program evaluation
- provide incentives
- motivate the athlete

Ranking	Explanation of benefit and justification of ranking

5.3 Aerobic and anaerobic training

Training programs aim to develop a range of fitness components together with skill development, moves and strategies. To develop an effective training program it is necessary to identify the correct **energy pathway** or body system that converts nutrients to energy.

- If we perform short sharp movements as in jumping and lifting, the body uses the **anaerobic** pathway (oxygen is absent) to supply energy.
- If movements are sustained and of moderate intensity, the **aerobic** pathway (with oxygen) supplies the bulk of energy needs.

We therefore need to closely examine the exact type of movements that will be performed in the game or activity for which we are training. This allows us to select training activities that develop the correct energy source, be it aerobic, anaerobic or a combination of both.

5.3.1 Aerobic training

The word aerobic means 'with oxygen'. Aerobic exercise refers to exercise that is dependent on oxygen utilisation by the body to enable muscular work. Activity that is of low to moderate intensity and continues for 90 seconds or more is generally termed aerobic because oxygen becomes available to the cells of working muscles for energy generation. Walking, marathon running and the 1500 metres in swimming are examples of activities that require a high degree of aerobic fitness.

To improve aerobic fitness we need to:

- engage in activities that are continuous and of long duration. Cross-country running, sand-hill running, cycling and jogging are examples of activities that develop our aerobic energy system.
- use the **FITT** (frequency, intensity, time, type) principle to provide guidance in developing an aerobic program to suit our needs. The principle provides guidelines for individuals who aim to improve cardiorespiratory fitness and some forms of resistance training.

FIGURE 5.27 Sustained effort at moderate intensity underlies aerobic training.

5.3.2 FITT principle

Frequency

For improvements to occur, individuals must train on at least three occasions per week. This can be increased to five, but the benefit to be gained from sessions in excess of this is minimal.

The aim is for a training session to sufficiently stress body systems, causing a response called an **adaptation**. This is an adjustment (for example, better utilisation of oxygen by muscle cells) made by the body as a result of exposure to progressive increases in the intensity of training. For resistance training, three sessions are sufficient while four is maximal, allowing rest days in between for muscle fibres to regenerate.

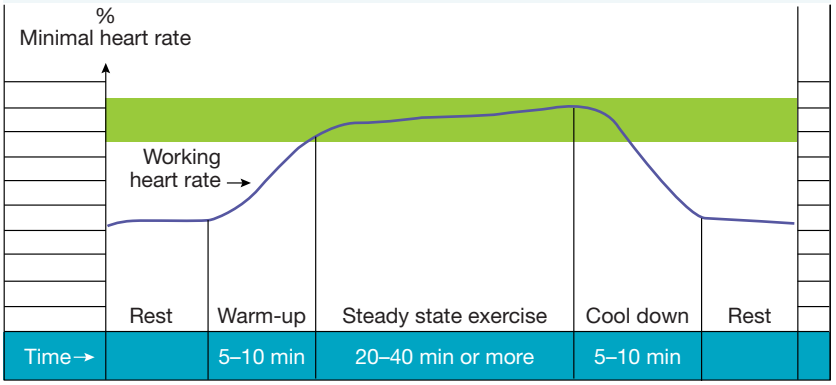
Intensity

Intensity refers to the amount of effort required by an individual to accrue a fitness benefit. The most accurate way of measuring intensity during aerobic exercise is by calculating your target heart rate and using this as a guide. The target heart rate together with the area above and below is called the **target heart rate zone**. When exercising, the level of intensity needs to be sufficient to keep the heart rate within the target heart rate zone for the required period of time. This is illustrated in figure 5.28. Here a person progresses from rest, through a warm-up and into the target heart rate zone where a steady state level of intensity is maintained for an extended period of time.

The level of intensity is established in terms of heart rate, which is calculated in beats There are two important steps that need to be taken to calculate your target heart rate zone.

1. *Determine your maximum heart rate.* To do this, simply subtract your age from 220. Hence, a 20-year-old person would have a maximum heart rate of 200 beats per minute.
2. *Determine the percentage of your maximal heart rate relevant to your fitness.* If your fitness is poor, work at 50 to 70 per cent of your maximum heart rate. If your fitness is good, work at 70 to 85 per cent of your maximum heart rate. If uncertain, work at the lower level and gradually increase the level of intensity.

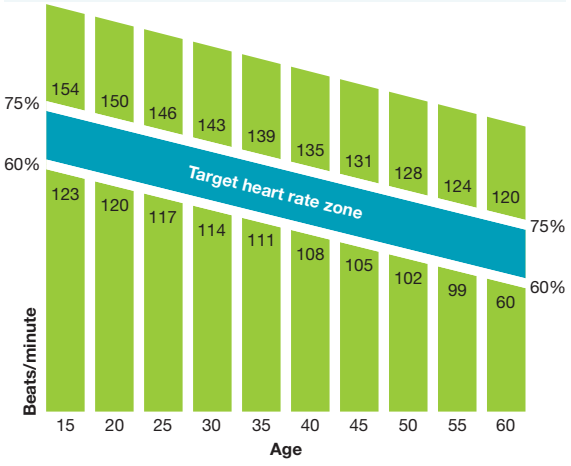
FIGURE 5.28 The intensity of exercise when applying FITT is moderate, sustained and within the target heart rate zone.



As an example, take a 20-year-old person of average fitness who wants to establish their training zone. Their maximal heart rate is 200 bpm, calculated by subtracting their age from 220. Using the figure 200 bpm, they calculate their lower level of intensity which is 140 bpm 200) and an upper level which is 170 bpm (85 per cent of 200). The training zone is the area in between, which is from 140 bpm to 170 bpm. Figure 5.29 shows the target heart rate zone for various age groups, based on 60 to 75 per cent maximal heart rate.

In resistance training programs, intensity is established in a number of ways but usually by varying the load, the number of times you perform an exercise (repetitions), the sets (a number of repetitions in succession) or the rest period.

FIGURE 5.29 The target heart rate zone varies according to age.

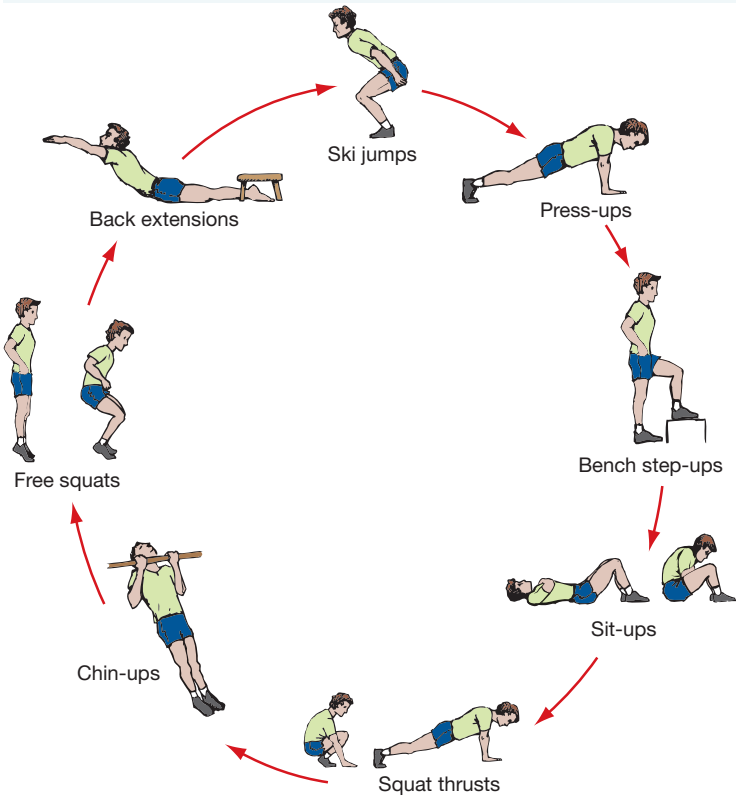


Time

For people in good health, a session in which the heart rate is held in the target heart rate zone should last from 20 to 30 minutes and increase to 40 minutes or more if possible. There is little sense in exercising for periods longer than 60 minutes or to exhaustion as this carries the risk of overtraining and the possible development of overuse injuries (elite athletes excepted). For those beginning a program or those with lower levels of fitness, the starting point should be around 15 minutes. Note that this does not include the warm up and cool down.

In terms of duration, six weeks is the minimal period for the realisation of a training effect; that is, for adaptations to have taken place. In resistance training programs, 30–45 minutes is generally sufficient and will depend on the intensity of exercise.

FIGURE 5.30 Circuits are an excellent way of improving aerobic fitness.



Type

The best type of exercise is continuous exercise that uses the large muscle groups. Running, cycling, swimming and aerobics are examples of exercises that utilise large muscle groups. These draw heavily on our oxygen supply, necessitating an increased breathing rate, heart rate and blood flow to the working muscles. Our aerobic fitness improves as the cardiorespiratory system adapts in response to the demands being made on it.

For resistance training, low resistance with high repetitions is preferable and this can be provided using many activities such as **circuit training** and resistance bands.

Use the **Circuit training** weblink in the Resources tab for more information about this topic.

Application

Aerobic training and the FITT principle

Choose any aerobic activity, particularly a sport or game that you play. Design a training session for this sport or activity based on the FITT principle. Ensure your session addresses the following:

- warm-up
- fitness work (show activities that incorporate FITT. Draw a chart similar to the one in figure 5.28 to show how you anticipate your heart rate to respond to your fitness activities.)
- skills and strategies (small section)
- cool down.

Use the **Aerobics** weblink in the Resources tab for more examples of aerobic activity.

Discuss your session with the class. Then have the class choose one session that would be challenging, interesting and convenient to run. Allow the student who designed this session to conduct it with the class.

Evaluate how well you think the session applied the principles of intensity, time and type.

on Resources

Weblink: Circuit training
Weblink: Aerobics

5.3.3 Anaerobic training

Anaerobic means 'in the absence of oxygen'. In anaerobic activity, the intensity level is much higher and the effort period much shorter than required in aerobic activity.

In general, activity that lasts for two minutes or less and is of high intensity is called anaerobic because muscular work takes place without oxygen being present. When we sprint for example, the muscles respond instantly and quickly exhaust any fuel reserves in the working muscles. Our increased breathing rate delivers more oxygen to this area, but it takes some time before it arrives as there is a limit to the speed of blood flow and therefore oxygen availability. Fortunately these muscles are able to use a restricted amount of stored and other fuel until oxygen becomes available in larger quantities.

FIGURE 5.31 Explosive movements are enhanced through quality anaerobic training programs.

Anaerobic exertion requires specialised training to generate the adaptations necessary for muscular work without oxygen. Training enhances the ability of muscle cells to improve their use of fuel reserves and be more efficient in converting blood sugar to energy during intense exercise.

It should be noted that anaerobic training generally requires an aerobic foundation, particularly in activities like sprinting and swimming. Other more spontaneous activities such as diving, vaulting and archery require a minimal aerobic base.

To improve anaerobic fitness, we need to:

- work hard at performing and enduring specific anaerobic movements such as lifting weights, throwing or jumping
- practise the required movements at or close to competition speed to encourage the correct adaptations to occur
- use activities such as interval training where periods of intense work are interspersed with short rests to train the anaerobic system to supply sufficient fuel
- utilise resistance (weight) training exercises to further develop the muscles required for the movement
- train to improve the body's ability to recharge itself; that is, to decrease recovery time after short periods of intense exercise
- train to improve the body's ability to tolerate higher levels of lactic acid, a substance that builds up in the muscles following intense exercise
- gradually develop the body's ability to utilise and/or dispose of waste that is created by intense exercise.

FIGURE 5.32 Specific activities to improve anaerobic fitness include weight training.

Table 5.18 summarises the basic differences between aerobic and anaerobic training programs.

TABLE 5.18 Differences between aerobic and anaerobic training programs

Feature	Aerobic	Anaerobic
Goals	Improved stamina, endurance, lung capacity, cardiorespiratory endurance	Development of force, power, body mass and speed
Warm-up	General, short, low intensity exercise. Cool down essential	Sustained (20 minutes or more), gradual increase in intensity, must be specific to muscles required in activity
Activities	Targets endurance type activities: marathon running, cycling, 1500 metre swimming, power walking, kayaking, triathlon together with the sustained phases of games	Targets explosive type activities: track 100, 200 and 400 metre, swimming 50 and 100 metre, diving, weight-lifting, discus, javelin, shot-put and the sprint phases in games
Targeted fitness components	Cardiorespiratory endurance, muscular endurance, body composition	Speed, power, agility
Resistance training	High repetition, weights with low resistance, circuits	Low repetition weights, high resistance, fast plyometrics
Physical benefits	Improved cardiovascular system and ability to endure performance	Strength, power and speed gains, increased local muscle recovery ability
Health benefits	High	Low to medium
Liabilities	Possibly decreased muscle mass, speed and power	Possibly decreased cardiorespiratory function unless supported by an aerobic program
Foundation	Does not require anaerobic foundation	Requires an aerobic foundation, but varies according to sport

A quality training program should encompass fitness activities that directly address the requirements of the selected sport or activity. Some sports require a high level of aerobic fitness and a general level of anaerobic fitness while the reverse is true of others. Games such as touch football, soccer and netball are characterised by periods of moderate intensity interspersed with periods of high intensity.

While the amount of aerobic/anaerobic fitness varies according to the game, it is also affected by the position of the player, each individual's effort and their base fitness level. The sprint in rugby, rally in tennis and man-to-man defence in basketball are all highly demanding, causing muscles to use available fuel and then requiring cells to find other sources for energy supply.

The change between aerobic and anaerobic energy supply is gradual rather than abrupt. When engaged in activity, the body switches between systems according to the intensity of exercise, with one system being predominant and the other always working but not being the major supplier of energy. A sprint during a touch football game requires anaerobic energy due to the instant and heavy demands made on the muscles involved in the movement. During this period, the aerobic system is still functioning, but is not the major energy supplier. When we think aerobic or anaerobic training, we therefore need to think in terms of which system will predominate and the time for which it will be engaged.

Inquiry

Aerobic versus anaerobic training

1. Listed below are six sports that may be predominantly aerobic or predominantly anaerobic. Complete the following table by comparing features that make training for each sport different. Think in terms of warm-up, time, distance, resistance work, activity types, duration, intensity, sessions per week and so forth.

Aerobic training	Anaerobic training
Triathlon • • • • •	Sprinting • • • • •
Soccer • • • •	Gymnastics • • • •
1500 metre swim • • • •	Javelin throw • • • •

2. Compare the relative importance of aerobic and anaerobic training for different sports.

5.4 Immediate physiological responses to training

Immediate physiological responses are the changes that take place within specific body organs and tissue during exercise. These changes are particularly observable in capacities directly related to performance, including heart rate, cardiac output, stroke volume, lactate levels and ventilation rate. When we increase our level of activity during training, the body makes specific changes to ensure that adequate oxygen and nutrients are being supplied to the muscles to meet the increase in demand. For example, aerobic exercise can require an increase in blood flow of 20 per cent or higher to the working muscles. The important responses to training are: heart rate, ventilation rate, stroke volume, cardiac output and lactate levels. These are discussed below.

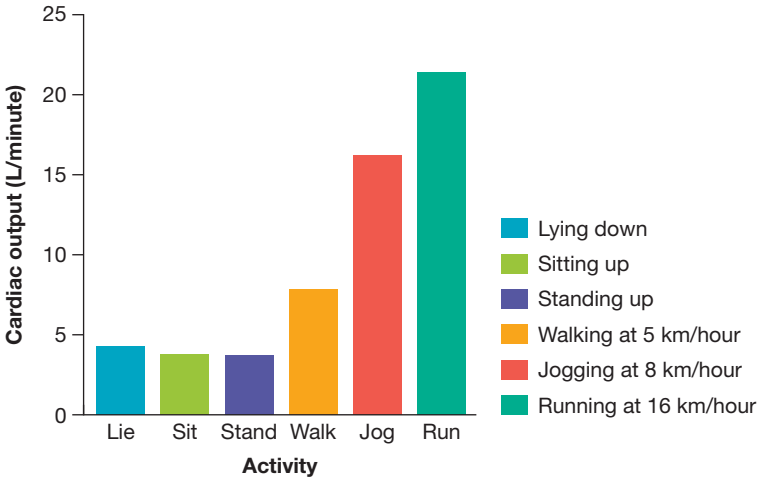
5.4.1 Heart rate

Changes in **heart rate** are the most obvious and easy to measure. Our *resting heart rate* is our heart rate when we are completely at rest. While the average resting heart rate is 72 bpm, readings of 27 to 28 bpm have been recorded in champion endurance athletes. A low resting heart rate is indicative of a very efficient cardiovascular system.

Heart rate increases with exercise. This is our *working heart rate*. Our heart rate increases according to the intensity of our exercise effort. Maximal heart rates are observed during exhaustive exercise.

During short-term (five to 10 minutes), moderate exercise or when moving from an inactive to an active state, our heart rate rises sharply. This is illustrated in figure 5.33.

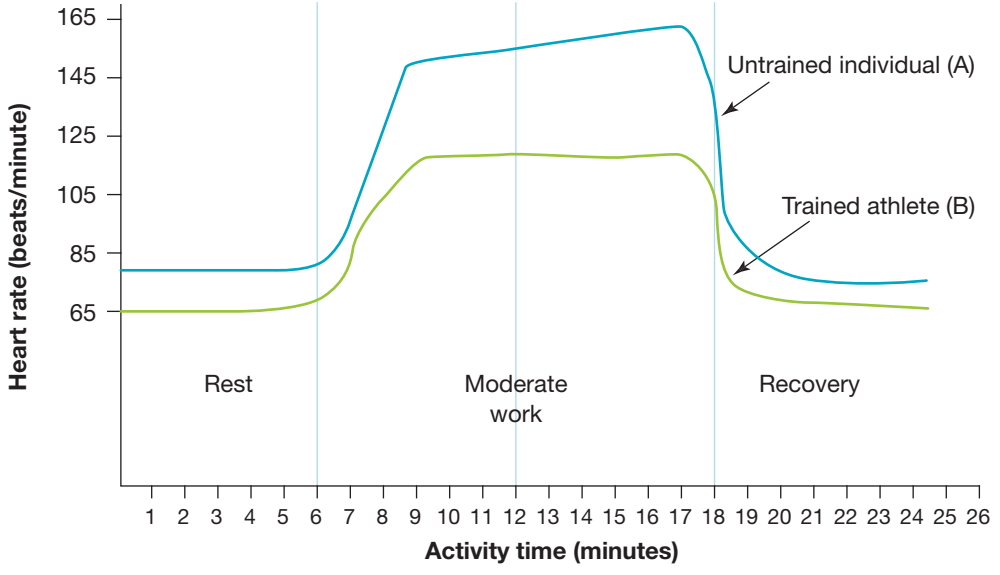
FIGURE 5.33 The effect of varying activities on heart rate



Source: Reprinted with permission from J.H. Wilmore and D.L. Costill, 2004, Physiology of Sport and Exercise 3rd ed. Champaign, IL: Human Kinetics page 230, figure 7.15a.

In a fit person, heart rate levels off during protracted exercise, reaching a **steady state**. Steady state is a period of time during which oxygen uptake remains at a uniform level, such as swimming at a constant speed. For an unfit person, heart rate continues to rise gradually as exercise is prolonged. For both groups, cessation of exercise causes a quick decline in heart rate, followed by a slower decline as it returns to the pre-exercise level. This decline is rapid in a fit person. However, for an unfit person, it may take some time, even hours. Heart rate is therefore a good indicator of the intensity of exercise and may be used as a fundamental measure of a person's cardiovascular fitness.

FIGURE 5.34 Heart rate response before, during and after moderate exercise



Inquiry

Heart rate graph

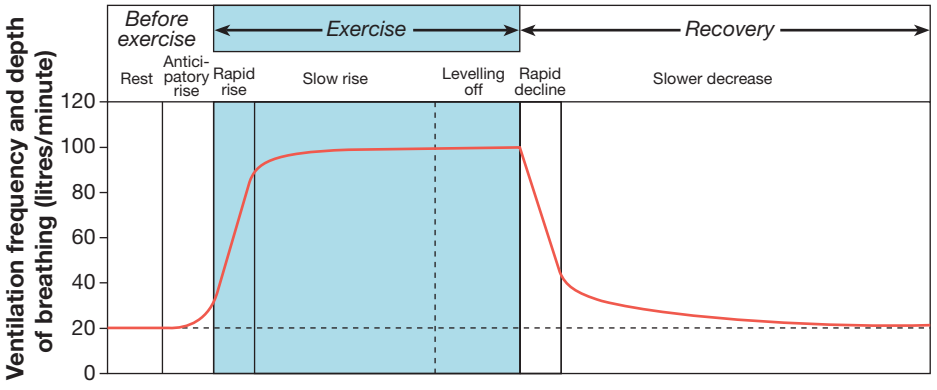
On a graph, plot the heart rate (HR) for a 16-year-old subject with a resting HR of 55 bpm who performs the following activities over one hour: rests for 10 minutes, runs for 30 minutes at 70 per cent maximal heart rate (MHR), followed by three 100-metre sprints at 90 per cent MHR with intervals of five minutes between each. Using the data you have plotted, describe how the heart responds to changes in exercise intensity.

5.4.2 Ventilation rate

When we begin to exercise, the demand for more oxygen by the muscle cells causes a **ventilation** response. Ventilation has two phases — *inspiration*, or breathing air into the lungs, and *expiration*, or the expulsion of air from the lungs. Ventilation rates are measured over a time period, usually one minute. A term commonly used is *minute ventilation* — that is, the amount of air that can be breathed in one minute. For most people this is around six litres.

During rest, the ventilation rate is about 12 breaths per minute, the lungs consuming around 500 millilitres of air per breath. Exercise causes many immediate adjustments in the workings of the respiratory system. The rate and depth of breathing increases moderately, even before exercise begins, as the body's nervous activity heightens in anticipation of exercise. Once exercise starts, the rate and depth of breathing intensifies. This is matched by an increase in oxygen consumption and carbon dioxide production, triggering elevated respiratory activity. At the end of exercise, breathing remains rapid for a short period of time, then gradually abates, finally returning to resting levels. Changes in ventilation rates between rest and steady state exercise are illustrated in figure 5.35.

FIGURE 5.35 Changes in ventilation rate during moderate exercise



Source: D. K. Mathews and E. L. Fox, *The Physiological Basis of Physical Education and Athletics*, W. B. Saunders, Philadelphia, 1976, p. 168. Reprinted with permission, McGraw-Hill Companies.

5.4.3 Stroke volume

When exercise increases, the amount of blood that the heart discharges increases considerably. Much of this is due to an increase in **stroke volume**.

Stroke volume is determined by:

- the ability to fill the ventricles by blood volume
- the ability to empty the ventricles as a result of ventricular contractions.

Stroke volume increases during exercise, with most of the increase being evident as the person progresses from rest to moderate exercise intensity. As intensity increases to a high level, there is less change in stroke volume. The magnitude of the increases is depicted in figure 5.36.

There is a significant difference in stroke volume between fit and unfit people. Whereas the sedentary person will maintain a stroke volume of 60 to 80 mL/beat, the well-trained athlete will reach 160 mL/beat at submaximal workloads. This large increase in the availability of oxygenated blood to the working muscles explains their superior performances. The differences are illustrated in table 5.19.

FIGURE 5.36 Changes in ventilation rate as a result of changes in exercise intensity

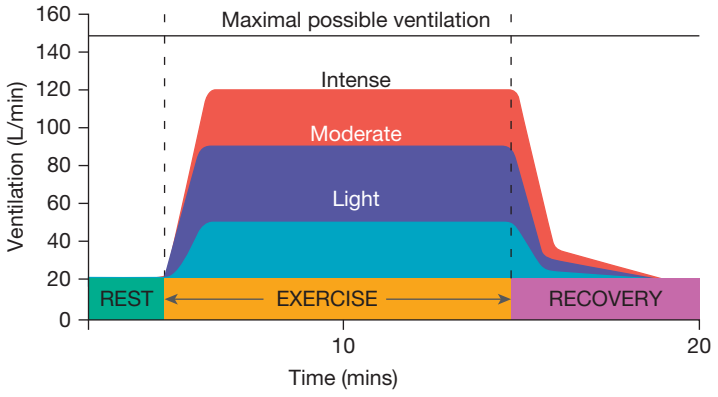
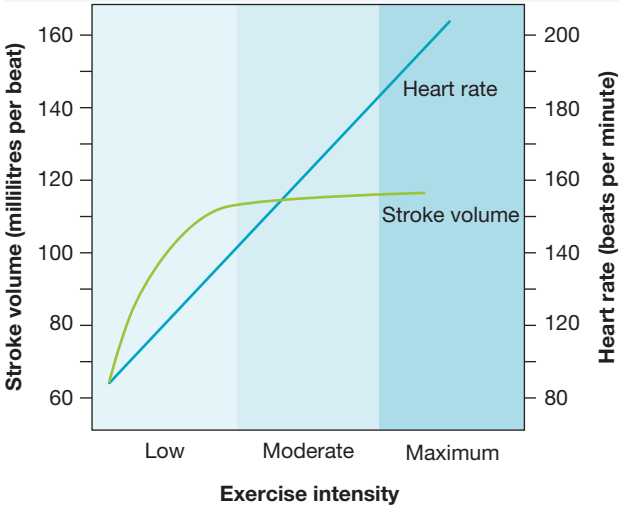


TABLE 5.19 Typical stroke volumes for different states of training

Subjects	SV rest (mL)	Maximum SV (mL)
Untrained	50–70	80–110
Trained	70–90	110–150
Highly trained	90–110	150–>200

It should be noted that the increase in stroke volume occurs as a result of more blood returning to the heart. This promotes a more forceful contraction and a more complete emptying of the left ventricle with each beat. A fit person usually has a greater stroke volume at rest and a significantly greater stroke volume during exercise than an unfit person. The relationship between increases in heart rate (intensity) and stroke volume is illustrated in figure 5.37.

FIGURE 5.37 Heart rate and stroke volume responses to exercise



Inquiry

Heart rate and stroke volume

Examine figure 5.37. Using the information, discuss the effects of an increase in exercise on both heart rate and stroke volume.

5.4.4 Cardiac output

Cardiac output is the amount of blood pumped by the heart per minute. It increases with exercise in the same way as stroke volume. Cardiac output is a product of heart rate and stroke volume. It can be calculated in the following way:

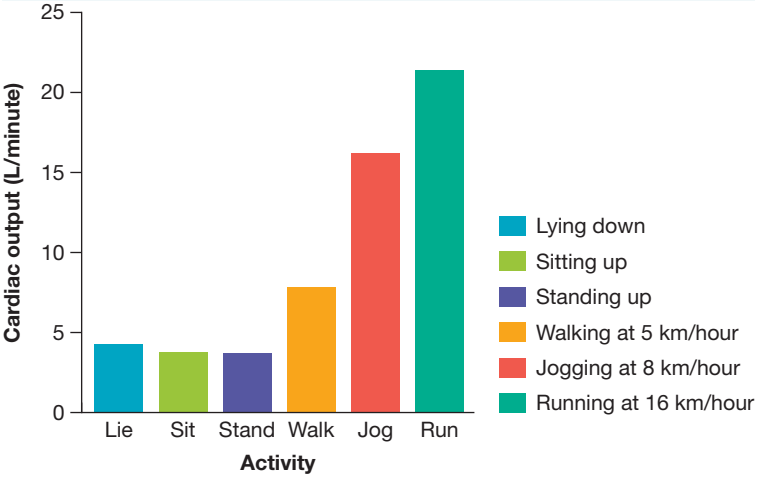
Cardiac output (CO) = heart rate (HR) × stroke volume (SV).

If an athlete's HR is 60 bpm and their SV is 100 mL/beat, their CO is worked out in the following way:

CO = 60 bpm × 100 mL/beat
= 6000 mL/min (6 litres/min).

Cardiac output increases in response to physical demands being made on the body. Figure 5.38 shows how progressing from lying down to running causes significant increases in cardiac output.

FIGURE 5.38 Cardiac output increases as exercise demands increase.



Source: Reprinted with permission from J.H. Wilmore and D.L. Costill, 2004, Physiology of Sport and Exercise 3rd ed. Champaign, IL: Human Kinetics page 230, figure 7.15c.

The working muscles' demand for additional oxygen causes blood flow to be redistributed within the body. While at rest, cardiac output is directed to physically inactive muscles. However, the demands of exercise mean that the body's blood must be redirected to the muscles that are now active. As shown in figure 5.39, muscles can demand around 84 per cent of blood flow during exercise.

Cardiac output for both trained and untrained people is approximately five litres per minute. This is despite trained athletes having lower resting heart rates and therefore not ejecting blood from the heart as frequently as untrained people. While the heart rate of the trained athlete is lower, their stroke volume is substantially higher.

Examine the figures in the table at the top of figure 5.39. While trained and untrained people have similar cardiac output, differences are evident in the lower heart rate and higher stroke volumes of trained athletes.

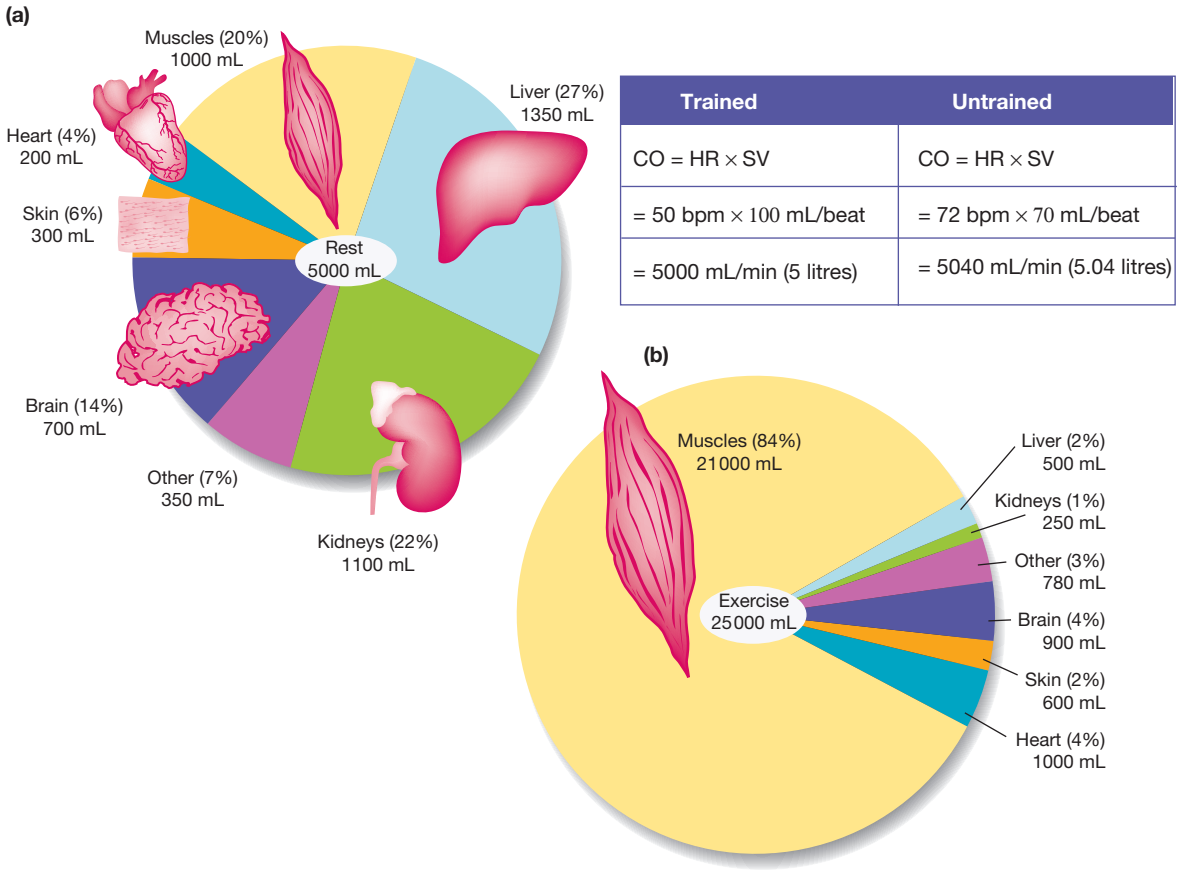
The immediate response to training indicates noteworthy differences between the two groups. While untrained people are able to increase cardiac output to around 20 to 22 litres per minute during exercise, highly trained endurance athletes will have an increase in the vicinity of 35 to 40 litres per minute. In addition, this increase is achieved at a slightly lower maximal heart rate.

Application

Calculating cardiac output

Calculate the cardiac output at maximal exercise for a person with a heart rate of 190 bpm and a stroke volume of 180 mL/beat. Draw a chart to illustrate cardiac output and comment on the lifestyle of the subject. Do they have a sedentary lifestyle or are they a trained athlete?

FIGURE 5.39 As we move from **(a)** rest to **(b)** exercise, cardiac output is redirected to active muscles.



Trained	Untrained
CO = HR × SV	CO = HR × SV
= 50 bpm × 100 mL/beat	= 72 bpm × 70 mL/beat
= 5000 mL/min (5 litres)	= 5040 mL/min (5.04 litres)

Source: W. McArdle, F. Katch and V. Katch, *Exercise Physiology*, Lippincott, Williams and Wilkins, 2006, p. 357. Reproduced by permission.

5.4.5 Lactate levels

Lactate is a chemical formed during the breakdown of carbohydrates in the absence of sufficient oxygen. There is always a small amount of lactate circulating in the blood — about 1–2 millimoles/litre. This lactate is continually being resynthesised by the liver to form glycogen and so is of benefit in providing the body with energy.

Generally, lactate flows freely in the blood and its concentration increases as the workload is increased. With each molecule of lactate formed, one **hydrogen ion** is also formed. It should be noted that it is the hydrogen, and not lactate, that is responsible for increasing the acidity of blood and subsequently making it difficult for muscles to function properly.

Vigorous physical exercise causes increases in levels of lactate. Lactate levels relate to the pH value of blood, which is affected by physical activity. Neutral pH is 7.0. A higher reading indicates elevated alkalinity, while readings lower than 7.0 reveal gradations of acidity. At rest, blood has a pH value of about 7.4, which means that it is slightly alkaline. However, as exercise intensity increases, the pH level drops and acidification of muscles increases.

High levels of lactate are produced when we exercise and there is insufficient oxygen available to the muscle cells. It accumulates rapidly when we exercise above the **lactate inflection point (LIP)**, which occurs at about 80–90 per cent MHR for trained athletes. The point is much lower for untrained athletes.

Table 5.20 illustrates that lactic acid concentrations increase as exercise intensity is raised. High levels of lactate make it increasingly difficult for muscle fibres to contract. Once the LIP is reached, further exercise results in fatigue and the subsequent inability to maintain the higher work output. If intensity is increased

beyond the LIP, such as by a sprint finish at the end of an endurance event, the onset of fatigue will be even more rapid.

TABLE 5.20 The effect of increasing intensity on blood lactate levels

Lactic acid concentrate (mmol)	Training for:	Heart rate	Percentage of maximum intensity
20.0	Maximum anaerobic power	200	
		200	
12.0		200	85–90%
8.0	Lactate inflection point	190–200	80–90%
		180	
		170	
		160	(60)–70–85%
4.0		150	
		140	
2.0	Aerobic threshold	130	60%
		120	50%
	Lactate threshold	110	
		100	
1.1	Resting state	>80	

Source: Adapted from T. Bompa, *Theory and Methodology of Training*, 3rd ed, Kendall/Hunt Publishing, Iowa, 1994, p. 305.

Although present, lactate does not cause fatigue prior to the LIP being reached. Lactate is a source of energy at low to moderate levels of intensity. However, once the LIP is reached, lactate contributes to fatigue because it cannot be removed from the bloodstream faster than it enters. The high concentration of lactate together with other factors, including high levels of hydrogen ions and the physical demands of the work being performed, contribute to fatigue and the subsequent inability to continue to work in the same manner as before the LIP was reached.

Application

Changing patterns of respiration and heart rate

1. Use the **Home Step** weblink in the Resources tab to download the procedures for the Home Step Test.
2. Divide into groups of three. Choose one student to perform the test, the second to monitor and record heart rate and the third to monitor and record ventilation rate. The heart rate and ventilation rates for each student will be required before, at the conclusion of and then three minutes following the test. This should be recorded in table 5.21.
3. Students should perform the test on a rotational basis, swapping roles between performer and recorder. At the required times, measure heart rate and ventilation rate for 15 seconds and multiply by four to establish rates per minute.
4. Use the website to establish your fitness level and then use the additional information in the table to discuss questions in the following inquiry.

TABLE 5.21 Heart and ventilation rates

	Before test	End of test	Three minutes following test
Student 1			
Heart rate (bpm)			
Ventilation rate			
Student 2			
Heart rate (bpm)			
Ventilation rate			
Student 3			
Heart rate (bpm)			
Ventilation rate			

Inquiry

Changing patterns of respiration and heart rate

1. Use the information in table 5.21 to draw a graph that illustrates your pattern for ventilation and heart rate.
2. Discuss reasons for the changing patterns of respiration and heart rate during this submaximal test.
3. Discuss the relationship between your fitness level as established by the test and how quickly your heart rate and ventilation rate returned to normal.

on Resources

Weblink: Home Step

5.5 Topic review

5.5.1 Summary

- Physical fitness implies the ability to work or play without experiencing undue fatigue while having enough energy in reserve for basic movements, emergencies and activities of interest.
- Health-related components of physical fitness include cardiorespiratory endurance, muscular strength, muscular endurance, flexibility and body composition. An improvement in the health-related components will assist personal health and lifestyle, including lowering the risk of hypokinetic disease (diseases related to lifestyle).
- Cardiorespiratory endurance refers to the ability of the working muscles to take up and use the oxygen that has been breathed in during exercise and transferred to the cells. It is important in endurance events such as cycling and marathon running.
- Muscular strength is the ability to exert force against a resistance in a single maximal effort. It is important in sports such as weight-lifting and wrestling.

- Muscular endurance is the ability of the muscles to endure physical work for extended periods of time without undue fatigue. Running for long periods of time requires considerable muscular endurance because the same muscle groups are contracting repeatedly.
- Flexibility is the range of motion about a joint or the ease of joint movement. It is important for injury prevention and in slowing muscle shrinkage as a result of the ageing process.
- Body composition refers to the percentage of fat as opposed to lean body mass in a human being. A certain amount of fat is essential to protect and insulate vital organs. Excess fat is called storage fat and is useful as a source of fuel in endurance events. High levels of excess fat hinder athletic performance in most events.
- Skill-related components of physical fitness include power, speed, agility, coordination, balance and reaction time.
- Muscular power is the ability to combine strength and speed in an explosive action. It is important in events such as running, throwing and jumping.
- Speed is the ability to perform body movements quickly. It is very important in sprint events and most team games.
- Agility is the ability to move the body from one position and direction to another with speed and precision. It is important in most team games.
- Coordination requires good interaction between the brain and the muscles, resulting in the smooth and efficient coordination of body parts. It is important in most team games.
- Balance is the ability to maintain equilibrium while either stationary or moving. There are two types of balance: static and dynamic. Static balance implies maintaining equilibrium while the body is stationary. Dynamic balance means maintaining equilibrium while the body is moving. Balance is important in most team games, but it is especially important in activities such as diving and gymnastics.
- Reaction time is the time taken to respond to a stimulus. Its importance is most evident in starts in athletics and swimming.
- The components of fitness can be measured using simple tests. By compiling the results of testing for each of the components, we gain an overall impression of our level of fitness. We call this a fitness profile.
- The two basic types of training are aerobic (with oxygen) and anaerobic (without oxygen).
- Aerobic training involves exercise that is sustainable and of low to moderate intensity. The FITT principle, (frequency, intensity, time, type) is used to adapt aerobic training programs to individual needs. Marathons, 400 metre swimming and triathlons are examples of activities that draw their energy from aerobic metabolism.
- Anaerobic training involves activities where the level of intensity is high but is maintained for short periods of time; for example, sprinting and high jumping.
- Most team games require energy utilising both the aerobic and anaerobic pathways. It is therefore important to establish the main sources of energy as a prerequisite in the development of training programs.
- Training causes an immediate physiological response seen in changes to heart rate, ventilation rate, stroke volume, cardiac output and lactate levels.
- Heart rate is the number of times the heart beats per minute. When we begin to exercise our heart rate increases and reaches a steady state during sustained moderate activity such as jogging.
- Breathing or ventilation rate increases during activity to deliver more oxygen to muscles.
- Stroke volume refers to the amount of blood ejected by the heart during a contraction. It increases significantly in response to exercise.
- Cardiac output, the total amount of blood pumped by the heart per minute, increases with exercise. When muscles work, blood is drawn from many parts of the body and redistributed to muscles.
- Lactate or lactic acid increases in the blood during exercise. If exercise is vigorous, lactate increases rapidly and inhibits performance if levels rise too high.

5.5.2 Questions

Revision

1. **Discuss** the difference between health-related and skill-related components of fitness. (P8) (4 marks)
2. Choose a test that measures cardiorespiratory endurance. **Describe** how you would conduct it on a group of soccer players at a preseason training session and suggest what the results mean. (P8) (5 marks)
3. **Compare** two tests of aerobic power in terms of ease of administration to a large group. (P8) (4 marks)
4. **Discuss** the difference between strength and power. **Describe** a simple test to measure each component. (P11) (4 marks)
5. **Discuss** the importance of body composition to both personal health and athletic performance. (P16) (4 marks)
6. You are the coach of a cricket team. Select the three most important skill-related components and **describe** how you would test these at training. (P11) (3 marks)
7. What is muscular power? **Identify** four sports or activities where muscular power would be of considerable benefit. (P7) (3 marks)
8. What is agility? What other components of physical fitness, if improved, would result in an improvement in agility? (P8) (3 marks)
9. What is reaction time? **Outline** a simple test to measure reaction time and suggest measures as to how this component could be improved. (P8) (3 marks)
10. **Discuss** the difference between static and dynamic balance. **Propose** three activities where static balance is more important than dynamic balance. (P8) (3 marks)
11. **Explain** the difference between aerobic and anaerobic training. (P7) (2 marks)
12. **Discuss** how the FITT principle is used to improve aerobic performance. (P10) (4 marks)
13. Work out the target heart rate zones for two people of average fitness aged 18 and 40. **Explain** why they are different. (P11) (4 marks)
14. **Explain** how anaerobic training can be enhanced. (P10) (4 marks)
15. Choose a team game such as AFL, netball or touch football. **Explain** how you would establish a training program that would ensure appropriate fitness for the sport. Include examples of activities that could be used to enhance fitness for that sport. (P8) (6 marks)
16. **Explain** how the heart responds to an increase in exercise. (P7) (3 marks)
17. **Explain** why your heart rate is different when sitting, jogging and sprinting. (P7) (3 marks).
18. **Explain** why ventilation rate rises with increases in exercise intensity. (P7) (3 marks)
19. **Outline** the difference between stroke volume and cardiac output. Why might their levels be different in trained and untrained athletes? (P7) (3 marks)
20. **Describe** the effect of increased lactate levels on performance. (P7) (4 marks)
21. **Explain** how anaerobic training improves tolerance to lactic acid. (P7) (3 marks)

Extension

Choose a sport or activity. List the six most important fitness components required. **Describe** where and how these components are used. Finally, **propose** or skills to develop each of these components. (P8) (10 marks)

Note: For an explanation of the key words used in the revision questions above, see Appendix 2, page xxx.

on Resources

- **Interactivity:** Revision quiz: auto-marked version (int-7239)
- **Interactivity:** Missing word interactive quiz (int-7240)
- **Digital doc:** Revision quiz (doc-26262)

5.5.3 Key terms

An **adaptation** refers to an adjustment made by the body as a result of exposure to progressive increases in the intensity of training. *p. 221*

aerobic means 'with oxygen'. *p. 220*

agility is the ability to move the body from one position and direction to another with speed and precision. *p. 210*

anaerobic means 'in the absence of oxygen'. *p. 220*

balance is the ability to maintain equilibrium while either stationary or moving. *p. 214*

blood glucose is blood sugar. It represents the immediate supply of fuel for the working muscles. *p. 204*

body composition refers to the percentage of fat as opposed to lean body mass in a human being. *p. 204*

cardiac output is the amount of blood pumped by the heart per minute. *p. 230*

cardiorespiratory endurance refers to the ability of the working muscles to take up and use the oxygen that has been breathed in during exercise and transferred to muscle cells. *p. 194*

circuit training requires participants to perform set exercises at a number of stations, working through the course in the shortest period of time. *p. 223*

coordination is the ability to harmonise the messages from the senses (such as sight, feel and sound) with parts of the body to produce movements that are smooth, skilful and well controlled. *p. 212*

An **energy pathway** is a system that converts nutrients to energy for exercise. *p. 220*

FITT is an acronym for frequency, intensity, time and type. It embodies a fitness principle that ensures a program has the quantity and quality of movement necessary to produce the desired physical improvement. *p. 221*

flexibility is the range of motion about a joint or the ease of joint movement. *p. 202*

heart rate is the number of times the heart beats per minute (bpm). *p. 227*

hydrogen ion (or H+) is a hydrogen atom that has lost its electron, the concentration of which determines the pH of a solution. *p. 231*

hypokinetic disease is a term given to modern lifestyle diseases associated with inactivity. *p. 194*

intensity refers to the amount of effort required by an individual to accrue a fitness benefit. *p. 221*

isometric exercises are muscular contractions where tension is created in the muscle, but its length remains the same; for example, trying to lift a weight that is too heavy to be moved. *p. 202*

lactate is a salt formed from lactic acid that accumulates during intense anaerobic activity. *p. 231*

The **lactate inflection point (LIP)** is a point beyond which a given power output cannot be maintained. It is characterised by lactic acid accumulation and decreased time to fatigue. *p.231*

muscular endurance is the ability of the muscles to endure physical work for extended periods of time without undue fatigue. *p. 201*

muscular hypertrophy relates to an increase in the size of the muscle resulting from an increase in the cross-sectional area of the individual muscle fibres. *p. 199*

muscular power is the ability to combine strength and speed in an explosive action. *p. 207*

muscular strength is the ability to exert force against a resistance in a single maximal effort. *p. 199*

reaction time is the time taken to respond to a stimulus. *p. 215*

speed is the ability to perform body movements quickly. *p. 209*

steady state is a period of time during which oxygen uptake remains at a uniform level, such as swimming at a constant speed. *p. 227*

stroke volume is the amount of blood ejected by the left ventricle of the heart during a contraction. It is measured in mL/beat. *p. 228*

target heart rate zone is an area surrounding the target heart rate and is calculated using percentages of maximal heart rate. *p. 221*

ventilation refers to our depth and rate of breathing and is expressed in breaths per minute. *p. 228*

TOPIC 6
The biomechanics of human movement

OVERVIEW

6.1 Introduction to biomechanics
6.2 Motion
6.3 Balance and stability
6.4 Fluid mechanics
6.5 Force
6.6 Topic review

OUTCOMES

In this topic students will:

- explain how body structures influence the way the body moves (P7)
- describe biomechanical factors that influence the efficiency of the body in motion. (P9)

6.1 Introduction to biomechanics

Biomechanics is a science concerned with forces and the effect of these forces on and within the human body. The word biomechanics originates from two words. 'Bio' means life. Mechanics is a branch of science that explores the effects of forces applied to solids, liquids and gases.

Biomechanics is very important to understanding techniques used in sport. It is of value to both coach and player because it is concerned with the efficiency of movement. A knowledge of biomechanics helps us to:

- choose the best technique to achieve our best performance with consideration to our body shape. For instance, an understanding of the biomechanical principles that affect athletic movements, such as the high jump, discus throw, golf swing and netball shot, improve the efficiency with which these movements are made. This improves how well we perform the skill.
- reduce the risk of injury by improving the way we move
- design and use equipment that contributes to improved performance.

Application

Newton's laws

Much of the content of this topic will directly or indirectly relate to Newton's three laws of motion. Although we are generally focused on the application of biomechanical principles to the forms of movement experienced in sport and activity, we need some understanding of these laws. Go to the **Newton's laws** weblink in the Resources tab to watch a video about them.

Inquiry

Newton's laws

Using what you learned from the **Newton's laws** weblink in the Resources tab or through other online research, write down Newton's three laws of motion. List any skill, such as kicking a soccer ball, where you think these laws might apply.

on Resources

Weblink: Newton's laws

6.2 Motion

In biomechanics, the term **motion** is used to describe movement and path of a body. Some bodies may be animate (living), such as golfers and footballers. Other bodies may be inanimate (nonliving), such as basketballs and footballs.

We see motion in all forms of physical activity. Part of a person's body (for example, the arm) may be moved from one position to another. The entire body may be moved from one place to another as in cycling, running and playing basketball.

There are a number of types of motion: *linear, angular* and *general* motion. How motion is classified depends on the path followed by the moving object. We will focus on linear motion in a range of sporting activities and apply the principle to enhancing performance.

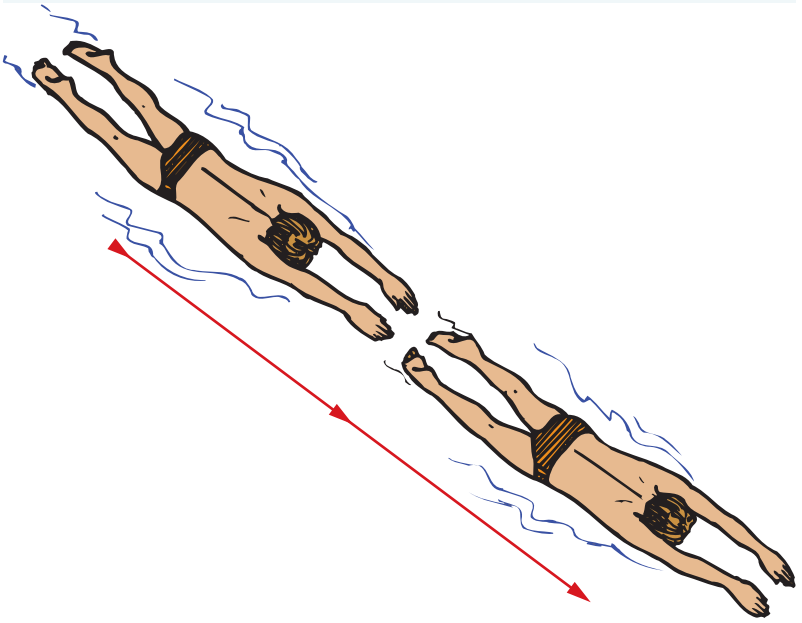
6.2.1 Linear motion

Linear motion occurs when a body and all parts connected to it travel the same distance in the same direction and at the same speed. An example of linear motion is a person who is standing still on a moving escalator or in a lift. The body (the person) moves from one place to another with all parts moving in the same direction and at the same time.

FIGURE 6.1 This skier is experiencing linear motion.

The easiest way to determine if a body is experiencing linear motion is to draw a line connecting two parts of the body; for example, the neck and hips. If the line remains in the same position when the body moves from one position to another, the motion is linear. This is shown in figure 6.2.

FIGURE 6.2 When the lines remain parallel and equal, the motion is linear.



Examples of linear motion include swimming and sprint events where competitors race following a straight line from start to finish. Improving performance in activities that encompass linear motion usually focuses on modifying or eliminating technique faults that contribute to any non-linear movements. Excessive up and down, rotational and lateral movements are examples of faults that erode performance directed towards achieving the shortest, most efficient pathway. Sprinters who rotate their arms across their bodies and swimmers who use an irregular arm pull that results in a zigzag movement pattern along the pool surface are examples of poor application of linear motion. Go to the **Basic biomechanics** weblink in the Resources tab (watch the first three minutes only) to review types of motion.

Application

Linear motion and swimming performance

The 50-metre sprint in swimming is an example of the application of predominately linear motion in a sporting event. Poor swimming technique can result in wasted energy and poor performance. The aim in sprinting is to direct all body action directly up the pool by eliminating excessive rotational and lateral movements.

Use the **Freestyle** weblink in the Resources tab to explore further.

Read the technique points and watch each of the short videos.

1. List 10 points that you consider to be fundamental to better freestyle technique.
2. On an excursion to a swimming centre, take turns with a partner in swimming a distance of about 20 metres. Focus on trying to swim efficiently, being mindful of the points you have listed on better technique. The observer should provide feedback from your list about your technique following each swim.

Inquiry

Application of linear motion to swimming

Discuss how the application of linear motion principles can enhance swimming performance.

on Resources

Weblink: Basic biomechanics

Weblink: Freestyle

6.2.2 Velocity

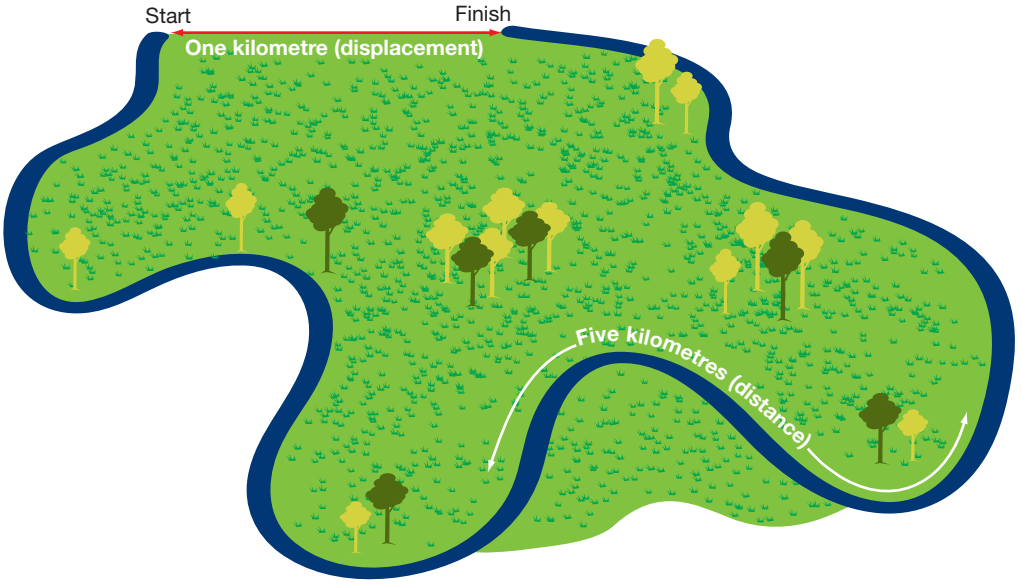
Velocity, like speed, refers to the rate of positional change of an object and is calculated using **displacement** divided by the time taken. Displacement is the movement of a body from one location to another in a particular direction, or an 'as the crow files' measurement. When we run in a straight line, we can calculate in terms of speed. However, when objects are projected or players move from one place to another on a sporting field, the path taken is rarely straight. Because the movement is not only about how fast we move but also about direction, velocity is a better term to use.

To illustrate the difference, think of an athlete in a 100-metre sprint whose average speed was calculated at 30 kilometres per hour. Here the direction from start to finish remains the same — a straight line. However, because the direction of the runner is constantly changing, the same runner on a circular track running at the same speed (30 kilometres per hour) would be measured in terms of velocity.

Similarly, a golf ball hit by a driver will rise to a point and then fall, its flight path resembling an arc. Because its direction is constantly changing (slowly rising and then falling, and possibly moving sideways) we calculate in terms of velocity. This will be fastest just after impact. The golf ball will continue to lose speed until finally it succumbs to air resistance and gravity, eventually falling to the ground. Because it is

travelling in both a vertical direction (say 70 degrees above a level ground surface) and a horizontal direction (say 250 metres), the measurement becomes the result of these two components and is called velocity.

FIGURE 6.3 In this cross-country course, the displacement is equal to one kilometre. However, the distance run is actually far greater because the direction is variable.



6.2.3 Speed

When an object such as a car moves along a road, or a person runs in a race, we often refer to how fast each is moving. This is called **speed**. If the runner covers a 100 metre track in 12 seconds, speed is determined by dividing the 100 metre distance by the time:

$$\frac{100}{12} = 8.3 \text{ metres per second (m/s)}$$

Speed is important in most sports and team games. The player who can move quickly has a distinct advantage in games such as touch football, rugby and soccer because not only is that player difficult to catch, but he/she can use their speed to gather opponents quickly in defence.

Much of our potential for speed is genetic and relates to the type of muscle fibre in our bodies. However, individuals can develop their speed as a result of training and technique improvements, the basis of which is the development of power and efficiency of movement.

FIGURE 6.4 Speed can be developed through application of biomechanical principles.

Application

Improving speed

This application requires students to perform the 30-metre flying speed test.

1. Use the **30-metre flying speed test** weblink in the Resources tab for more information.
2. Record your times for the first 30 metres and the entire 60-metre sprint. Use the inbuilt calculator to predict your 100 metre time.
3. Use the **Momentum Sports** and **Perfect Condition** weblinks in the Resources tab to establish the characteristics of good technique in running.
4. Work in pairs with one person observing while the other performs short sprints for analysis. You could develop a rating scale using the points listed in table 6.1 to show progress in acquiring better technique through feedback from practice.

TABLE 6.1 Rating scale for progress in acquiring better technique through feedback from practice

Technical point	Excellent	Good	Needs improvement	Advice from observer
Toe up				
Heel up				
Knee up				
Reach out				
Claw back				
Core stability				

When, in the opinion of the observer, technique has improved sufficiently, re-run the test and compare times with the previous effort.

1. Why is it called a speed test? If the test was to measure velocity, how might it differ?
2. Comment on the effect that better running technique made to speed improvement over a short distance.
3. Discuss the importance of good technique in other sporting activities such as surfing, downhill skiing and speed skating where speed with stability is crucial to success.

on Resources

- **Weblink:** 30-metre flying speed test
- **Weblink:** Momentum Sports
- **Weblink:** Perfect Condition

6.2.4 Acceleration

The powerful sprinter, like a car, is able to increase speed quickly. This is called **acceleration**.

How do we use acceleration to enhance performance? Firstly we need to realise that acceleration requires substantial force production, mainly by the calf, quadriceps, gluteal and upper body (vigorous arm action) muscles. Programs that focus on developing explosive power in these parts of the body will assist in overcoming inertia (Newton's first law) and getting to full speed in the shortest period of time.

We often think of acceleration in terms of the 100-metre sprint runner — overcoming inertia with force produced by a vigorous leg action combined with a slow rise from crouch to upright. But acceleration is important in many other sports and particularly in team games. Here, players often need to accelerate not only forward but sideways, backwards and diagonally to cover defence or move into a space. Sometimes this is from a static start such as in a jump ball in basketball, penalty shot in soccer or set scrum in rugby. But often, and particularly in team games, acceleration takes place from a position where a player is already in motion — jogging, swerving or moving cross field. For example, when a rugby player carrying the ball while running spots a small gap in the defence and accelerates to avoid being tackled by the defence.

The degree to which we can improve acceleration will vary from one person to the next. Some coaches may work on increasing stride frequency and/or stride length. Shorter strides assist acceleration as the foot is in contact with the ground more frequently, but this reduces stride length. Taller athletes will have a longer stride length and necessarily lower stride frequency. However, the longer stride will be a bigger advantage when top speed is reached.

FIGURE 6.5 A sprinter aims to develop a technique that enables maximum acceleration.

Acceleration improvement is reliant partly on technique but also on improving overall strength and strength-related power. Some individuals may have a genetic advantage here with a higher proportion of white muscle fibres relative to red muscle fibres, because acceleration requires explosive force production. Strength and power can be developed through resistance training programs that include exercises such a calf raises, squats and lunge walks. Plyometric activities are also important but are more relevant to the development of a controlled deceleration, for example, following the release of the javelin or following a lay-up in basketball. In terms of techniques for improving acceleration, emphasis needs to be placed on increasing/strengthening the pushing motion of the foot while keeping the centre of gravity low and forward, all combined with a driving arm action.

Application

Speed, acceleration and performance

Use the **Run faster** weblink in the Resources tab and watch the video *How to run faster — speed training drills to improve speed and form running*. As a class, learn and spend some time practising the drills.

Inquiry

Speed, acceleration and performance

1. How might drills improve acceleration?
2. Discuss the relationship between better technique and improved acceleration.

on Resources

Weblink: Run faster

6.2.5 Momentum

Momentum (biomechanics) is a term commonly used in sport. For instance, we sometimes refer to the way in which momentum carried a player over the line in a game of football.

Momentum is a product of mass and velocity. It is expressed as follows:

$$\text{momentum} = \text{mass} \times \text{velocity} \; (M = mv)$$

The application of the principle of momentum is most significant in impact or collision situations. For instance, a truck travelling at 50 kilometres per hour that collides with an oncoming car going at the same speed would have a devastating effect on the car because the **mass** of the truck is much greater than that of the car. The car would be taken in the direction that the truck was moving.

The same principle can be applied to certain sporting games such as rugby league and rugby union, where collisions in the form of tackles are part of the game. However, collisions between players in sporting events tend to exhibit different characteristics to that of objects due to a range of factors, including:

- *the mass differences of the players* — in most sports, we do not see the huge variations in mass that we find between cars, bicycles and similar objects
- *elasticity* — the soft tissue of the body, which includes muscle, tendons and ligaments, absorbs much of the impact. It acts as a cushion.
- *evasive skills of players*, which often result in the collision not being 'head-on'. In some cases there may be some entanglement just prior to collision, such as a palm-off or fend. This lessens the force of impact.

The momentum described in the previous situation is called **linear momentum** because the object or person is moving in a straight line. However, there are numerous instances in sport where bodies generate momentum but they do not travel in a straight line; for example, a diver performing a somersault with a full twist, a tennis serve, football kick, discus throw and golf swing. In each of these cases, the body, part of it, or an attachment to it such as a golf club or tennis racquet, is rotating. We call this **angular momentum**.

Angular momentum is affected by:

- *angular velocity.* For example, the distance we can hit a golf ball is determined by the speed at which we can move the club head.
- *the mass of the object.* The greater the mass of the object, the more effort we need to make to increase the angular velocity. It is relatively easy to swing a small object such as a whistle on the end of a cord. Imagine the effort that would be needed to swing a shot-put on a cord.
- *the location of the mass in respect to the axis of rotation.* With most sport equipment, the centre mass is located at a point where the player is able to have control and impart considerable speed. Take baseball bats and golf clubs for example. Here, the centre of mass is well down the shaft on both pieces of equipment.

FIGURE 6.6 When moving bodies do not travel in a straight line, it is called angular momentum.

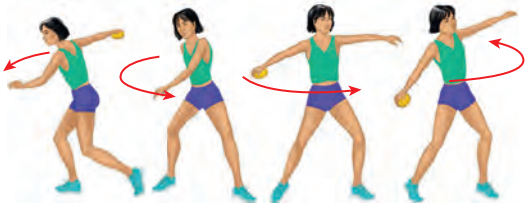


FIGURE 6.7 In a baseball hit, the momentum transferred to the ball depends on the mass of the bat and its linear speed at the time of impact.

This location enables the player to deliver force by combining the mass of the implement at speed in a controlled manner, thereby maximising distance.

Application

Angular momentum in stick games

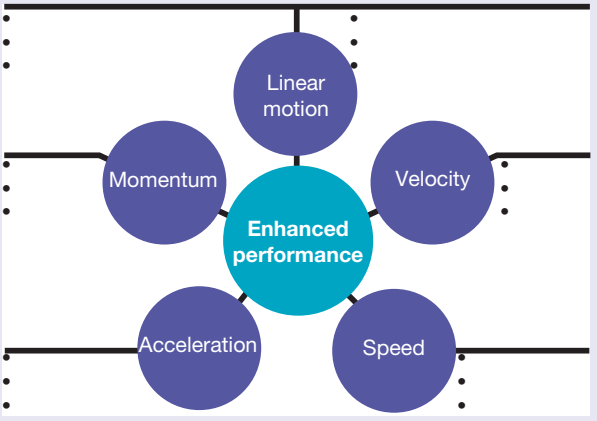
1. Choose two pieces of sporting equipment used for hitting, such as golf clubs or hockey sticks. Select the type of ball normally hit with this type of equipment. Shorten the shaft of one of the sticks (you may have a piece of damaged equipment that could be used, or move your hands well down the shaft of the equipment).
2. Place the ball on the ground and hit each of the balls as far as possible. Measure the distance that each of the balls was hit.
3. What were the distances of each of the respective hits?
4. Explain the difference in terms of the ability to generate angular momentum.
5. Sportspeople such as golfers and hockey players sometimes need to 'shorten the shaft' to play a particular shot. Use sporting examples to explain why this change of technique might be necessary and the implications for momentum on performance.

Inquiry

Principles of motion

Copy the mind map in figure 6.8 into your workbook and then complete it by identifying specific principles that support the motion principles identified.

FIGURE 6.8 Mind map to summarise the principles of motion



6.3 Balance and stability

6.3.1 Centre of gravity

The **centre of gravity** of an object is the point at which all the weight is evenly distributed and about which the object is balanced. Knowing the position of the centre ot gravity is very important to improving sport performance. In a rigid object such as a cricket ball or billiard ball, the centre of gravity is in the centre of the object. This means that the mass is equally distributed around this point; that is, the weight is equally balanced in all directions. If the object has a hollow centre, such as a tennis ball or basketball, the centre of gravity is located in the hollow centre of the ball (see figure 6.9(a)).

However, some objects commonly used in sport are not exactly spherical or have an evenly distributed mass; for example, the tenpin bowling ball or the lawn bowl. Both have a 'bias'; that is, a slight redistribution of the mass to one side of the object. When the object is rolled on a flat surface, it gradually moves in the direction of the side with the greater mass (see figure 6.9(b)).

In the human body, the position of the centre of gravity depends upon how the body parts are arranged; that is, the position of the arms and legs relative to the trunk. Because the human body is flexible and can assume a variety of positions, the location of the centre of gravity can vary. It can even move outside the body during certain movements (see figure 6.10).

FIGURE 6.9 **(a)** If an object is perfectly round, the centre of gravity is in its middle. **(b)** If the centre of gravity is to one side, the object moves to that side when rolled on a flat surface.

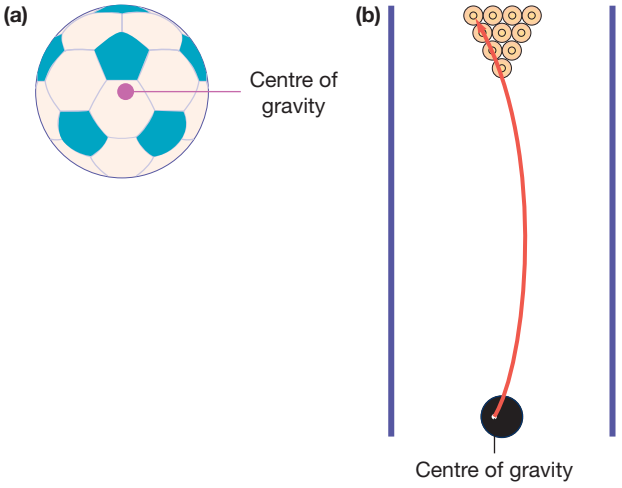
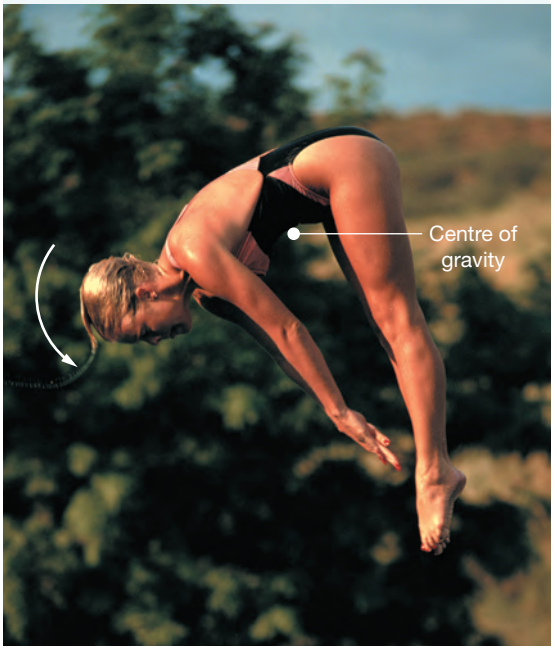


FIGURE 6.10 The point of the centre of gravity in the human body varies according to the position of the body.



Application

Varying the centre of gravity to enhance performance

Use a range of commonly used starting positions for the 100-metre sprint. Vary the centre of gravity so that, in some starts, it is well forward, others about centre and the remainder, well back. Use both crouch starts and upright starts. Time each of the starts over 10 metres and record your information.

1. How were the times affected by varying the position of the centre of gravity?
2. Which position was the most successful in terms of time?
3. You are to teach the start to a group of young students. Suggest the biomechanical principles that you consider to be most important in generating a good start.

Varying the centre of gravity in the execution of a skill can enhance performance. Skilled high jumpers and long jumpers both lower the centre of gravity in the step or steps immediately preceding take-off. This enables them to propel their body over a slightly longer vertical path than would otherwise be possible.

In high jump events, the athlete needs to clear the bar for the jump to be successful. Most jumpers currently use the Fosbury flop technique to do this (see figure 6.11). The 'flop' is a more efficient method because the centre of gravity does not need to clear the bar by the same margin as is required in conventional jumps, such as the scissors. The lower the centre of gravity remains in relation to the bar (but with the body still making a clear jump), the more efficient the movement because the jumper requires less effort to clear the bar. Using

the scissors technique, the jumper propels his or her body considerably higher because the centre of gravity is located higher in the body at the moment the bar is being cleared.

FIGURE 6.11 In jumping events, the closer the centre of gravity is kept to the bar while still clearing it, the more efficient the movement.

Application

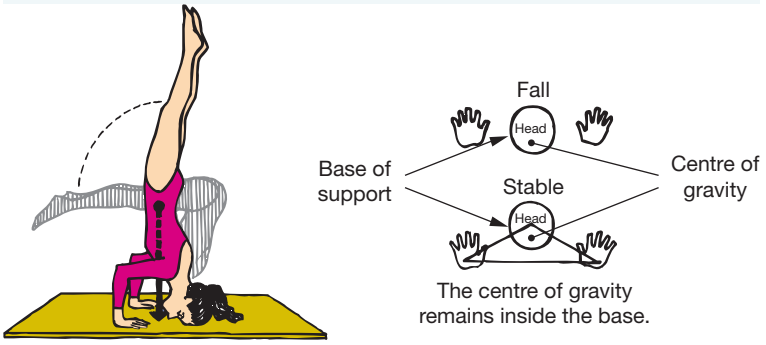
Watch the flop!

Use the **Fosbury flop** weblink in the Resources tab to see why this flop is more biomechanically efficient than other methods of high jumping.

Static balance activities such as headstands and handstands require precise manipulation of the centre of gravity. To balance on your hands as in a handstand, or on your head and hands as in a headstand, the centre of gravity must be controlled by the base of support. If it moves away from a perpendicular position directly over the base, the gymnast falls.

Most learners find it difficult to assume headstand and handstand positions because when they prepare to kick up, they do not push their centre of gravity far enough forward prior to the kick. As a result, the body falls back in the direction of the centre of gravity unless it is stopped by a push from the legs. As shown in figure 6.12, the centre of gravity, which is located approximately about the waist, needs to be pushed well forward during the kick-up phase and then moved back above the base of support to balance.

FIGURE 6.12 Manipulating the centre of gravity is important in balance activities.



Manipulating the centre of gravity requires considerable skill and contributes to the difficulty of skills such as the headstand and handstand.

Application

Observing control of the centre of gravity

On mats and with appropriate support and assistance, try to perform headstands and handstands. Observe the movements in both successful and unsuccessful attempts.

1. Discuss why some attempts were successful and others unsuccessful.
2. What advice could you give to improve the success rate?

Application

Observing and controlling the centre of gravity

Divide the class into half, with group one being the observers and group two the subjects. Those in group one are to run and, at the sound of a whistle, stop quickly and maintain balance. Group two is to observe and record group one's success in achieving balance immediately the whistle is blown.

1. Discuss the level of success or otherwise in achieving balance quickly.
2. In what way were the arms, legs and feet manipulated in order to improve the chances of success?

Like static balance, dynamic balance activities also require skilful control of the centre of gravity. In many moving activities, such as skiing and surfing, there is a fine line between the balance necessary for control and loss of balance resulting in a fall.

Application

Manipulating the centre of gravity to improve performance

Select two or three students to perform a range of evasive movements, such as a swerve, sidestep and change of direction, on a flat surface. Observe the angle of the body in each movement as the direction is changed. Repeat the movements a number of times and record your information using a series of stick figures.

1. Plot the approximate location of the centre of gravity on each of the stick figures. Then draw three or four lines through each stick figure, dividing it into equal segments. Can you detect any changes in the location of the centre of gravity?
2. Discuss how the centre of gravity was being relocated to enable the change of direction to occur.
3. Explain how controlled manipulation of the centre of gravity can enhance performance.

Resources

Weblink: Fosbury flop

6.3.2 Line of gravity

The **line of gravity** is an imaginary vertical line passing through the centre of gravity and extending to the ground. It indicates the direction that gravity is acting on the body. When we are standing erect the line of gravity dissects the centre of gravity so that we are perfectly balanced over our base of support (the base of support is discussed more fully in section 6.3.3). This is illustrated in figure 6.13.

Our base of support has a limited area. Widening our stance increases the size of the base of support. However, rules of some sports and competitions limit the size of the base of support; for example, the starting

blocks for competitive swimmers. The closer the line of gravity moves to the outer limits of the base of support, the less stable we become.

Movement occurs when the line of gravity changes relative to the base of support. Movement results in a momentary state of imbalance being created, causing the body to move in the direction of the imbalance. In specialised sporting movements, such as the start in athletics, diving and rhythmic gymnastics, the precision with which the line of gravity moves in relation to the base of support directly affects the quantity and quality of movement.

During practice of specialised skills, athletes progressively develop a feel for the line of gravity relative to the base of support, enabling the controlled instability required for movement. This means that less force is required to initiate the desired movement. For example, swimmers on the blocks bend forward, moving the line of gravity to the edge of the base of support so that less force is required to execute the dive. Springboard divers do likewise by moving the line of gravity to the front edge of their base of support, enabling frontward movement with the take-off. This is illustrated in figure 6.14.

FIGURE 6.13 We are perfectly balanced when the line of gravity dissects the centre of gravity.

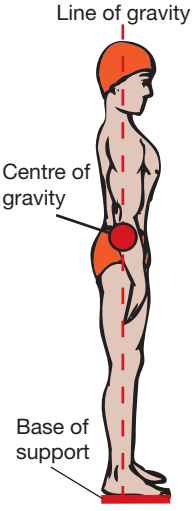
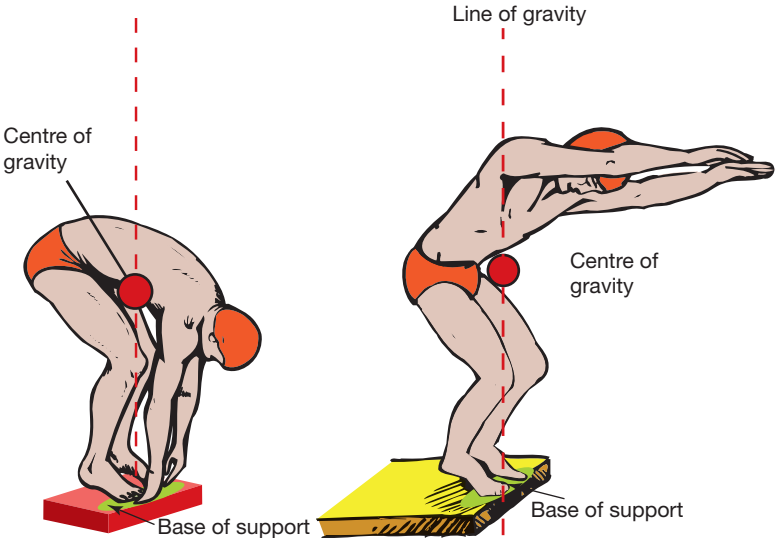


FIGURE 6.14 The line of gravity relative to the base of support moves to initiate movement.



Inquiry

Line of gravity and the sprint start

Use the **Sprints** weblink in the Resources tab to observe the seven photographs and read the technique points for the standing, crouch four point, 40-yard dash, three point and block starts. Print the information sheet (or alternatively source similar images of sprint starts) and draw a thick line that identifies the exact position of the base of support in each of the photographs. Try to locate the centre of gravity for individuals in each of the photographs. Then draw the line of gravity through the centre of gravity and extend to the base of support. Comment on how far the line of gravity is relative to the extreme edge of the base of support and if you think this would enable a more efficient start. Justify your answer.

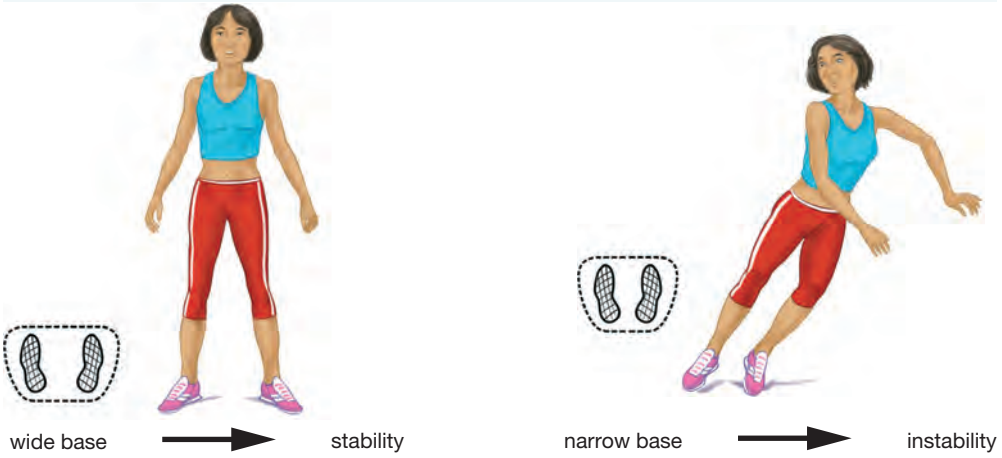
Resources

Weblink: Sprints

6.3.3 Base of support

Sustaining the balance of all individuals and objects is a **base of support**. The base of support refers to an imaginary area that surrounds the outside edge of the body when it is in contact with a surface. It affects our stability or our ability to control equilibrium. A narrow base of support allows the centre of gravity to fall close to the edge of the base of support. Only a small force is needed to make the person lose their balance (see figure 6.15). A wide base of support is essential for stability because the centre of gravity is located well within the boundaries.

FIGURE 6.15 A wide base of support promotes stability.



The relative position of the centre of gravity to the base of support is important for stability. The further the centre of gravity from the base, the more unstable is the body or object. There are many examples where athletes use the base of support to their advantage.

- The gymnast performing a pirouette has a very narrow base of support and must work hard to ensure that their centre of gravity remains within the base.
- Wrestlers widen their base of support to prevent their opponents from moving them into a disadvantageous position.
- Tennis players lower the centre of gravity and widen the base of support in preparation to receive a fast serve. This enhances balance and enables the centre of gravity to be moved in the desired direction more readily.
- Swimmers on the blocks widen their feet and move the centre of gravity forward to improve their acceleration.
- Golfers spread their feet to at least the width of their shoulders to enhance balance when they rotate their body during the swing.

Application

Base of support and different positions

Have five students assume a range of positions with varying bases of support; for example, a pirouette, headstand, crouch balance, start and boxing stance. Try to move each student from their position. Record the results.

1. Draw the shape and size of the base of support for each activity above. Compare the amount of effort required to displace each person from their position.
2. Discuss the degree to which the mass of the student affected your ability to dislodge each from their position.

Application

Base of support and changing stances

Choose a golf club or hockey stick. Hit five balls with your feet together (narrow base of support) and five balls using a normal stance. Measure the distances for each hit and calculate an average distance for each piece of equipment.

1. How much variation was there in average distances between the different stances?
2. Discuss why there was a difference.
3. Suggest five other activities where knowledge of the base of support is important to improving performance.

Inquiry

Base of support and improving skills

Choose any sport or activity. Discuss how knowledge of the centre of gravity and base of support could enhance performance in a range of skills in that sport.

on Resources

Weblink: Balance and stability

6.4 Fluid mechanics

Fluid mechanics is a branch of mechanics that is concerned with properties of gases and liquids. An understanding of fluid mechanics is important for performance improvement because physical activities such as running, throwing and swimming all take place in fluid environments, be it air, water or a combination of both.

The type of fluid environment we experience impacts on performance. For example, when we throw a javelin, hit a golf ball or swim in a pool, forces are exerted on the body or object and the body or object exerts forces on the surrounding fluid. Knowledge about how to equip ourselves and better execute movements in specific fluid environments improves safety and can significantly enhance performance.

FIGURE 6.16 Examples of fluid environments in which we perform

6.4.1 Flotation

You have probably observed that some people appear to **float** better in water than others. Many people are able to push and glide from the pool wall, floating momentarily but then sinking, usually feet first. Others have difficulty getting under the surface of the water during a 'duck dive', their feet kicking and splashing on the surface as they try to submerge.

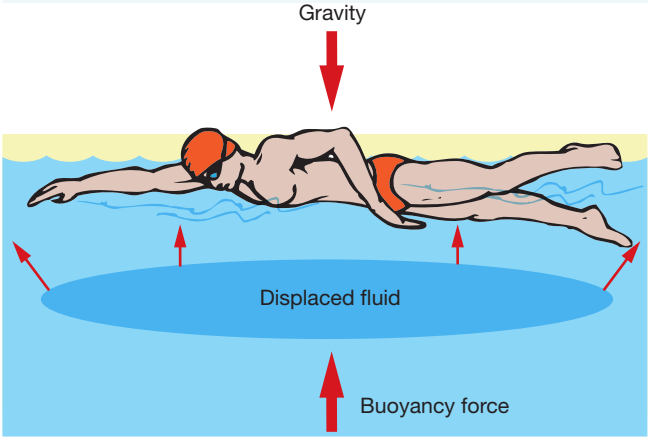
The ability to float — to maintain a stationary position on the surface of the water — varies from one person to another. Flotation impacts on swimming, survival in water and even our ability to learn to swim. To better understand flotation, we need firstly to understand the impact of forces that act on a floating body or object.

Our body floats readily on water when the forces created by its weight are matched equally or better by the **buoyant force** of the water. Buoyant force is the upward force on an object produced by the fluid in which it is fully or partially submerged. For an object to float, it needs to displace an amount of water that weighs more than itself. Conversely, if the object displaces a quantity of water that weighs less than itself, it sinks. Hence, wearing a personal flotation device (PFD) increases buoyancy because its size displaces a lot of water with only a minimal increase in weight.

The water displaced by the object does not lie directly below it, as illustrated in figure 6.17, but spreads throughout the pool (or whatever confines the water) and exerts forces on all surfaces of the body or object. Go to the **Why do things float?** weblink in the Resources tab to see a video where this principle of displacement is explained further.

Body **density**, or its mass per unit volume, also impacts on the ability to float. Density is an expression of how tightly a body's matter is enclosed within itself. The density of the human body varies from one person to another. The average weight density of the human body is approximately equal to that of water. If our weight density is high, that is, we are relatively fat free, the body sinks in water. Conversely, if we have higher proportions of less compact tissue such as fat, we tend to float. In other words, a body or object floats if its density is less than that of the fluid. A cork, for example, is less dense than water, allowing it to float, while a solid metal bar has a far greater density and consequently will sink.

FIGURE 6.17 The swimmer's weight is resisted by upward forces equal to the weight of the displaced fluid.



Inquiry

How buoyancy works

Use the **How stuff works** weblink in the Resources tab for more information about buoyancy.

1. Explain why a bowling ball sinks to the bottom of the tank while a basketball stays close to the surface.
2. Discuss the effect of body composition on flotation.

You have probably observed that the human body does not float evenly if left in the prone position. This is because the density of the human body (body composition) is not uniform as it is composed of different materials. Diverse body tissue including bone, fat and muscle each has a **specific density**. Some materials are considered to be relatively dense, such as teeth and bones, whereas other parts such as lung tissue and intestines have lower densities.

Again, the distribution of organs and tissue throughout the body makes some areas less dense in comparison to others. For example, the upper body contains the lungs (low density tissue), making this area less dense than the lower body, which contains a high percentage of bone and muscle. Because human body density is not uniform, **average total body density** is the determining factor in flotation.

The degree of density changes the buoyancy of an object or body. Objects with densities higher than that of water (more mass) sink, while those with densities lower than that of water (less mass) float. However, it

is common for people to sink non-uniformly from a horizontal, stationary floating position and this usually begins with the feet. The positioning of tissue such as the lungs relative to the legs impacts on flotation and affects which parts sink first.

Inquiry

Sink or float

1. Explain why some people float better than others.
2. Why might it be necessary for some people to wear personal flotation devices (PFDs) when performing skills in deep water?
3. Explain why deep inhaling and holding breath might enhance one's ability to float.
4. Why does the sculling arm action allow us to remain on the surface of the water?
5. Explain why you float when you stretch out but sink when you roll your body into a ball.
6. Explain why, when we push and glide, we remain on the surface of the water but begin to sink as our forward movement stalls.

on Resources

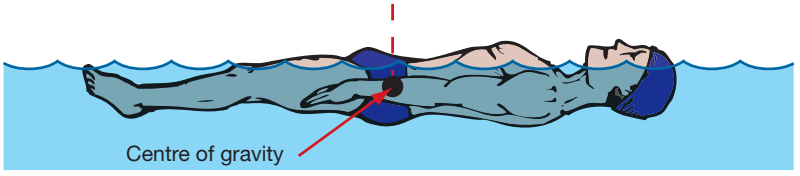
Weblink: Why do things float?
Weblink: How stuff works

6.4.2 Centre of buoyancy

If our average total body density is higher than that of water, we sink but this does not happen uniformly. To understand why this happens we need to understand the link between the body's centre of gravity and its centre of buoyancy.

Every floating object has a centre of gravity and **centre of buoyancy**. We saw in subtopic 6.3.1 that the centre of gravity is the point around which the body's weight is equally balanced in all directions. While differing body shapes contribute to variations in the exact location of the human body's centre of gravity, even when floating the centre of gravity is generally found about the waist, as illustrated in figure 6.18.

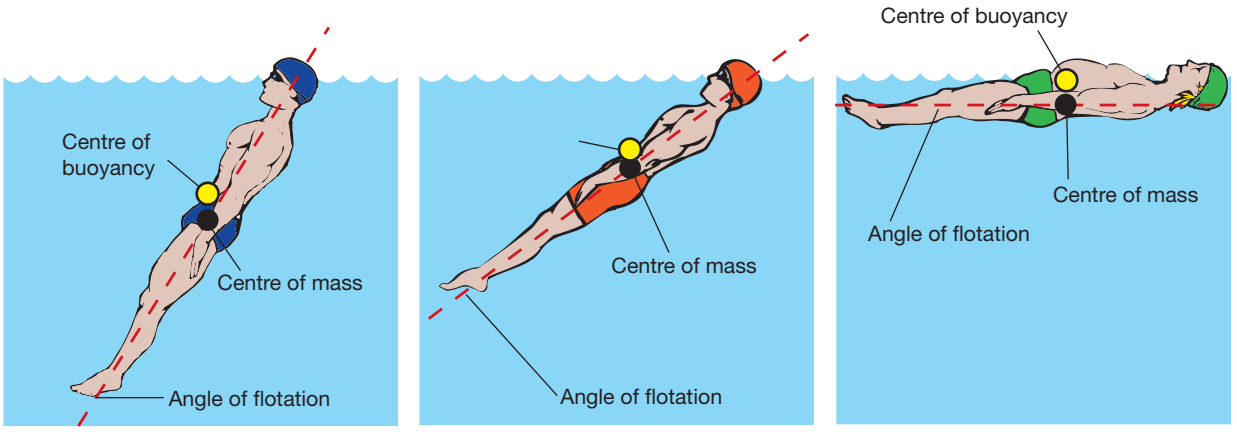
FIGURE 6.18 The centre of gravity of the human body is located about the waist.



The centre of buoyancy is the centre of gravity of the fluid displaced by a floating object. Around this point, all the buoyancy forces are balanced.

During unassisted horizontal flotation, the human body's centre of buoyancy is not vertically aligned to its centre of gravity. The lungs, which contain a large volume of air, draw the centre of buoyancy towards the chest. As illustrated in figure 6.18, the body's centre of gravity (centre of mass) is located more towards the hips and the exact position varies from one individual to another. During an attempt to float, gravity pulls the lower body downwards (greater mass) while the buoyant forces push the chest and upper body upwards (less mass in this area). The result is that the body rotates until the centre of mass lies directly below the centre of buoyancy. This leaves the body in varying degrees of diagonal positions depending on the position of the centre of mass in each individual. The impact of varying body compositions on flotation is illustrated in figure 6.19.

FIGURE 6.19 Body composition influences the relationship between centre of mass and centre of buoyancy, changing the depth and angle of flotation.



Application

Centre of buoyancy

Work in pairs at a swimming pool with one person observing and the other recording the observations. During the course of the exercise, the person in the water needs to assume positions listed in table 6.2 and hold each for a period of 10–15 seconds. The recorder observes what happens to the unassisted floating body in terms of buoyancy and rotation and records the information in the second column.

TABLE 6.2 Buoyancy and rotation of unassisted floating body

Position in water	Flotation and body position changes	Why it happened
Prone float		
Back float		
Knees to chest		
Prone float with arms and legs spread		
Prone float with legs supported by kickboard		
Body vertical, arms by side, feet together		
Side float		
Duck dive (unassisted by hands and feet kick)		

Inquiry

Centre of buoyancy

1. In pairs, use the third column in table 6.2 to explain flotation and body position changes.
2. As a class, discuss the relevance of flotation to performance of survival skills and swimming generally.

6.4.3 Fluid resistance

When a body or object moves, whether it be in air or water, it exerts a force and simultaneously encounters a resisting force from that medium. In sporting competitions such as swimming and athletics, **drag** and **lift** forces are constantly responding to the object or body's thrust. When competitors throw objects such as the discus or javelin, or propel themselves forward, maximum length/speed is generated when drag is minimised. Lift is the force that operates at right angles to the drag.

FIGURE 6.20 Negative lift helps maximise traction and improve performance.

While in most activities lift is essential in keeping the implement airborne, sometimes negative lift is an advantage. An example of using technology to create favourable negative lift is the use of an inverted wing on Formula 1 cars (see figure 6.20) to maximise downforce and ultimately improve performance.

There are many types of forces exerted by fluids that resist an implement or body trying to move through it. At the same time, technological improvements have enabled us to better use the specific fluid to decrease resistance; for example, better configuration of the dimples on a golf ball can improve its flight performance. This is explored more fully when we examine the Magnus effect (see page xxx).

Drag is the force that opposes the forward motion of a body or object, reducing its speed or velocity. It is a resisting force because it acts in opposition to whatever is moving through it. Drag forces run parallel to flow direction (airflow, water), exerting a force on the body in the direction of the stream. An example of where we find drag forces in sport is to watch a swimmer push off the pool wall following a turn. The swimmer's forward motion gradually decreases due to resisting forces applied by the water, which makes the swimmer stop unless arm or leg action begins. A body that is streamlined (contoured to reduce resistance) and technically efficient moves through the medium, creating less drag than a body that is not as streamlined. This difference in the amount of drag created by non-streamlined and streamlined bodies is illustrated in figures 6.21 and 6.22.

FIGURE 6.21 When a body is not streamlined, considerable drag is created, making it more difficult to move through the fluid.

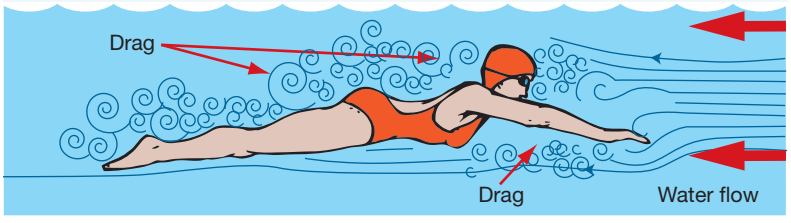
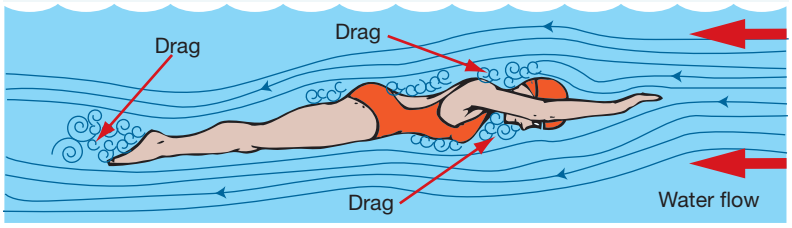


FIGURE 6.22 The streamlined body creates much less drag, allowing it to move more efficiently through the medium.



The amount of drag experienced depends on a number of factors, including:

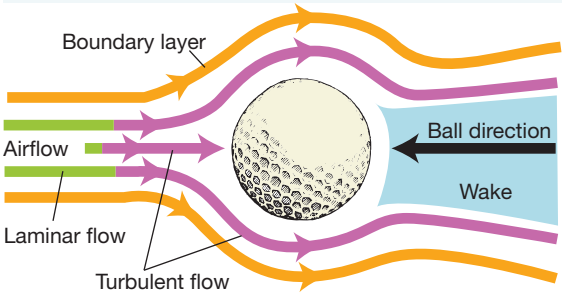
- *fluid density*. Because water is denser than air, forward motion in this fluid is more difficult.
- *shape.* If a body or object is streamlined at the front and tapered towards the tail, the fluid through which it is moving experiences less turbulence and this results in less resistance.
- *surface*. A smooth surface causes less turbulence, resulting in less drag.
- *size of frontal area*. If the front of a person or object (area making initial contact with the fluid) is large, resistance to forward motion is increased.

There are two types of drag forces — surface drag and profile drag. **Surface drag** or **skin friction** refers to a thin film of the fluid medium sticking to the surface area of the body or object through which it is moving. This layer sticks to the next layer and progressively to neighbouring layers. However, attachment to outer layers becomes increasingly weaker until there is no attachment at all.

The fluid in the immediate vicinity of the surface of a projectile comprises the **boundary layer**. When an object such as a discus is projected into a medium, pockets of fluid in the boundary layer become unstable as the object moves through it. The thrust of the object disturbs air that is in **laminar flow** to make way for its mass. This air is then forced to detour around the object but becomes mixed in the process. Some attaches itself to the object and even rotates with it if the object is spinning. Turbulence develops, causing forces known as surface drag to be exerted on the object (and it in turn exerts forces on the fluid), causing forward movement to be slowed.

The coarser or less streamlined the surface of the object, the thicker is the boundary layer. This is illustrated in figure 6.23 where the air ahead of the golf ball is in laminar flow until disturbed by the advancing ball and causing the formation of a boundary layer to develop around the ball. The thick, turbulent air attached to the ball slows its progress.

FIGURE 6.23 The airflow of an object moving through a fluid becomes disrupted and some attaches itself to the object in the boundary layer.

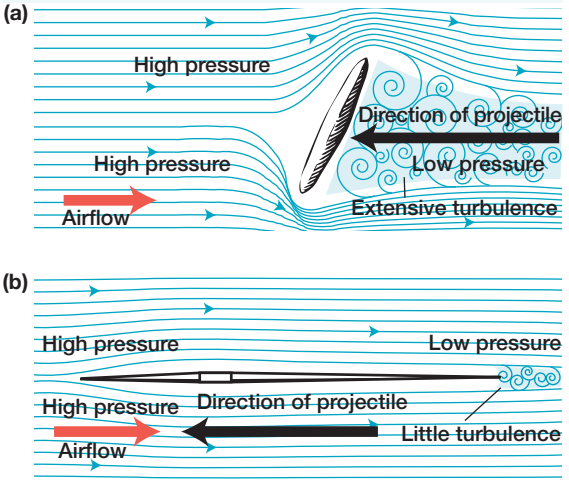


Profile drag (also called **form** or **pressure drag**) refers to drag created by the shape and size of a body or object. As they move through fluids, bodies or objects cause the medium to separate, resulting in pressure differences at their front and rear. The separation causes pockets of high and low pressure to form, resulting in the development of a **wake** or turbulent region behind the body or object. Pressure drag is a component of the total drag, all of which combine to slow down the object.

When we swim, for example, fluid pressure at the front of our body is greater than fluid pressure behind our feet. Objects with bigger cross-sectional areas produce more form drag in comparison to streamlined objects which, because of their shape and smoothness, cause less drag. Cyclists try to reduce form drag by reducing the size of their frontal area (bending forward) and by 'drafting' or following closely behind other cyclists to reap the benefits of being in the low pressure area.

Figure 6.24(a) demonstrates an object with a large cross-sectional area causing an extensive wake at its rear. The wake encompasses whirling currents that tend to flow in an upstream direction, giving rise to forces that oppose the forward motion of the body or object. The more

FIGURE 6.24 The blocking effect of bigger objects causes greater turbulence and more drag than more streamlined objects.



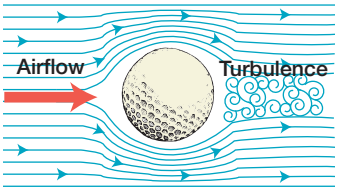
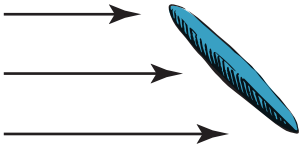
streamlined object in figure 6.24(b) causes less interference to airflow, resulting in a smaller low pressure area and subsequently less drag.

Inquiry

The effects of drag on performance

Examine the illustrations in the left column of table 6.3. Use the right column to identify types of drag and the effect of this on performance. Discuss your findings with the class.

TABLE 6.3 Types of drag and effects on performance

Body or object	Types of drag and effect on flight/performance
Golf ball in flight 	
Downhill speed skiing 	
Discus in flight 	
Cycle racing 	
Sprinting 	

Much has been done to try to minimise resistance forces that oppose movement in fluid mediums. Most developments have taken place in regard to technique, tactics, clothing and equipment design. For example:

- *technique.* Cyclists, speed skaters and downhill skiers all bend forward at the trunk.
- *tactics.* Distance runners and cyclists follow one another closely where possible.
- *clothing.* Tight bodysuits made of special friction-reducing fabrics are worn by runners, cyclists and swimmers.
- *equipment design.* Designs of equipment such as golf balls, golf clubs, cricket bats, bicycle helmets, footballs and surfboards are continually being modified to make them more aerodynamically efficient.

Application

Using biomechanics to improve performance

In table 6.4, compare performance A with performance B for the three activities. Under performance A, identify relevant types of drag and elaborate on the effect this has on performance. Under performance B, identify any technique, equipment, design and other modifications that have influenced performance/design.

TABLE 6.4 Effects of drag on performance

Performance 1A	Performance 1B
	
Types of drag and impact on performance:	Technique/equipment modifications to reduce drag:

Performance 2A	Performance 2B
	
Types of drag and impact on performance:	Technique/equipment modifications to reduce drag:

Performance 3A	Performance 3B
	
Types of drag and impact on performance:	Technique/equipment modifications to reduce drag:

Inquiry

Applying fluid mechanics principles to movement and performance

Choose one sport from the three categories shown in table 6.4. Explain how the principles of fluid mechanics have influenced changes designed to improve movement and performance.

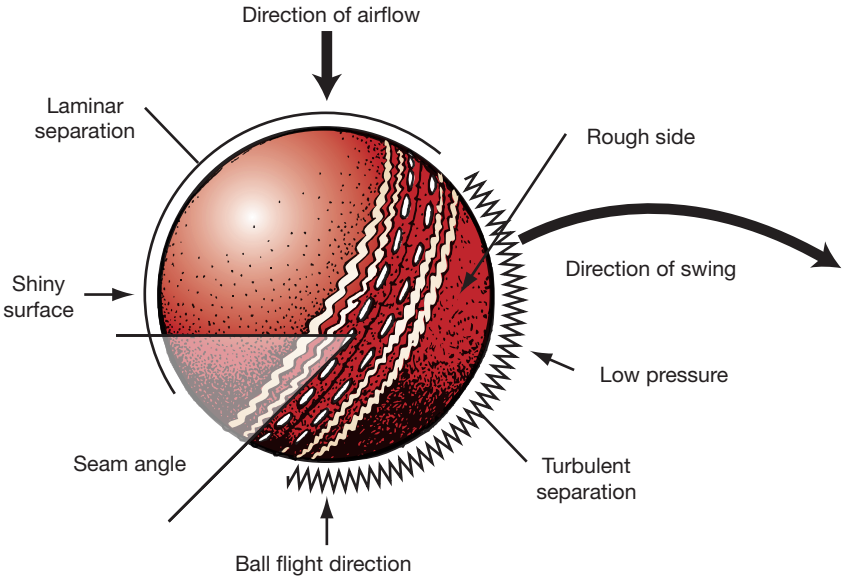
The Magnus effect

The **Magnus effect** explains why spinning objects such as cricket and golf balls deviate from their normal flight paths. When an object such as a cricket ball or golf ball is bowled or hit into the air, its spinning motion causes a whirlpool of fluid around it that attaches to the object. According to the direction of spin, the object's movement is affected.

We are familiar with three types of spin. **Topspin** occurs when a ball or object rotates forward on its horizontal axis causing it to drop sharply. **Backspin** is the opposite and occurs when a ball or object rotates backwards, causing it to fall slowly at the end of flight. Both topspin and backspin shorten the flight of the ball. **Sidespin** refers to rotation around a vertical axis, causing the ball or object to curve left or right during flight.

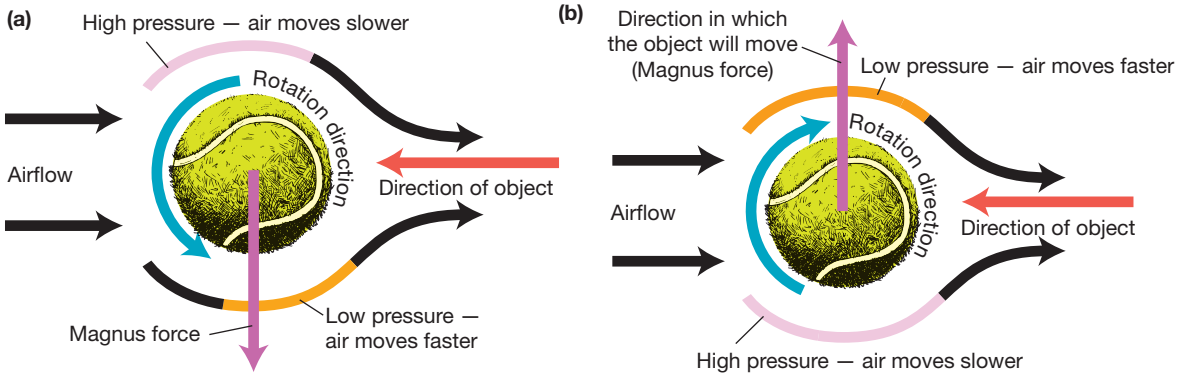
Spinning causes the formation of pockets of high and low pressure. The size of the pressure pockets depends on the speed of rotation and roughness of the surface. Fast bowlers shine one side of a cricket ball to enhance the streamlining effect while leaving it rougher (through contact with the pitch) on the other side. This assists a properly delivered ball to swing during flight as one side of the ball is able to move through the air with less resistance than the other side. This is illustrated in figure 6.25. The cricket ball experiences a force towards the side of the low pressure causing it to move in that direction. In fact, where pressure differences occur, objects always move from the area of high pressure to low pressure.

FIGURE 6.25 The seam alignment, together with surface differences on each half of a worn cricket ball, can be used to enhance its ability to swing.



Two sports that rely heavily on backspin and topspin are tennis and table tennis. While the surface of the table tennis ball is relatively smooth, the dimpled face of the bat allows considerable velocity to be imparted, enhancing the Magnus effect. The comparatively rougher surface of the tennis ball enhances its ability to 'grab' air in the boundary layer and dip quickly when hit over the net with topspin. The impact of topspin and backspin is illustrated in figure 6.26. Use the **Backspin on a basketball** weblink in the Resources tab to watch the effect of backspin on a basketball dropped from a high dam wall.

FIGURE 6.26 **(a)** Topspin and **(b)** backspin. The direction of rotation of an object causes pressure differences that affect ball flight.

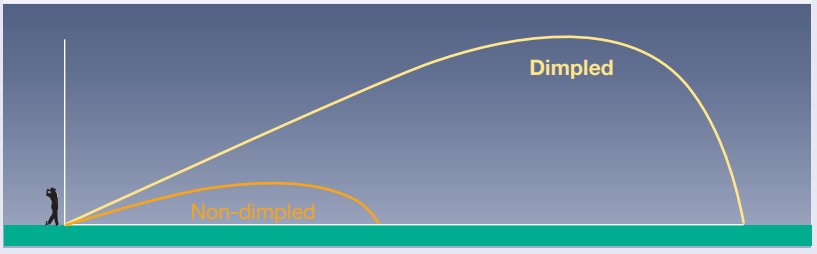


Inquiry

Using fluid resistance principles to advantage

Use figure 6.27 to explain how the Magnus effect affects the flight of dimpled and non-dimpled golf balls.

FIGURE 6.27



Inquiry

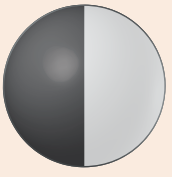
Using the Magnus force to enhance performance

Choose a sporting skill such as baseball pitching or goal kicking in soccer where the Magnus force influences the flight of the projectile. Investigate what players do to vary the Magnus effect and use it to improve performance. Present your findings in a short presentation.

Application

Observing the Magnus effect on ball movement

1. Colour one half of a table tennis ball (as illustrated) to enable better vision of its flight path.
2. Have an experienced table tennis player in the class serve a range of balls using different bat surfaces to impart backspin, topspin and sidespin. Observe the flight of the ball with each sequence of serves, noting its swing, rise or dip.



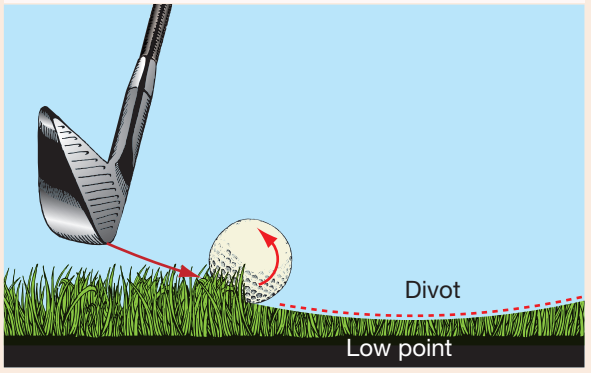
3. Take turns in trying to return serves and note changes in technique to enable a successful return.
4. As a class discuss:
   (a) the techniques/types of surfaces used to impart the various types of spin
   (b) adjustments that need to be made in technique to address each type of spin.

Application

Applying spin to an object

Using soft plastic golf balls try to impart spin during a hit. You will hear the golf ball spinning if you hit it well enough. To maximise spin, you need to hit the ball into the ground as illustrated in figure 6.28.

FIGURE 6.28



Use figure 6.28 to explain why a golf ball needs to be hit downwards to make it climb. Use the **Golf physics** weblink in the Resources tab for more information.

on Resources

- **eLesson:** Fluid mechanics (eles-0157)
- **Weblink:** Backspin on a basketball
- **Weblink:** Golf physics

6.5 Force

6.5.1 How the body applies force

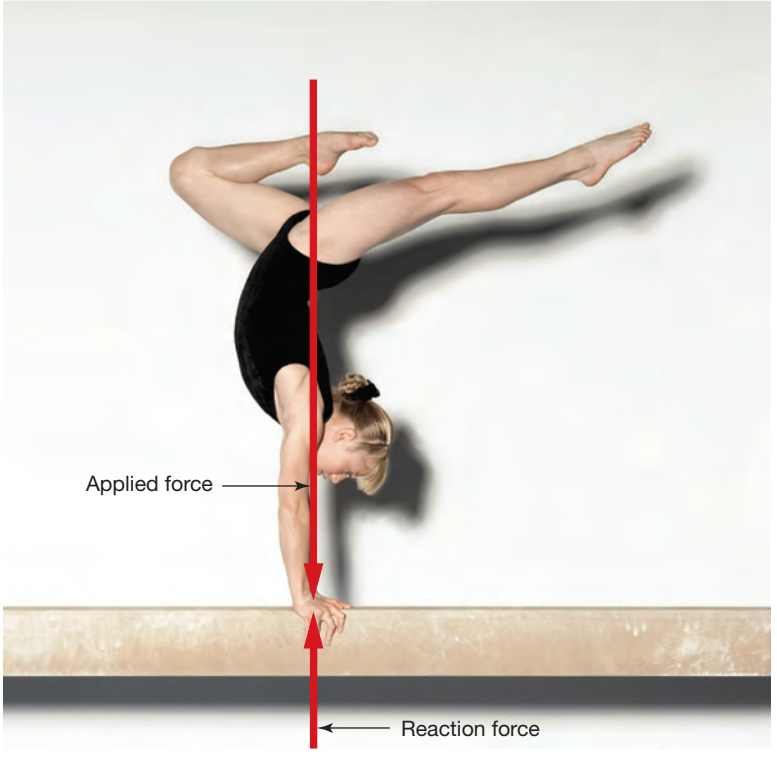
Players are able to apply **forces (biomechanics)** to objects such as the ground to enable them to run faster, or to a tennis racquet to enable them to hit the ball harder. In doing this, the players are confronted with opposing forces such as gravity, air resistance and friction.

Forces can be internal or external. *Internal* forces are those that develop within the body; that is, by the contraction of a muscle group causing a joint angle to decrease (for example, the contraction of the quadriceps when kicking a football). *External* forces come from outside the body and act on it in one way or another. For example, gravity is an external force that acts to prevent objects from leaving the ground (see figure 6.29).

There are two types of forces — **applied forces** and **reaction forces** (see figure 6.30). Applied forces are forces applied to surfaces such as a running track or to equipment such as a barbell. When this happens, a similar force opposes it from outside the body. This is called a reaction force. The result is that the runner is able to propel his or her body along the track surface because the applied force generated by the legs is being matched equally by the reaction force coming from the track surface. The greater the force the runner can produce, the greater is the resistance from the track. The result is a faster time for the distance. This is explained by Newton's third law: 'For every action, there is an equal and opposite reaction'. In other words, both the runner and the track each exert a force equal to whatever force is being applied.

FIGURE 6.29 Players experience both internal and external forces.

FIGURE 6.30 Every reaction force is matched equally by an applied force.



We see evidence of the application of force in all physical activity. Consider the following examples: the high jumper, discus thrower, cricket bowler and basketball player all exert forces when executing movement skills. How effective would they be if they were suspended and had nothing to push against?

FIGURE 6.31 Applied and reaction forces increase during the delivery stage of bowling.

Inquiry

Fast bowlers a 'shoe-in' for injuries

(You may use the **Bowling** weblink in the Resources tab for more information.)

1. How does a bowler apply force at the time of release during bowling?
2. How are forces absorbed when a bowler releases the ball?
3. What type of injuries can result when forces are applied in this manner?
4. How might improved footwear assist in the absorption of forces?

on Resources

Weblink: Bowling

Inquiry

The principles of forces

1. Use arrows to indicate the direction of the applied force and the direction of the reaction force in figure 6.32.

FIGURE 6.32

2. What would be the effect on the runner's performance if the applied force was increased?
3. Suggest how the principle of forces could be applied to the start in running, generating a more powerful long jump or winning a scrum in rugby with a lower pack weight.

To propel the body higher as in high jumping, faster as in running, or further as in long jumping, we need to develop **power (biomechanics)**. Power is expressed by the formula

$$\text{power} = \frac{\text{work}}{\text{time}}$$

where work is equal to force × distance.

An increase in strength (force) or an increase in the speed at which muscles shorten results in an increase in power. While an increase in both causes an increase in overall power, the athlete must decide which component (strength or speed of muscular contraction) is of greatest benefit. Jumpers and runners need to focus on rapid muscular contraction while controlling the strength aspect. This is called *speed-dominated* power. In contrast, the weight-lifter needs power and must be able to lift the weight. He or she needs to develop *strength-dominated* power. By identifying the specific requirements of the sport, the athlete can be better prepared by developing the type of power required.

6.5.2 How the body absorbs force

Forces exerted on the body are absorbed through the joints, which bend or flex in response to the impact. We see evidence of the body absorbing forces in activities such as rebounding in basketball, landing in high jump and stopping the bounce while on a trampoline (see figure 6.33).

When the body lands on a floor or similar surface, it exerts a force on the surface. In response, the surface exerts a force on the body. If we did not bend the knees and allow a slow, controlled dissipation of the forces by the muscles, the risk of injury to the joint would be increased. In an activity such as the landing phase of a long jump, the muscles in the front of the thigh (quadriceps) lengthen while absorbing the force (see figure 6.34). Joint flexion helps prevent injury to surrounding tissue.

FIGURE 6.33 There are many instances in sport where the body must absorb force.

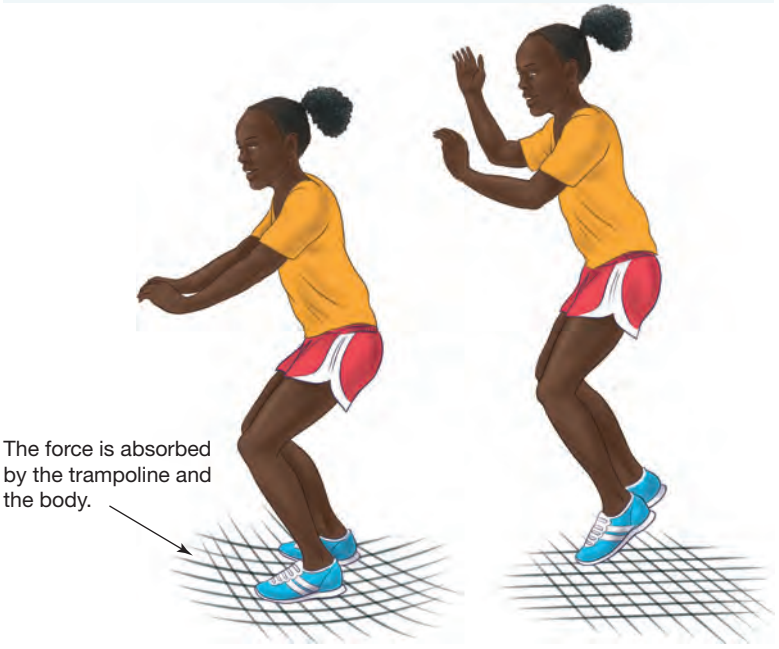


FIGURE 6.34 Joint flexion in absorbing forces helps prevent injury to muscles, tendons and ligaments.

Application

Observing forces being absorbed

Perform two long jumps — one covering a short distance and the other, the maximal distance that can be jumped. Observe the amount of knee flexion that you experience in each of the jumps.

Inquiry

Absorbing forces

1. From your observation, was there a difference in the amount of knee flexion required for each jump in the application above?
2. Discuss why flexion is used in a movement of this type and why we may instinctively vary the degree of flexion.
3. To what degree do you think footwear and the landing surface assist in absorbing force?
4. Discuss why hard surfaces could result in more injuries than soft surfaces.

The body also absorbs forces while catching balls or similar objects. In the process of catching, a force is exerted by the ball on the hand and a force is exerted by the hand on the ball. Catching a ball can sting if the force of the ball is not absorbed effectively.

The impact felt by an object being caught is the product of:

- the force of the ball
- the distance through which the hands move while receiving the ball.

Since the force of the ball remains constant, the only variable that can be changed is the distance through which the hands move when catching the ball. To increase the catching distance and thereby absorb the force more effectively, we can use a number of techniques, including:

- the catching arm can be outstretched. When the ball meets the hand, the arm can be drawn quickly to the body.
- smothering the ball with the other hand
- catching with an outstretched arm and moving it past and behind the body to increase the distance over which the ball is caught.
- pivoting the body during the catching action.

While some of these principles may help to reduce the impact from objects such as cricket balls, an overemphasis on reducing pain from impact may result in a dropped catch. Correct technique and practice are essential.

Application

Observation of forces being absorbed while catching

Have two students throw an egg underarm to one another. Gradually increase the distance between the two. Closely observe the action of the hands as they receive the egg.

It would take little force to break the egg. From your observations, discuss how the students avoided breaking the egg for a period of time (if they did).

Application

Techniques for absorbing forces when catching balls

1. In pairs and using a range of types of ball (such as cricket balls, softballs and baseballs), practise catching using the techniques suggested above.
2. Do you think any of the techniques suggested helped absorb the force of the balls?
3. If the techniques helped, from which technique did you find the greatest benefit? Why?

Inquiry

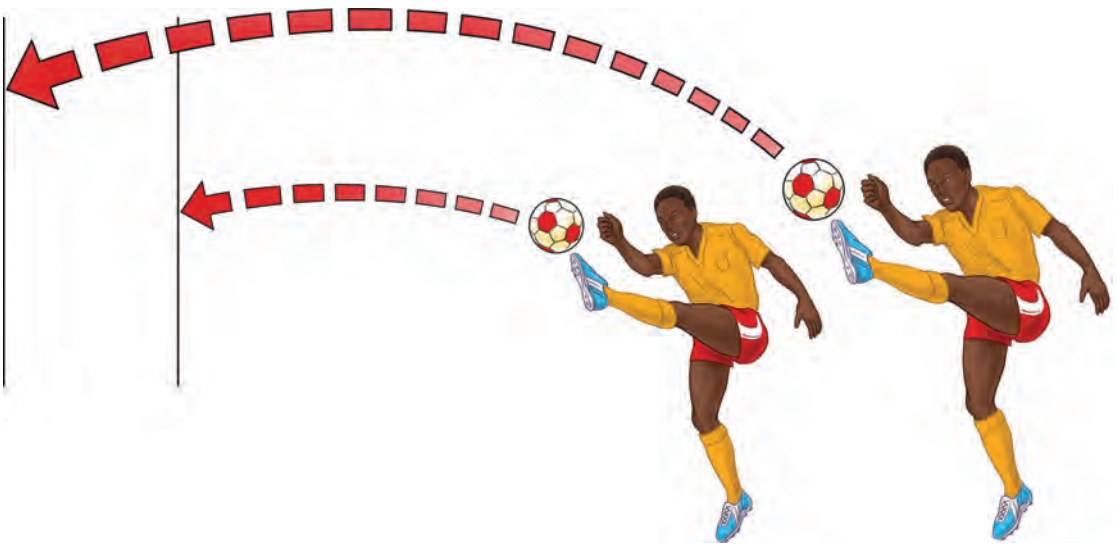
Analysing techniques for absorbing forces

How can the problem of absorbing force and developing technique be amalgamated in the development of young players?

6.5.3 Application of force on an object

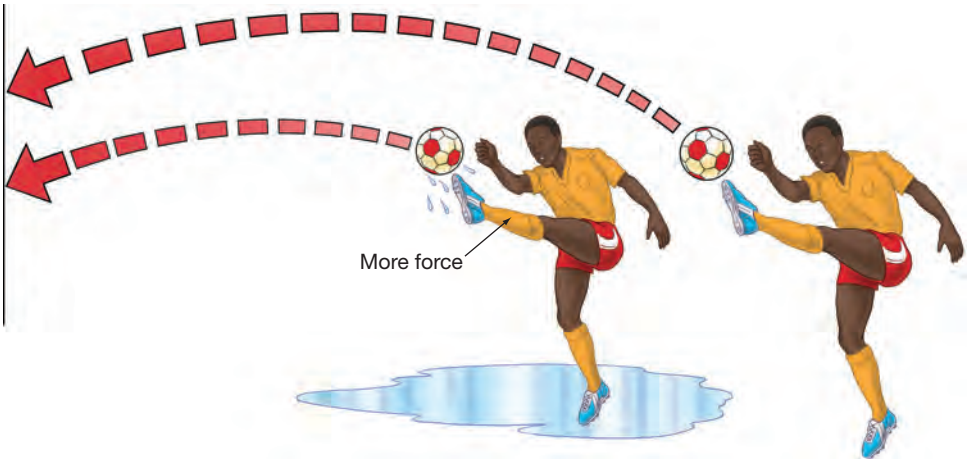
When applying force to objects, such as to a barbell, cricket bat or netball, there are a number of considerations. First, the quantity of force applied to the object is important. The greater the force, the greater is the acceleration of the object. A small soccer player whose mass and technique allows only small effort production provides little force to the ball in comparison to the same ball being kicked by a bigger player (other factors being equal) (see figure 6.35).

FIGURE 6.35 The greater the force, the more we are able to accelerate the object.



Second, if the mass of an object is increased, more force is needed to move the object the same distance. For example, if a football becomes heavier as a result of wet conditions, more force is required to pass or kick it (see figure 6.36).

FIGURE 6.36 If mass increases, for example, a ball becomes wet, more force must be applied to move the object the same distance.

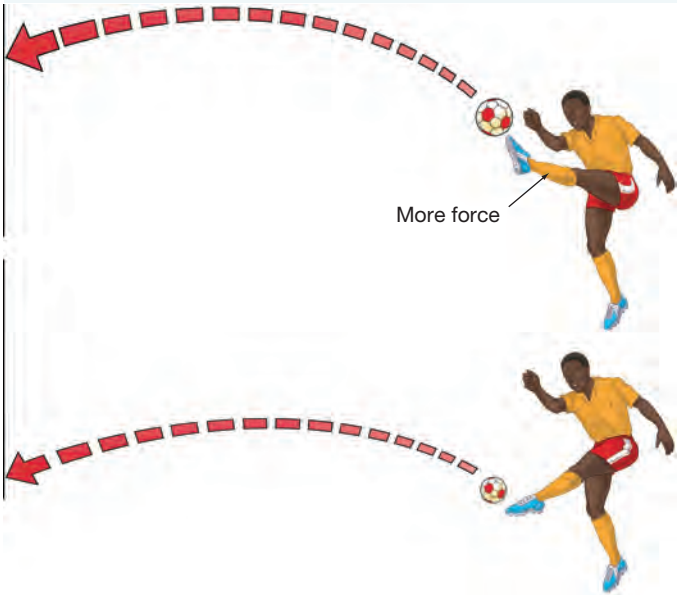


Third, objects of greater mass require more force to move them than objects of smaller mass (see figure 6.37). The size of the discus, javelin and shot-put used in athletics competitions is smaller for younger students than older students. This assumes that older students have greater mass and are thereby able to deliver more force than younger students because of their increased size (mass) and (possibly) strength.

In many sports and activities, for example, ice skating or the hammer throw, the body rotates about an axis. When this happens, **centripetal force** and **centrifugal force** are experienced. Centripetal forces are forces directed towards the centre of a rotating body and centrifugal forces are directed outwards. Two examples are

the golf swing and hammer throw. Here a body rotates, generating powerful forces on objects (in this case, a golf club/ball and hammer ball), allowing them to be propelled distances far greater than would be possible without body rotation.

FIGURE 6.37 As the size of an object increases, more force is required to move it.



We experience these forces often in our lives. Passengers in cars experience centripetal and centrifugal forces each time a car goes around a bend. The centrifugal forces cause the passenger to slide towards the outside of the bend. Similar forces operate in the spin-dry cycle of a washing machine, removing water from the clothes. The greater the speed about the axis, the greater the force produced.

Another example is that of ice skaters who link arms to form a 'chain'. When the chain rotates about an 'axis' (the person closest to the centre), considerable speed is experienced by the person at the end of the chain. To counteract the centrifugal force, the skaters need to lean towards the centre and push outwards against the ice to maintain balance.

FIGURE 6.38 To remain balanced, a hammer thrower must lean further away from the heavy steel ball as rotation increases.

To manage centripetal and centrifugal forces in sporting situations it is important to:

- begin carefully so that you learn to feel the forces as they develop
- respond gradually, trying to match the force exactly

- work on your balance so that you become comfortable leaning beyond where you would normally be balanced
- ensure you have a firm handgrip if holding an object such as a bat or high bar
- bend your knees and ensure you have good traction if working on a track, field or circuit.

Application

Applying forces

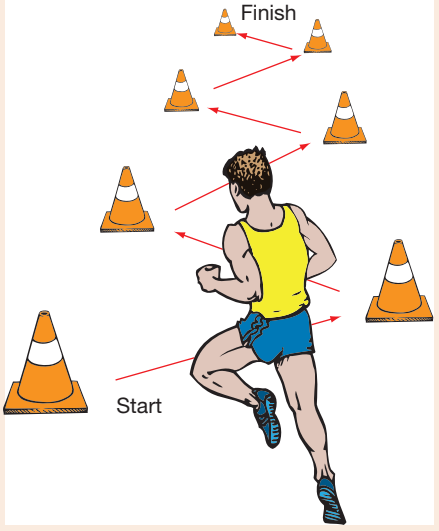
1. Place two objects of varying mass (for example, a shot-put and a tennis ball) on the classroom floor. Move each using a similar force, such as a finger flick.
2. Which implement could you move the furthest?
3. Explain the differences in distance in terms of application of force to the masses of the respective objects.

Application

Applying forces when changing direction

Set up two lines of markers approximately five metres apart as shown in figure 6.39.

FIGURE 6.39



Run to each marker, then change direction by pushing off the foot nearer that marker. Keep your pattern of directional changes to the finish.

1. Explain how forces work in changing direction.
2. In what activities might more effective change of direction improve performance?

Inquiry

Applying forces during the take-off in a long jump

Identify ways of maximising force application to improve the distance jumped. You can use the **Forces in long jump** weblink in the Resources tab for more information.

Application

Applying forces to objects

Use the **Tennis serve** weblink in the Resources tab to view a video or find another video online of Roger Federer serving.

1. Roger Federer's first serve is around 200 kilometres per hour. How is he able to apply this much force to the ball?
2. Why is the development of force an advantage in most sporting activities?

Application

Biomechanics revision

Use the **Basic Biomechanics** weblink in the Resources tab to review your knowledge of biomechanics and specifically how it can be applied in practical situations.

on Resources

Weblink: Forces in long jump
Weblink: Tennis serve
Weblink: Basic biomechanics

6.6 Topic review

6.6.1 Summary

- Biomechanics is a science concerned with forces and the effect of these forces on the human body. A knowledge of biomechanics helps us choose appropriate equipment, improve technique and reduce the risk of injury.
- Motion is the movement of a body from one position to another.
- There are three types of motion — linear, angular and general.
- Velocity is equal to displacement divided by time. It is useful when calculating how quickly people or objects travel when their path is irregular (cross-country runner) or curved (javelin thrower).
- Speed is equal to the distance covered divided by the time taken.
- Acceleration is the rate at which velocity changes in a given amount of time. It is very important in short distance events.
- Momentum is the quantity of motion a body possesses. It is most apparent in collision situations. When this happens, momentum continues in the direction of the body with the greater mass (as long as other factors are equal).
- Momentum can be linear (in a straight line) or angular (moving around a point). Angular momentum can be seen in most activities, particularly when we use equipment such as sticks, bats and clubs.
- The centre of gravity of an object is the point about which all the weight is evenly distributed. The centre of gravity in humans is located approximately at waist height and in the middle between the front and back of the trunk.
- Knowledge of the location of the centre of gravity has important implications for sporting events such as high jump.
- The line of gravity is an imaginary vertical line passing through the centre of gravity and extending to the ground.

- The base of support refers to an imaginary line that surrounds the outside of the body when it is in contact with a surface. We improve balance by using a wide base of support. It becomes increasingly difficult to balance as we narrow the base of support.
- Fluid mechanics is a branch of mechanics concerned with properties of gases and liquids.
- Our body floats when the forces created by its weight are matched equally or better by the buoyant force of the water.
- Body density, or its mass per unit volume, impacts on the ability to float. A body or object floats if its density is less than that of the fluid.
- The weight and distribution of organs and tissues throughout the body influences flotation and the way the body floats (or sinks).
- The centre of buoyancy is the centre of gravity of a volume of water displaced by an object when it is immersed in that water.
- Drag is the force that opposes the forward motion of a body or object, reducing its speed or velocity.
- Lift is the component of a force that acts at right angles to the drag.
- The amount of drag is influenced by fluid density, object shape (bulky or streamlined), surface smoothness and size of the frontal area.
- Surface drag or skin friction refers to a thin film of the fluid medium sticking to the surface area of the body or object through which it is moving.
- Profile drag (also called form or pressure drag) refers to drag created by the shape and size of a body or object.
- The Magnus effect explains why spinning objects such as cricket and tennis balls deviate in the air from a normal flight path.
- Force is the push or pull acting on a body. The body applies force in movements such as running and jumping. These applied forces are met equally by reaction forces. The concept of applied and reaction forces is explained by Newton's third law.
- Power is the application of force applied rapidly. Power is important to most activities, usually of short duration, such as jumping, starting in athletics and throwing.
- In both landing and ball-catching situations, forces can cause pain and sometimes injury. A knowledge of biomechanical principles helps us learn to absorb these forces effectively.
- The mass of commonly used sporting objects, such as soccer balls, can vary within a game if they become wet. The current mass of the object determines the amount of force that needs to be applied to gain the desired result.

6.6.2 Questions

Revision

1. **Define** the term 'linear motion'. **Identify** two different sporting activities where players utilise linear motion for some of the time. (P9) (2 marks)
2. Use a sporting example to **explain** the difference between speed and velocity. (P9) (2 marks)
3. Choose one athletic event where speed is an advantage. **Explain** how biomechanical principles could be applied to improve speed in this event. (P9) (4 marks)
4. What is acceleration? **Describe** how application of biomechanical principles can improve acceleration. (P9) (4 marks)
5. What is the difference between linear and angular momentum? Use an example to **describe** how we would identify each in a sporting situation. (P9) (4 marks)
6. What is centre of gravity? Using examples from a sporting activity, **discuss** how centre of gravity is controlled to improve performance. (P9, P7). (5 marks)
7. **Explain** how a high jumper can clear the bar without their centre of gravity reaching the height of the bar. (P9) (3 marks)
8. **Explain** the importance of the line of gravity in movement. (P7) (3 marks)

9. What is meant by the term 'base of support'? **Describe** two activities that differ in the size required for the base of support. How do athletes in these activities control upper body movements from the base of support? (P9, P7) (5 marks)
10. **Explain** how extending the arms while walking across a log assists with balance. (P7) (2 marks)
11. **Explain** why the ability to float might vary from one person to another. (P7) (4 marks)
12. **Discuss** the relationship between body density and the way we float (or sink). (P7) (5 marks)
13. **Describe** the relationship between the body's centre of gravity and centre of buoyancy in terms of flotation position. (P9) (5 marks)
14. **Describe** how drag and lift forces impact on the flight of a javelin. (P9) (4 marks)
15. **Discuss** the factors that impact on the amount of drag a body or object experiences in fluid environments. (P9) (5 marks)
16. **Explain** the difference between surface drag and profile drag. (P9) (4 marks)
17. **Describe** how streamlining improves swimming efficiency. (P9) (2 marks)
18. Use examples to **explain** developments that have taken place to reduce the impact of drag. (P9) (4 marks)
19. **Describe** how spin affects objects that are moving through a fluid environment. (P9) (3 marks)
20. **Explain** the Magnus effect in terms of pressure differences and resulting flight path. (P9) (4 marks)
21. **Define** Newton's third law. Use the law to **explain** the difference between applied and reaction force and how these are applied to typical sporting activities. (P9) (5 marks)
22. **Describe** how forces are absorbed in the body. Using a catch in cricket as an example, **explain** how the absorption of forces can be more effective and less painful. (P9) (4 marks)
23. Using the topspin serve as an example, **discuss** the factors that affect the application of force to objects. (P7, P9) (4 marks)

Extension

24. **Explain** the difference between topspin, backspin and sidespin. In your answer, use examples of how these types of spin are applied in sports using the hand, foot, racquet and a golf club. (P9) (4 marks)
25. Copy the following table on to a large piece of paper. Divide the class into four groups and complete one of the concept areas each. Have groups report their findings. Complete the full table based on class feedback and keep the information as a summary of the chapter. (P7, P9) (5 marks)

Concept	Specific principle	Example to explain how this principle influences movement
Motion	Linear motion Velocity Speed Acceleration Momentum	
Balance and stability	Centre of gravity Line of gravity Base of support	
Fluid mechanics	Flotation Centre of buoyancy Drag Lift Magnus effect	

(*Continued*)

Concept	Specific principle	Example to explain how this principle influences movement
Force	Applying forces Absorbing forces Applying force to objects	

Note: For an explanation of the key words used in the revision questions above, see Appendix 2, page xxx.

on Resources

Interactivity: Revision quiz: auto-marked version (int-7241)
Interactivity: Missing word interactive quiz (int-7242)
Digital doc: Revision quiz (doc-26263)

6.6.3 Key terms

Acceleration is the rate at which velocity changes in a given amount of time. *p. 242*
Angular momentum is the quantity of angular motion in a body or part of a body. *p. 244*
Applied forces are generated by muscles working on joints. *p. 262*
Average total body density is an average of all the specific densities of body components such as bones, teeth and lungs. *p. 252*
Backspin is the opposite and occurs when a ball or object rotates backwards causing it to fall slowly at the end of flight. *p. 259*
The **base of support** refers to an imaginary area that surrounds the outside edge of the body when it is in contact with a surface. *p. 250*
Biomechanics is a science concerned with forces and the effect of these forces on and within the human body. *p. 238*
The **boundary layer** is that layer of fluid whose speed is reduced because it is attached to the surface of an object that is moving through it. *p. 256*
Buoyant force is the upward force on an object produced by the fluid in which it is fully or partially submerged. *p. 252*
Centre of buoyancy is the centre of gravity of a volume of water displaced by an object when it is immersed in that water. *p. 253*
The **centre of gravity** of an object is the point at which all the weight is evenly distributed and about which the object is balanced. *p. 245*
Centrifugal force is a force directed away from the centre of a rotating body. *p. 267*
Centripetal force is a force directed towards the centre of a rotating body. *p. 267*
The **density** of a body or object refers to its mass per unit volume. *p. 252*
Displacement is the movement of a body from one location to another in a particular direction, or an 'as the crow flies' measurement. *p. 240*
Drag is the force that opposes the forward motion of a body or object, reducing its speed or velocity. *p. 255*
To **float** is to maintain a stationary position on the surface of the water. *p. 251*
Fluid mechanics is a branch of mechanics that is concerned with properties of gases and liquids. *p. 251*
Force (biomechanics) is the push or pull acting on a body. *p. 262*

Laminar flow is a streamlined flow of fluid with no evidence of turbulence between the layers. *p. 256*
Lift is the component of a force that acts at right angles to the drag. *p. 255*
The **line of gravity** is an imaginary vertical line passing through the centre of gravity and extending to the ground. *p. 248*
Linear momentum is a property of a body that is moving. It is equal to (or a product of) its mass × velocity. *p. 244*
Linear motion takes place when a body and all parts connected to it travel the same distance in the same direction and at the same speed. *p. 239*
The **Magnus effect** explains why spinning objects such as cricket and golf balls deviate from their normal flight paths. *p. 259*
Mass refers to the amount of matter in a body. *p. 244*
Momentum (biomechanics) refers to the quantity of motion that a body possesses. *p. 244*
Motion is the movement of a body from one position to another. *p. 238*
Power (biomechanics) is the ability of muscle groups to contract at speed. *p. 264*
Profile drag (also called **form** or **pressure drag**) refers to drag created by the shape and size of a body or object. *p. 256*
Reaction forces are equal and opposite forces exerted in response to applied forces. *p. 262*
Sidespin refers to rotation around a vertical axis causing the ball or object to curve left or right during flight. *p. 259*
Specific density is the density of a particular tissue type such as bone or lung tissue. *p. 252*
Speed is equal to the distance covered divided by the time taken to cover the distance. *p. 241*
Surface drag or **skin friction** refers to a thin film of the fluid medium sticking to the surface area of the body or object through which it is moving. *p. 256*
Topspin occurs when a ball or object rotates forward on its horizontal axis causing it to drop sharply. *p. 259*
Velocity (average) refers to the rate of positional change of an object and is calculated using displacement divided by the time. *p. 240*
A **wake** is an area of turbulence behind an object moving through a fluid. *p. 256*

TOPIC 7
First aid

OVERVIEW

7.1 Setting priorities for managing a first aid situation and assessing the casualty
7.2 Crisis management
7.3 Management of injuries
7.4 Management of medical conditions
7.5 Physical environment
7.6 Infection control and protection
7.7 Legal and moral dilemmas
7.8 Support following first aid situations
7.9 Topic review

OUTCOMES

In this topic students will:

- propose actions that can improve and maintain an individual's health (P6)
- demonstrate strategies for the assessment, management and prevention of injuries in first aid settings (P12)
- form opinions about health-promoting actions based on critical examination of relevant information (P15)
- use a range of sources to draw conclusions about health and physical activity concepts. (P16)

The priority when assessing and managing first aid patients is minimising the harm to:

- yourself
- bystanders
- the casualty.

When managing the first aid situation, it is important that the circumstances and eventual outcomes for the patient are improved as much as possible. Expediency and appropriate care here positively affect the individual's quality of life.

7.1 Setting priorities for managing a first aid situation and assessing the casualty

7.1.1 Situational analysis

For most of our lives few, if any, emergencies requiring us to use life-sustaining skills ever happen. However, there is a chance that at some stage we may need to resuscitate a person whose breathing or heart function (or both) have ceased. This could be the result of a range of circumstances, including:

- a car accident
- drowning
- electric shock
- a serious sporting injury
- a heart attack
- a stroke
- drug overdose
- envenomation (bites by snakes, spiders, etc.).

To deal with this quickly, effectively and without risk to yourself or others, you need to:

- *analyse the situation.* Observe what has happened (poisoning, car accident, drowning, etc.) and ask yourself: 'What's the best I can do for this person in terms of the skills that I have?'
- *plan how to deal with the situation.* Prioritise your intended actions, dealing with the most important issues first.
  - Use bystanders (if available) to get medical assistance and help where necessary.
  - Minimise danger to yourself and others.
  - Clear airways and restore breathing.
  - Control bleeding.
  - Tend to other injuries, such as burns and fractures.

You may be alerted to a potentially life-threatening situation by instances such as:

- the noise of a car crash
- a scream if a person is bitten by a venomous spider
- smoke
- an alarm
- being part of a situation where an accident or mishap occurred, such as a sporting injury or electrocution in the home.

In these situations it is essential that your life and safety are not placed at risk. You need to approach the situation and remain alert to possible environmental hazards that may have contributed to the accident or occurrence. You must not become a victim yourself. For example:

- a house or room may be filled with smoke. Entering the room without proper equipment will cause you to suffocate.
- you may be tempted to save a drowning person when you cannot swim
- a person may be trapped in a burning car and the chance of the fuel tank exploding is imminent.

You cannot administer effective first aid if you are injured in attempting to help someone else. All first aid situations need to be approached with caution as further injury only serves to compound an already difficult situation. A commonsense approach in managing potential dangers together with the need to work within one's training and expertise will ensure the best outcome for all people involved.

Use the **Australian Resuscitation Council** weblink in the Resources tab to explore further.

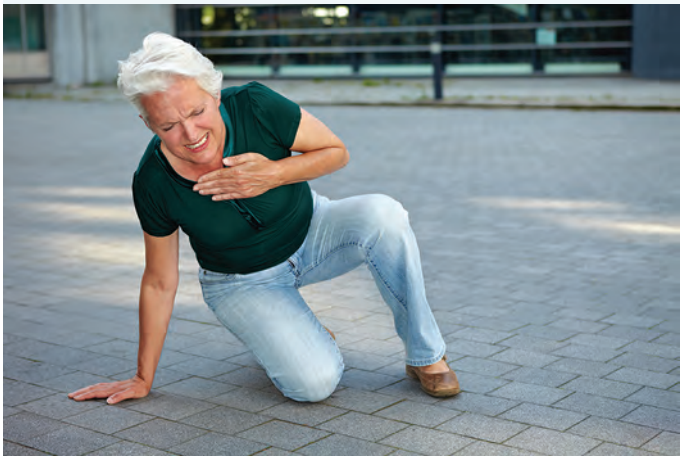
on Resources

Weblink: Australian Resuscitation Council

7.1.2 Priority assessment procedures

In emergency situations, it is important to act quickly but calmly. Urgency is critical because if the passage of air to the lungs is blocked or the heart has ceased to beat, brain function progressively shuts down. Each second lost places the patient at further risk of brain damage and death.

FIGURE 7.1 Settings where first aid may be required are many and varied.



The first person to arrive should tend to the immediate needs of the patient while a second person, if available, should focus on contacting an ambulance and using bystander assistance to locate first aid equipment such as an AED (automated external defibrillator). Should two people arrive at the same time, the most experienced should immediately attend to the casualty.

Procedures to follow during an emergency may include:

- requesting a mobile phone from bystanders
- contacting emergency services
- directing people to go for help
- instructing people on how to give two-operator cardiopulmonary resuscitation
- requesting assistance with bandaging, control of bleeding or attaching slings and splints
- observing people who may be in a state of shock.

When contacting emergency services, the following order of priorities needs to be observed.

- Dial 000, or 112 from a mobile phone, and request help.
- State the type of accident (car, drowning, electrocution, etc.).
- State the number of people injured, approximate age(s), their condition and the aid that is currently being provided.
- Clearly identify the location by providing the house number, street and suburb. If an accident has happened on the road, name the road and the nearest cross-street if possible.

Inquiry

Managing emergency scenarios

From a class discussion, generate a list of situations that people are likely to come across that may require emergency care (for example, plane crashes, emergency landings, being trapped in a snow cave). Have each person in the class briefly write a scenario for one of the incidents. Read each scenario. As a group, suggest the potential dangers that exist and develop an overall management plan for handling each situation.

FIGURE 7.2 The Australian Red Cross produces a free app with first aid basics including instructions for CPR.

7.1.3 DRSABCD

The DRSABCD action plan is easy to remember and, when the procedures are carried out correctly, you have the best chance of sustaining life, preventing further injury and minimising risk to all. Follow this plan when you believe someone is not breathing or their heart has stopped beating. The DRSABCD basic life action plan is summarised in table 7.1.

TABLE 7.1 DRSABCD basic life action plan

D	Danger	Check for dangers and hazards to the rescuer, bystanders and the casualty.
R	Response	Assess the level of consciousness of the casualty.
S	Send for help	Call triple 000, or dial 112 if using a mobile phone, for an ambulance or ask another person to make the call.
A	Airway	Open, clear and maintain the casualty's airway. Check for signs of life.
B	Breathing	Look, listen, feel. If breathing, place in the recovery position. If not, place on back and start CPR.
C	CPR	Give chest compressions followed by rescue breaths at a ratio of 30:2.
D	Defibrillation	Where possible, ensure a defibrillator is utilised as quickly as possible.

Danger

The first step is to check for danger to:

- yourself
- other people
- the patient.

No further steps should be taken until all elements of danger are removed. This may require actions such as:

- turning off the power at a light switch or fuse box
- dragging an injured person away from flames or dangerous fumes
- extinguishing flames or removing flammable liquid.

The danger of cross-infection from communicable diseases, such as tuberculosis and meningitis, is of concern to many. However, the risk of cross-infection from mouth contact during rescue breathing is very low. Use of a mask if available will lower the risk but some people may be unwilling, untrained or uncomfortable with the procedure altogether. If this is the case, they should be shown how to perform chest compressions and be instructed to assist in this manner.

Response

The next step for the rescuer is to determine the victim's level of consciousness. They may be unconscious and therefore unable to respond in any manner, or partly conscious and able to make some response such as a groan or movement. To assist in making an assessment, the rescuer should gently squeeze the shoulder of the victim and ask questions or give commands in a loud voice, such as 'Can you hear me?', 'Open your eyes' or 'Squeeze my hand'. If there is a response, place the victim in the recovery position and seek medical help.

FIGURE 7.3 Check the patient's response.

Management of a conscious patient

Management of a conscious patient requires

- treating shock, bleeding, fractures and other injuries as may be required
- placing the patient in a comfortable position, taking into account the type of injuries sustained.

Priority with an unconscious patient

If a patient is unconscious, rescuers must be aware of two important considerations. The first relates to the airway. This must be kept open regardless as brain damage will quickly be caused through lack of oxygen if the airway is blocked. The second relates to the potential for spinal injury. Here rescuers must avoid twisting movements of the head and neck as movements of this nature may further aggravate an injury. However, the priority always is to keep the airway open even if this involves manipulations that may require head and neck twisting.

How to place the patient in the recovery position

- Kneel beside the unconscious patient, knees slightly apart and centred between the patient's shoulders and waist.
- Lean across the patient and grasp the arm on their far side. Extend this arm out from the body.
- Take the patient's nearest arm and place this across their chest so that their hand rests on the shoulder of the arm that is extended (figure 7.4).

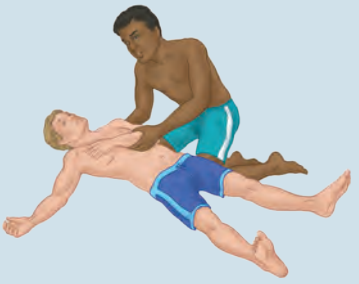


FIGURE 7.4 Preparing the patient to be moved into the recovery position

- Place your hand that is nearest to the patient's leg behind their knee while supporting the shoulders with the other hand. Lift the leg until the foot is flat on the floor (figure 7.5).

FIGURE 7.5 Positioning the nearest knee in preparation for the roll

- Using both hands, roll the patient away from you and on to their side. The lower arm should still be outstretched. The upper leg should roll across and on to the floor. The neck may need to be supported. The patient is now in the recovery or lateral position (figure 7.6).

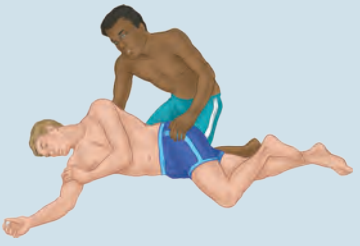


FIGURE 7.6 Patient in the recovery position

Send for help

If there is no response, immediately send for help by dialling triple zero (000) and indicate ambulance, fire or police. If other people are present, have them make the call while you check the airway and breathing. The person making the triple zero call should be prepared to answer questions and be aware of the condition of the patient. Questions may relate to the specific location (house number and street), access, type of injury (for example, drowning), number of people injured, estimated age, breathing and level of consciousness. Remember to stay on the phone as there may be more questions and possibly instructions given until emergency personnel arrive.

FIGURE 7.7 The head tilt and jaw support

Airway

If there is no response, it could well be that the airway is blocked, preventing oxygen from reaching the brain. Simply opening the airway could well be sufficient to start a recovery. Ensuring that the airway is open is critical as all further action will be in vain if the blockage remains.

The airway can be checked after tilting the head back. This is performed by placing one hand on the forehead and the index finger and thumb of the other hand on the chin, then gently extending the neckline. This procedure is carried out while the patient is lying on their back, except in drowning cases where the patient is placed in the lateral or recovery position (see figures 7.4, 7.5 and 7.6). The degree of head tilt increases with the age of the casualty. In the case of infants, head tilt is not required but the head must always be supported during the administration of rescue breaths. Some head tilt is required with young children, increasing to full head tilt (keeping safety in mind) with adults.

FIGURE 7.8 Opening the airway by extending the neckline

Any foreign objects may then be cleared by inserting fingers carefully into the mouth. False teeth need not be removed unless they have become dislodged from their original position. It is desirable that the head is tilted backwards and slightly downwards to permit drainage of fluid and mucus from the mouth.

FIGURE 7.9 The mouth must be cleared of foreign objects as these may stop the passage of air to the lungs.

With the airway cleared, the rescuer can now look for any *signs of life*. These signs are if the victim is:

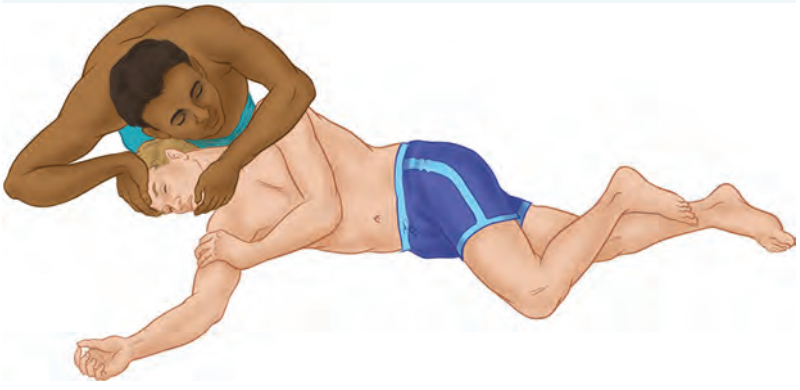
- conscious or unconscious
- responsive or unresponsive
- moving or not moving
- breathing or not breathing

If breathing commences:

- leave the patient in the same position ensuring that the head is tilted and the airway remains open
- reassure the patient
- send for medical assistance.

If the patient is breathing but unconscious, place the patient in the recovery position and support him or her until help arrives.

FIGURE 7.10 Looking for signs of life in a drowning victim



Breathing

The check for breathing should take five to 10 seconds and certainly no more than 10 seconds. Some patients, particularly adults, may gasp during the first minutes following collapse. Rescuers need to be aware of the difference between gasping and breathing. During a gasp, the patient will draw in breath sharply. This short, convulsive intake of air should not be mistaken for breathing.

Rescuers need to focus on determining whether or not breathing is present. If breathing is not present, **cardiopulmonary resuscitation (CPR)** must begin immediately. Cardiopulmonary resuscitation is a life-sustaining procedure that uses chest compressions and rescue breathing to stimulate blood flow and oxygen delivery when a person has stopped breathing or their heart has stopped beating.

CPR

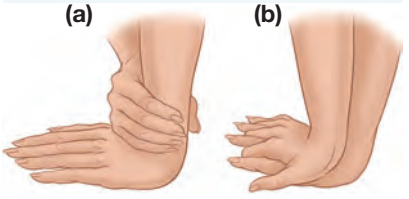
Chest compressions begin immediately and should be given at the rate of about 100 per minute. Rescuers should push hard and fast, briefly relaxing after each downward thrust to allow the chest to return to its normal position. Chest compressions keep the blood flowing so it is important to maintain a rhythm that is interrupted only by brief rescue breaths.

FIGURE 7.11 Place the heel of the hand on the chest at about the nipple line.

To perform a chest compression:

- maintain the same kneeling position as required for the rescue breath
- locate the breastbone (centre of the chest) at about the nipple line and on it place the heel of one hand. Fingers should be parallel to the ribs (figure 7.11).
- place the heel of the other hand on top and either interlock the fingers or hold the wrist so that the arms work as one (figure 7.12)
- the rescuer's shoulders should be directly above the patient's chest, allowing body weight to assist the compressions. Providing chest compressions can be exhausting, so it is important for the rescuer to use their weight, not just their arms.
- the depth of compressions should be about one-third of the depth of the chest for all age groups
- focus on making each compression a smooth, rhythmical action, the downstroke (compression) taking the same period of time as the upstroke (relaxation phase)
- for infants, use only two fingers to apply compressions. These should be placed slightly below the nipple line (figure 7.13).
- in the case of children, rescuers decide between one or two hands depending on the size of the patient (figure 7.14).

FIGURE 7.12 **(a)** Keep the palm flat and grip the wrist firmly with a thumb/finger lock or **(b)** fingers interlocked.



If two rescuers are present, the roles should be changed approximately every two minutes because of the tiring nature of the procedure.

FIGURE 7.13 Use two fingers when giving CPR to infants.

FIGURE 7.14 Use one or two hands when giving CPR to children.

The second step in providing CPR is to give the patient two **rescue breaths**. A rescue breath is a breath given to a victim who is not breathing. The breath takes one second to deliver and makes the victim's chest rise.

In providing a rescue breath, it is important to breathe normally. Do not take a big breath or blow hard into the patient's lungs. A normal breath should be sufficient to make the patient's chest rise. Do not check the pulse, but continue to be aware of any signs of life in the patient.

To perform a rescue breath:

- kneel beside the patient and tilt the head back
- place the thumb across the chin, the index finger underneath and then lift the chin
- pinch the nostrils with the thumb and index finger of the hand providing the head tilt
- place your mouth firmly over the person's mouth making an airtight seal
- take one second to breathe into the patient's mouth
- turn your head towards the patient's stomach and place an ear close to the patient's mouth. Listen for air being exhaled and watch for a fall in the chest.

FIGURE 7.15 Give the patient two rescue breaths.

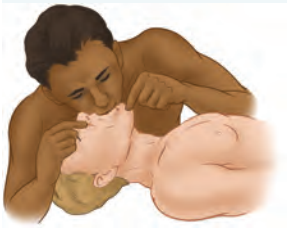


FIGURE 7.16 Watch for the patient's chest to fall after a rescue breath.

It is important for the rescuer to observe the chest following the first rescue breath. If it fails to rise, the head-tilt chin-lift needs to be done again to ensure there is no obstruction to the airway. Then provide the second rescue breath.

Rescuers should continue the cycle of 30 chest compressions followed by two rescue breaths until:

- signs of life return
- more qualified help arrives
- continuation is impossible due to exhaustion
- an authorised person pronounces life to be extinct.

FIGURE 7.17 Two-operator CPR

Signs of life:

- responsive
- conscious
- breathing
- moving

Application

Demonstrate CPR procedure using a manikin

Form groups of three and assign a manikin to each group. Allocate the following roles:

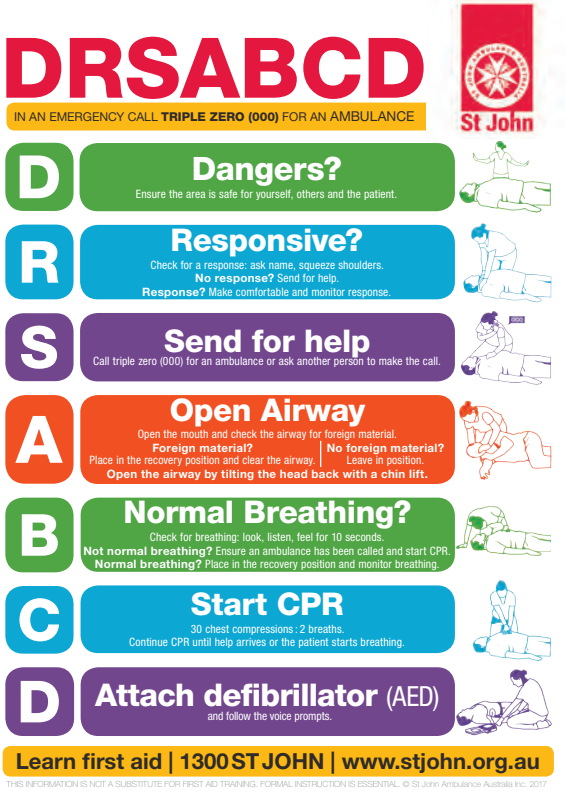
- rescuer
- bystander
- observer.

In the demonstration, the rescuer prepares for and then performs CPR on the manikin for two minutes, following which he/she is then assisted by the bystander for a further minute. The role of the observer is to make notes on the demonstration and then provide feedback that addresses the following:

- positioning (on back, head tilt, chin lift)
- checks for signs of life (responsive, conscious, breathing, moving)
- finds no signs of life (begins CPR)
- procedure (30 compressions followed by two rescue breaths)
- observation (looks, listens, feels)
- timing (30 compressions to two breaths, aiming for 100 compressions and no more than eight breaths per minute — or, if unwilling to do mouth-to-mouth, perform continuous compressions at a rate of approximately 100 compressions per minute)
- mouth seal — must be effective
- capacity of rescue breath (sufficient to raise chest)
- position of shoulder and arms (directly over chest)
- depth of compressions (one-third depth of chest)
- rhythm of compressions (50:50 compression to relaxation).

Rotate roles at the end of two minutes and then take time to provide feedback. Have the group cycle through the demonstration at least three times, or until the CPR can be demonstrated accurately and effectively.

FIGURE 7.18 The basic life support flowchart



Defibrillation

Use of **defibrillators** greatly improves the chances of survival, particularly following a heart attack. A defibrillator is a device that provides an electric shock to a patient whose heart has stopped beating. It can be used on any adult or a child aged over one year. Once an automated external defibrillator (AED) is turned on, voice prompts/visuals will guide the person or persons giving first aid through the process including attachment of the pads. It will still be necessary to provide further compressions and breaths after each shock if a

number need to be delivered by the AED. It is important to follow the voice prompts/visuals, which will provide all necessary instructions until ambulance officers arrive.

Defibrillators were once used only in hospitals. They are now regularly used by ambulance officers and other qualified rescue personnel. In fact, AEDs are now available in NSW schools and some public places such as clubs, stadiums and major shopping centres. There is a push to have them in all places where large groups of people gather, and particularly on trains and buses. They are easy to use, have simple to follow instructions and do not require qualifications to carry out the required procedure.

Some emergency care situations involve multiple injuries and CPR may be needed. In situations like this, you need to prioritise, working progressively from the most to the least serious condition. Priority order can be remembered if you keep in mind the four Bs and work through them in the following order:

1. Breathing
2. Bleeding
3. Burns
4. Bones.

FIGURE 7.19 An automated external defibrillator (AED). These are easy to use by people without any first aid qualifications. If used in the first three to five minutes of a person suffering sudden cardiac arrest, survival chances are increased dramatically.

Application

Scenario test

You are lying on your bed reading a book. You hear a loud noise and your reading light goes out. You race to the kitchen and arrive at the same time as your older sister. You find your younger brother, Ben, lying on the floor, apparently unconscious. There is smoke coming from the toaster which has fallen from the bench.

In groups of three, re-enact this situation. Demonstrate the procedures you would follow in providing emergency care to Ben if:

- you were the only person other than Ben in the house
- you now have help from your older sister who knows little about emergency care.

During the scenario, practise the transition from one-operator to two-operator CPR and coordinate the operations.

Inquiry

Prioritising emergency procedures

1. Discuss how effectively the emergency procedures required in the application above were put into place.
2. What role did you give to your sister? Why?
3. Discuss how you would allocate priorities in situations where you have a number of helpers, but none of them have emergency care experience.

7.1.4 STOP regime

Using the STOP regime for evaluation of suspected injuries precedes a whole of body assessment. Use of STOP, particularly in sports situations, increases the chances of correct diagnosis of minor injuries, leading to a more accurate whole of body assessment.

FIGURE 7.20 The STOP regime

STOP regime

If you have established that there is no danger to life, use the STOP regime to assess the severity of other injuries such as injury to ligaments, tendons and muscle. STOP is an acronym for

Stop
Talk
Observe
Prevent further injury.

Stop	Stop the athlete from participating or moving. Stop the game if necessary.	→	Don't panic — stay cool.
Talk	Talk to the injured athlete. • What happened? • How did it happen? • What did you feel? • Where does it hurt? • Does it hurt anywhere else? • Have you injured this part before?	→	Provide a few words of encouragement.
Observe	Observe the following while talking to the athlete. **General:** • Is the athlete distressed? • Is the athlete lying in an unusual position/ posture? **Injury site:** • Is there any swelling? • Is there any deformity? • Is there any difference when compared to the other side/limb? • Is there tenderness when touched? • Does it hurt to move the injured part?	→	If the answer to any of these questions is yes, seek an ASMF accredited sports trainer or qualified first aid support.
Prevent further injury	**Three options**		
	Severe injury Suspected head, facial, spinal, chest, abdomen injuries, fractures or major bleeding	→ *Get help* Get professional help; don't move the athlete. →	• Keep onlookers away. • Comfort the athlete until professional help arrives.
	Less severe Soft tissue injuries such as sprains, strains and muscle bruises	→ *RICER regime* The first 48 hours are vital with soft tissue injuries. →	• Rest • Ice • Compression • Elevation • Referral
	Minor injuries Bumps and bruises that do not impair performance	→ *Play on* A few words of encouragement will help. →	• Monitor any such injuries. • Minor injuries should also be managed using the RICER regime.

Source: © The STOP Regime, Matthew Reid, Sportsafe, Australian Sports Medicine Federation and Australian Sports Commission, Canberra, 1990.

The same applies if the injury is incurred outside a sporting situation. The injured person needs to demonstrate that they can perform movements, skills or actions without assistance. If there is any doubt about the risk of further injury to the injured person, consult an appropriate professional.

7.2 Crisis management

7.2.1 CPR

In cases where the danger has been removed, the patient has been rolled into the recovery position and the airway checked for materials that might cause an obstruction, there is still a chance that breathing will not commence. In these situations, *cardiopulmonary resuscitation* (*CPR*) must be administered.

Review section 7.1.3 where the procedure for compressions and rescue breaths for CPR is described in detail. Use the **CPR demonstration** weblink in the Resources tab to view a video.

on Resources

Weblink: CPR demonstration

7.2.2 Bleeding

Bleeding is the loss of blood from any of the body's blood vessels. By observing a wound, it is possible to determine the type of vessel that is damaged. If the blood comes from an artery it will be bright red and may spurt. If the blood is from a vein it will be darker and the flow is not as forceful. If the blood is from a capillary it will tend to ooze. The first two types of cut are life threatening and require immediate attention.

Bleeding is caused by cuts, contusions, lacerations and abrasions. Most bleeding happens externally, as in the case of a bleeding nose or a laceration to the leg. The steps for management of bleeding from a laceration or similar injury are:

- use the DRSABCD action plan (see section 7.1.3)
- apply direct pressure by holding a pad or dressing firmly over the site
- lay the casualty down and elevate the injury
- rest the injured area
- do not give anything to the patient by mouth, particularly aspirin, as this tends to increase the rate of bleeding
- loosen tight clothing
- seek medical advice.

The acronym PER is helpful in remembering what to do in the case of bleeding. It stands for:

- **P**ressure
- **E**levation
- **R**est.

It is important that embedded objects (for example, gravel and broken glass) and bandages that are soaked with blood are not removed as this may increase both the damage to the injury and allow further loss of blood. Where possible, wear gloves to minimise infection through blood-to-blood contact.

7.2.3 Shock

Shock is a condition where the body closes off the blood supply to the extremities (arms, legs and skin) to ensure enough oxygen reaches vital organs (heart, lungs and brain). This can be potentially damaging and even life threatening as it may lead to the collapse of the circulatory system. The causes of shock include:

- loss of blood from a wound
- loss of fluid, as happens with dehydration, burns and bleeding
- heart attack
- being involved in an accident.

The most common symptoms of shock are:

- paleness and cold, clammy skin
- weak, rapid pulse

- rapid, shallow breathing
- nausea and faintness.

In the event of shock, use the following management procedures:

- Use the DRSABCD action plan.
- Reassure the patient.
- Seek medical advice.
- If there is no evidence of fracture to the person's limbs, raise the legs above the level of their heart.
- Dress any wounds or burns.
- Loosen any restrictive clothing, particularly around the neck.
- Keep the casualty comfortable (not too hot or cold), but do not give them any food or drink.

7.2.4 Neck and spinal injury

The signs and symptoms of a neck or spinal injury are:

- pain at or below the site of the injury
- loss of movement
- lack of movement below the site of the injury
- tingling in the hands or feet.

Management of neck and spinal injuries

If the casualty is conscious:

- reassure them
- loosen any tight clothing
- do not move them. Support their head and apply a cervical collar if one is available.
- seek medical attention
- monitor the casualty closely.

If the casualty is unconscious, treat them as if they have a spinal injury and use the DRSABCD procedures. Be careful when turning the patient onto their side. Apply a brace to the neck if possible and try to minimise all neck movement.

7.2.5 Moving the casualty

Unless absolutely essential, a casualty should not be moved. However, there may be some situations where it is necessary to move a casualty quickly, such as

- from a smoke-filled room
- to higher ground level because of rising water
- from a building that is in danger of collapse.

However, if there is no impending danger, the preferred method of transport is by ambulance. This is because medical officers are trained how to move injured people and have the necessary equipment and vehicle to do so. Unnecessary movement may further complicate the injury and make rehabilitation more difficult.

If a casualty needs to be moved, use the following guidelines.

- Work through the DRSABCD regime.
- Work with the patient and tell them what you intend doing. Seek their help when you move them.
- Ensure that fractures have been immobilised and other injuries such as burns or punctures treated.
- If you need to lift the injured person, use your leg muscles and keep your back straight.
- Hold the patient firmly and communicate with them frequently so that you become immediately aware of any problems when you are moving them.
- Stop as often as is necessary.
- Minimise movement of the neck and spinal cord.

Application

First aid scenarios

Prior to the lesson, have one student copy the following scenarios to cards:

1. You are the first to arrive at a traffic accident where the driver is conscious but bleeding from the face and hands.
2. Your brother is cooking vegetables on the stove and accidentally knocks the handle of a saucepan, tipping boiling water on to his thigh.
3. Two cars have collided. The driver of one car remains conscious but trapped, while there is no movement from the driver of the other car. A passenger in that car becomes hysterical.
4. Your best friend asks you to come to her house urgently. When you get there you find her unconscious on the floor with an empty pill bottle beside her.
5. You are relaxing by the river watching people waterski. One of the skiers hits a submerged log, throwing him off balance. He is picked up by the boat driver, but complains of severe pain in the back and that he has no feeling in one of his legs.
6. You are at a party when a fight breaks out. Your friend is hit on the nose and mouth, causing bleeding and dislodging a tooth.
7. You are the first to arrive at a car accident where the driver is unconscious at the wheel, having sustained facial injuries. There is a strong smell of alcohol.

During the lesson, the student should distribute the cards to small groups and allow each group five minutes to conduct an assessment of the situation, then plan an appropriate response.

Pass the cards around the groups until all students have addressed each scenario. At the conclusion, the student leader collects the cards and shuffles them. The leader then chooses a card, reads the scenario and selects a person from each group to briefly report on their response to the situation. Encourage class discussion of issues and evaluate the responses.

7.2.6 Medical referral

The patient needs to be sent to hospital if any of the following happened:

- CPR was required
- the patient was unconscious at some stage
- conditions such as a heart attack or spinal injury were suspected.

7.2.7 Care of the unconscious casualty

Proper care of an unconscious person includes

- rolling them to the recovery position when breathing returns
- supporting their neck to ensure that it remains extended and allows a passageway of air to the lungs
- if outdoors, protecting them from the weather
- keeping them warm
- not giving them food or drink until a medical officer gives approval. This is particularly important where surgery may be required.
- collecting details about the history of the injury.

Inquiry

Utilising safe procedures when moving a casualty

In groups, discuss procedures that need to be employed to safely move a casualty in each of the following scenarios.

- A person has a suspected heart attack while at work in a city office block
- A glass repair worker has cut his arm while repairing a window in a suburban house
- A person suffers shock following a car accident on a country road

- A player incurs suspected neck and spinal injuries as a result of a tackle during a school football game. Report your findings to the class.

7.3 Management of injuries

Individuals can sustain a wide range of injuries. It is particularly important to be able to identify the symptoms for each type of injury and be familiar with the appropriate management techniques. Paying careful attention to the surrounding environment (such as the presence of electrical wires) and gaining an account of what happened from listening to the injured person or bystanders helps assess the type of injury and determine the management technique. Table 7.2 lists types of injury, their associated symptoms and a suggested management plan.

TABLE 7.2 Types of injury, associated symptoms and management

Type of injury	Signs and symptoms	Management
Cuts and lacerations		
• abrasions	• scraped skin caused by a fall on a hard surface	• cleanse thoroughly with sterile material • apply nonstick dressing
• open wounds	• incisions or lacerations	• DRSABCD • control bleeding using pressure • cleanse thoroughly • apply clean dressing • seek medical attention
• penetrating wounds	• deep wound from an object, for example, a bullet	• control bleeding using pressure • clean if possible • apply clean dressing • seek medical attention
Fractures. These can be closed (skin unbroken), open (bone protrudes) or complicated (damage to organs).	• sound from the bone breaking • pain at the site • swelling and deformity • tenderness • loss of power • difficult to achieve normal range of movement	• DRSABCD • control bleeding • immobilise with a sling or splints • observe for shock and treat if necessary • seek medical attention
Dislocations — this refers to the bone being dislodged from the joint	• swelling • discolouration • pain • deformity • tenderness • inability to move	• DRSABCD • support • apply ice • elevate if possible • seek medical attention
Head injuries and concussion	• blurred vision • loss of memory • headache • change in size of one pupil • bleeding from nose or ears • abnormal response to commands	• DRSABCD • support the head or neck • keep airway open • if conscious, lay in the lateral position • do not apply pressure to a bleeding head if a skull fracture is suspected • seek medical attention

(*Continued*)

TABLE 7.2 Types of injury, associated symptoms and management (*Continued*)

Type of injury	Signs and symptoms	Management
Eye injuries	• irritation to the eye • watering • redness • pain to the eye itself • inability to open	• rubbing and removal of embedded objects must be avoided • lay in the lateral position • cover both eyes • seek medical attention
Nasal injuries	• pain • swelling • deformity • bruising	• instruct casualty to breathe through the mouth • blowing the nose should be avoided • assume sitting position with head and shoulders leaning forward • apply pressure with the index finger and thumb to the soft part of the nose just below the bone • apply pressure for 10 minutes or until bleeding stops • seek medical attention
Burns. These can be caused by fire, chemicals, electricity and radiation.	• severe pain • possible swelling • redness • blistering • shock	• remove the casualty from the danger or the danger from the casualty (for example, fire, smoke, electrical wires with a stick or nonconducting implement) • DRSABCD • hold burnt area under cold running water • remove jewellery and clothing only if it is not stuck to the skin • seek urgent medical attention *Note:* Do not break blisters or apply creams, lotions or adhesive dressings.
Teeth injuries	• bleeding from the mouth • dislodged tooth	• if the tooth has been loosened, keep it in place and seek immediate dental advice • if the tooth has been knocked out, re-implant and splint to an adjacent tooth using aluminium foil, if possible. If not, place in milk or clean with the casualty's saliva and seek urgent dental assistance. Most teeth can be saved if the root is not handled, hygiene is observed and attention is immediate.
Electrocution	• unconsciousness • electrical wires may be visible	• DRSABCD • cool burnt area under running water • seek urgent medical attention
Chest injuries. These may range from bruised or fractured ribs to lung injuries.	• pain, usually on breathing and coughing • difficulty in breathing • tenderness when touched	• place in a comfortable position • encourage shallow breathing • pad the injured area • seek urgent medical advice
Abdominal injuries. These are injuries to the stomach and pelvis caused in such instances as car crashes and tackles.	• shock • pain in the region • nausea or possibly vomiting • difficulty in breathing • possible blood in the urine or coming from the anus.	• DRSABCD • loosen clothing in the area; for example, belts • lie patient on their back. Slightly elevate shoulders and bend the knees. • do not allow the casualty to consume food or drink • seek urgent medical attention.

7.3.1 Applying bandages, slings and splints

Folding a triangular bandage

To fold a triangular bandage:

- place an open triangular bandage on a flat surface
- fold the apex to meet the middle of the base
- halve to form a broad fold bandage
- fold the two ends in to meet at the centre
- fold the ends of the bandage to meet in the centre again
- fold the bandage in half to form a compact package.

Triangular bandages are usually stored folded this way.

Arm sling

The arm sling is used to support a fractured forearm and wounds to the arm.

- Reassure the casualty.
- Place the casualty in a comfortable position with the injured part supported.
- Face the casualty.
- Place the open triangular bandage across the chest with the point of the bandage well beneath the injured arm (apex level with the elbow).
- Take the upper point over the shoulder and behind the neck.
- Bring the lower point over the injured arm.
- Tie the two ends together with a reef knot on the injured side so that the knot fits into the hollow of the neck.
- Fold the apex neatly in front of the arm and pin or tape. Make sure the hand is fully supported and the fingernail of the little finger is exposed.
- Check for circulation.

Use the **Arm sling** weblink in the Resources tab to view a video.

Collar and cuff sling

The collar and cuff sling is used to elevate the arm when the hand or forearm are bleeding. It is also used when the humerus is injured.

- On a flat surface, roll a triangular bandage along its length.
- Pick up one end and form a circle that is about the size of your hand.
- Pick up the other end and form another circle of similar size.
- Place one circle on top of the other and slide on to the patient's arm.
- Pull the ends to secure at the wrist.
- Then pull the ends to the back of the neck and secure by tying.

Use the **Collar and cuff** weblink in the Resources tab to view a video.

Elevation sling

The elevation sling is used to stabilise the arm and upper body region in case of collarbone and shoulder injuries. It is also used to elevate bleeding hands to help slow the bleeding.

- Reassure the casualty.
- Place the casualty in a comfortable position, with the forearm from the injured side across the chest with fingers touching the opposite shoulder.
- Face the casualty.
- Drape the open bandage over the chest. The apex should be beyond the elbow and the upper point tucked under the fingertips.
- Ease the base of the bandage under the forearm and elevate the injured wrist.

- Cover the arm with the bandage and pinch the material at the elbow.
- Tie the two ends with a reef knot on the uninjured side.
- Fold the apex neatly in front of the arm and pin or tape.
- Check for circulation.

Use the **Elevation sling** weblink in the Resources tab to view a video.

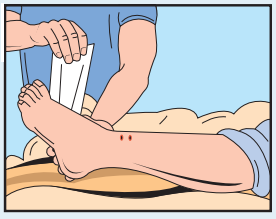
SNAPSHOT

Pressure immobilisation bandaging

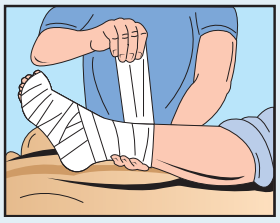
First aid for bites to the lower limb

The principle of pressure immobilisation bandaging as a first aid measure is to prevent the spread of toxins through the body. This is done by applying enough pressure to compress the lymph vessels, and by preventing movement of the affected limb.

The Pressure Immobilisation Technique (PIT) is recommended for application to bites and stings by:

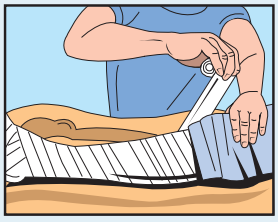


- all Australian venomous snakes, including sea snakes
- funnel-web spider
- blue-ringed octopus
- cone shell.

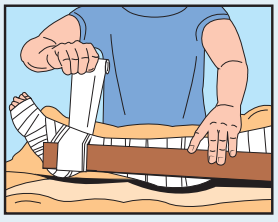


The Pressure Immobilisation Technique is NOT recommended for the first aid management of:

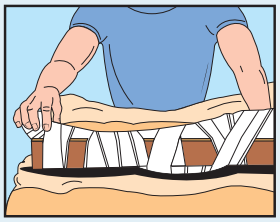
- other spider bites including redback
- jellyfish stings
- fish stings including stonefish bites
- stings by scorpions, centipedes or beetles.



If on a limb, apply a broad pressure bandage over the bite site as soon as possible. Elasticised bandages (10 to 15 cm wide) are preferred over crepe bandages. If neither is available, clothing or other material should be used. The bandage should be firm and tight; you should be unable to easily slide a finger between the bandage and the skin.

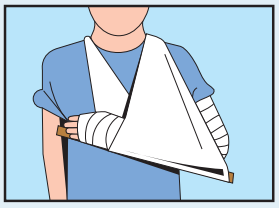


In order to further restrict lymphatic flow and to assist in immobilisation of the limb, apply a further pressure bandage, commencing at the fingers or toes of the bitten limb and extending upward to cover as much of the limb as possible. The bandage should be applied over existing clothing if possible. The purpose of this bandage is to further restrict lymphatic flow and assist immobilisation.



Splint the limb including joints on either side of the bite, to restrict limb movement. The splint material can be incorporated under the layers of the bandage. For the upper limb, use a sling.

Keep the victim and the limb completely at rest. Bring transport to the victim if possible. Transport the victim to medical care, preferably by ambulance.



Source: *A clinician's guide to Australian Venomous Bites and Stings* 2013 © Seqirus.

If the bite is not on the limb, applying firm direct pressure on the bite site may be useful. Do not restrict breathing or chest movement and do not apply firm pressure to the neck or head.

Note:

- DO NOT cut or excise the bitten area, or attempt to suck venom from the bite site.
- DO NOT wash the bitten area.
- DO NOT apply an arterial tourniquet. (Arterial tourniquets that cut off circulation to the limb are potentially dangerous and are not recommended for any type of bite or sting in Australia.)

Source: Australian Resuscitation Council.

Application

Applying bandages

Working in pairs, take turns to apply a splint, an arm sling and a pressure immobilisation bandage to your partner. (Bandages can be made from material or purchased from the Royal Life Saving Society of Australia.) Use the **How to tape** eLesson in the Resources tab to find out the correct way to apply supportive tape to a sports injury.

on Resources

Weblink: Arm sling
Weblink: Collar and cuff
Weblink: Elevation sling
eLesson: How to tape (eles-2580)

7.4 Management of medical conditions

Certain medical conditions require specialised attention. For example, treating a heart attack victim is different from treating a person suffering an asthma attack or an epileptic seizure. Table 7.3 provides information on how to recognise the most common medical conditions (signs and symptoms) and the management strategies that should be adopted in each situation.

TABLE 7.3 Signs, symptoms and management of common medical conditions

Medical condition	Signs and symptoms	Management
Heart attack — a life-threatening condition in which the heart ceases to function due to inadequate blood supply	• discomfort in the middle of the chest • possible pain in arm and neck • irregular pulse • shortness of breath • shock	• DRSABCD • seek urgent medical help

(*Continued*)

TABLE 7.3 Signs, symptoms and management of common medical conditions (*Continued*)

Medical condition	Signs and symptoms	Management
Stroke — caused by a sudden blockage of blood to the brain	• slurred speech • blurred vision • pupils may be irregular in size • loss of movement • possible seizures • possible loss of consciousness	• DRSABCD • seek urgent medical help
Diabetes — a condition where the body is unable to either produce or regulate the insulin required to maintain normal blood sugar levels	Prior to treatment • loss of body weight despite increased appetite • increased urination • increased thirst and hunger • irritability • aggressiveness • possible palpitations	• meals at regular intervals • eat complex carbohydrates as opposed to simple carbohydrates • regular exercise • appropriate timing of insulin • avoid large amounts of fat
	Hypoglycaemia (low blood sugar) • rapid pulse • profuse sweating • trembling • hunger • aggression • dizziness	• DRSABCD • seek urgent medical help • do not attempt to give glucose or drink to an unconscious patient • if conscious, administer glucose and drink as required
	Hyperglycaemia (high blood sugar) • rapid pulse • drowsiness, possibly progressing to unconsciousness • thirst • smell similar to acetone on breath • need to urinate frequently	• DRSABCD • seek urgent medical help • if conscious, allow the self-administration of insulin
Epileptic seizures — seizures triggered by an abnormally high discharge of electrical activity to the brain. They range from the more serious *grand mal* characterised by spasms and loss of consciousness to *petit mals*, commonly referred to as 'absences'.	Some *petit mals* may go almost unnoticed because the person may appear 'vacant' or 'absent' for a short period. More serious seizures can be recognised by the following: • rigid body • tightened jaw • some mouth frothing • possible loss of bladder control • loss of consciousness.	• DRSABCD • place in lateral recovery position • remove dangerous objects • during sleep, ensure that the airway is fully open and that the patient is breathing • check pulse • seek medical help

(*Continued*)

TABLE 7.3 Signs, symptoms and management of common medical conditions (*Continued*)

Medical condition	Signs and symptoms	Management
Asthma — condition whereby breathing difficulties are experienced due to constriction of the airways in the lungs	• tightness in chest • sweating and paleness • fast, shallow breathing • hunched body posture • excessive throat clearing • laboured breathing • difficulty in exhalation • increase in pulse rate • wheezing noises	• reassure the person • assist with medication • monitor breathing • provide water for them to drink • encourage controlled breathing and relaxation • seek medical help if their condition deteriorates
Anaphylaxis is a severe and sudden allergic reaction that occurs when a susceptible person is exposed to an allergen. The reaction appears within about 20 minutes and can rapidly become life threatening. The most common allergens are foods such as nuts and soy, and insect stings such as bee and wasp.	• breathing difficulties • swollen tongue and possibly swollen face, lips and eyes • difficulty talking • swelling or tightness in the throat • loss of consciousness • wheeze or persistent cough • hives, welts or body redness • vomiting, abdominal pain	• DRSABCD • remove the trigger and minimise the effects of co-factors; for example, spit out food, remove the sting • implement the individual's anaphylaxis management plan if known. Students in New South Wales schools who are known to be at risk should have an individual health-care plan providing details of an emergency response. The plan may require use of an EpiPen by trained staff. • seek urgent medical assistance (ambulance)
Poisons — substances that are harmful if taken into the body. They can be taken or absorbed in a number of ways, including swallowing, injection, inhalation or being absorbed through the skin.	• headache • blurred vision • vomiting • breathing difficulty • drowsiness • abdominal pain • tight chest • breath smells of fumes or other odours • possible change in skin colour • nausea	If the person is unconscious: • DRSABCD • seek urgent medical attention. If the person is conscious, determine the type of poison and treat accordingly. If the substance is unknown: • DRSABCD • do not induce vomiting • seek urgent medical attention. If the substance is corrosive (such as acids): • DRSABCD • do not induce vomiting • give milk or water • seek urgent medical advice. If the substance is medicinal or general: • DRSABCD • induce vomiting • seek urgent medical help.
Bites and stings **Snakebite**	• puncture marks • headache • double vision • rapid pulse • tightness in chest/breathing difficulties • faintness • sweating	• DRSABCD • rest • reassure the patient • apply a pressure immobilisation bandage over the site of the bite and beyond • immobilise the affected area • do not elevate • call for medical help

(*Continued*)

TABLE 7.3 Signs, symptoms and management of common medical conditions (*Continued*)

Medical condition	Signs and symptoms	Management
Bee and wasp	• sharp pain at the site of the bite • possible swelling	• remove sting by scraping or flicking sideways (do not squeeze) • apply ice • monitor for allergic reactions • seek medical advice
Redback spider	• stinging pain at the site • faintness • sweating • swelling • rapid pulse	• DRSABCD • reassure the person • apply ice • seek medical advice
Funnel-web spider	• intense pain at site of bite • profuse sweating • cold skin • shivering • sense of numbness • breathing difficulty • abdominal pain • nausea	• DRSABCD • reassure the person • apply pressure bandage over the bitten area and extend down the limb (see snapshot p. 292) • seek urgent medical attention
Bluebottles	• localised sting marks • pain • headache • vomiting • breathing difficulties	• DRSABCD • immerse the area in hot water to help alleviate pain • seek medical attention
Exposure to heat and cold **Heat exhaustion** — condition caused by dehydration. It is usually experienced by athletes working in hot, humid conditions.	• rapid, weak pulse • clammy, pale skin • headache • dizziness • profuse sweating • fatigue • extreme thirst • dilated pupils • loss of coordination	• DRSABCD • rest in cool, shaded area • provide cool water • apply ice to head, neck and other areas to cool the body • seek medical assistance
Heatstroke — a serious condition of extreme dehydration. It is characterised by a breakdown of the temperature regulatory mechanism and subsequent rapid rise in internal body temperature.	• disorientation leading to possible unconsciousness • marked increase in core body temperature • rapid pulse • hot, dry skin • fatigue • lack of sweat despite exertion • rapid breathing • constricted pupils • possible respiratory and cardiac arrest	• DRSABCD • seek urgent medical help • rest in shade • cool the body with wet towels and ice • provide plenty of water • do not wrap in blankets

(*Continued*)

TABLE 7.3 Signs, symptoms and management of common medical conditions (*Continued*)

Medical condition	Signs and symptoms	Management
Hypothermia — medical condition caused by exposure to very low temperatures, as might be experienced if trapped in a snowstorm	• shivering • weak pulse • slurred speech • slow response to instructions • shallow breathing	• DRSABCD • protect from the elements — wet ground, wind and rain • remove any wet clothing and replace with warm blankets. If possible, place casualty in a sleeping bag. • provide warm fluids to drink • do not use artificial measures such as electric blankets and hot water to provide extra heat • seek medical attention

7.5 Physical environment

The nature of the physical environment may, in part, have been responsible for the occurrence of the accident in the first place. For example, a drowning may have occurred because of rapidly rising water. A traffic accident may be due to oil on the road. Whatever the circumstances, it is important that protective measures be observed and strategies put into place so that a further injury does not occur.

FIGURE 7.21 The forces of nature can cause changes to the physical environment that are potentially dangerous.

7.5.1 Traffic accidents

In the case of traffic accidents, the rescuer must be aware of the potential danger from:

- oncoming traffic
- fallen electricity wires
- flammable liquids such as LPG, gas and petrol
- glass and debris
- fire.

Protective strategies that the rescuer needs to observe include:

- providing a protective barrier by parking a vehicle between the oncoming traffic and the accident
- turning hazard lights on
- placing a warning signal or sending a person back up the road to warn traffic
- turning the ignition off if the engine is still running
- lighting the area with low beam if the accident has occurred at night to raise awareness and increase safety.

When the rescuer has followed the protective strategies, they can:

- call for or send for help
- assess the number of casualties and potential dangers. If fallen electricity wires are in contact with the vehicle, the vehicle must not be touched as electrocution may occur.
- implement the DRSABCD procedures (see section 7.1.3).

Do not remove the casualty unless one or a number of the following conditions is present:

1. there is evidence of increasing shock and the casualty is upright in the car
2. the casualty is unconscious and an adequate airway cannot be maintained

3. the casualty's position prevents access to control bleeding
4. there is danger of fire. (*Source: Australian First Aid*, vols 1 and 2, St John Ambulance Australia, Canberra, p. 218.)

7.5.2 Water environment

The water environment can disguise particular problems. The rescuer must be aware of:

- their own physical limitations, such as their ability to swim
- the desperation of a drowning person and their potential to cause difficulty to the rescuer
- hazardous objects under the water and not visible to the observer
- dangerous rips and currents
- changes in weather conditions
- water temperature.

Protective strategies that need to be used include

- sending for help immediately
- not placing yourself at risk if you are not sure that you can perform the rescue safely
- using ropes, branches and flotation devices where possible
- entering unknown waters carefully.

Go to the **Water safety in Australia** weblink in the Resources tab to watch a short video about water safety in Australia.

on Resources

Weblink: Water safety in Australia

7.5.3 Electricity

Electricity has an immense potential for danger because it is not visible. We know it is in electrical wires. When the wires are exposed through circumstances such as frayed or cut electrical insulation or fallen power lines, electricity is conducted through any metallic material that is in contact with the wires. By touching the conducting material, such as a car body, electrocution occurs. The voltage in most wires is sufficient to cause severe burns and instant death. The rescuer needs to:

- be aware of the deadly nature of electricity and how it is conducted
- examine the situation and assess the potential for harm.

Protective strategies include

- not touching cars or objects that are in contact with fallen power lines
- turning the power off at the source (light switch or main switch) in the case of a domestic accident
- removing live power cords with nonconducting material such as a stick if the power cannot be turned off immediately.

Inquiry

Safety issues and protective strategies

Divide the class into small groups. Allocate one of the following physical environments to each group:

- traffic accidents
- water environments
- electricity.

Choose three students to act as recorders and to be responsible for summarising the information reported from groups. Then have each group:

- analyse the safety issues with their specific environment
- formulate strategies that need to be observed to ensure safety.

Groups report and recorders collate the information relevant to their physical environment. When all groups have reported, recorders summarise the information and distribute to the class.

7.6 Infection control and protection

There is a risk of cross-infection (passing infection from one person to another) when administering first aid. This is particularly so when giving CPR or managing wounds. Illnesses that can be transferred include:

- colds and influenza
- HIV/AIDS
- glandular fever
- measles
- chickenpox
- mumps
- herpes
- hepatitis.

Administration of first aid requires that measures be taken to avoid transmission of infection under any circumstances. The first aider must use hygienic practices and create a barrier so that the infection cannot pass from one person to another. The situations that cause most concern are in relation to HIV/AIDS infection and blood-borne viruses such as hepatitis B and C.

7.6.1 HIV/AIDS

The HIV virus (human immunodeficiency virus) that causes AIDS can be transmitted only through the exchange of blood and, in some cases, body fluids, from an infected to a noninfected person. Although this is unlikely in the administration of first aid, it is best that appropriate precautions be taken.

Highest concentrations of the HIV virus are in blood. To pass the virus from one person to another during first aid, both the casualty and the rescuer need to have cuts or wounds that are open and the blood of the infected person needs to mix with the blood of the noninfected person. This situation, although possible, is highly unlikely.

It is important to realise that this type of infection must pass from the bloodstream of one person and into the bloodstream of another for transmission to take place. Although HIV exists in saliva, the quantity exchanged during CPR would not be sufficient for effective transmission and, in any case, the virus would be destroyed by the stomach juices.

To prevent transmission, the first aider needs to implement appropriate management strategies that prevent any possibility of viral transfer. The simplest way is to assume that every casualty is infected and take the following precautions:

- use disposable plastic gloves
- cover sores, grazes, cuts, abrasions or incisions of any nature that exposes anyone's blood
- cover the face of an unconscious person with a face mask before administering CPR
- wash hands and any surfaces of the body that have made contact with the casualty with soap and warm water as soon as possible following treatment.

7.6.2 Blood-borne viruses (hepatitis B and C)

Hepatitis comprises three viruses — hepatitis A, hepatitis B and hepatitis C. While it is difficult to contract HIV, it is not as difficult to contract some of the hepatitis strands. We do not catch the virus like a cold or influenza. It must be transmitted from an infected person to a noninfected person.

Hepatitis B is present in blood, semen, vaginal secretions and, to a lesser extent, in saliva. Usual modes of transmission include sharing needles, unprotected sex, ear piercing and tattooing. The virus can be transmitted during first aid, particularly if there is an exchange of blood. Contracting hepatitis B carries the risk of serious illness, such as cirrhosis of the liver and cancer due to damage to the liver cells. Hepatitis C is transmitted through blood-to-blood contact as may happen with sharing needles, or by sharing contaminated equipment such as ear-piercing implements. Like hepatitis B, it too has the potential to cause extensive liver damage.

7.7 Legal and moral dilemmas

7.7.1 Legal implications

The legal implications of providing emergency care are often a cause of concern for many people. To come across a situation where a person or people have been badly injured is distressing. However, the manner in which first aid is administered needs to be orderly and in accordance with one's level of training. The key objectives are to keep the patient(s) safe and provide help. The level to which a first aider provides this is related to their training and expertise. It is important that common sense prevails and under no circumstances is the first aid situation made worse by the person or people providing assistance. The Royal Life Saving Society of Australia (RLSSA) explains

> 'An individual is under no duty to rescue or provide first aid to an injured or ill stranger unless a 'duty of care' is owed to that person. However, first aiders have a moral responsibility to perform first aid for fellow human beings in a time of crisis. Good Samaritan laws exist in many States of Australia. Although these laws vary, they are designed to encourage rescuers to provide emergency first aid without fear of legal liability when there is no duty to assist.'

Sometimes, duty of care exists that requires first aid to be offered. The RLSSA clarifies: 'A duty of care arises when, at law, there is a sufficient relationship between one person and another. For example, a teacher owes a duty of care to their students, an employer owes a duty of care to its employees, and the driver of a motor vehicle owes a duty of care to other road users and pedestrians.' If we choose to be involved, how far do we need to go to satisfy 'duty of care'? The RLSSA suggests that, where duty of care exists, the legal requirement is to provide a standard of care that would be considered to be reasonable.

> 'Once a person begins to provide first aid, a duty of care is established and the first aider is required to act in accordance with training and experience, if any. First aiders are normally safe from litigation as long as they deliver first aid within their level of training. However, first aiders who go beyond their level of training may compromise the victim and may expose themselves to the threat of legal liability for causing further injury or death. It is important to maintain respectful behaviour and be mindful of the fact that the victim may have different cultural beliefs and practices. A first aider should communicate with the victim where ever possible and clearly outline the type of treatment or management they intend to perform.'

Of concern also to many first aiders are the legal implications of touching another person during the provision of first aid.

> A person who is touched without consenting to it can take legal action for assault. A first aider must seek permission from the victim before providing first aid. If the victim is unresponsive or unable to communicate, the law assumes that consent would have been given. If the victim is a child, consent for first aid must be obtained from a parent or legal guardian. If there is threat to life and a parent or guardian is unavailable, consent is implied and first aid should be provided.

Source: *First Aid: A training guide for the management of emergencies*, Royal Life Saving Society — Australia edition, Victoria, 2016.

First aiders should document written records of exactly what happened should they be involved in providing emergency first aid. The account should provide

- the date
- time of incident
- factual explanation
- advice given
- details of witnesses if any were present.

This information should remain confidential to protect the privacy of the victim, but may be required in a court of law.

We do not need to attempt rescues if our own life will be placed in danger in the process. However, it is important that we act in the spirit of the law; that is, that we provide whatever aid we can within the level of our ability.

Inquiry

Legal issues in first aid

Use the **Legal issues in first aid** weblink in the Resources tab. Read the information regarding the 'main legal considerations relating to first aid', then summarise the legal issues under each heading in a table like the one below.

Duty of care	Negligence	Consent	Recording

on Resources

Weblink: Legal issues in first aid

7.7.2 Moral obligations

In emergency situations there exists a certain moral responsibility to act in accordance with your training and provide assistance to the injured or distressed. It would be considered a responsible action to help people involved in an accident. It would be irresponsible not to help people unable to help themselves. Fortunately we are not frequently tested with these situations to see just how we would respond. In many cases, the emergency first aid required is for a family member and we react instinctively. But what would we do if we came across a road accident where none of the victims were known to us?

Responsible citizenship suggests that we should help and provide assistance to the best of our ability. Imagine how you would feel if you were in an accident and the only people able to provide support walked away.

The ability to empathise with others or try to feel as they feel in that particular situation is important when confronted with moral dilemmas. As we grow, we learn to develop a sense of compassion and are often saddened by circumstances where injury or perhaps tragedy occurs to others. We realise that victims in accidents, people drowning or perhaps people suffering a heart attack or stroke need immediate help because they are unable to do anything about their situation at that time. For some, the circumstance may be related to a state of physical health that needs immediate medical assistance; for others, they may just have been in 'the wrong place at the wrong time'.

Put yourself in the situation of having been critically injured while on a street or at a railway station. Imagine yourself lying on the ground, in pain, trapped and unable to talk. How would you feel if people walked past,

not wishing to get involved, your life slowly slipping away? While imagining a situation like this is very confronting, it provides you with an opportunity to make a decision that might be as defining as deciding life or death for the person involved.

Application

What would you do?

Read the following scenario.

> The conversation in the car was lively, but was about to be shortlived. It was not difficult to see the car ahead in the night as the red tail-lights shone through the mist. Suddenly the lights were gone. A cloud of dust appeared, followed by the sound of the car smashing into something solid off the roadside.

Dave slammed his foot on the brake as our vision of the road ahead vanished in the dust cloud. We could just make out the blinking lights of the upturned vehicle well off the road. We stopped, got out and moved closer to the accident. The muffled sounds of people inside could be heard. I felt a sudden chill penetrate my spine. What do we do? My first instinct was to get out fast.

Inquiry

Responding to an accident

1. In the application above, are the two people in the car behind required to provide emergency first aid?
2. How would you act in this situation?
3. Why did you make this decision?
4. If you were in a similar accident and somebody came to your aid, how would you feel?
5. What assistance would you provide if one of the victims was unconscious, but as you checked their pulse, you found a number of syringe marks in their forearm?
6. Discuss your actions with the class.

7.7.3 Commonsense versus heroics

Basic first aid training reinforces the principles of commonsense and the prevention of further injury. The first principle of the DRSABCD action plan is to remove the danger from the patient or the patient from the danger so that there is no further injury and possible loss of life. There may be some risk involved, but a rescue action does not call for heroics. How often do we hear of people who are unable to swim jumping into water to save a drowning person? Had the rescuer thrown a flotation device or rope instead, certainly one life and possibly two would have been saved. Using commonsense is absolutely essential in rescues and requires that the rescuer is able to think clearly, plan thoughtfully and act wisely.

Application

Legal and moral dilemmas

Hold a class debate on this statement: ‘People should be legally bound to provide first aid to the injured rather than it be a matter of choice.’

7.8 Support following first aid situations

7.8.1 Debriefing

Debriefing involves obtaining information about the circumstances of the incident that resulted in first aid being administered. The rescuer or rescuers may be required to give an account of what happened and describe as precisely as possible the nature of the incident. Police officers, ambulance officers or accident investigation personnel may make these inquiries.

During debriefing, it is important to:

- take the time to ensure that the full picture is gathered
- make all descriptions as accurate as possible
- remain impartial and describe the incident exactly as it occurred.

7.8.2 Counselling

Rescuers involved in emergency procedures where there were fatalities and serious injuries (for example, spinal injuries or amputations) may need counselling. Providing emergency care, organising help and possibly watching life slip away can be very upsetting for individuals and result in personal pain. This can lead to anxiety, depression and possibly an inability to cope. Where this is evident, individuals should seek or be advised to seek help. Help is available from various counselling organisations including hospitals, medical support centres and State government organisations such as NSW Health.

In the event of major crises, it is not uncommon for large groups of counsellors to be sent to disaster areas to support people in direct contact with casualties. Counselling is beneficial as it provides the opportunity to 'work through' situations and dispel feelings of blame and inadequacy.

Emergency first aid may provide an opportunity for a life or lives to be saved. However, if life is lost, rescuers should not feel that the blame rests with them if they acted in accordance with their training and ability level.

Inquiry

Sources of support in delivery of emergency first aid

Use the **Emergency first aid training** weblinks in the Resources tab for more information about first aid training.

on Resources

- **Weblink:** Emergency first aid training 1
- **Weblink:** Emergency first aid training 2
- **Weblink:** Emergency first aid training 3
- **Weblink:** Emergency first aid training 4
- **Weblink:** Emergency first aid training 5

7.9 Topic review

7.9.1 Summary

- There are many situations, including drowning, traffic accidents, electrocution and heart failure, where first aid may be required.
- Sound first aid is based on commonsense practices and adequate knowledge of what to do.

- Correct administration of first aid requires that the DRSABCD procedures be followed. The acronym DRSABCD stands for danger, response, send for help, airways, breathing, compressions, defibrillation.
- The DRSABCD procedures help the first aider to remember what to do and in what sequence to do it to deliver life support.
- Cardiopulmonary resuscitation (CPR) is required if the patient is not breathing and has no signs of life. This procedure combines chest compressions with rescue breaths.
- Cardiopulmonary resuscitation can be given using one or two operators. Two-operator CPR is more efficient than one-operator CPR.
- Crisis management can also involve treating other injuries and conditions such as shock, bleeding and neck and spinal injuries.
- The first aider also needs to know about the management of injuries such as cuts, lacerations, fractures, dislocations, electrocution and concussion, as well as head, eye, nasal, teeth, burn, chest and abdominal injuries.
- Certain medical conditions, such as heart attack, stroke, diabetes, epilepsy, asthma, anaphylaxis, poisoning, bites and stings, and exposure to heat and cold require specialised knowledge. The first aider needs to be able to analyse signs and symptoms and implement appropriate action.
- The environment where the first aider is attempting to administer first aid may be hazardous. Traffic, water and electricity present particular problems. It is important that all precautions are taken and that the rescuer is not injured as a result of the surrounding conditions.
- There is potential for infection to be transmitted during the administration of first aid. In particular, HIV/AIDS and blood-borne viruses such as hepatitis B and hepatitis C can be transmitted through the exchange of blood and (to a lesser degree) the exchange of other body fluids. During the administration of first aid, the rescuer needs to implement safety precautions such as wearing gloves and protective face masks and washing their hands following treatment if possible.
- Some people hesitate to provide first aid because of legal implications and the possibility of litigation. While people are not required to give first aid to strangers, most find themselves providing assistance out of concern, duty of care and responsible citizenship. Some people, such as teachers and nurses, are entrusted to care for other people and need to provide assistance that reflects their level of training.
- A first aider need not fear litigation in any circumstances providing they work within the limits of their abilities and to the best of their knowledge.

7.9.2 Question

Revision

1. **Describe** the planning procedures you need to make if you and a friend came across a traffic accident where the occupants were injured. (P6) (4 marks)
2. **Explain** how you would assess if a person was conscious or unconscious. (P15) (2 marks)
3. **Outline** the technique for clearing the airway. (P12) (3 marks)
4. **Outline** the steps that need to be taken by one operator administering CPR to an unconscious adult. (P12) (4 marks)
5. **Explain** how the rate and depth of compressions vary when giving CPR to infants, children and adults. (P6) (3 marks)
6. **Describe** how you would apply the STOP regime to a football player who was unable to get up off the ground following a tackle. (P12) (3 marks).
7. **Explain** the measures you would take to control shock in a person who has just survived a car accident. (P12) (4 marks)
8. **Describe** the difference between a fracture and a dislocation. **Outline** the management techniques used to stabilise a shoulder dislocation in preparation for medical attention. (P12) (4 marks)
9. What are the differences in the signs and symptoms of hypoglycaemia and hyperglycaemia? **Explain** how each case of diabetes is managed. (P12) (5 marks)
10. **Comment on** the measures you would take to manage a person suffering from heatstroke. (P12) (3 marks)

11. A player has had a tooth knocked out of its socket during a game of basketball. **Describe** how you would manage this injury. (P12) (2 marks)
12. **Describe** how you would apply an elevation sling to a person with a fractured collarbone. (P12) (4 marks)
13. **Investigate** how the signs and symptoms of heart attack and stroke may differ. (P15) (4 marks)
14. **Identify** the signs/symptoms of funnel-web spider bites and **suggest** how they might be managed.
15. How would you identify if a person was suffering from anaphylaxis? **Describe** how would you manage this condition. (P6, P12, P15) (5 marks)
16. **Discuss** the personal safety issues you need to address if you come across a traffic accident while you are driving at night. (P15) (5 marks)
17. **Identify** the types of infection that can be transmitted during the administration of first aid. What measures can be taken to prevent cross-infection? (P6) (5 marks)
18. **Discuss** the legal implications of providing first aid to a casualty and causing injury in the process. **Outline** the measures that need to be taken to avoid litigation in these circumstances. (P16) (6 marks)
19. **Explain** what is meant by 'duty of care' in first aid? How long does it last once you have started first aid? (P15) (2 marks)
20. **Identify** when consent *is* or *is not* required in first aid situations. (P15, P16) (3 marks)
21. What is the difference between debriefing and counselling? **Outline** the situations in which each may be necessary. (P16) (4 marks)

Extension

You and a friend are the first to arrive at the scene of a car accident. The driver and three passengers are injured. A quick assessment reveals the following:

(a) casualty one is bleeding from the lower leg
(b) casualty two is unconscious but does not appear to be bleeding
(c) casualty three is conscious and has a leg trapped, but otherwise appears to be in a satisfactory condition
(d) casualty four is conscious, has burns on their arms and is hysterical.

Outline your action plan and, specifically, your priority for treatment. **Determine** how you would manage each of the casualties until medical assistance arrives. (P6, P12) (10 marks)

Note: For an explanation of the key words used in the revision questions above, see Appendix 2, page 400.

on Resources

Interactivity: Revision quiz: auto-marked version (int-7243)
Interactivity: Missing word interactive quiz (int-7244)
Digital doc: Revision quiz (doc-26264)

7.9.3 Key terms

cardiopulmonary resuscitation (CPR) is a life-sustaining procedure that uses rescue breathing and chest compressions to stimulate blood flow and oxygen delivery when a person has stopped breathing or their heart has stopped beating. *p. 281*

chest compressions are downward thrusts on the centre of the chest that stimulate blood flow to vital organs in the body. *p. 281*

defibrillator a device that provides an electric shock to a patient whose heart has stopped beating. *p. 283*

hepatitis refers to a disease that causes varying degrees of inflammation and subsequent damage to the liver. *p. 300*

rescue breath a breath given to a patient who is not breathing. The breath will take one second to deliver and will make the patient's chest rise. *p. 282*

TOPIC 8
Composition and performance

OVERVIEW

8.1 Composition and movement mediums
8.2 Space
8.3 Dynamics
8.4 Time and rhythm
8.5 Relationships
8.6 The process of creating movement
8.7 Combining and arranging movements
8.8 Appraisal
8.9 Topic review

OUTCOMES

In this topic, students will:

- develop, refine and perform movement compositions in order to achieve a specific purpose (P13)
- utilise a range of sources to draw conclusions about health and physical activity concepts (P16)
- analyse factors influencing movement and patterns of participation. (P17)

8.1 Composition and movement mediums

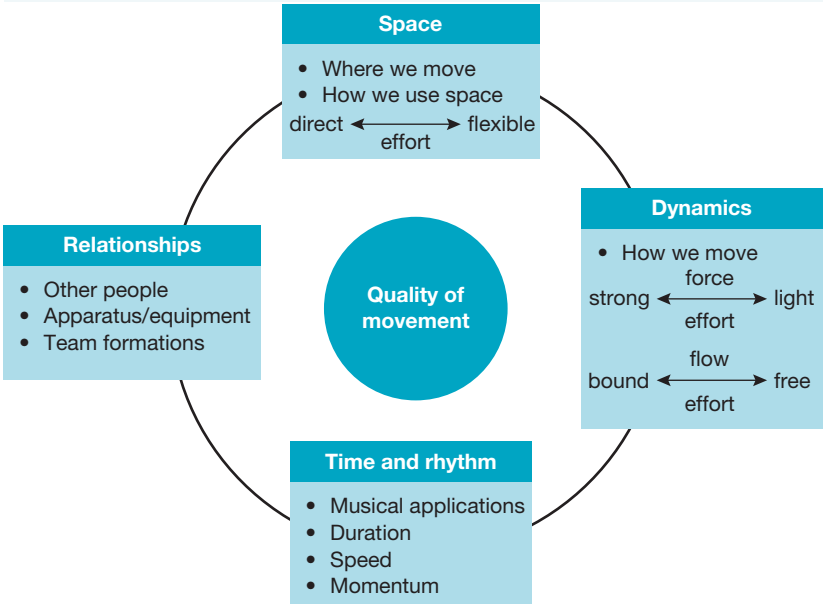
Many physical activities involve the use of different movements linked together to achieve a purpose or communicate an idea. Linking movements for a purpose is referred to as the art of composing. A **composition** is a movement pattern consisting of a number of movement sequences. The end result of learning a movement composition is the **performance**. There are several **movement mediums** through which individual skills are linked together to create a movement or a performance. These media include gymnastics, aerobics, dance and games.

Often there are similar skills within these media. However, depending on the purpose of the movement, these skills can look very different when they are performed. For example, compare jumping for height and jumping for distance. Both types of jump include the simple movement sequence of run, jump and land. By varying the speed of run-up, the force of take-off and landing, the coordination of body parts in the air, and the height and length of the jump, we can change this movement sequence. By varying the different movement elements, we can create a movement that fulfils what we are trying to achieve; that is, the purpose of the movement.

Developing a movement pattern or movement sequence that reflects the intention or purpose of a performance requires the choreographer, composer or coach to use and manipulate the **elements of composition**. These elements are integral to movement composition and performance. If we examined a gymnastics floor routine that required the same movements to be performed by different gymnasts, we would find that each performance was different, depending on

- how the performer used the space
- the pace at which the movements were performed
- the relationships the performer developed with other people
- the coordination and timing of movements.

FIGURE 8.1 Overview of the elements of composition



By changing different aspects of movement, each gymnast can produce a unique performance while still including the same skills. By manipulating the elements of composition we give quality to the movement pattern.

The major elements of composition include

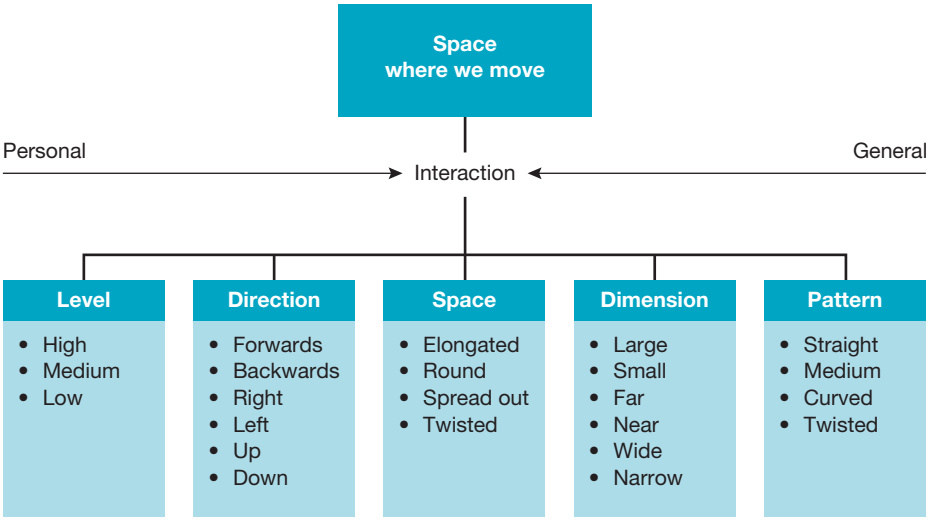
- space — where we move and the shape of our movement
- dynamics — the degree of energy applied to a movement and the continuity and control of our movement
- time and rhythm — the speed and duration of our movement; the underlying beat
- relationships — movement in relation to people and the environment.

8.2 Space

Space is the medium in which movement takes place. The immediate space around you is called **personal space**. **General space** is the space shared with others or things such as equipment or props. A person's success in moving partly depends on their ability to use space successfully, whether it be in outmanoeuvring an opponent in a game or in creating an aerobics routine.

There are many spatial aspects that you should consider when looking at where movement takes place and the shape that your body or movement makes in space. These spatial elements are summarised in figure 8.2.

FIGURE 8.2 Spatial elements of movement



8.2.1 Direction

There are many **directions** in which a person can travel within their performance space. These directions include forwards, backwards, right, left, up, down, diagonal, zigzag, circular or turning. Moving in any of these directions results in specific actions, such as rising, falling, advancing or retreating. The direction in which we move gives importance or expressiveness to our movement. For example, a dancer may move in a zigzag fashion to portray the idea of evasion, or a player in touch football may run a diagonal line in an offensive play to draw an opposition player.

When moving in any direction, there is usually a body part that naturally leads the movement. For example, when moving backwards the back leads. Changing direction as we move through space adds complexity to a movement task. Compare the basketball player who travels in a straight line forward dribbling a ball to a basketball player who weaves around opposition players while dribbling a ball.

In games, direction is used to achieve a specific goal. Generally, a forward direction is when the player or team is travelling towards their opponents' goal or try line. In dance, gymnastics and aerobics, direction is used to enhance the visual appeal of a performance.

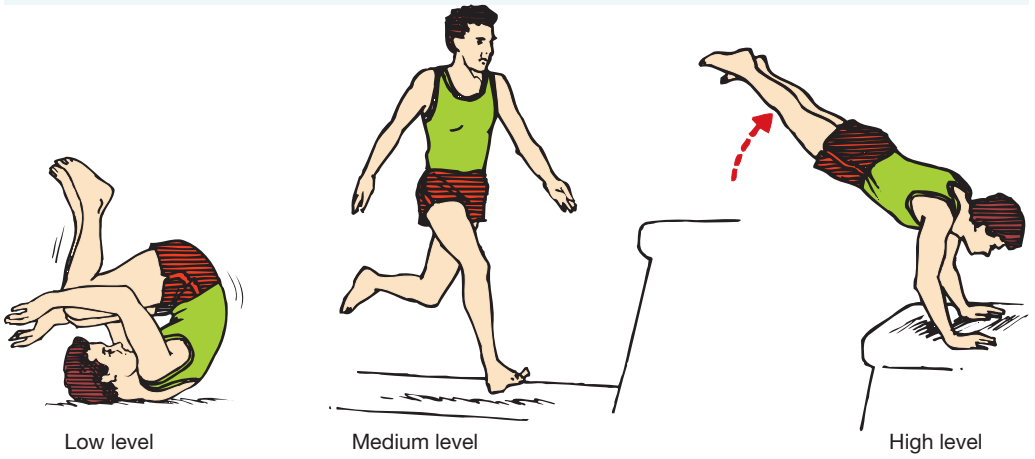
8.2.2 Level

Level is the height of the movement in personal space:

- high level is generally above the shoulders
- low level is below the hips
- medium level is between the shoulders and hips.

Some activities require the performer to move at different levels during a movement. When performing a leap in dance, the performer moves from a medium level during the running phase to a high level during the leap and returns to a medium level on landing. In an aerobics class, an instructor leads the class through moves that will be performed at all three levels. A pitcher in softball can use the air space, direction and different levels to achieve a range of pitches, such as a slow lob pitch (high), a straight fast pitch (medium) or a drop pitch (low).

FIGURE 8.3 The use of high, medium and low levels in gymnastics



Application

Space: direction and levels

Perform the following activities, which relate to direction and levels.

1. Standing in one spot, perform a simple movement, such as twisting, bending, stretching or reaching. Observe yourself in a mirror while you perform. Now try performing the same movement while you face your body in different directions.
2. Use a variety of directions, such as backward, forward, sideways, or any four of the diagonal directions, to walk across a space.
3. Move around a space using a basic walk. As you walk, begin to change direction on specific counts. Practise changing directions on every eighth, fourth and second count.
4. While walking around a space, change the level of your walking. Change from middle, to high, to low.
5. Alter the level of other locomotor movements while moving around the space.

Source: Reprinted with permissions from S.C Minton, 2007, *Choreography: a basic approach to using improvisation*, 3rd ed. Champaign, IL: Human Kinetics,19, 22, 35.

8.2.3 Dimension

Dimension is the size or extent of the movement or performance space. It considers our personal and general space. The dimensions or size of a field, court or performance space have an effect on the movement patterns that occur within the space. Imagine doing an individual gymnastics routine on a floor the size of a rugby

league field, or playing a game of touch on a netball court. A composer needs to know the size and shape of the performance space in order to know how many skills or movements to include so the composition fits into the space. If a set aerobics routine was to be performed in a smaller space, the range of movements may need to be reduced and the direction of movement altered.

Application

Dimension and composition

Compose a simple dance routine and gymnastics floor routine. Perform the routines in a space large enough to fit the routine. Reduce the performance space and perform the routines again.

1. Compare how the reduced space affects the dance and gymnastics routine.
2. What elements of composition need to change to accommodate the reduced space? Why?

Dimension includes the relationship of our body parts to one another and to objects in space. As a movement extends away from the body into space, the movement becomes large. As the movement comes near to the body, it becomes small. Movements can pass through many stages in between in the process of becoming smaller and larger. This process of shrinking and expanding movements has a functional role in games and adds to the aesthetic nature of dance and gymnastics. The body can shrink by bending in and expand by stretching out.

In games, players often need to change their body dimension in space to give an advantage in either attack or defence. For example, when performing a zone defence in basketball, players expand their body by stretching their arms out and taking a wider stance in an effort to reduce the space through which a defender may try to attack.

The perception of the body's dimension in space is a significant aspect in our performance of movement tasks. Dancers or gymnasts may concentrate on the extension aspect, known as amplitude, in order to achieve long lines in the body and limbs. In performing rolls and somersaults, a gymnast aims to make the movement small by keeping the body curled to assist the speed of turning. However, if the gymnast does not have a perception of the body's position at any time during the turn, the somersault may not be completed before the landing, or if the tuck is held too long, over-rotation may occur.

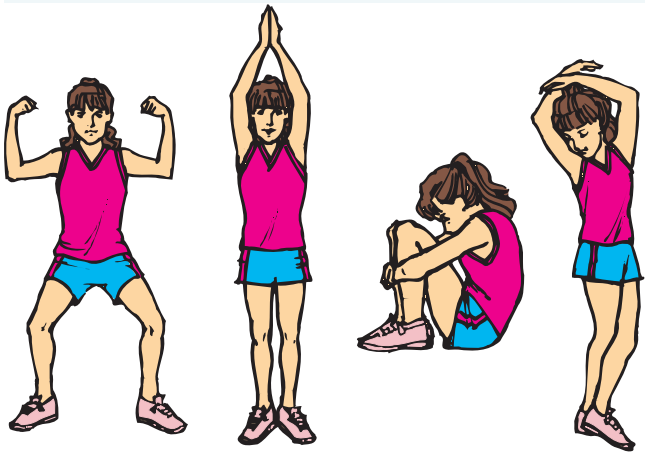
FIGURE 8.4(a) Dimension relates to the playing or performance space and the relative positions of players or performers within it.

FIGURE 8.4(b) We use different dimensions to achieve specific tasks.

8.2.4 Patterns and formations

Patterns and **formations** are the imaginary lines that the body or its parts make when moving in general space, whether it be in the air, on the ground or floor, on your own or in combination with other performers. Movements can make either straight, angular, curved or twisted patterns, or combinations of these four basic patterns; for example, circular, spiral, square or zigzag.

FIGURE 8.5 Some angular, straight, curved and twisted movement patterns



In games we may need to change our movement pathway due to another person. This occurs frequently in games as teams set up offensive and defensive moves in response to the positioning of opposition players. Individual players use straight runs, dodges, weaves and changes of direction in an attempt to outmanoeuvre an opposing player.

Application

Patterns and formations

Choose a team game of which you have a good knowledge. Design an offensive tactical move that could be used in this game. Draw this move, including lines of player movement and equipment, such as the ball.

1. How have the patterns formed in the move created space for attack?
2. Draw a defensive formation to counter the offensive pattern. Discuss why this pattern would be effective.

In aerobics, many instructors use a variety of organisational patterns for their class to promote group activities; for example, line work formations, circles, relay formations and circuits. Dancers and gymnasts use this spatial aspect by varying independent air and floor patterns, or accompanying air and floor patterns to communicate certain feelings or images, and to add emphasis, interest or variety to their performance.

Application

Patterns

Observe the following movement sequences and draw the pattern formed during the movement:

1. gymnastics floor routine
2. back line throw in netball (both ball and players)
3. hits by a batter in cricket in one over
4. a short sequence of a dance routine (principal dancer only).

Explain the meaning or tactic behind each pattern formed.

Inquiry

Space

1. Why is the use of space critical to games strategies?
2. Suggest ways that space is created and reduced in team game situations.
3. Analyse a performance in games and debate how effectively space was used.

8.3 Dynamics

The element of **dynamics** incorporates both the force exerted during movement and the flow of the movement. Varying the force and flow of a movement results in dynamics. The dynamics of movement allows performers to better express the purpose of their performance. By changing the degree of energy applied to a movement and the control of the movement through space, a performer can achieve or portray the purpose of the performance. For example, a dancer can perform a movement using a high degree of energy to generate a strong force that may communicate the idea of assertiveness. Alternatively, they could use light force in their movements to convey the idea of softness or passiveness.

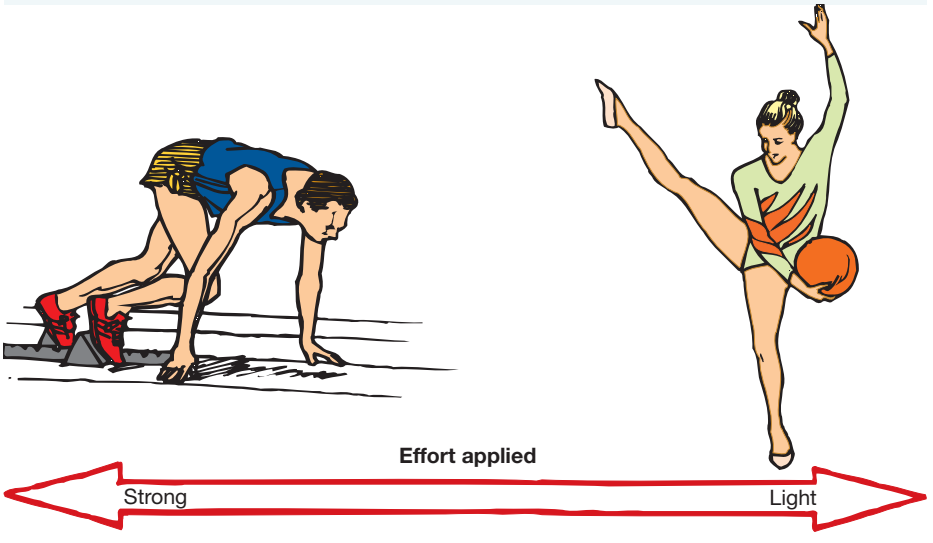
8.3.1 Force

Force (composition and performance) refers to the magnitude or intensity of the energy exerted, expended, or released. Force is active and is realised in movement. The amount of force used affects the quality of any given movement.

The effective use of movement skills in various situations partially depends on our ability to control the force created and to absorb the force appropriately. For example, to perform a handspring vault in gymnastics, force is created in the take-off on the vault and absorbed on landing.

You may have heard a spectator comment on the 'weak' attempt made by a player to tackle an opposing player. This simply refers to the degree of energy applied in attempting the tackle. The degree of force applied to movement can be either strong or light.

FIGURE 8.6 Force can vary from strong to light.



Strong movements are those performed with a large degree of energy. Movements such as jumping, striking, kicking and take-off in gymnastics are strong movements as they require a high degree of energy or force to do them. Weak or light movements are those done with a small degree of energy. Catching a cricket ball where the hands 'give' in the action of catching requires a small degree of energy resulting in a light force. A rhythmic gymnast will catch a ball by using the entire body to follow the fall and to absorb the weight of the ball. This enables the catch to be soft and silent and does not interrupt the trajectory of the ball.

The dynamics of movement can be described in other ways. When a movement is performed with consistent, even release of energy, it can be described as smooth or sustained. An ice-skater skating at the same speed produces a sustained release of energy. A movement can be described as explosive when energy is suddenly released. The start in a sprint race or the take-off in a leap in dance are explosive movements. When energy is released in short bursts it produces a jerky movement.

Application

Force, flow and speed

Perform movements using variations in force, flow and speed of movement.
For example:

- walking on the moon compared to walking across a busy road dodging traffic
- drifting aimlessly through outer space compared to hang-gliding to a predetermined landing area
- the movement of a bee compared to a butterfly
- a slow jog in the park compared to fleeing from danger.

Inquiry

Impact of varying force, flow and speed

1. How are the dynamics of force and flow used in each movement performed in the application above?
2. How does the use of dynamics create realism for the audience?
3. What changes in the use of space when you increase the force?
4. How does the use of dynamics improve the quality of movement?

8.3.2 Flow

Flow is concerned with the movement of the body or an object through space and time. Within this element there are three aspects that can describe the movement: continuity, body flow and control.

Continuity refers to the way movements follow from one to another when combining movements in a serial skill. These movements can be performed in either an uninterrupted way, where the movement is flowing without stops or starts, or in an interrupted way, where there are stops and starts. When dance and gymnastics movements are sequenced together in an uninterrupted way they are visually appealing to the spectator.

Body flow relates to the way the movement flows through the body while moving. For example, an undulating body wave involves successive flow through the body as one body part starts a movement that is passed onto another adjacent part in a sequential way.

The successive movement of body parts is also a desirable technical requirement in the execution of many game skills. Whether it be striking, kicking, hitting or throwing, the coordination and flow of body parts is critical in the success of execution of the skill.

Control deals with the way movement is controlled or not controlled and suggests an effort reflecting flow. It can be seen as a continuum from bound to free.

If at any moment during a movement the body can be stopped, controlled or restrained without difficulty, the flow of the movement is said to be bound. The movement may not necessarily stop altogether, but it may

be altered or restrained momentarily. Bound flow may also be described as controlled, restrained, cautious, limited or withheld. A performer who is learning a skill or movement sequence will often stop and start in practice as they try to master the skill or movement. Think of a person learning to juggle.

Free flow occurs when the movement flows in an unhindered manner and it is difficult to stop the movement suddenly. The person moving is generally not attending to any cues and moves automatically through the various parts of the movement action. Free flow may also be described as uncontrolled, abandoned, fluent or outpouring. A performer who is extremely skilled may move with free flow as the skills can be executed automatically.

Inquiry

Dynamics

Observe a dance performance (or recording of a performance).

1. Identify the dynamics of the performance.
2. What was the purpose or message of the performance?
3. How did the changing dynamics communicate the ideas or purpose of the performance?

8.4 Time and rhythm

Timing and **rhythm** are essential elements in all movement mediums. Rhythm is the mathematical organisation of times in music, dance, aerobics and movements skills. The successful execution of skills in games depends on the timing and coordination of body parts. For example, striking a fast pitch ball in baseball requires the athlete to time their swing so that they can generate a large degree of force when the bat strikes the ball. The point of time at which the ball is struck while swinging the bat forward will also influence direction. For example, a late swing by a right-handed batter is more likely to travel close to first base. The visual appeal of dance and aerobics relies on the performers being in time with the music and each other.

FIGURE 8.7 The execution of skills depends on correct timing.

8.4.1 Musical applications

Performances or compositions within the movement mediums of dance, aerobics and gymnastics are created to sounds and music. The music or sounds organise the timing of movements.

In movement, rhythm has two aspects:

- the metric organisation of time (beat, tempo, accent)
- the organisation of a single movement or a series of movements into patterns or forms.

Rhythm is determined by:

- beat — the steady, underlying beat or pulse that is organised in repeatable patterns

- measure — a number of beats grouped into a unit. Most commonly there are two, three or four beats or counts per measure. (In music, a measure is called a bar.)
- metre — the number of beats in one measure, such as 2/4, 3/4, 4/4 or 6/8. The first number represents the number of beats per measure, while the second number represents the time value of the beat.
- accent — the emphasis or stress put on a beat within a measure. It is usually put on the first beat of a measure, but it may occur on any beat.
- tempo — the speed of the beat. It can be fast, moderate or slow. Tempo is frequently indicated at the beginning of a piece of music. A movement in 3/4 time may move slowly, but if the tempo is increased, the same movement could be performed quite quickly with the impact or feeling of the movement changing. By changing the tempo of the beat, the performer can explore and create movements that portray an intended purpose.
- rhythmic patterns and phrases — result from combining beats into a pattern within a measure or a phrase. Rhythmic patterns are usually subsets of rhythmic phrases. In some dances, it is obvious when a phrase ends and a new one starts. This is evident in folk and social dance. Some locomotor patterns have natural rhythmic patterns. Some are even, such as running, walking and hopping, and some are uneven, such as skipping and galloping.

In dance, rhythmic patterns are generated when a dancer moves at a varying tempo within a movement sequence or within a specific number of pulse beats. Adding silences or places where you hold a pose or body shape also contributes to rhythmic patterning.

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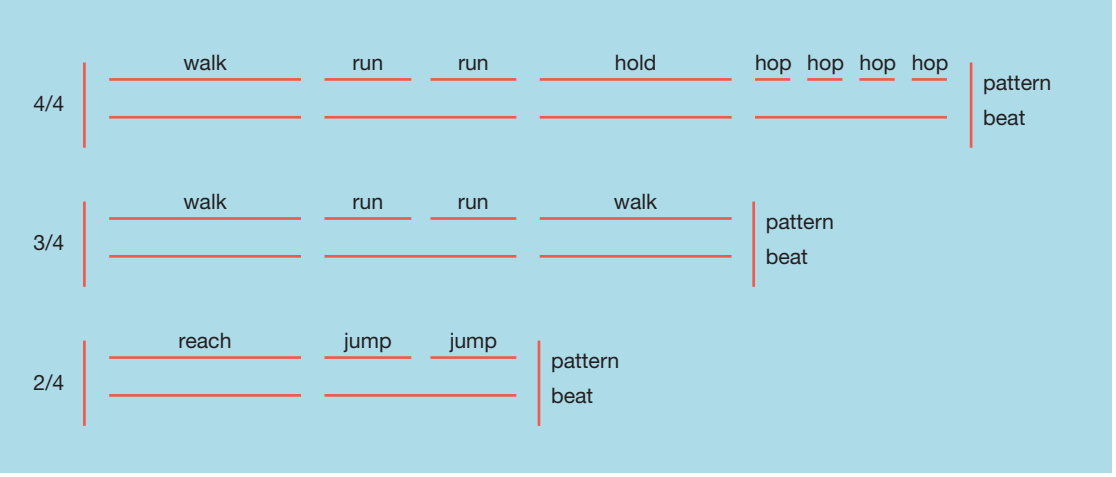
FIGURE 8.8 The pattern and underlying beat of three types of metre



Source: Reprinted with permission from S.C. Minton, 2007, *Choreography: a basic approach to using improvisation*, 3rd ed. Champaign, IL: Human Kinetics page 37.

Inquiry

Rhythm

Discuss how the element of rhythm is applied to:
(a) individual games, for example, golf
(b) team games, for example, touch football
(c) running
(d) gymnastics.

8.4.2 Duration

The time taken to perform a movement is a continuum from short to long. Within all media of movement, the **duration** of a performance or movement can have a great impact on what the performer is trying to achieve. In aerobics, a performer may take a long period of time to perform one push-up in a routine compared to a series of push-ups performed quickly. In games, rules influence the movement being performed and the positioning of players. For example, in basketball offensive players have a three second limit in the keyhole and in netball the goal shooters have three seconds in which to shoot a goal. In rugby league, slowness in playing the ball allows the opposition to advance and reduce the chances of the offensive team gaining ground.

In dance, a change in the duration of a movement being performed can impact on the quality of the performance. For example, a performer would need to take a long period of time to perform a movement such as pushing against an imaginary barrier, or a short period of time to perform a punch-like action.

Duration also refers to the length of time in which the activity is performed. The length of a music track may determine the duration of a dance or floor gymnastics routine.

Governing sports bodies determine the duration of games; for example, touch football is played in two halves of 25 minutes each. Performers must be physically prepared for the duration of the performance. If their physical abilities and fitness levels are poor, the performance will suffer.

FIGURE 8.9 The duration of the movement skill of shooting in basketball is influenced by the speed of the player and the pressure of the defence.

8.4.3 Momentum

Momentum (composition and performance) is determined by the speed at which we perform a movement or movement phrase. Speed can be seen on a continuum from fast to slow. Some movements require us to control the pace at which we perform in order to achieve a specific purpose. For example, a baseball fielder needs to field and throw a fielded ball at a fast speed in order to beat the runner to the base. On the other hand, an aerobics instructor may need to slow down a series of movements in the learning phase or to maintain a high level of safety.

The speed in any movement is not usually constant. An increase or decrease from one speed to another is common. These changes in speed give moments of acceleration and deceleration during the movement. Acceleration and deceleration have many uses in dance, such as representing someone fleeing from danger, the building intensity of a fight, or the wind down showing fatigue and exhaustion. In gymnastics, a performance on the uneven bars may require the gymnast to increase the momentum of movement as she circles the bars, and decrease the momentum as she holds a handstand on the high bar. In games, a tactical ploy by teams is to increase or slow down the tempo and momentum of the game to 'put off' the opposition.

FIGURE 8.10 The speed at which movements are performed varies according to the purpose of the movement or the performance.

Application

Time and rhythm: momentum

View short excerpts from a dance, a gymnastics floor routine and a game. Alternatively, compose your own short movement sequence in each of the movement mediums.

Inquiry

Changing momentum

1. In each medium used in the application above, identify where there were changes in the momentum of the performance.
2. What was the purpose of the changes in momentum?
3. How was momentum used in the dance to add to the quality of the performance? Give examples.

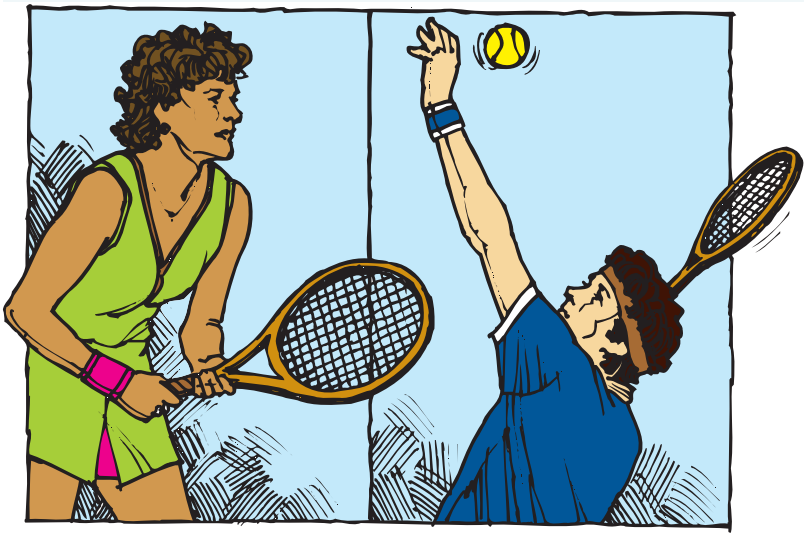
8.4.4 Self-paced versus externally paced

The use of the element of time in the execution of any movement skill is important. To perform any movement skill successfully, we need to put together the subroutines or phrases (related component parts) in sequence. The smoothness and continuity of a movement (rhythm and flow) is influenced by pacing (how we time our movement) and anticipation (how we predict what is going to happen).

When we can determine when to start and finish a movement and how fast to perform it, the skills are said to be a **self-paced movement**. Performing a serve in tennis is a self-paced skill, as the performer is able to completely control the pace of the movement.

We are not always able to control the pace or timing of our movement, however. In some activities we have to constantly time and adjust our moves in relation to the movements of an opponent or a ball, such as returning a serve in tennis or in dribbling around an opponent in basketball. These movements are said to be **externally paced movements**, as are dances and aerobic routines, which are restricted by external musical rhythms. Environmental factors such as the weather and the playing surface also impact on the performance of a skill.

FIGURE 8.11 A tennis serve is a self-paced movement, but receiving the serve is an externally paced movement.



Application

Externally paced versus self-paced skills

From the skills listed below, choose one that you can perform competently. Perform each skill as a self-paced skill and then as an externally paced skill.

- A layup in basketball
- Hitting a softball off a tee-ball stand
- Kicking a soccer ball at a target

Inquiry

Skills

1. Which is the easiest type of skill to perform, self-paced or externally paced? Explain your answer.
   (a) How did you make the skill an externally paced skill?
   (b) How did this affect your performance of the skill?
2. What would happen if you had no previous experience at performing this skill and you had to perform it as an externally paced skill?
3. What impact would using self-paced compared to externally paced skill practices have on a beginner learning a new skill?

8.4.5 Timing

In all movement timing is crucial. This is especially evident in dance, aerobics, floor gymnastics, rhythmic gymnastics and ice-skating, where skills and movements are choreographed to music. It is very obvious to the audience when a performer is out of time either with the music or with the other performers. It detracts from the aesthetic appeal of the performance. In games, timing is vital to the successful performance of skills. For example, when hitting a ball in softball, the batter must time the swing of the bat to hit the ball.

The timing of movements is often controlled by external factors such as positioning of opponents, environmental factors, music and the pace required. Timing can be discrete in nature. It is discrete when it has a distinct beginning and end, such as a leap or throw. Timing is continuous when the activity continues without a break, such as cycling or running.

FIGURE 8.12 The rhythm of a dance is determined by the sounds or music to which it has been choreographed.

Inquiry

Timing and rhythm

1. Select a sport that you are familiar with. Identify three or four skills performed in this sport. For example, soccer has the skills of kick, trap and dribble. Explain how timing and rhythm relate to the skills of this sport.
2. View a group dance. Explain how the elements of time and rhythm are used in the dance.
3. Compare the application of timing and rhythm between games and dance.
4. Use the **Choreographer's toolbox** weblink in the Resources tab to view performances of the elements of composition — shape, space, timing and dynamics — as they apply to dance.

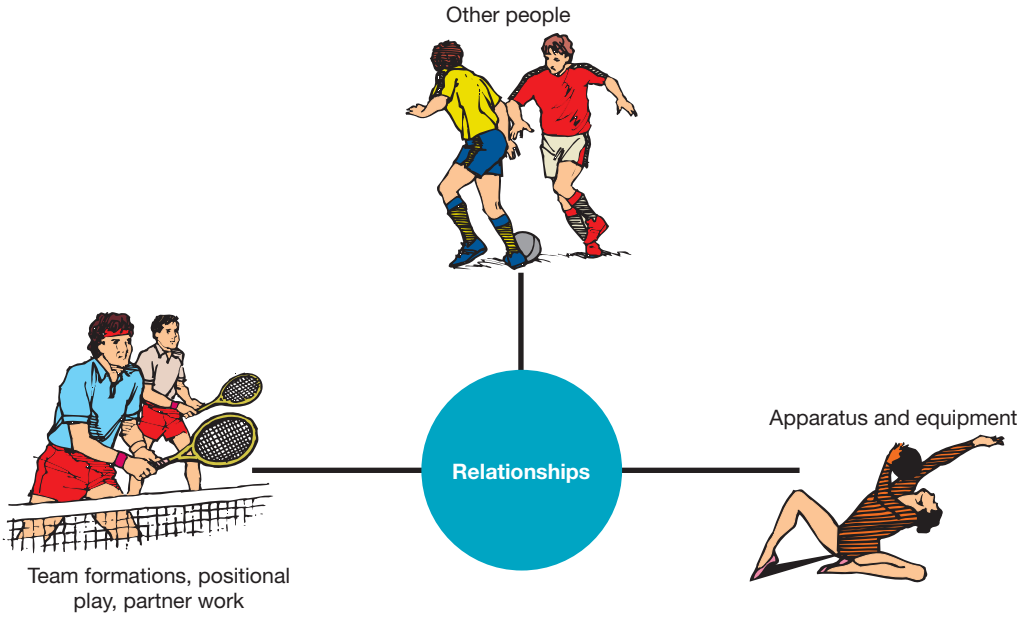
on Resources

Weblink: Choreographer's toolbox

8.5 Relationships

When we move in space we have a relationship with our surroundings. These relationships reflect the way we move, respond or react to people and the environment in which we are moving. The more aware we are of this relationship, the more effective we are in achieving our purpose or communicating our movement message. The relationship that the performer has with others and with their own surroundings can change in response to the purpose of the movement.

FIGURE 8.13 Movement relationships



8.5.1 Other people

FIGURE 8.14 A movement in unison

Within all movement mediums, the relationships or bonds that develop between performers are critical to the overall performance. A successful result in games often depends on the cohesiveness of the team and teamwork on the field or court. Team players must have a good understanding of the role of their team members as well as their own role in the game. They need to be aware of the positioning of others and be confident that their team members will be in the correct position during team plays. When watching elite athletes play, the relationship between the players is obvious. For example, during offensive moves in the keyhole in basketball, it is not uncommon for players to pass the ball without looking at where they are passing, as they know that a team member will be there to receive the pass. Within games, movement sequences or plays can be practised and put into play on the field or court in which players know the spatial position they and their team members should be in order to gain advantage. Often circumstances can change in games that break down set plays. The team that has superior skills and fitness in conjunction with positive communication and good game sense can capitalise on these situations and take the advantage in a game.

In contrast, dance, gymnastics and aerobics have set movement sequences choreographed to an underlying beat, sound or music. Performers move in space in time to the cues of the sound or music, so the relationships between the performers are clearly defined. Relationships between performers are developed through the use of a variety of techniques. For example, two people can move together in different ways:

- in unison (same movements at the same time)
- in contrast (different movements at the same time)
- in sequence (one after another)

- mirrored (moving at the same time with a mirror image of the movement)
- echoing (same movement but at a different time)
- shadowing (guarding)
- in opposition (movements have opposite qualities or move against one another).

Larger groups can make similar sorts of movements but the combinations are more complex. Large group unison movement in dance can be very effective and powerful, yet is difficult for the dancers to perform well.

Communication is important in the development of relationships between performers. Communication can be verbal or nonverbal, such as gestures, eye contact, facial expressions and movements. Verbal communication is most often used in games where team players call out team plays, advice or encouragement. Nonverbal cues, such as those between the catcher and pitcher in baseball, are important in communicating plays. In dance and floor gymnastics, the use of nonverbal communication is a powerful tool in relaying the message of the performance.

Application

Moving with others

Apply the following techniques when moving with others in a game or aerobics routine: unison, sequencing, mirroring, opposition.

8.5.2 Apparatus and equipment

Through movement we can also relate to the apparatus we use and to the equipment we manipulate to effect movement. The body can be used in unique ways to manipulate and control objects. It is important to consider the special properties of these objects when using them. For example, even though squash and tennis are both racquet sports, they vary not only in the structure of the game, but also in the properties of the equipment and court. Therefore, we need to vary our movements and actions when playing either sport.

The way we use our body and the elements of movement can influence the effectiveness and the efficiency of movement when using equipment. Racquets, bats and clubs can act as an extension of the body's levers. They therefore can be used to increase the degree of an imparted force and to control the direction of the force and the speed of a movement. Using apparatus incorrectly can also negatively affect a performance. When using apparatus in rhythmic gymnastics, the gymnast must keep the apparatus moving and manipulate the object with flowing movements to score maximum points. In hockey, the relationship between the player and their hockey stick is obvious. A skilled player can manipulate their hockey stick to perform a range of skills to outmanoeuvre the opposition. The stick becomes an extension of the player's body.

FIGURE 8.15 The use of various apparatus in flowing movements in rhythmic gymnastics is crucial to its aesthetic appeal.

FIGURE 8.16 The correct manipulation of equipment is crucial to the execution of skills.

8.5.3 Team formations, positional play and partner work

In games, successful team play is based on the ability of the team to execute plays in which each player understands and executes a specific role. Players have a responsibility to be in the correct position. Players also rely on other team members to be in or move into a specific position within the playing space when executing plays. Team formations are used in both offence and defence in games.

FIGURE 8.17 Use of a defensive formation in basketball

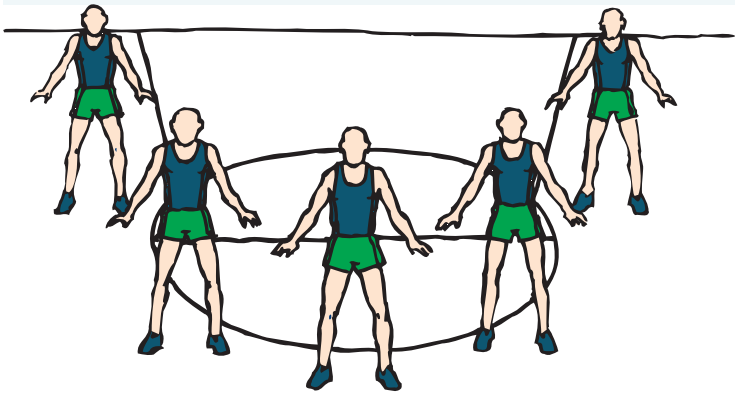


FIGURE 8.18 In partner work, performers work together to create a unique performance.

In an aerobics team composition, which consists of three performers, the performers incorporate a variety of team formations in their display of strength and flexibility. This emphasises the group's relationships and adds to the visual presentation. In dance, pairs aerobics and pairs ice-skating, partner work is integral to the performance. In partner work, each performer is essential to the whole. There is a shared objective. Performers move in different ways such as in unison, contrast and opposition to achieve the desired outcome.

Creating or composing movement requires practice as well as a good knowledge of the elements of composition and how to use or manipulate them in the creative process. Movement composition within each medium utilises a variety of elements, although some are more relevant than others.

Inquiry

Exploring a movement medium

Choose a movement medium you have a good knowledge of, then answer the following questions.

1. What is the purpose of the performance?
2. What are the motivating factors to create movement for the performance?
3. What skills are common to this movement medium?
4. What role does skill development play in the achievement of the purpose?
5. What elements are relevant to this medium?

8.6 The process of creating movement

In the beginning of the creative process, the coach or choreographer needs to explore and improvise with the movement skills specific to their medium to discover possible movement solutions. They need to practise with variations in spatial elements, dynamics, time, rhythm and relationships in order to achieve a movement that leads to the desired outcome. For example, in determining an effective offensive play for a rugby league team attacking their try line, a coach may use a variety of combinations of players, direction, positional play, and patterns and formations to break the defensive line to score a try. In dance, the use of stage space and the relationship between dancers are elements that the choreographer should explore.

The process of creating movement also depends on the performer's skill level. Within dance, creating movement depends on dance technique and the ability of the choreographer and performer to explore movement. Through this movement exploration and improvisation, it is important to allow the individual to express movements that feel 'right' and act on impulses and intuition. When composing movement, we need to take into account the kinaesthetic abilities that gifted performers possess and allow **improvisation** to take place.

8.6.1 Defining the purpose or motivating factors

The purpose or intention of movement composition and the motivating factors behind the development of composition are the basis of performance. The purpose of the movement refers to the reason why we are doing it. For example, in games the purpose is to score. In some games, such as basketball, the purpose is to score more goals. In other games, such as golf, the purpose is to score less. Motivating factors refer to the stimuli or sources of inspiration that are shaped to communicate the coach's or choreographer's intent. For example, the motivating factor to vary a movement in a gymnastics routine may be to increase the degree of difficulty, which leads to a higher score. In aerobics, the music used is the stimulus that influences the sequencing of skills, the arm movements used and the tempo of the routine. In dance, the inspiration may be the use of a prop that inspires the choreographer to compose a movement sequence. It is these factors that guide the creative process of composing movement.

The initiating factors of movement composition vary across the movement mediums. In order to understand the purpose or motivating factors it is necessary to look at each movement medium separately.

TABLE 8.1 The purpose and motivating factors of each movement medium

Movement medium	Purpose	Motivating factors
Games	• Score • Win • Outplay the opposition to gain the advantage	• Put the opposition on the defensive • Use specific talents of team members • Use individual characteristics, such as strength and height
Competition aerobics	• Achieve personal best results • Win • Aesthetic appeal • Entertainment • Display of strength and flexibility	• Achievement of flexibility and strength • Design a unique performance that incorporates the compulsory components • Higher degree of difficulty • Greater aesthetic appeal • Music
Gymnastics	• Score • Win • Achieve high degree of difficulty in skills • Aesthetic appeal • Achieve personal best	• Music • Design a unique performance that incorporates the compulsory components • Greater aesthetic appeal • Higher degree of difficulty
Dance	• Entertain • Communicate an idea • Inspire • Aesthetic appeal	• Music, sounds, rhythmic patterns • Visual stimuli such as pictures or interesting objects • Props • Tactile stimuli • Kinaesthetic such as gestures and everyday movements • Imagery; for example, feelings such as having your feet on a hot road or being in a chase

Inquiry

Purpose or motivating factors of activity

1. What is the purpose of aerobic fitness classes?
2. Identify and discuss the factors that would influence the selection of movements incorporated into an aerobics fitness class.
3. Is the purpose of competitive games the same as social games? Explain.

FIGURE 8.19 The purpose of dance is to communicate an idea, to entertain and to inspire.

Application

Purpose and motivating factors

Explore the motivating factor of imagery, which is used to motivate movement in dance.

1. Imagine the feeling of swimming in very cold water on a hot day.
2. Move like a piece of paper being blown in the wind.
3. Visualise your body performing a leap.
4. Imagine you are walking with very tired and heavy legs.

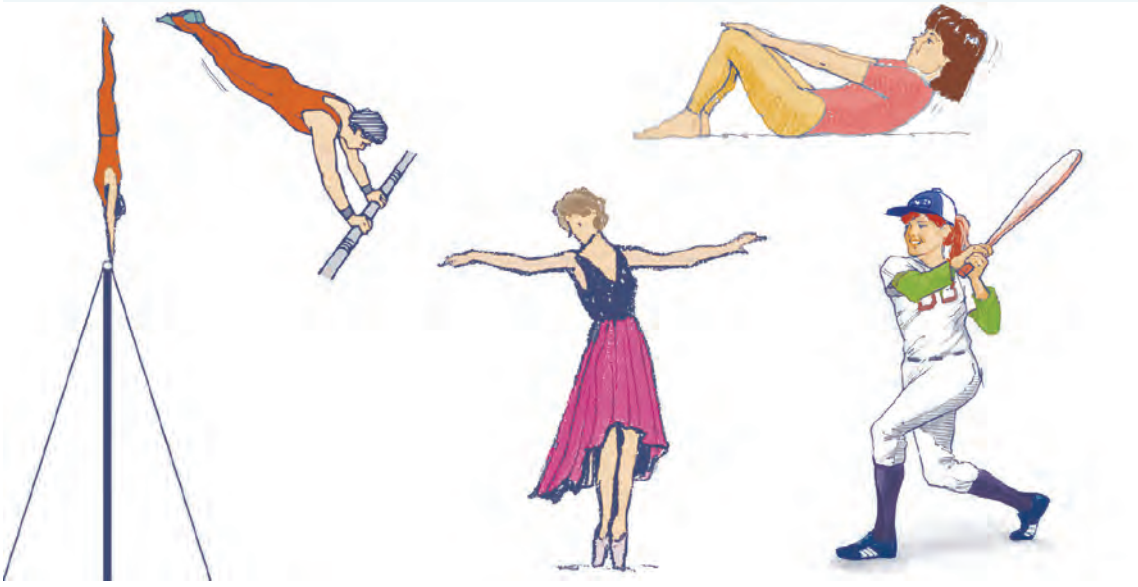
8.6.2 Generating movement relevant to the purpose

In the process of composing movement, the coach or choreographer must be familiar with the skills of that specific movement medium. They need to select skills relevant to the purpose. Each movement medium has specific skills that are basic to it. They can be **locomotor**, **nonlocomotor** or manipulative in nature. Locomotor skills are those that involve moving from place to place. The basic locomotor skills include walking, running and jumping. Variations to these basic skills are hopping, leaping, galloping, skipping and sliding. Nonlocomotor skills relate to those movements performed on the spot (above a stationary base). Basic nonlocomotor movement skills include bending, stretching, swinging, swaying, pushing, pulling, rising, falling, twisting and turning.

TABLE 8.2 Examples of skills basic to each movement medium

Movement medium	Locomotor	Nonlocomotor
Games	• Running • Dodging • Jumping • Walking	• Bending • Twisting • Swinging • Stretching
Aerobics	• Star jumps • Step touch • Step hop • Jogging • Grapevine • Easy walk	• Crunches • Push-ups • Kicks • Squats
Gymnastics	• Running • Tumbling • Leaping	• Balances • Swinging
Dance	• Walking • Sliding • Leaping	• Stretching • Bending • Turning • Twisting • Rising • Falling

FIGURE 8.20 Recognising the basic skills specific to each movement medium is one of the first steps in the process of generating movement.



Recognising the basic skills specific to each movement medium is one of the first steps in the process of generating movement. The level of skill of the performers is also an important consideration at this stage of movement composition. It impacts on the choreographic process. For example, a basketball coach may plan an offensive play that requires a player to perform a jump shot. However, if that player is only in the early stage of learning this skill, the play will not be successful.

Not only does the coach or choreographer need to identify the purpose of the performance and then choose the relevant movement skills, they must then vary the elements of composition to produce the desired performance. For example, in rhythmic gymnastics the coach needs to consider the use of spatial elements, rhythm, timing and dynamics when choreographing a ribbon routine. They may vary the direction of movement of the performer, the levels of both the performer and the ribbon, or the relationship the performer has with the ribbon to generate a unique routine.

The choreographer or coach must allow improvisation during the production, rehearsals or practice sessions. It is important in group performances to encourage all members to work together to form a united and coordinated performance or team play.

8.6.3 Exploring variations

Movement exploration allows spontaneous movements to occur. The exploration process is guided by the coach or choreographer or suggestions for movement. This process encourages performers to extend and vary movements they have already learned and movement combinations.

TABLE 8.3 Examples of ways to explore variations to known movements and combinations

Movement medium	Variations
Games	• Vary the momentum of play. • Change the direction of flight of the ball and the angles run. • Vary offensive and defensive patterns. • Vary team formations. • Vary the pace of movement execution.
Aerobics	• Add equipment, such as steps, weights or rubber bands. • Vary arm lines; for example, front raise, lateral raise, back raise. • Vary the basic sidestep; for example, use a step touch, double step touch, step hop, or step curl. • Vary the tempo of the music. • Vary the momentum of the movements. • Vary the degree of difficulty by adding difficult arm lines and complex step sequences, and using changes in directions. • Vary the intensity: high versus low impact.
Gymnastics	• Select music with varying tempo that can be used for changes in momentum. • Vary the direction of travel: use diagonals, up and down. • Use different arm movements in floor routines. • Vary dimensions: use rolls, leaps and tumbling sequences as opposed to vertical positions.
Dance	• Allow the performer to improvise with movement. • Vary the spatial elements of direction and dimensions. • Vary the dynamics of movement: strong versus weak. • Vary relationships; for example, introduce props and other performers, or emphasise different body parts.

FIGURE 8.21 Exploring arm movements to set aerobics sequences adds variety and difficulty to the movement.

Application

Exploring variations

Choose a movement medium, then compose a simple movement sequence. Teach this movement sequence to other class members. As a group, explore ways of varying the movement sequence learned.

1. Identify the elements that apply to this medium.
2. Change and manipulate these elements to explore a variety of movements with this sequence.

Example: Offensive play in touch football

Original movement sequence: two settles (one pass hit ups), followed by a dump and scoop, followed by a pass.

Variations:

- run wider angles in the settles (change in direction and dimension)
- add a wrap on the settles (change in patterns)
- add a dummy pass in the dump (change in dynamics)
- add a switch move between the person who scooped and another player (change in patterns; direction; relationships).

8.6.4 Improvisation

Improvisation is the unplanned and spontaneous discovery of movement. It is initiated by a motivation or stimulus. Improvisation allows the performer to follow a more personal stimulus where internal cues become important. During the process of improvisation in dance, the performer should be conscious of how the movements flow and connect. The movement should have a beginning, middle and end, allowing the movement to come to a natural conclusion.

Application

Improvisation in dance

These improvisation exercises allow you to explore movement in an uninhibited way. Allow movement to flow; do not force it.

1. Lie on the floor. Take several deep breaths. Focus on your body. Let your body follow some of the small movements that develop.
2. Let some of these movements become larger. Alternatively, allow them to lead you into new and extended actions.
3. Now try exercises one and two while listening to soft, soothing music.
4. Imagine that you are in a cool, quiet forest. Feel and sense this situation. Think about the spongy pine needles beneath your feet, the sunlight filtering through the trees, small animals scampering out of your path, and the closeness of foliage and vegetation. Begin to move while you focus on how you feel about this imagined situation.

Source: Reprinted with permissions from S.C. Minton, 2007, *Choreography: a basic approach to using improvisation*, 3rd ed. Champaign, IL: Human Kinetics, 19, 22, 35.

Improvisation within games occurs frequently, particularly during offence. A coach may compose a set play in a given part of the playing area involving specific team members. Unfortunately the defence's movements are an unpredictable factor, often resulting in the offensive team having to improvise during a set play to counteract the movements of the defensive team.

When an aerobics instructor is choreographing movements to music tracks, they often improvise with arm and leg movements and direction of travel. They do this to compose a challenging movement sequence.

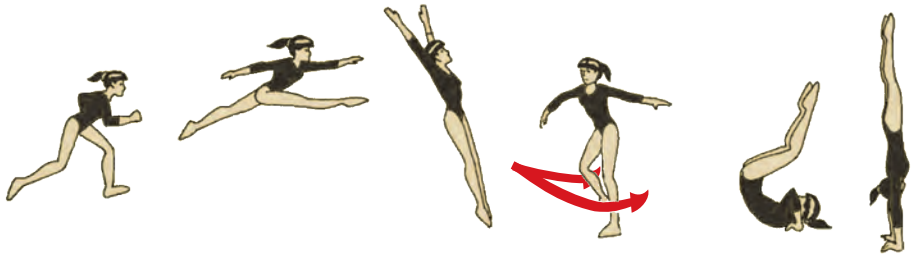
FIGURE 8.22 The process of creating movement can include improvisation, so long as the performance still flows and connects.

Source: © Image addict

8.7 Combining and arranging movements

Whether we are performing a dance, a gymnastics or aerobics routine, or playing a game, our movement skills and elements will be combined and arranged into some pattern or structure. The process of composing involves arranging skills into movement **phrases**. A phrases is a number of related movement skills or action. These phrases are combined into a number of **sequences** (a group of related phrases) which, when linked, form the final composition. To fully understand the process of choreography it is important to understand the rules and conventions of the movement medium and the variety of ways in which movements can be arranged.

FIGURE 8.23 A gymnastics phrase — run, leap, land, turn and roll to balance



8.7.1 Rules and conventions of the medium

When examining each movement medium it is obvious that each has its own rules and conventions that direct the choreographic process. The very nature of each movement medium influences the selection of skills and the use of elements.

Games

Games are mostly characterised by the movement of the body in order to propel or retrieve an object, which is most commonly a ball. They have a predetermined objective, such as to score goals. Games tend to rely mainly on the use of a range of locomotor skills together with the use of manipulative skills such as kicking, throwing and striking. Each game has specific rules that govern the play of the game. These rules impact on how the compositional elements are used. For example, the use of dimension in space is a particular consideration in games such as:

- netball, where player movement is governed by the thirds of the court
- touch football, where the five metre rule applies in defence
- basketball, where the three second rule applies to offensive players in their keyhole.

It can often be challenging for athletes to adjust to the rules and conventions of other games. For example, a netball player playing touch football may have difficulty adjusting to throwing the ball backwards in order to advance forward.

FIGURE 8.24 We use both locomotor and manipulative skills to play most games.

Dance

The medium of dance incorporates many styles including ballroom, classical (ballet), jazz, Afro or primitive, Latin American, folk and modern dance. A particular style of dance often has certain techniques or 'rules' that separates it from other styles. A particular style is often identified by where the body moves, what parts

of the body move and how the movements are arranged. However, the two things common to all styles is the use of the body and the expressive quality of the movement. The type of dance that is performed is therefore determined by the way the body is used to express a feeling or action. The movement skills and elements give us the dance materials to determine what we can do, where we can move and the various qualities we can express with our body.

FIGURE 8.25 Different dance styles involve variations in the application and use of movement skills and elements.

Gymnastics

Gymnastics can take a variety of forms: Olympic (formal or artistic), rhythmic (using small hand apparatus), educational (creative or movement exploration) and general (team events).

The movements involved in gymnastics are characterised by the skilful manoeuvring of the body to perform predetermined, specific tasks. These movements often involve the use of a piece of apparatus or equipment.

The type of locomotor movement skills performed require precise execution. Nonlocomotor skills, such as turns, balances and pivots, are used extensively. Most often in gymnastics there is a standard sequence of motor actions to conform to. The compositional elements are then applied to the movement skills to achieve these predetermined movement objectives and a particular quality.

Aerobics

The medium of aerobics encompasses competitive aerobics (including singles, pairs and team aerobics) and aerobics fitness classes. Competitive aerobics requires four compulsory movement skills to be performed: crunches, push-ups, star jumps and kicks. Each skill must be done at least four times consecutively and be identical in execution. Moves can be added to the routine, but must not be contraindicated or gymnastic in nature. A time limit also applies in competition. Compulsory moves are the basis of a competitive aerobics routine; other skills are added and the compositional elements are applied to achieve a unique performance.

FIGURE 8.26 Aerobic fitness classes involve the use of aerobic movements with the aim of improving health and fitness.

In aerobic fitness classes, the instructor uses movement skills and elements to achieve the purpose of improving the health-related components of fitness through a sociable form of exercise. The exercises can be structured in many different ways to suit the participants in a class and to achieve specific goals such as toning, strengthening, stretching or aerobic fitness.

8.7.2 Sequencing

A movement sequence is the combination of a group of related phrases that come to a natural conclusion. The choreographer or coach arranges a number of sequences into a movement pattern. This becomes the final outcome or composition.

Sequencing is the process of putting movements and phrases together into larger sections in an ordered, sensible way. Sequences may flow from one to the other or be joined by transitional or connecting phrases.

A sequence of play in a game of hockey might be a series of individual and team offensive manoeuvres or plays (phrases) to bring the ball from one end of the field to the other past the opposition to score a goal.

An aerobics sequence could be a number of movement tracks following on from one another.

The structure or arrangement of a movement composition is referred to as its form. The form shapes the way in which the movement sequences and phrases are put together to make the whole. Form is more evident in and applicable to dance, gymnastics and aerobics than it is to games. The order and arrangement of the sequences within a composition is often determined by the accompanying music.

When music is used as the stimulus for the movement, the movement composition will often follow the accompanying musical form. For example, a musical composition that has three contrasting sections will often have a chorus or original theme that will be returned to. A dance composition can reflect the same arrangement with repetition of the original movement theme.

8.7.3 Transitions

Transitions are the joining sections of movement phrases and sequences. The transition should be a natural progression from one phrase or sequence to another. Transitions are an integral part of choreography because they contribute to the continuity and unity of a composition. The audience should not be distracted by transitions as they should be fluid and automatic.

Transitions can vary in size and complexity. A transition in dance may be as simple as a change in direction or focus, or it may be a movement phrase itself. In aerobics it may be a change in the music track or the tempo of the music.

8.7.4 Repetition

Repetition involves repeating certain movement phrases so that the audience can see these movements again and identify with them. Repetition also supports the learning of movement skills and phrases. For example, an aerobics instructor will choreograph a movement sequence to a music track, repeating the basic skills so that the class has a chance to learn the sequence. The instructor provides variety to these movements by manipulating elements such as direction travelled and arm lines.

There should be a balance of repetition and variety. If movements are repeated too much they become predictable. If there is too much variety it is difficult for the audience to identify with a string of unrelated movements.

8.7.5 Variation

Adding variation to set movements and sequences is important in all movement mediums. It creates interest and visual appeal in gymnastics, dance and aerobics. Adding variation to movements in games gives more options in offence and defence and reduces the predictability of team plays.

FIGURE 8.27 In sports such as netball, adding variations to set plays can make it more difficult for the opposing team to predict players' moves.

Application

Variation to a movement sequence

Compose and perform a movement sequence in your chosen movement medium. Experiment with the elements of composition and the movements to devise at least four variations to this movement sequence. For example, in an aerobics routine variation can be accomplished by changing

- the arm lines
- the direction of travel
- leg movements in side touches (such as a knee lift or step tap)
- the music and tempo.

Inquiry

Variation and performance

1. What effect does each variation in the application above have on the performance?
2. How can variations be used to increase the difficulty or intensity of a performance?

8.8 Appraisal

Appraisal is the process of determining the quality, quantity and status of a movement performance or skill. It gives the coach, choreographer and performer feedback on performance. Appraisal is an integral part of composition and performance as it gives information about the following factors:

- the degree of success of the performance
- self-evaluation

- the ability and success of others
- self-improvement
- areas that need correction
- recognition of skill level
- motivation.

8.8.1 Ways of appraising

There are several ways that we can appraise a performance.

Observation

Objective observation is judgement based on a predetermined set of criteria used to measure a performance. Examples of criteria could be:

- the use of the elements of composition
- presentation
- music selection
- height jumped
- distance thrown.

Subjective observation is based on feelings, impressions or opinions rather than a predetermined scoring system.

A rating scale is an observation technique used to measure a specific aspect of the performance. It allows us to focus on specific qualities or desirable aspects of a performance. A category (excellent, good, fair and poor) and a rating scale (5, 4, 3, 2, 1) can be determined and applied to the observation.

FIGURE 8.28 Height jumped is an example of objective observation of performance.

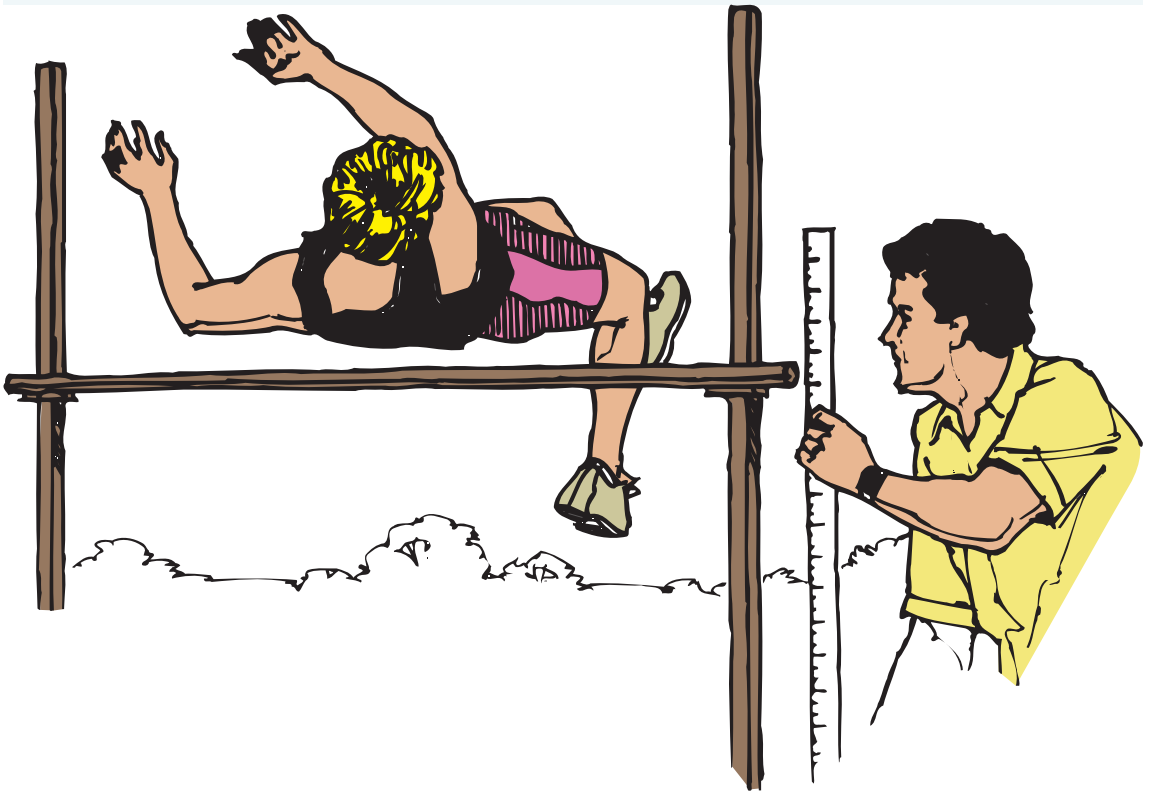


FIGURE 8.29 A dance evaluation form showing a sample of components that can be assessed with a rating scale

Criteria		Level of achievement				
		Inadequate	Limited	Sound	High	Outstanding
		1	2	3	4	5
Use of the element of composition	• Space (floor pattern, shape, focus, etc.) • Rhythm elements (beat, accent, tempo, phrasing) • Relationships (variation, groups, etc.) • Flow (uninterrupted) • Force (change in the dynamics) • Time					
Composition	• Musicality • Structure • Choreography					
Performance	• Technical ability • Presentation					

A check list is a list of things to look for when observing a movement performance. Figure 8.30 shows how a rating scale and a check list can be used to measure skills.

FIGURE 8.30 An example of how a rating scale can be used in association with a check list to measure basketball skills

Basketball skills	Subskills	Rating	Faults
Shooting	Grip	Good	For example:
	Stance	Fair	Unbalanced
	Take-off	Poor	Feet too close together
	Ball release		Feet not parallel
	Follow-through		
Dribbling			
Passing			
Footwork			

Application

Developing a rating scale

In your chosen movement medium, develop a rating scale that could be used when appraising a performance.

Analysis

Norms are useful standards that allow individual performance scores to be compared to the performances of others who have taken the same test. A norm is a scale that enables a raw score to be converted to a score that can be compared to and interpreted in relation to a large, representative group. For example, physical fitness tests such as the beep test use norms.

A percentile rank is a common normative scoring scale used in motor performance tests. It is based on the actual performance score. For example, an eightieth percentile score indicates that the individual has scored better than 80 per cent of those taking the test.

Statistics are often used to appraise the performance of an individual or team. For example, statistics may be collated about the goal average of a shooter in netball, the number of rebounds in basketball, or tackles in rugby league.

Application

Appraisal and statistics

Observe a game that you are familiar with. Identify the areas of performance you wish to appraise. Record statistics for the game and make an analysis of each player's or the team's performance based on the statistics.

Experiencing

When a performer has mastered a skill or movement, they develop the ability to judge if they have performed that skill or movement correctly. This internal appraisal mechanism or kinaesthetic sense is characteristic of a skilled performer.

To become an objective observer such as a judge, it is essential that the individual spends a lot of time judging performances.

Inquiry

Ways of appraising

1. Identify and list objective methods of observation.
2. How can an appraisal of a performance be made more objective?
3. Why is it important to receive feedback about performance?
4. How could the coach or performer use this feedback?
5. Why is it important that judges of performance are experienced?
6. How does an experienced performer have an advantage over an inexperienced performer when appraising their own or others' performance?
7. Would an audience appraisal of a performance be a good indication of the quality of a performance? Explain.

Inquiry

Appreciating mediums

1. Choose a dance or gymnastics performance. Describe how an observer may appreciate that performance if viewing from an aesthetic perspective.
2. Choose a different medium such as a game. Describe what to look for to appreciate the game from an artistic perspective.

8.8.2 Aspects of appraisal

Appraisal is the process of determining the

- quality (worth or value)
- quantity (for example, measurements)
- status (level)

of a movement performance or skill. Appraisal may involve procedures such as judging, measuring or interpreting a performance to estimate its value or worth. It is based on specific and/or established criteria or on personal opinion. Appraisal determines the extent to which movement goals are achieved. When appraising a performance, the following can be considered:

- how the elements of composition are used
- how creative or innovative the skills and movements are
- the arrangement of movement
- whether the performance achieves its intended purpose.

Elements of composition

When appraising a performance, this question needs to be addressed: 'How are the movement elements being used to enhance the quality of movement and performance?' For example, the following questions about the use of elements can help determine whether a dance is good or not:

- Is the whole stage area being used to its best advantage?
- Are there positive relationships between performers?
- Are the relationships between performers and props effective?
- Are the movements used appropriate to the music selected?
- How do the elements combine to produce aesthetic appeal?
- Have the elements been manipulated to add variety to the dance?

A good performance would use the elements of movement to show variation and creativity to produce quality movement.

Creativity and innovation

Adding creative and innovative movements to a performance adds to the aesthetic appeal for the audience. In competition aerobics, performers are judged on their creativity in the presentation component of the judging. Performers should demonstrate the creative use of movements and transitions. Demonstrating unique movements that add difficulty to the performance is an important aspect of judging gymnastics. Innovations and variations to gymnastics skills make a performer more competitive. Creativity in movements within games is often used to reduce the predictability of team plays to gain the advantage.

Arrangement of movement

A performance must show flow and continuity in the arrangement of the movement. Selected skills must suit the purpose of the performance and must be sequenced in a logical pattern. Transitions from one movement phrase to another must demonstrate coordination, flow and creativity.

Achievement of purpose

When judging a performance it is critical that the purpose of the performance is evident. In dance it would mean the clear communication of intent or an idea. Ambiguity detracts from the performance. The audience does not like to be left wondering what a performance was about, so it is important choreographers select movements, music and props that reflect their intention.

In games, it is quite simple to judge the achievement of the purpose. The final tally of goals is one method of determining this. The final score is an indication of the success of a performance in gymnastics.

Application

Appraisal

1. View a recording of a movement performance, such as an aerobics routine or dance. Make a personal appraisal of the performance. Share this with the class, explaining the reasons for your judgements.
2. As a class, design a set of criteria that reflect each aspect of appraisal; that is, the elements of composition, creativity and innovation, arrangement of movement and achievement of purpose. Now view the recording again and make an appraisal based on the aspects identified by the class.
3. As a class, discuss
   (a) the differences in appraisal
   (b) the impact of set criteria on judging
   (c) objective versus subjective appraisal.

8.8.3 Establishing and applying criteria

In order to give a fair evaluation of a performance it is important to:

- consider the nature of the activity
- analyse the components of each activity
- identify what is required to produce a quality movement or series of movements in each activity.

Each movement medium has similar characteristics, but each also has some that are unique to that activity; for example:

- gymnastics requires balance, coordination, power, flexibility, agility, body control and precision of movement
- games require skills specific to the game, flexibility in adapting to changing conditions and many of the fitness components
- dance requires coordination, balance, agility, rhythm, a good kinaesthetic sense and an expressive quality in movement
- aerobics requires flexibility, strength, cardiovascular fitness, creativity and rhythm.

It is therefore appropriate that we consider the nature and components of each activity to develop a set of criteria for measuring performance in each of these areas.

Criteria for judging gymnastics

Gymnastics consists of a number of disciplines: women's and men's artistic (Olympic) gymnastics and rhythmic gymnastics. Gymnastic routines are evaluated using a scoring system where the maximum score is 10 points. Judges deduct points or fractions of points for errors or faults.

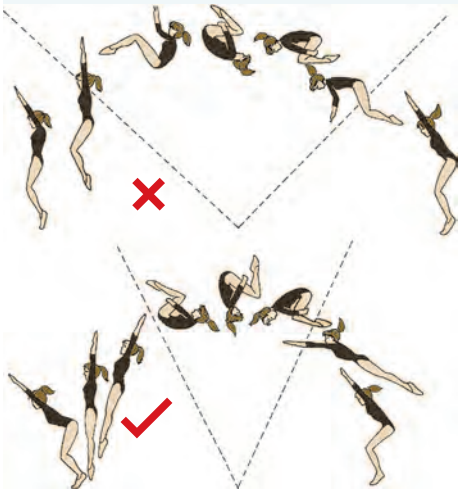
A gymnastics judge needs to know and be able to identify:

- the skills the gymnast is performing (what it should look like and what is wrong if it is executed incorrectly)
- the qualities required for an ideal execution of the routine.

In artistic gymnastics, a performance is evaluated by considering:

- what the gymnast demonstrates; for example, difficulty, set requirements, original and risky moves, the composition of the routine and the connecting movements between skills
- how well the gymnast demonstrates the skills and the connections. This is termed execution and includes artistry, technique and style.

FIGURE 8.31 Good timing and sure execution give a stylish performance in artistic gymnastics.



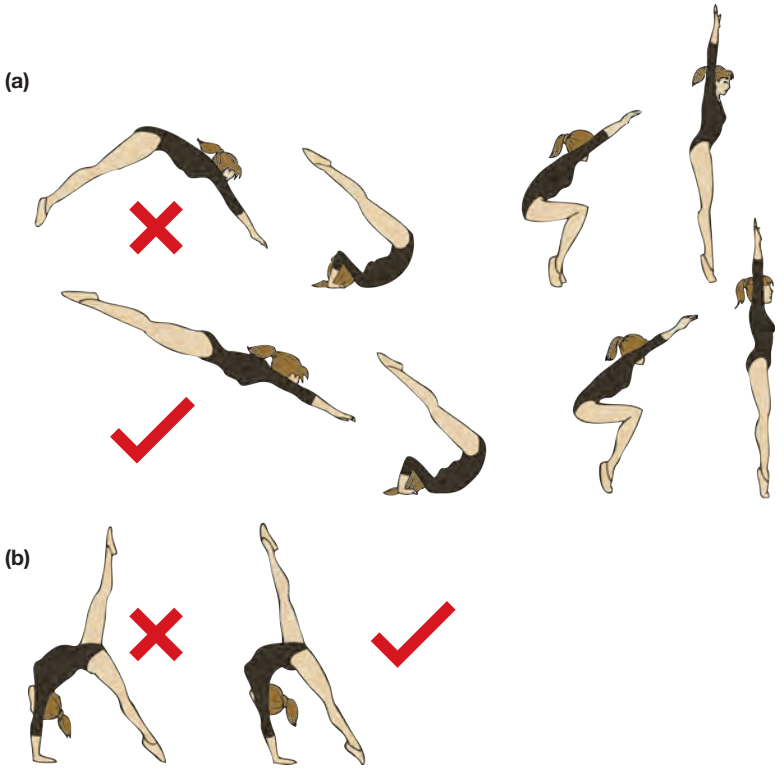
Criteria for execution include:

- exactness of the phrases of the skill — phrases need to be performed with precision and a defined body shape and show quick, crisp transitions
- fullness of amplitude — the range through which the body moves; that is, height, length, stretch and flexibility
- stretched arms and legs — the routine should demonstrate optimum posture and extension of body parts
- precision of timing — the performance must demonstrate absolute sureness, lightness of movements and style.

The execution of the skills in an artistic performance is judged by recording the mistakes made during the routine. Typical faults include:

- posture — poor positioning of the arms, legs, feet, body and head
- balance — wobbles, unsure landings, off direction and touching the floor or apparatus
- amplitude — lack of height or length, poor stretch or lack of flexibility
- rhythm — pauses, loss of rhythm, lack of continuity, monotonous tempo, extra swings, turning too early or too late, having a routine that is too long or too short.

FIGURE 8.32 **(a)** Changes in body shape need to be well defined in artistic gymnastics. **(b)** Incorrect and correct amplitude



Criteria for judging games

Performance in a game can be judged on:

- the execution of basic skills; for example, running, jumping, stopping, starting, twisting, passing and striking
- the use of game techniques — these are skills specific to each game; for example, manipulating a hockey stick to control a ball in hockey

- physical fitness
- perceptual motor ability — the ability to relate to the position and movements of other players and changing game situations
- team play.

Objective appraisal in games is made by using statistical information obtained from the game.

Criteria for judging aerobics

In competition aerobics a routine must be between one minute 40 seconds and one minute 50 seconds long. It is judged on a skill component, representing 60 per cent of the performer's score, and a presentation component that comprises 40 per cent of the performer's score. These components are based on the following criteria.

1. Skill:
    - strength — balanced upper and lower body strength and the clear demonstration of leverage and applied strength principles
    - flexibility — full range of motion in the major joints
    - form — overall execution should show coordination and technical control
    - exercise selection — this should be varied, safe and appropriate and show a balanced use of all the major muscle groups
    - transitions — these must demonstrate coordination, flow and creativity
    - synchronisation of pairs and teams — performers should 'move as one' and match in style and the execution of movement.
2. Presentation:
    - showmanship
    - creativity
    - musical selection
    - music interpretation
    - appearance
    - physique.

Criteria for judging dance

While the criteria for judging a dance performance may vary depending on the dance style or genre, certain general criteria can be applied to all.

A good dance performance is distinguished by:

- technical competence — the performer demonstrates technical skill in the execution of movement skills appropriate to the style of dance and shows coordinated and logical movements
- use of elements — the elements of composition show development, variation and creativity to give quality
- music
- performance and presentation — achievement of the purpose of the performance
- communication — the performer demonstrates stage presence and entertains and communicates with the audience
- stagecraft — costuming, lighting, props, scenery and sets used to heighten the story or mood of the dance.

FIGURE 8.33 A dance judge looks for key criteria when appraising a performance.

Different percentage weightings may be allotted for each criterion and in a dance competition, a panel of judges may be required to allow for the most objective appraisal.

Application

Establishing and applying criteria

1. As a class, devise a set of criteria that could be used to appraise a performance.
2. Individually, make a judgement about the performance based on the established criteria.
3. Compare and discuss your judgements.

Inquiry

Using criteria to make a judgement

1. Was this method of appraisal fair and objective?
2. How could this process be made more objective?
3. Suggest reasons for differences in final judgements.
4. How could the performer use the feedback from the appraisal?
5. Use the **Performance videos** weblink in the Resources tab to view two dance performances. As individuals, apply the criteria for judging dance to rate each performance. As a class, discuss your appraisals.

Resources

Weblink: Performance videos

8.9 Topic review

8.9.1 Summary

- The elements of composition are identified aspects of movement that can be changed or manipulated to produce movement patterns.
- The elements of composition include space, dynamics, time, rhythm and relationships.
- The element space includes direction (moving forwards, backwards, right, left, up, down or diagonal), level (high, medium, low), dimension (the size or extent of the movement or space), patterns and formations (imaginary lines that the body or its parts make when moving in general space).
- Dynamics refers to the force with which a skill is performed and the flow of movement.
- Time and rhythm refer to the synchronisation of a movement to music, sound or a beat; the coordination of body parts to perform a skill; how long it takes to perform the movement; and the pace at which it is performed.
- When a performer controls the timing of a movement, it is defined as self-paced.
- An externally paced skill is controlled by outside factors such as game rules, music or opponents.
- The element relationships reflect the way we respond or react to people and the environment in which we are moving.
- Within all movement media our relationship with others and the environment is constantly changing.
- The process of creating movement is influenced by many factors. These include the purpose of the performance, the stimulus or motivating factors that initiate the movement, the elements of composition and the skill level of the performer(s).
- The purpose of movement refers to the reason why we are doing it, or the intent of the performance.

- Motivating factors refer to the stimulus or sources of inspiration that initiate the process of composing movement.
- One of the first steps in generating movement is to identify the purpose and recognise the skills (locomotor, nonlocomotor or manipulative) that are specific to the movement medium.
- Manipulation of the elements of composition gives quality to a performance.
- Movement exploration is guided discovery of movement. Improvisation is spontaneous discovery of movement. Both are useful tools in the process of creating movement.
- When combining and arranging movement, the coach or choreographer arranges skills into movement phrases, combines phrases into sequences and then combines sequences into the end performance.
- Each movement medium has specific rules and conventions that govern the choreographic process.
- Transitions are the joining sections of movement phrases and sequences. They need to be a natural progression from one phrase or sequence to another.
- Repetition of movements supports the learning of skills. Variation of movements in a performance creates interest and visual appeal. There must be a balance of each in any performance.
- Performance appraisal provides information about a performance. Appraisal is the process of determining the quality, quantity or status of a performance.
- In the process of appraisal the following aspects of performance should be observed: use of elements, creativity and innovation, clear purpose and accurate arrangement of movements.
- There are several ways to judge or appraise a performance. They include: objective and subjective observation, use of rating scales, percentile ranks, statistics and norms.
- To provide an objective appraisal of a performance it is important to establish set criteria on which to judge the performance. Each movement medium has specific skills and qualities that require specific criteria for judging.

8.9.2 Question

Revision

1. **Identify** the elements of composition. (P17) (2 marks)
2. How do the elements of composition apply to different movement mediums? **Describe**, using examples. (P17) (5 marks)
3. **Outline** how space is used in floor gymnastics. (P17) (3 marks)
4. How could dynamics add quality to a dance performance? (P17) (2 marks)
5. **Identify** and state the relationships that exist in the game of basketball. (P16) (3 marks)
6. **Describe** the role of rhythm in dance and aerobics. (P16) (2 marks)
7. Why is timing important in games? **Explain**, using examples. (P16) (3 marks)
8. Select a sport. **Discuss** the use of team formations in offence and defence. (P13) (5 marks)
9. 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. (P17) (5 marks)
10. Select a movement medium. **Describe** how each element is used to compose movement in this medium. (P17) (5 marks)
11. **Identify** the skills that are specific to aerobics. How could variation be used to add quality to an aerobics routine? Give examples. (P13) (5 marks)
12. What is the difference between movement exploration and improvisation? **Discuss** the purpose of each in the process of movement composition. (P17) (6 marks)
13. How can the specific rules and conventions of each movement medium influence the process of creating movement? **Describe**, giving examples. (P17) (4 marks)
14. **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. (P16) (7 marks)
15. **Explain** the difference between objective and subjective appraisal. (P17) (2 marks)
16. **Explain** the importance of experience in the process of appraising performance. (P16) (3 marks)

17. **Create** a set of criteria that could be used to appraise a performance in your selected movement medium. Base the criteria on the aspects for appraisal. (P16) (5 marks)
18. **Explain** the role of appraisal in movement composition and performance. (P16) (3 marks)

Extension

1. **Describe** how the elements of composition can be observed in a floor gymnastics routine. (P17) (5 marks)
2. **Discuss** how the elements of composition can be manipulated to plan an attacking move in a chosen sport. (P17) (7 marks)
3. **Describe** the process of establishing and applying criteria when judging a performance in a chosen movement medium. (P16) (6 marks)

Note: For an explanation of the key words used in the revision questions above, see Appendix 2, page xxx.

Resources

Interactivity: Revision quiz: auto-marked version (int-7245)
Interactivity: Missing word interactive quiz (int-7246)
Digital doc: Revision quiz (doc-26265)

8.9.3 Key terms

appraisal is the process of determining the quality, quantity and status of a movement performance or skill. *p. 28*
A **composition** refers to a movement pattern consisting of a number of movement sequences, with a beginning, middle and end. *p. 2*
dimension describes the size or extent of the movement or performance space. *p. 4*
direction is the course our moving body follows or the direction in which we move. *p. 3*
duration refers to how long it takes to perform a movement or the time in which a movement must be performed. *p. 11*
dynamics refers to the flow and force produced by the body as it moves. *p. 7*
elements of composition are identified aspects of movement that can be changed or manipulated to produce movement patterns. They include space, dynamics, relationships, time and rhythm. *p. 2*
externally paced movements are skills where the pace and timing of the skill is controlled by outside influences such as music or an opponent. *p. 13*
flow is the control of movement through space. *p. 8*
force (composition and performance) is the degree of energy applied to a movement. *p. 7*
formations refer to the design groups of players or performers make while performing offensive or defensive moves or movement phrases. *p. 6*
general space is the space shared with other people or objects. *p. 3*
improvisation refers to the spontaneous discovery of movement. *p. 18*
level is the height of the movement in personal space. *p. 4*
locomotor skills are those that involve moving or travelling. *p. 20*
momentum (composition and performance) is the speed at which we perform a movement. *p. 11*
movement exploration refers to guided discovery or exploration of movement. *p. 22*
movement mediums refer to physical activities that use gross motor movements as their medium. They include dance, gymnastics, aerobics and games. *p. 2*
nonlocomotor skills are performed while the body is in a stationary position. *p. 20*
patterns refer to the floor patterns made by a performer as they move from one point to another. *p. 6*

performance is the end result of learning a movement composition. It is the game, dance, gymnastics or aerobics routine. *p. 2*

personal space is the space immediately around you. *p. 3*

A **phrase** is a number of related movement skills or actions. *p. 24*

repetition in movement is repeating a movement or movement phrase. *p. 27*

rhythm is the mathematical organisation of time in music, dance, aerobics and movement skills. *p. 24*

self-paced movements are skills where the performer has control over the timing of the skill, including when it begins and when it ends. *p. 12*

A **sequence** is a group of related phrases. *p. 24*

sequencing is the organisation of single movements into short and long phrases, then into sequences and sections and finally into a completed performance. *p. 27*

space is the medium in which movement takes place. It is defined by shape and size. *p. 3*

transitions are a natural evolution from individual movements to phrases and major sections of a dance, game or routine. *p. 27*

TOPIC 9
Fitness choices

OVERVIEW

9.1 Meanings of exercise
9.2 The value that people place on exercise and fitness
9.3 Individual fitness activities
9.4 Group fitness activities
9.5 Settings for exercise
9.6 Advertising and promotion
9.7 Motivators and barriers to participation
9.8 Topic review

OUTCOMES

In this topic students will:

- describe factors that contribute to effective health promotion (P5)
- propose actions that can improve and maintain an individual's health (P6)
- plan for participation in physical activity to satisfy a range of individual needs (P10)
- form opinions about health-promoting actions based on critical examination of relevant information (P15)
- use a range of sources to draw conclusions about health and physical activity concepts (P16)
- analyse factors influencing movement and patterns of participation. (P17)

In our everyday lives we engage in a variety of physical activity, from washing the car and doing the housework to getting dressed for school or work. Completing these types of task requires a small amount of effort and often we use only our upper body to do them.

Although these activities require the expenditure of a certain amount of energy through the movement they involve, their contribution to overall health and fitness is minimal. In order to gain health and fitness benefits, it is necessary to engage in moderate to vigorous activity. Individuals who choose to lead an inactive lifestyle are at risk of developing many lifestyle diseases. Inactivity is a major risk factor of coronary heart disease and contributes to other risk factors, including obesity, high blood pressure, stroke and diabetes.

FIGURE 9.1 People engage in a variety of physical activities. The impact these activities have on their health varies according to the intensity of the activity.

9.1 Meanings of exercise

The reasons why people participate in exercise and what exercise means to them is varied. It may mean an enjoyable experience that aids in stress release and relaxation, or it may be an activity that is planned to achieve benefits such as weight loss and improved cardiovascular efficiency. Exercise may simply mean hard work. Regardless of what exercise means to different individuals, people generally take on exercise for the health and fitness benefits that result.

Application

Meanings of exercise — survey

Conduct a survey of 10 or more people. Select people from a variety of age groups, both genders, different cultural backgrounds and a range of exercise experience. Ask them the question 'What does exercise mean to you?'

Inquiry

Meanings of exercise — survey results

Answer the following questions using the results from the survey in the application above.

1. Suggest reasons for the wide range of opinions about exercise among people.
2. How does the meaning of exercise change with age? Suggest reasons for this change.
3. What does exercise mean to you?
4. What things have influenced your opinion about exercise?
5. Do you regard exercise as an important component of lifestyle? Explain.

9.1.1 Exercise as a form of physical activity

Physical activity in the form of **exercise** has always been considered positive lifestyle behaviour. Exercise itself is a special form of physical activity because it is planned, structured and consists of repetitive bodily movements. Performing a series of push-ups and sit-ups is considered exercise because movements are repeated with the intention of improving selected components of fitness, in this case, muscular strength and/or muscular endurance. The different types of physical activity are shown in table 9.1.

TABLE 9.1 Types of physical activity

Type of activity	Description	Example
Play	Activities engaged in for enjoyment and recreation rather than a serious or practical purpose	
Games	Activities that one engages in for amusement or a form of competitive activity or sport played according to rules	

TABLE 9.1 Types of physical activity

Type of activity	Description	Example
Sports	Activities involving physical exertion and skill, in which an individual or team competes against another or others for entertainment	
Transportation (active)	Travel between destinations by walking, cycling or other non-motorised modes	
Chores	Routine tasks, for example, jobs done around the home	
Exercise	Activities requiring physical effort, carried out to sustain or improve health and fitness	
Recreational activities	Leisure activities. Leisure is discretionary time, which is time outside of work and study commitments.	

Exercise varies in intensity or the amount of effort we put into performing the movements. Intensity can be categorised as light, moderate or vigorous and is measured in a number of ways. **Light exercise** is activity that requires approximately three to four times as much energy as rest. It is equivalent to brisk walking. Needing more effort is **moderate exercise**, which is activity that requires approximately five to six times as much energy as rest. It is equivalent to jogging at a comfortable pace. The highest level of intensity is called **vigorous exercise**. It is activity that requires seven times or more energy as rest. It is equivalent to a fast jog or activity that makes the person 'huff and puff'.

The easiest method of assessing the intensity of effort is to use the talk test, which measures intensity in terms of the subject's ability to maintain conversation while exercising.

- *Low intensity* — at this level the person is able to sing while doing the activity.
- *Moderate* — normal conversation can be held while performing the activity.
- *Vigorous* — there is insufficient breath to carry on conversation while exercising.

However, athletes in training and those who are genuinely trying to monitor cardiorespiratory fitness improvement use the heart rate's response to exercise as the basis of measurement. Exercise causes your heart rate to increase in proportion to your exercise intensity. In other words, the harder you work, the higher is your heart rate. This relationship continues until you approach exhaustion where maximal values are attained. At this point, your heart rate begins to level off.

Training at a level of intensity that is too close to your resting heart rate provides little, if any, benefit to fitness. Alternatively, training at near maximal values quickly leads to exhaustion and subsequently is of little value. In between resting and maximal values is a zone called the **target heart rate (THR)**, which can be used to help you train at a level of intensity where performance benefits are maximised.

To find your target heart rate, calculate your maximal heart rate, which is approximated by subtracting your age from 220. For example, a 20-year-old person would have a maximal heart rate of 200 beats per minute (220 minus age).

For exercise of moderate intensity, the target heart rate is 50 to 70 per cent of the maximal heart rate. For exercise of vigorous intensity, the target heart rate is 70 to 85 per cent of the maximal heart rate.

The target heart rate zones are illustrated in figure 9.2. People beginning exercise programs should aim to hold their heart rate in the moderate intensity zone. As fitness improves, the target heart rate is increased to 70 to 85 per cent of maximal values (vigorous zone). Only well-trained athletes are able to work at the anaerobic threshold zone and then for only limited periods of time.

FIGURE 9.2 Target heart rate zone

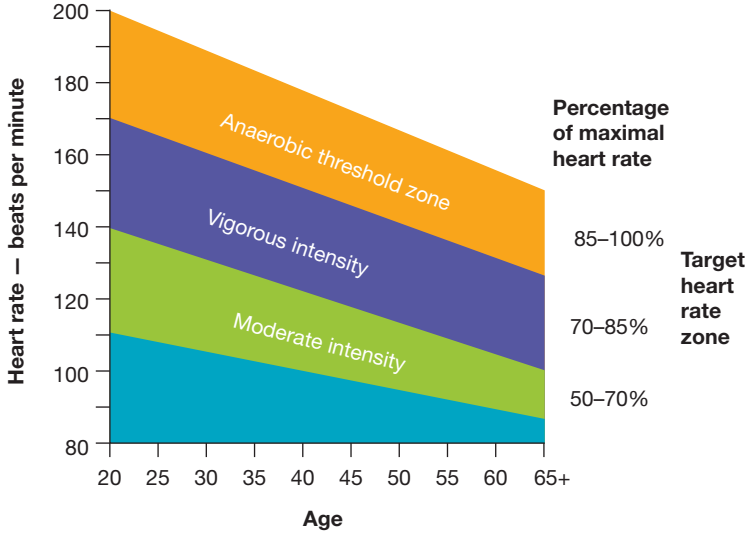
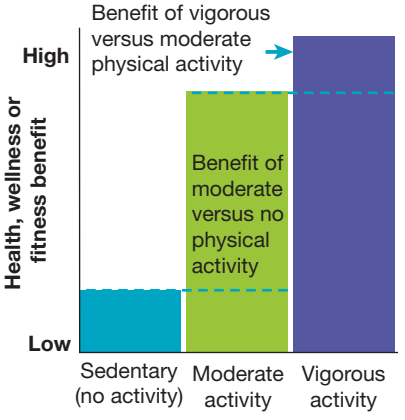


FIGURE 9.3 Health benefits of physical activity



Source: *From Concepts of Fitness & Wellness: A Comprehensive Lifestyle Approach* 5E by Corbin, Welk, Lindsey & Corbin, 2004 © The McGraw-Hill Companies, Inc.

Examples of activity that are considered light, moderate or vigorous are illustrated in table 9.2.

TABLE 9.2 Examples of intensity-related activities

Physical activity intensity	Examples*
Light activity	• Swimming for recreation • Strolling around the shops • Flying a kite • Gardening (e.g. light weeding)
Moderate activity	• Walking for pleasure • Cycling on level ground • Putting away groceries • Handwashing a car • Operating heavy power tools • Horse riding
Vigorous activity	• Jogging or running • Step aerobics • Playing an energetic sport (e.g. basketball, football or tennis) • Carrying heavy loads (over 25 kg) • Pushing a non-motorised lawnmower • Loading a truck

*Dependent upon age, ability and fitness.

Physical activity of moderate intensity benefits people of all ages, with greater benefits going to people who are able to partake in vigorous activity. This is illustrated in figure 9.3.

There is increasing evidence that these benefits occur soon after adopting an active lifestyle. Physical activity should start as a lifelong habit in childhood. Its benefits are greatest if activity is maintained throughout life.

Australia's Physical Activity and Sedentary Behaviour Guidelines (Australian Department of Health) suggest the following in terms of physical activity.

Young people aged 13–17 years

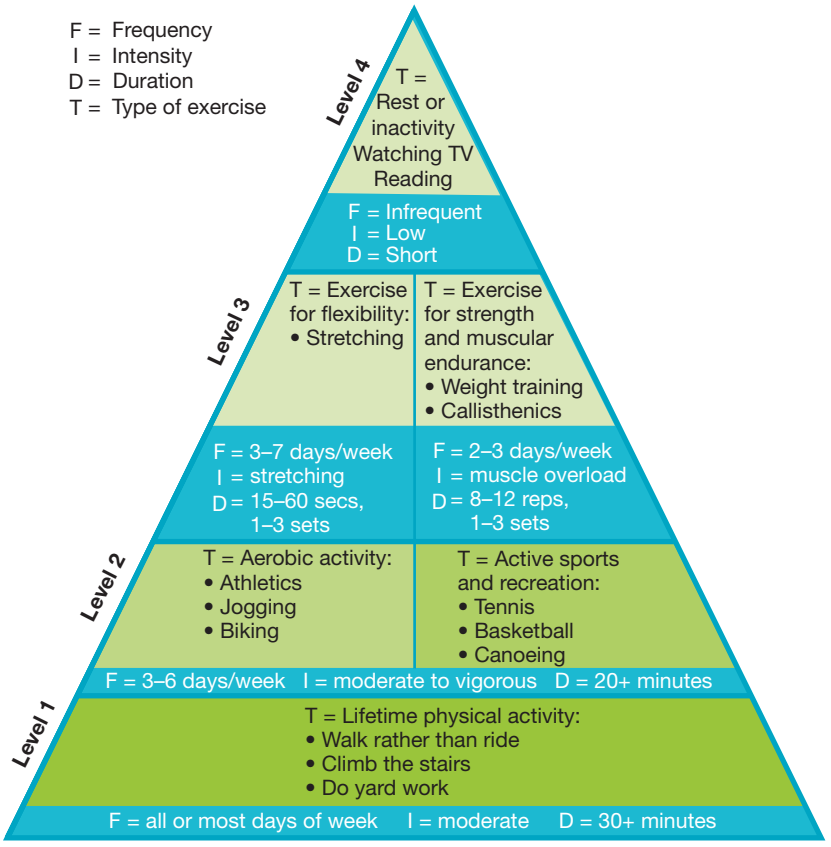
- *Frequency*: every day
- *Intensity*: moderate to vigorous
- *Duration*: 60 minutes and up to several hours. This can be accumulated across the day.
- *Type*: a range of activities including activities that strengthen muscle and bone on at least three days per week.

Adult recommendations

- *Frequency*: most if not all days per week
- *Intensity*: moderate to vigorous
- *Duration*: accumulate 2½ to 5 hours of moderate intensity physical activity or 1¼ to 2½ hours of vigorous intensity physical activity, or an equivalent combination of both moderate and vigorous activities, each week
- *Type*: a range of activities including muscle strengthening on at least two days per week.

Figure 9.4 shows how Australia's Physical Activity and Sedentary Behaviour Guidelines relate to frequency, intensity, duration and type of activity. Proportionally, we need more of level one type activity, progressively decreasing to lesser amounts of levels two and three and little of level four.

FIGURE 9.4 The physical activity pyramid



Source: From *Concepts of Fitness & Wellness: A Comprehensive Lifestyle Approach* 5E by Corbin, Welk, Lindsey & Corbin, 2004 © The McGraw-Hill Companies, Inc.

Inquiry

Exercise as a part of lifestyle

1. Examine your own lifestyle and determine your level of activity. Do you engage in sufficient moderate activity each day? Keep a record of the physical activity (type and frequency) you engage in over a two week period.
2. Are you meeting the recommended level of physical activity for your age group?
3. Identify ways in which you could increase the amount of activity you engage in each day. Include both planned exercise and opportunities for incidental activity.
4. To what extent should exercise be a part of lifestyle?

on Resources

Interactivity: Physical Activity and Sedentary Behaviour Guidelines (int-6653)

9.1.2 Exercise and its relationship to fitness

What does it mean to be fit? Fitness is a difficult concept to define as it means different things to different people. If we consulted the authorities we would discover a variety of definitions, including:

> *the ability to carry out daily tasks with vigour and alertness, without undue fatigue and with enough reserve energy to enjoy leisure time pursuits and to meet unforeseen emergencies* (World Health Organization)
>
> *the capability of the heart, blood vessels, lungs and muscles to function at optimal efficiency* (Getchell, 1979).

Application

Meanings of fitness — survey

Design a survey to investigate the meanings of fitness. Survey a range of people from different age groups. An example of a fitness survey is shown below.

Name	What does it mean to be fit?	What do you need to do to improve your fitness?	Do you consider yourself to be fit? Why?
Me			
Friend			
Teacher Coach			
Team-mate			
Mum			
Dad			
Uncle			
Neighbour			

Inquiry

Fitness survey

Use the results from the survey in the application above to help you answer the following questions.

1. Is fitness important to people?
2. Do people know how to maintain or improve their fitness? How could they get this information?
3. What does it mean to be fit?
4. Identify your own fitness goals. What do you need to do to achieve these goals?

Consider the fitness levels of an Australian basketball player and an Australian marathon runner. Do they both satisfy the definitions in regard to individual fitness? Do these definitions give us an accurate determination of each individual's fitness level? Can we gain an accurate comparison of fitness levels between these athletes? As basketball and distance running are very different in their physical demands and skills, we need to look at fitness in regard to the components needed to perform physical activity.

Physical fitness refers to a set of attributes that people have or achieve and that relates to the ability to physical activity. These attributes can be divided into two sets of components.

1. Health-related components include
   - cardiorespiratory fitness
   - flexibility
   - muscular endurance
   - strength
   - body composition.
2. Skill-related components include
   - speed
   - power
   - coordination
   - balance
   - agility
   - reaction time.

FIGURE 9.5 The components of fitness required to play basketball include strength, speed, agility and coordination.

For those people who wish to improve their general health and fitness, it is necessary to undertake a regular, moderate intensity exercise program that incorporates the health-related components. For those people who wish to improve their fitness levels in order to improve sports performance, exercising at a moderate intensity is not sufficient. A planned training program is needed. It should incorporate specific exercises to improve the fitness components required of the sport or performance. The intensity of exercise needs to be vigorous and can be measured by heart rate. Both the intensity and frequency of exercise increase as fitness gains are achieved.

FIGURE 9.6 Rugby union requires strength and power. Players incorporate weight training into their training programs to improve these fitness components.

Regardless of your fitness requirements, including exercise as a regular lifestyle behaviour is essential to improve and maintain health and fitness. The specific exercise program adopted must meet your specific needs.

9.2 The value that people place on exercise and fitness

In the past, people did not need to plan for physical activity. Work was much more labour intensive, so fitness was achieved through work. As technology was introduced in the workplace and home, and physical labour was replaced by mechanisation, the need for planned exercise to improve health and maintain fitness became apparent. As people's lifestyles became more sedentary, the incidence of lifestyle diseases increased. The fitness boom in the 1970s and 1980s resulted from an increase in community concern about the morbidity and mortality rates associated with lifestyle diseases, particularly coronary heart disease. Activities such as aerobics and fun-runs became popular as they led to improved cardiovascular functioning. Although the fitness boom and health promotion programs have led to an increased awareness about the importance of physical activity and fitness, statistics reveal that almost half of the adult population in New South Wales are still insufficiently active. Females are less active than males.

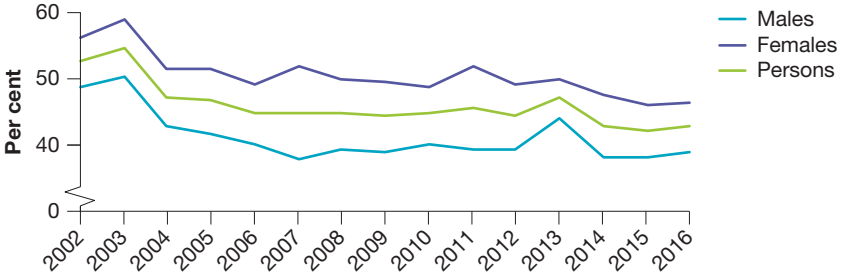
9.2.1 Changing attitudes to fitness

The latest report on physical activity from HealthStats NSW, published October 2017, revealed that almost half the adults in New South Wales did not engage in sufficient physical activity. The report found that:

- 42.8 per cent of adults aged 16 years and over (38.9 per cent of men and 46.5 per cent of women) undertook insufficient levels of physical activity (less than 150 minutes of moderate or vigorous activity a week; or 150 minutes of activity, or more, over fewer than five sessions a week)
- 29.8 per cent of persons aged 18 years and over (32.8 per cent of males and 27.0 per cent of females) in New South Wales were sufficiently active in the last week (more than 300 minutes of physical activity over five sessions)
- 21.0 per cent of students aged 12–17 years (25.0 per cent of boys and 16.7 per cent of girls) undertook adequate levels of physical activity
- In summer 63 per cent of students and in winter 51 per cent of students in years 6, 8 and 10 undertook adequate levels of physical activity, as estimated from the 2010 NSW Schools Physical Activity and Nutrition Survey. (State of New South Wales NSW Ministry of Health, www.health.nsw.gov.au)

Further information from HealthStats NSW reveals that, following a peak in 2003, the trend for the general population doing insufficient physical activity has shown a gradual decline and now appears to have plateaued (see figure 9.7).

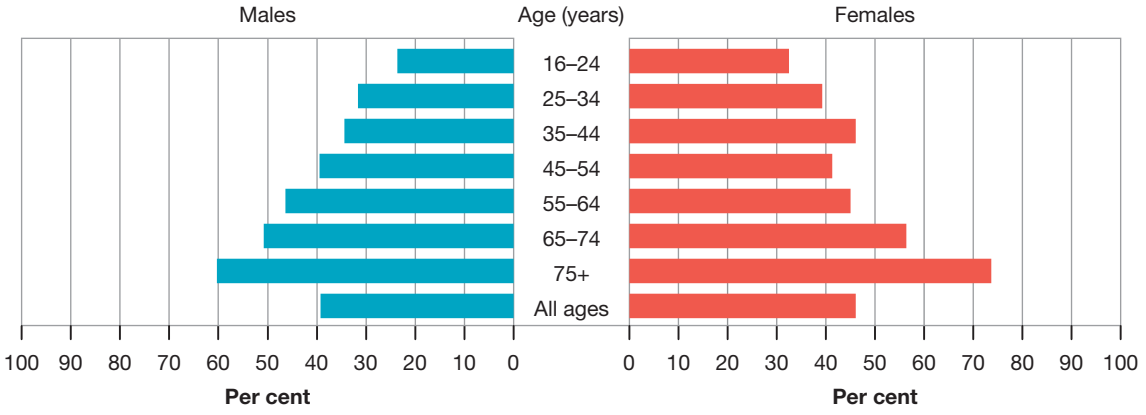
FIGURE 9.7 Insufficient physical activity, persons aged 16 years and over, NSW, 2002–16



Source: Adapted from www.healthstats.nsw.gov.au.

However, this trend does not reflect problems in specific age groups. Examination of figure 9.8 shows that, while insufficient physical activity is an issue for a small percentage of those aged 16–24, as people age they are less inclined to exercise. This peaks in the 75+ age group where medical issues may make it difficult to achieve suggested activity targets.

FIGURE 9.8 Insufficient physical activity by age and sex, persons aged 16 years and over, NSW, 2016



Source: Adapted from http://www.healthstats.nsw.gov.au/Indicator/beh_phys_age/beh_phys_age_snap.

People's attitudes to fitness determine whether they participate in regular physical activity. Attitudes to fitness are influenced by a number of factors.

- Age — statistics show that people who are aged between 16–34 years are the most physically active of all age groups. Older age groups have lower levels of adequate activity and are more sedentary.
- Gender — males are more active than females. Reasons for this in Australia appear to be associated with stronger influences on physical activity from school and family on boys than on girls. For example, participation in extracurricular sporting activities here is lower among girls than among boys.
- Family — adolescents who have parents who are active or support them in their activity generally value fitness.
- Peers — the attitudes of a person's peer group can put pressure on that person. If the peer group does not value exercise and is not active, others in the group can feel pressured into adopting the same values and behaviours.
- Media — the media are a powerful channel through which the fitness message is given. Awareness raising of the benefits of fitness and the types of activities and sports available can positively impact on the attitudes of individuals.

- Past experience — the physical activity that adolescents experience within the school setting or local community can directly affect the decisions of adolescents to continue to be active as they get older. Research shows that if children's experiences with activity are fun and foster skill development, they are more likely to adopt physical activity as a lifelong behaviour.
- Cultural — women from non–English-speaking backgrounds (NESB) are more likely to be sedentary. They often do not receive the social support they need to be active. People from a NESB are significantly less likely to be adequately active (NSW Health).
- Socioeconomic status — people with a lower level of education are more likely to be sedentary. This could be attributed to a lack of knowledge about the benefits of fitness and a lack of opportunity, funds or facilities.

The degree to which an individual values fitness is determined by a combination of many factors. As a person grows older, the value they place on fitness may change many times. For example, a person who suffers from heart disease later in life and who has never engaged in exercise may now recognise the importance of regular exercise to improve their cardiovascular efficiency.

FIGURE 9.9 Parents can have a positive influence on their children's attitudes to exercise and fitness.

Application

Changing attitudes to fitness — survey

Use the following survey to gain a range of opinions about the value people place on fitness. Survey at least 12 people from a variety of age groups.

Survey: attitudes to fitness

1. Name: .....
2. Age: .....
3. How often do you exercise?.....
   .....
4. What intensity do you exercise at?.....
   .....
5. Why do/don't you exercise?.....
   .....
6. Do you value fitness?.....
   .....
7. What factors have influenced your attitude to fitness? .....
   .....
   .....
8. Has your attitude to fitness changed over time? Why?.....
   .....
   .....

Inquiry

Fitness and values

1. From the people you surveyed in the application above, what value do people place on fitness?
2. Are there any similarities in attitudes and values?
3. What reasons are given that support the value of fitness?
4. What are the predominant factors that influence people's attitudes to fitness?

9.2.2 Fitness as a commodity

The **commodification** of exercise and fitness became increasingly apparent during the fitness boom of the 1970s. The individual, community, government and business sectors became aware of the need for everyone to participate in activities that improved their health. Companies recognised that fitness could be a profit-making **commodity**. The establishment of fitness centres, along with a renewed interest in many physical activities, became commonplace.

Fitness centres provide a range of activities designed to meet every exercise and fitness need. They promote a range of services, have fully trained personnel and provide a wide range of exercise equipment based on the latest technology. Through advertising, the fitness industry aims to convince the consumer that the easiest and best way to get fit is by using their services. Advertising within the fitness industry can be presented in many forms. Advertisements often depict male and female bodies that mirror society's perception of the perfect body. The use of special deals, a range of fitness activities, extended hours and child minding facilities further appeal to the consumers.

SNAPSHOT

How to do a fitness audit (and why it's a good idea)

By Cassie White, Health Journalist, ABC RN Life Matters

What's more terrifying than being financially audited by the tax office? Having your fitness regimen audited by a personal trainer.

FIGURE 9.10 Most Australians could benefit from increasing their level of physical activity.

The goal of an audit is to objectively and systematically determine whether you meet fitness requirements. It means it's the time to drop a truth bomb on your exercise habits. And since we're auditing, let me throw a few numbers at you.

Let's start with Australia's physical activity guidelines. These are evidence-based recommendations about how much physical activity you should get every week.

They make three broad suggestions:

- Move more — adults are encouraged to accumulate 2.5 to 5 hours of moderate intensity exercise, or 1.25–2.5 hours of vigorous intensity exercise per week, or a combination of both.
- Sit less — we're told to break up extended periods of sitting.
- Get strong — do muscle strengthening activities (e.g. go to the gym, or do body weight exercises) at least two days per week.

All up, that's a requirement of five hours of physical activity per week. In case you were wondering, there are 168 hours in a week.

So where are we as a nation right now?

According to the most recent Australian Health Survey, about 70 per cent of Australians don't move nearly enough. Less than one in five adults take 10 000 steps per day, which is the minimum amount we need just to function — not to be fit. But enough numbers. It's time to find out where you stand, and put a system in place to have you meeting the criteria.

What is fitness?

Your overall fitness level can be broken up into three components:

- **Cardiovascular fitness** — your body's ability to transport and utilise oxygen. This includes activities like walking, running, cycling, swimming and aerobics.
- **Balance and flexibility** improve the full range of motion of your muscles and joints. Yoga, tai chi and Pilates can all help you achieve this.
- **Musculoskeletal fitness** helps strengthen muscles, improve bone density, maintain a strong core and help you maintain a healthy weight.

All three forms of exercise are necessary for a strong, durable and healthy body.

Performing your fitness audit

First: what are you already doing?

It might be confronting to find out you're not moving enough. But you might be moving more than you think. Start with the big ticket items. So the group fitness classes, brisk walks, weekend runs with friends, laps at the pool or gym sessions.

Next, think about your incidental exercise, which is often unplanned. Don't include walking up a single flight of stairs. But do count other activities you might not consider exercise — your bike ride to work, walking the kids to school, playing in the park on the weekend and even vigorous gardening (just be careful not to swing the mattock too hard!).

Next: keep tabs on how much you're moving throughout the day, every day.

Most smart phones come with apps that will help you track your physical activity, so try using one for a week to get a better idea of what you're really doing. Another option is to buy a cheap pedometer to track your steps.

Or go old school, and write everything down. If you walk to the shop for ten minutes to get the paper, add that in. Playing soccer in the park for 15 minutes when you get home from work — that also counts. And don't forget, if you're really huffing and puffing after you exercise, then you're likely doing vigorous exercise and that counts for double. So a 10-minute run equals a 20-minute walk.

Then: tally up your minutes to find out what's really going on. If you're nowhere near the mark, don't panic. Now's the time to get moving.

FIGURE 9.11 Weight bearing exercises help to build strength.

Like most things in fitness, I recommend gradually building up your exercise time, rather than trying to go from zero to 100 in one hit. Otherwise, you'll likely feel overwhelmed and throw in the towel. Chances are, once you get started and begin to experience the benefits of exercise, you'll prioritise finding more time in your life for it.

Sometimes the process of doing an audit is enough to help us shift our thinking around activity, and suddenly we start to look for opportunities to move more.

Most common excuses not to exercise:

- 'I can't afford it'
  It's true, not everyone can afford a trainer. But gym memberships are about $20 a week for a huge variety of classes and equipment. You probably spend more on coffee or beer. Also, walking and jogging are free.
- 'I'm tired'
  Yep, we all are. Turn off the telly, put away your phone and go to bed earlier.
- 'I'm busy'
  I have corporate clients who work long hours every day, carry massive amounts of responsibility, then go home to young families. They make time to exercise.
- 'I don't like exercise'
  Chances are you've never really tried it. This is a great way of not taking responsibility for yourself.

Where is your spare time?

If you work out that you really need to do more, the next step is figuring out how. This will mean overcoming the classic barrier for not exercising — not having enough time. The truth is, many of us have more time than we realise. So, again, this is going to require you to be honest with yourself.

Where in your day do you have time to do something active?

A simple way I help people find extra time in their day is to break their day into 30 minute blocks. You then look at what you are doing in each block. Often people are surprised to find they have more time than they realised. There's often at least one period of 30 minutes in their day where they're not doing anything. I tell them to fill that time with something active.

Next, think carefully about all the time during your day when you're 'busy'. How many of those minutes are you actually just wasting time? Be totally honest here — remember, you're being audited. What you're looking for are any times you might be able to fit in some exercise. All these sessions of 30 minutes add up, so over the course of the week, you're getting close to what's recommended in the guidelines.

What systems can you put in place to free up more time?

- Do Sunday meal preparation so you can exercise after work, instead of going home to cook dinner.
- Organise with the boss to take a slightly longer lunch break 2–3 times a week and either stay back later/start earlier, so you can exercise during the day.
- Record your favourite shows during the week and binge-watch them on the weekend.
- Wake up 30 minutes earlier every morning.

Finding your exercise

Once you've carved out your exercise minutes, it's time to choose what to do. That'll depend on your budget, location and schedule. Also try and find things you enjoy. It doesn't have to be running, it might be a dance class or tai chi.

FIGURE 9.12 Bodyweight exercises are free, require no fancy equipment and can be done almost anywhere.

Whatever your circumstance, there are plenty of options and going for variety can help stop boredom. The other advantage of doing a few different things is that you're likely to be working different parts of your body and developing different types of fitness.

I also recommend going with the most convenient option. Give yourself as little wiggle room to make excuses as possible. Sure, if you've got hours to kill, get in the car and drive to the gym. But if it's early in the morning and

you've only got 30 minutes, roll out of bed and go for a fast walk. If you allow your brain to get involved, all sorts of bad can happen.

Also let your time determine the form of exercise you do. For example, if you've only got 20–30 minutes, do something vigorous that really gets your heart rate up. Make your session short and sharp.

Do what you want, but always do these things

Walk. It's a fantastic form of low-impact exercise. If you're someone with a lot of injuries — especially hips and ankles — walking is a great way to get your heart rate up and get moving.

You also need to include two muscle-building activities each week. If you aren't at a gym, bodyweight exercises are fantastic: squats, lunges, push-ups, planks and hip extensions.

Finally, lying on the couch is very important. Especially if you're someone who's quite into fitness, you need to give yourself a chance to recover.

Cassie White is a Sydney-based personal trainer, yoga coach and health journalist.

Source: www.abc.net.au/news/health/2017-02-06/how-to-do-a-fitness-audit/8245170.

Application

Fitness centres

Research your local fitness centre to find out the following information:

- services offered
- cost for each service
- payment plans
- special offers or package deals
- equipment available
- expertise of staff
- availability of staff for individual support
- facilities for the disabled
- child-care facilities.

Inquiry

Fitness commodity — local fitness centre

1. Would the fitness centre you examined in the application above meet your fitness needs? Explain.
2. Do you think this fitness centre is value for money? Explain.
3. Before paying to join this fitness centre, what could people do to determine if it is worthwhile?
4. Why has the fitness industry continued to be a viable, profitable industry?

People should recognise that gyms are not a quick fix to their health and fitness needs. To improve your fitness level takes effort and commitment to planned exercise. However, the fitness industry does provide a range of beneficial services and expertise. Fitness centres meet the fitness needs of a large number of people. For many people, they provide the expertise and environment they need to improve their fitness. It is important for people to determine their fitness needs and investigate the services, cost and expertise offered by fitness centres before they make a financial commitment and join a gym.

If you decide that the local fitness centre is not what you want, the fitness industry offers many other services and products to aid you in your goal of improved fitness and health. If you require motivation and expertise, employing a personal trainer may suit your needs. If you are not comfortable 'sweating it out' in the company of others, a wide range of online and downloadable exercise videos and DVDs are available. Fitness clothing, nutritional supplements, home gyms and exercise machines are other products on offer.

FIGURE 9.13 Fitness centres can provide a range of services and facilities including aerobics, battle rope, yoga, power boxing, weight training, step class, personal trainers, nutritional advice, saunas and spas.

The fitness industry has incorporated the latest technology into many products, providing convenience and up-to-date information. Communication with members is now more likely to take place through social media than through radio and newspaper advertising, while the smartphone has become the tool that has taken the fitness experience to a new level. Those who feel they are time poor can instantly connect to YouTube or virtual training apps and complete a session either at home or in the office.

Club branded wearable apps, usually with headphones, provide users with almost everything they need for a total fitness experience. Apps are becoming the ultimate fitness tracker, with body sensors able to crunch data from multiple tracking devices and have it instantly processed and available to the wearer or fitness trainer for analysis. Some club mobile branded apps have additional functions where fitness class vacancies appear on screen, class passes are provided, cancellations can be made and even virtual workouts conducted. Programmable wristbands and Fitbit activity trackers are popular, with at least one brand that targets behaviour modification — these have the ability to detect performances falling short of goals and can even provide a mild shock as negative reinforcement.

FIGURE 9.14 Fitness is a commodity. A wide variety of services and products are aimed at improving your fitness.

Wearables apps are currently at the cutting edge of technology, able to create a workout that is smarter, enjoyable and more expedient than that experienced generations ago. Smartphone owners these days use apps regularly, with the fitness experience being a high priority for some. Incorporated in the phone, or with links to data tracking tools through body sensors, the screen is in essence a dashboard, providing a single view of the wearer's well-being and fitness with steps, distance, heart rate, kilojoules expended and intensity being accessible at a glance. Some apps have the technology to simulate the experience of having a personal trainer with them providing advice, encouragement and motivation — all through the headphones.

Even equipment such as treadmills and bicycle ergometers have a new look. Some have integrated television screens while most have heart rate monitoring devices. Sessions, particularly on bicycle ergometers, are often conducted in teams, with some gyms capable of projecting individual data onto big screens, enhancing motivation, effort and reward. Some gyms have also adopted very flexible operating hours, providing 24 hour access to members to cater for people who cannot attend specific sessions.

Inquiry

Commodification

Choose one of the following physical activities and investigate its commodification:

- HIIT training
- running
- swimming
- aerobics.

Consider the following questions in your investigation.

1. What equipment has been specifically designed and produced to aid performance in this activity?
2. How has the commodification of this activity influenced participation (consider cost, image, motivation and accessibility)?
3. Has the commodification of exercise and fitness had a positive or negative effect on the individual's level of health and fitness?

9.3 Individual fitness activities

There is an incredible range of physical activities on offer, from the commercially driven activities that offer fun and challenge, such as indoor rock climbing, to the more traditional exercise types. The challenge for the individual is to find an exercise type that meets their fitness needs and that is enjoyable.

What type of exercise should you choose to improve your fitness? Do you prefer exercising by yourself or in a group? Have you got the time or the money to join a gym? Does working out at home best meet your needs? It is not always an easy choice to make. Having a good knowledge of the range and variety of fitness activities available definitely helps you make the correct choice.

In the past, jogging or swimming were the practical options to improve fitness for people who preferred to exercise by themselves. Today many individual fitness activities are available, some of which require specific knowledge and skills. Raised awareness of health has led to the revival of many fitness and recreational activities and the emergence of new ones. Activities such as indoor rock climbing, in-line skating, snowboarding and power boxing are examples of fun and challenging fitness activities that are now available.

9.3.1 Power walking

One of the easiest low impact activities is power walking. Brisk walking for 30 minutes each day at a pace of around four to six kilometres per hour improves fitness and overall health. It is just a matter of putting on a comfortable pair of shoes and heading out the door. One of the benefits of power walking is that you can do it anytime, such as in your lunch hour or before or after work. Power walking is safe, cheap and convenient.

Walking is an excellent exercise for heart health and for health in general. If you walk regularly you tend to:

- feel more confident, happy and relaxed
- control your weight better
- have lower blood pressure and lower cholesterol levels
- have stronger bones
- be less likely to have a heart attack and recover better in the event of one
- be less likely to have a stroke
- be less likely to develop diabetes in middle age (*Facts on Walking for Pleasure and Health*, Active Australia).

To have a greater impact on fitness, walking at a greater intensity, uphill or carrying a load is required. To maintain motivation when power walking, change your route, include regular bushwalks and walk in parks.

The benefits of walking are recognised by many people. It is a recommended form of exercise for people recovering from heart disease because it is low impact. It is one of the most popular forms of exercise for people across all age groups.

FIGURE 9.15 Power walking is a popular form of exercise. It appeals to people of all ages as it is low impact and convenient.

9.3.2 Running

Running is an activity that can be done only at moderate or vigorous intensity. It is an effective aerobic activity because it involves movement of the whole body. Running is a convenient and time-efficient form of exercise. For those people who don't have a lot of spare time, a 20 minute run could be a good fitness option. It is advisable to run on grassed surfaces rather than the road to reduce stress on the joints. Cross-country running is a great way to maintain motivation.

It is important to start slowly and increase intensity as your fitness level improves. This can be done by increasing the distance run, incorporating speed play, or running in more challenging environments such as hilly areas.

9.3.3 Swimming

Leisurely swimming is sufficient to gain health benefits. Swimming laps using various strokes improves cardiovascular efficiency. Swimming is an activity that can be enjoyed all year round for most people. Heated indoor pools cater for the need to have swimming facilities available all year. Swimming is relatively inexpensive and requires little equipment, making it a cheap and convenient form of exercise.

Swimming is not restricted to the local community pool. Pools can be found in leisure centres and resorts. The popularity of swimming as a fitness activity has led to the emergence of aquarobics. As one of Australia's favourite physical activities, swimming is an effective conditioning activity that is low impact, but uses both the upper and lower body, giving a total body workout. It is often recommended as a form of exercise for asthmatics as it helps to build up lung capacity, and for people rehabilitating from injury, due to its buoyancy effect.

FIGURE 9.16 Swimming is a good way to improve cardiovascular fitness.

Inquiry

Swimming fitness

Use the **Swimming — health benefits** weblink in the Resources tab for more information.

1. Read the information about the benefits of swimming.
2. Use the information to evaluate swimming as an individual fitness activity.

Resources

Weblink: Swimming — health benefits

9.3.4 Cycling

Cycling is an activity that most people enjoy in their youth but many stop doing as they get older. Like running, cycling provides a good cardiovascular workout. Cycling at a vigorous intensity (more than 16 kilometres per hour) has beneficial effects on fitness.

Your decision to start cycling may be influenced by the cost of a bike or the area you live in. Busy city roads are not the ideal place to exercise. Some communities have recognised this and built cycle paths through their suburbs in an effort to encourage people to cycle and to improve the safety of cyclists.

The introduction of the mountain bike has broadened the choice of terrains people can ride over. People can now ride on rugged surfaces through the bush. For those people who don't like road riding, this is a great option.

The benefits of cycling to health and fitness are well recognised. The fitness industry has endeavoured to make cycling accessible to everyone by producing stationary bicycles. These are available in most gyms or can be bought for home use. The introduction of indoor cycling classes, known as 'spin', at fitness centres has become a popular fitness option. It is particularly appealing to those people who are not confident road riding or cannot afford their own bike. It is also a great option in bad weather.

The most popular form of cycling is road cycling, with more than 15 per cent of Australians riding a bicycle in a typical week. While many of these are recreational and utility riders, a large number are members of various clubs or social groups who choose to ride because they simply enjoy the experience and comradery. The upper level of cycling is racing, with individuals and groups all over Australia regularly participating in fun rides, marathons and professional races. Many of these are conducted on open roads and may take days to complete. The Sydney to Wollongong bike ride is an example of a one-day fundraising ride with 10 000 riders participating annually.

Cycling is an excellent fitness activity and is preferred by many as considerable body weight is taken off the knee joints. However, the large leg muscles are still required to do much of the work, challenging the cardiorespiratory system to respond and continually improve its efficiency. Cycling also has a social side, with the pain of a tough ride frequently broken up by coffee stops. It is not uncommon to see large groups of cyclist on country roads making their way to the next stop.

New lightweight, aerodynamic bicycles with drop handlebars, multiple gears and high pressure tyres make the modern bike faster, more efficient and easier to ride up steep gradients. Helmets, Lycra bodysuits and sun protection clothing assist with safety from the elements, while new laws in New South Wales make it safer for cyclists sharing the road with motor vehicles. For example, when cars are passing cyclists, they must allow at least a 1-metre distance between the vehicle and the bike in zones of 60 kilometres per hour or below.

FIGURE 9.17 Cycling is a great fitness activity and can be performed either recreationally or as a competitive sport.

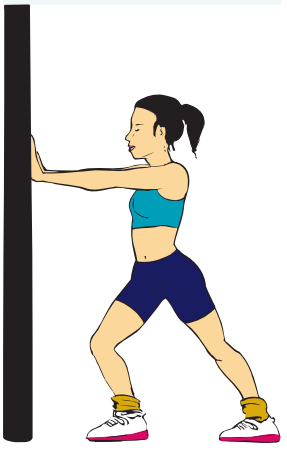
At the high end of cycling for fitness is chain gang cycling, where high-speed training sessions are conducted on the road in two lines. Those behind the leaders gain some benefit from drafting. Off-road fitness training can also be conducted in gyms, where cyclists do circuits with an emphasis on leg speed and development in low impact, high intensity spin classes.

9.3.5 Weight training programs

Weight training programs can be undertaken at home or in a gym that has the appropriate equipment. Programs can be isometric, isotonic or isokinetic. Weight training is a good option for people who want to improve the specific fitness components of strength and muscle endurance.

In isometric training, muscles develop tension but do not change in length. A typical isometric exercise would be pushing or pulling against an immovable object. By devising a series of exercises that are isometric in nature the individual can do their training program in a variety of places. They do not need a specific environment in which to exercise. The best gains in fitness are made in isometric training programs using six to eight repetitions of exercises, each lasting six seconds.

FIGURE 9.18 By pushing or pulling against an immovable object, tension is developed in muscles. This is referred to as isometric muscular contraction.



Isotonic weight training programs involve lifting weights through a full range of movement. This type of training requires the use of free weights and can incorporate weight machines. It is usually done at a fitness centre or gym, but can be done at home if the equipment is available. This is the traditional type of weight training and is the most popular.

Isokinetic weight training involves the use of elaborate machines that allow maximum muscle tension through the full range of movement. Isokinetic machines are designed so that the muscular force exerted by the body is equalled by the resistance of the machine. This type of training equipment is available in some fitness centres. The major advantage of this type of training is that strength gains will be constant throughout the full range of movement because the level of resistance is constant.

FIGURE 9.19 Isotonic weight training involves lifting a weight through a full range of movement using free weights.

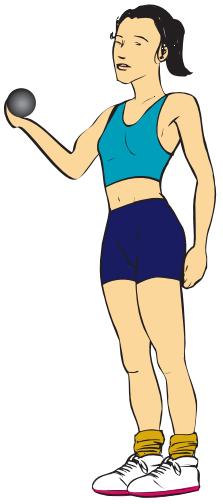


FIGURE 9.20 Many types of equipment are available for use in weight training programs.

Weight training can be used to add muscle bulk, increase strength, improve power or develop endurance.

Weight training requires specific skills and knowledge, so it would be beneficial to seek expert advice on the correct use of equipment, the number of **repetitions** and **sets** to be undertaken and the types of exercises for each major muscle group. A weight training program can be designed to meet individual fitness requirements.

Application

Weight training

Participate in a weight training session at your local gym or in your weights room at school that incorporates the three types of weight training, then complete the following.

1. Identify the exercises that were isotonic, isometric and isokinetic.
2. Identify the muscle(s) each exercise was designed to work.
3. How many sets and repetitions did you do of each exercise?
4. Identify safety guidelines for weight training.
5. What are the benefits of each type of weight training?

9.3.6 Tai chi

Tai chi is one of the martial arts systems. It is enjoyed by many people and, due to its slow controlled movements, is popular with all age groups. It involves slow, even, circular and coordinated movements. Tai chi is an exercise incorporating movements in coordination with your mind and respiration.

Tai chi is a series of exercises combined into a routine. Instruction with a master over a period of time is necessary to become proficient. Practising some simple tai chi forms repeatedly improves physical well-being.

In the tai chi practice, the principles of balance, which include joint involvement (ankle, knee, hip), lower body awareness and posture, are explored. The benefits from this type of exercise are particularly applicable to older people, although the benefits can be enjoyed by all. Due to its focus on controlled, correct movement and balance, tai chi can benefit people who suffer from arthritis, lower back pain and stress. Tai chi is a great exercise option, particularly for people seeking a holistic approach to improved health and fitness.

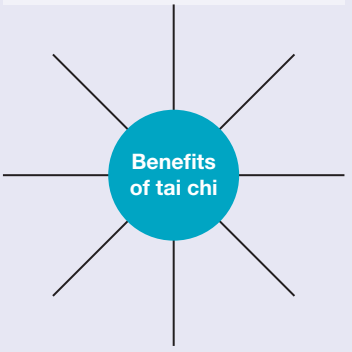
Inquiry

The health benefits of tai chi

Use the **Tai chi** weblink in the Resources tab for more information.

1. What is tai chi?
2. Use the web diagram in figure 9.21 to help you identify the potential benefits of tai chi.
3. What special considerations need to be taken into account before beginning tai chi?

FIGURE 9.21



on Resources

Weblink: Tai chi

9.3.7 Pilates

Pilates is a program that focuses on the development of core muscles, resulting in improved body balance, posture and alignment. Added strength and flexibility to the large torso muscles enables better control of the back and limbs, leading to improved coordination and balance.

In recent years, Pilates has become popular with people from all sports including golfers, footballers and gymnasts as well as dancers. In activities where core strength is important to stabilise the spine and enable safer, more forceful movements to be made, Pilates is an ideal fitness choice.

Use the **Pilates** weblink in the Resources tab to explore further.

Inquiry

Pilates

Use the **Pilates — health benefits** weblink in the Resources tab for more information.

1. What is Pilates?
2. From the list, identify what you consider to be the 10 most important health benefits of Pilates.
3. Describe the two forms of Pilates.
4. What precautions do people need to take before engaging in a Pilates program?

on Resources

Weblink: Pilates

Weblink: Pilates — health benefits

9.3.8 Yoga

Yoga originated in India. Today, many different types of yoga exist. Yoga is holistic in nature, emphasising the body's energy flow. It focuses on breathing exercises, known as pranayama, and physical postures called asanas. The specific breathing exercises address poor breathing habits and better utilise the muscles used in breathing. The physical postures and exercises improve muscular tone, strength and flexibility allowing energy to flow more freely throughout the body.

Yoga is beneficial because it: re-energises the body, giving a feeling of being more powerful; reduces stress; induces calmness; improves flexibility and muscle tone; and improves immunity.

As yoga ranges from gentle to demanding, it is suitable for everyone. It is important to choose a teacher and a class that suit your specific needs. Yoga is a popular form of exercise with people of all age groups and fitness levels.

The benefits of yoga have been recognised by the fitness industry. As a result, many commercial fitness centres offer classes in yoga. An example is the 'yoga/stretch' class available at some centres. This class involves traditional yoga postures and stretching exercises. It is designed to be a total mind and body experience where you improve your flexibility, increase your strength and relax your mind while learning proper breathing techniques.

FIGURE 9.22 Yoga focuses on breathing exercises and physical postures, and is popular with people of all ages and fitness levels.

9.3.9 Emerging individual fitness activities

While activities such as swimming, running and cycling represent traditional ways of improving fitness, alternative methods are constantly being promoted, many with considerable appeal. Fitness facilities and home gyms offer an array of equipment and activities that challenge our physical demands, often with the lure of burning fat or expending kilojoules.

Treadmills, rowing machines and cross-trainers can be used in the privacy of your home to provide challenging cardiovascular workouts. These are also available in fitness centres, along with elaborate weight training machines, free weights, sport-specific training equipment, step machines, and warm-up and stretch rooms. Many fitness establishments promote fitness activities that combine aspects of self-defence with gruelling fitness workouts that challenge our highest levels of fitness. Individuals can do martial arts, shadow boxing and, with the help of personal trainers, individual circuits.

FIGURE 9.23 Personal trainers can assist people to reach their fitness goals.

There has been a rapid growth in the personal training industry in recent years. With expansion of the fitness industry, many people engage personal trainers, to provide individual assessment, develop an appropriate program, instruct on equipment usage and act as a motivating partner.

HIIT

Another emerging and highly popular fitness activity is high intensity interval training (HIIT) as it is physically demanding yet time expedient and highly adaptable to many environments. HIIT is a form of interval training where repeated periods of intense anaerobic work are alternated with brief periods of recovery. With the inclusion of well thought out activities, it can make fitness a fun experience.

If done on a field and with a focus on sprinting, one interval could involve short sprints followed by recovery walking. The type of activity could be changed for each interval — from sprinting to sprinting backwards,

sprinting on hands and legs, hopping, and so forth. In the gym, an interval could last 30 seconds, the first 20 seconds being spent on performing an activity such as squats followed by 10 seconds of rest. After two intervals, the activity may change to lunges, push-ups, jumping jacks, burpees, crunches and whatever else participants like to include.

In fact, HIIT can be readily adapted to a range of exercise modes including swimming, cycling, cross training and specific fitness classes. Activities need to be interesting and challenging while the level of intensity is very high during the work phase (at approximately 80 per cent MHR) and mildly active (such as walking) during the recovery phase. Work phases can vary considerably in time, but must be sustainable while high in intensity without being totally exhausting. Progressive bouts of HIIT will result in a gradual improvement in fitness.

Application

Individual fitness activities

Investigate the range of individual fitness activities available in your local area. Determine two activities that would suit your ability and fitness needs and participate in them.

Inquiry

Assessment of fitness activities

1. List the benefits of each activity you located in the above application.
2. Who would these activities suit?
3. How much does each activity cost?
4. What is the time commitment involved for each?
5. Where could you get further information about each activity?
6. Evaluate each activity in terms of your personal needs.

Inquiry

Ranking fitness activities

The section of work just completed focused on individual fitness activities, namely power walking, running, swimming, cycling, weight training, tai chi, Pilates and yoga. Use the following ranking chart to prioritise the activities in terms of interest to you as part of an individual fitness program. Justify your ranking. In the final column, insert a 'yes' or 'no' regarding whether you have access to these facilities in your area. Use the information for a class discussion about fitness activity preferences.

Ranking	Justification	Access (yes or no)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		

9.4 Group fitness activities

For those people who seek the company of others in their quest for fitness, there are numerous group fitness activities to choose from. Fitness and leisure centres provide a range of fitness classes including step, pump, flex, power boxing and dance.

Many communities have the facilities to offer a range of team sports such as netball, soccer and hockey. Indoor facilities provide the opportunity to participate in indoor sports such as indoor cricket and basketball. Tennis and squash courts can also be found in most communities. They provide the individual with the opportunity to join a friend for a social game without being part of a formal competition.

Group fitness activities provide the opportunity to meet new people and establish friendships. They allow the individual to feel part of a group. Group activities are an appealing fitness option for many people.

9.4.1 Aerobics

Aerobics classes incorporate various conditioning exercises performed to music. A typical aerobics routine involves a warm-up phase, conditioning phase and cool-down phase. Aerobics can cater for a variety of ability and fitness levels. Classes can be designed to be low impact or high impact. Individuals within the class can change the intensity of the exercise being performed to meet their needs. Aerobics improves cardiovascular efficiency, strength, flexibility and agility. The use of energetic music and the instructions and encouragement of the instructor help to increase motivation.

A variation on the traditional aerobics class is the 'fat burner', which is a combination high and low impact class. The exercises are designed to increase participants' heart rate to between 130 and 140 beats per minute to promote greater kilojoule expenditure. Benefits include improved cardiovascular endurance, strength and muscle tone. This class is suitable for everyone, but is specifically for those people who want to improve cardiorespiratory fitness and lose weight. 'Blitz tech' is a combination of high and low impact aerobics with very little choreography. It includes easy movements and equipment keeping the intensity high. This type of class is suitable for everyone as you can work at your own fitness level.

9.4.2 Aquarobics

Aquarobics or water aerobics evolved from aerobics. It involves doing conditioning exercises similar to those performed in an aerobics class in water. As water is much more resistant than air, aquarobics provides a good whole body workout. Participants move in the water following an instructor.

Aquarobics is an excellent fitness option for people who have back or joint problems, the elderly and the overweight due to the cushioning effect of the water. The use of hand weights can increase the intensity of exercise.

FIGURE 9.24 Aquarobics is a popular fitness activity for all age groups.

SNAPSHOT

Aquarobics

Aquarobics classes have proved popular with people who may not have otherwise been involved in exercise.

Aquarobics is an extremely enjoyable class from which many benefits such as rehabilitation, fitness and social integration can be gained.

Benefits

- Exercise in water is easier as it supports body weight
- Reduces stress on joints
- More comfortable environment to exercise in
- Allows a full range of movement without excessive strain
- Increases circulation and promotes relaxation
- Reduces stress levels
- Potential weight loss through caloric expenditure and increased muscle tissue

Class descriptions

Power

A high energy workout for overall fitness and toning guaranteed to increase the heart rate.

Tone

A toning and firming class using weights and water as a resistance. Suitable for all fitness levels.

Deep water

Using buoyancy belts there is no impact on joints.

Gentle

Designed for seniors. Beneficial for those with blood pressure, arthritis, joint problems or injury rehabilitation.

Seniors

Designed for the more active seniors.

Special needs

Designed for people suffering from MS, stroke, Parkinson's and arthritis, back, hip, knee injury, pre- and post-operation.

What to bring

Swimwear and towels are required.

Who can participate

Aquarobics is for all levels. The program offers a variety of options so that you can work out at your own level. It is essential that each participant is able to swim.

Source: Sutherland Shire Council, brochure for Sutherland Leisure Centre, New South Wales. © Sutherland Council Leisure Unit.

Inquiry

Aquarobics

Read the snapshot about aquarobics, then use the PMI chart below to list points that you consider to be favourable, unfavourable and worthy of further consideration. Summarise the points considered 'interesting' from the group and use them as the basis of a class discussion in evaluating aquarobics as a group fitness activity.

Plus	Minus	Interesting

9.4.3 Pump classes

Pump classes are non-aerobic fitness classes that use barbells to improve muscle tone, strength and endurance. The instructor leads participants in working out the major muscle groups of the body to music. The weights are adjustable to suit all fitness levels. This type of class is suited to people who would like an introduction to weight training and who wish to improve muscle tone and body shape.

Another non-cardiovascular fitness class is the ABT or abdominal, butt and thigh class. Participants use hand weights to direct the workload to specific areas such as the abdominals, buttocks and upper legs. The movements are slow and lead to improved muscle tone, strength and muscular endurance.

9.4.4 Step classes

This class incorporates aerobic moves to music using a stepped platform. The platform is adjustable to suit the individual's fitness level. Step classes improve cardiovascular fitness and muscular endurance. As the moves are choreographed to music, classes are divided into advanced and beginners, depending on the complexity of the moves. Step classes provide a further challenge for people who want a variation to the standard aerobics class. This class is suitable to all levels of fitness. Variations on the step class include easy step, which is designed for beginners as it has less choreography, and step moves, which is for advanced participants. Step moves is highly choreographed, incorporating high intensity and dynamic movements.

FIGURE 9.25 The original step class incorporates aerobic movements done on a stepped platform. It is designed to improve cardiovascular fitness.

9.4.5 Spin classes

Spin is also known as cycle classes or RPM. In this demanding fitness activity, participants or 'spinners' perform routines on stationary exercise bicycles that simulate outdoor cycle training. Music is used to enhance the atmosphere while the instructor leads the group through a range of cycling speeds designed to engage both the aerobic and anaerobic energy systems.

A typical session consists of a warm-up followed by instructor-led routines that imitate hill climbs, sprints and interval training. How hard you exercise is up to you, but it is important for spinners to set their own goals for each session. Should you wish to focus on your aerobic fitness, your level of intensity will be moderate, interspersed with infrequent bursts of speed. If you wish to focus on both anaerobic and aerobic fitness, there will be frequent periods of high intensity combined with periods of moderate effort. Intensity is raised by both increasing the speed at which you cycle and/or increasing the cycling resistance using the dial on the cross-bar of the bike.

Spin is excellent for improving cardiorespiratory fitness. It is also beneficial as a form of exercise for people who experience joint injuries or tendonitis. Use the **Spin class** weblink in the Resources tab to view a video.

on Resources

Weblink: Spin class

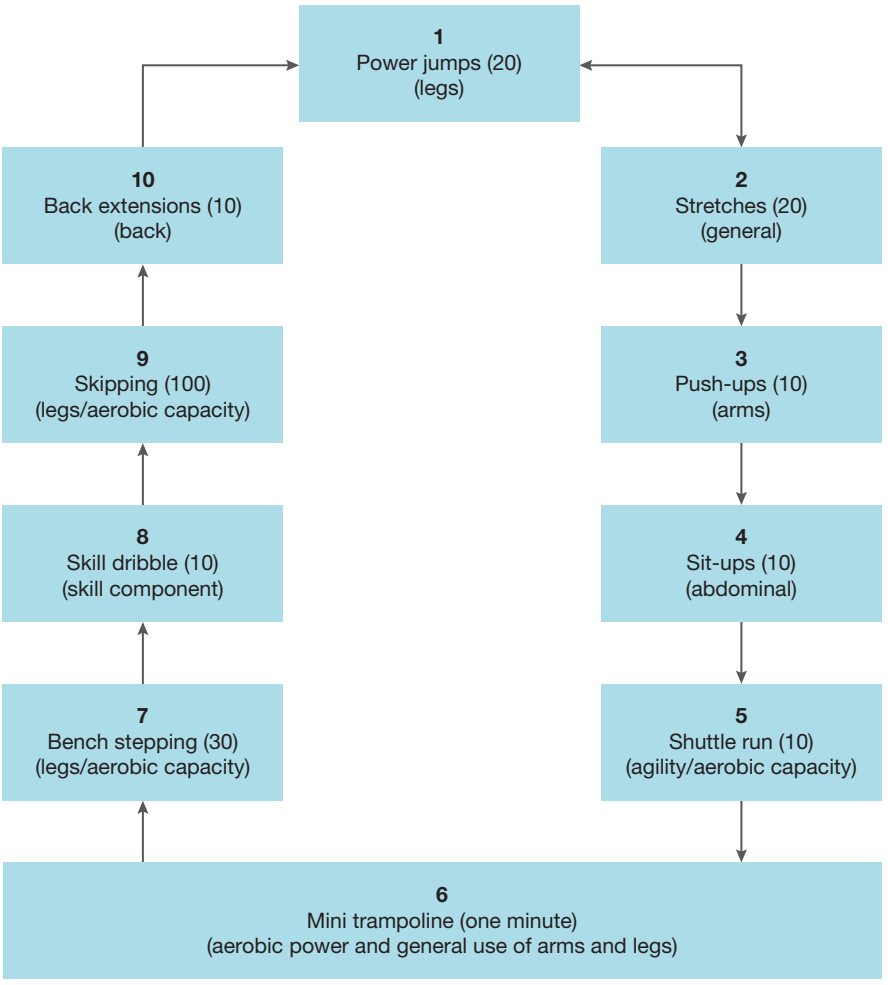
9.4.6 Circuit training

Circuit training can be used to improve both fitness components and skill level. It involves the progressive use of a circuit of different types of exercise. Each exercise is performed for a specified number of repetitions or for a prescribed time period before moving to the next exercise. The exercises are separated by a brief timed rest interval. Each circuit is separated by a longer rest period. The total number of circuits performed during a training session may vary from two to six.

Circuits can be anaerobic or aerobic in nature, depending on the type of exercise, the time spent on each exercise and the number of circuits performed. Circuits can be designed to focus on strength and muscular endurance or cardiovascular fitness and flexibility.

Use the **Circuit training** weblink in the Resources tab to see a circuit in progress with some good ideas for exercises.

FIGURE 9.26 A typical conditioning circuit



on Resources

Weblink: Circuit training

9.4.7 Team games

Participating in team games is one of the most popular types of exercise available. Team games provide the opportunity to participate at various levels from social to high level competition. The social aspect of exercising with others is very appealing to some people. Team games provide the opportunity to develop new friendships and be a part of a team. Often people are more motivated to exercise if they know other team members are reliant on them.

A vast range of team games is available in most communities. Netball, soccer, basketball,

FIGURE 9.27 People enjoy team games for the competition and the social benefits they provide.

rugby league and rugby union are examples of team games that are played by a range of people with varying ability levels. Indoor sports such as European handball, indoor soccer, indoor cricket and indoor netball offer the benefit of being able to play all year round regardless of weather conditions.

Participating in a team game requires people to participate at set times and usually involves a cost to cover affiliation fees and uniform. Depending on the level of competition, the individual may be required to devote a lot of time to training. Before joining a team, it is important to be clear about the commitment required. For many people who decide to participate in team games, the social and physical benefits provide the motivation to continue playing.

Application

Participation in team games

Investigate the range of team games available in your community and interview people who participate in them. The interview questions should include the following:

- Why do you participate in this team game?
- What are the benefits of participating for you?
- How did you first get involved in this team game?
- How often do you play and train?
- How much does it cost to participate?

9.4.8 Exercise for specific groups

The exercise and fitness needs of people change over time. Young children and the aged are limited by their physical capacities. Pregnant women need to alter their exercise regime to accommodate their changing body. The competitive athlete needs to exercise at a much higher intensity to achieve a competitive fitness level. These groups need to modify their exercise type and intensity to meet their specific needs. Regardless of the capabilities of people, exercise should be encouraged and made available to ensure everyone has the opportunity to improve their health and well-being.

Pregnant women

Exercise during pregnancy used to be considered dangerous. New research shows that exercise is not only safe, it should be undertaken. Research has found that there is no substantial difference in the pattern of delivery of the baby between non-exercising women and women who exercised at a moderate level during pregnancy. Women who exercised heavily during pregnancy are more likely to give birth at full-term. Like everyone else, pregnant women benefit from regular physical activity.

An exercise program can benefit pregnant women in many ways. The maintenance of healthy heart and blood vessels and improved muscular strength (particularly upper body and abdominal strength) can aid in posture and carrying the baby. Common disorders associated with pregnancy, such as lower back pain and leg cramps, can be eased. Exercise can help prevent varicose veins by improving circulation. By maintaining or improving fitness, pregnant women are able to control unnecessary weight gain, feel better about themselves and cope with the demands of labour.

Following are guidelines for maintaining fitness during pregnancy.

- Consult your doctor about your exercise program.
- Listen to the messages your body gives you.
- Work on good posture.
- Exercise gently.
- Exercise for fun.
- Realise that slowing down is normal.
- Do not overextend your joints beyond their normal range of movement.

- Always warm up and cool down.
- Strengthen your abdominal and pelvic floor muscles.
- Exercise carefully if you are lying on your back.
- Drink plenty of water.
- Modify your exercise program. (*Mum's the Word. Exercising During Pregnancy*, NSW Sport & Recreation.)

Children

The age of children impacts on their:

- capacity to learn skills
- level of motivation to be active
- physiological capabilities
- susceptibility to injury.

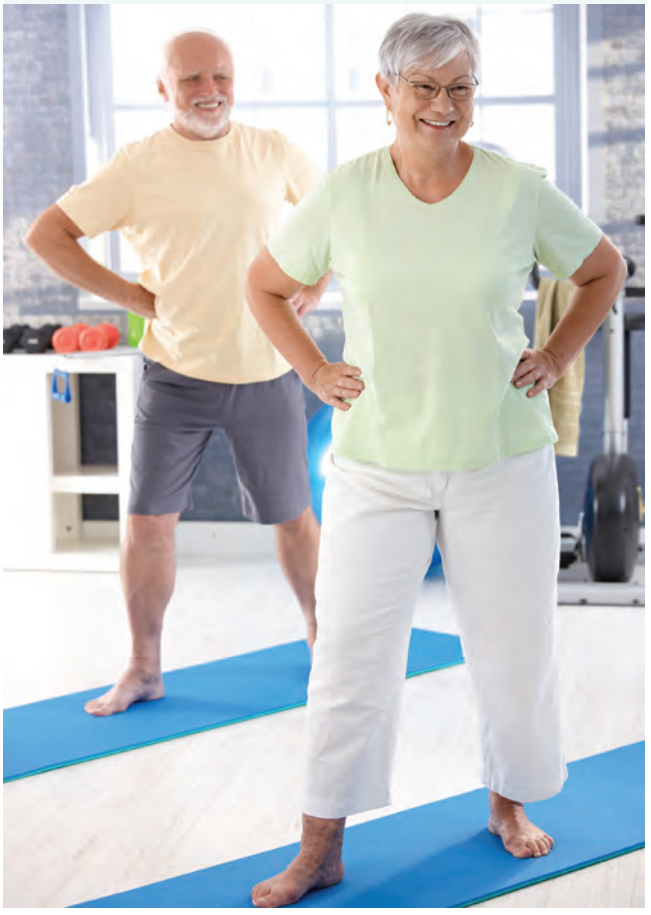
Children have lower levels of motor control and are unable to process much information at one time. For young children, the focus should be on fun, skill development and activity, not competition and 'win at all costs'. If children enjoy activity when they are young and are taught how to perform fundamental movement skills correctly, they are more likely to continue exercising as they get older.

FIGURE 9.28 Children need to enjoy exercise so they are encouraged to keep exercising.

People training for fitness

For athletes whose primary goal is to maintain a high level of fitness so that they can be competitive, it is essential that a specific training program be followed. This program includes fitness activities that reflect the energy system being utilised in competition and needs to be of high intensity. Following the FITT framework (see topic 5) for program design is necessary. The principles of progressive overload and specificity need to be applied in the design of a program. People who train for fitness need to be constantly challenged so that they continue to improve as they train towards their peak.

FIGURE 9.29 Modified low to moderate exercise can be beneficial to older people.



The aged

Regular physical activity can be very beneficial for older people. As we age there is a gradual decline in our physiological capabilities, such as reduced heart/lung capacity, bone density and muscular strength. However, if people remain active as they age the rate of decline can decrease or be delayed.

The reasons why older people exercise need to be considered when designing exercises specific to this group. Most older people exercise to be with others, make new friends and have some fun in addition to the health benefits gained. This has

implications for fitness service providers when designing exercise classes for older people. A general exercise class (for example, super circuit, aerobics, aquarobics) requires a longer warm-up and cool down together with a reduced aerobic segment. A specific relaxation component will also be popular. Without doubt, the principal focus of such classes should be the pursuit of fun and enjoyment.

Modified low to moderate exercise can be beneficial to older people. The physical, social and psychological benefits lead to improved well-being. Older people will be encouraged to exercise if they are able to participate in gentle exercises designed specifically for their needs.

9.4.9 Emerging group fitness activities

Motivation to improve and maintain fitness often requires the support of activities that are different, interesting and challenging. Traditional fitness activities such as circuits and team games are popular with most, but may be inconvenient, time consuming or may not have personal appeal. Group fitness activities such as boot camps have an emphasis on fun, challenge and opportunity for maximal workout and are becoming popular because classes are conducted over a short period, usually four weeks, and offer quick results. Within fitness centres, classes such as dance and core are also popular, the latter due to its focus on strengthening the abdominal and back regions of the body through controlled exercises such as pushing, pulling and rotating.

New ways of getting involved in group fitness activities are constantly evolving to meet demand for a fitness experience that is convenient, challenging, personally rewarding and socially satisfying. Wearable fitness trackers for monitoring, together with iPhone-embedded apps and recording and monitoring features, are all part of the new experience. But what about an equally inspiring group setting where participants can gather, communicate, perform, support and share experiences — and then connect through social media? Some ways that this can happen are listed below and may even be available at nearby fitness centres.

- **Zumba.** This type of activity combines dance and aerobic sequences with music. Well-known aerobic movements such as squats, lunges, on-the-spot steps, turning step and grapevine are choreographed to fit music that is mainly of Latin American origin such as the samba and salsa. Sessions normally last an hour and consist of continuous songs or instrumental music to which dance moves are created, each song demanding the learning of a sequence of pre-choreographed steps.
- **Gyrotonic.** This modern form of 'yoga for dancers' combines movements associated with yoga, swimming, tai chi, dance and gymnastics. With a focus on balance, controlled breathing, coordination, core strength and flexibility all combined in fluid movement sequences, this type of exercise is becoming popular as joints are not stressed and it is safe for seniors.
- **Pop Pilates.** Once again, this is a blend of a number of activities to create a fitness experience that is different and possibly more appealing. In this case, Pilates, dance and music are combined into sequences that aim to provide a full body workout.
- **Krav Maga.** Activity here focuses on incorporating self-defence movements into fitness workouts. As interest in self-defence particularly among women has increased, Krav Maga provides the opportunity to combine a highly demanding fitness workout focusing on strength, cardio and defence skills learning within a combatant environment.
- **Combined workout formats.** Instructors are continually looking for innovative ways to take clients to a new level of fitness within a captivating environment. Doing the same movements each time we go to the gym stimulates neither the imagination nor the level of motivation. What is happening now and will continue to be developed into the future is for instructors to incorporate existing fitness protocols into experiences that address the specific needs of their clientele. Imagine the best of what boxing, HIIT, rowing, treadmill running, aerobics and cycling could do if put into a circuit supported by music, wristband technology and big screen feedback.
- **Barre Body.** This combines movements from yoga, Pilates and ballet barre conditioning into a unique activity. It may involve stretching, sculpting and even interval training in movements drawn from ballet, yoga and Pilates. While not as physically demanding as other activities such as HIIT, it does aim

to significantly improve balance, alignment, core strength and flexibility, particularly in the lower body. Hand weights, exercise ball and resistance bands are used extensively in high repetition/low resistance exercises.

Many emerging group fitness activities are supported by child-care facilities, massage, sauna, spa and perhaps a physiotherapist and nutritionist. In addition, sessions are conducted by qualified instructors who not only motivate the group, but ensure that participants work within their fitness level. Fitness gyms for women are also becoming popular and attract clientele who may feel intimidated in some gyms that may be male dominated.

Application

Group fitness activities

1. Identify the types of fitness class available in your local area.
2. On separate days, participate in two of these classes.
3. Write a report comparing the two types of fitness class. Include the following in your report:
   - the benefits of each class
   - the availability and cost
   - the nature and difficulty of each
   - who it would suit
   - time commitment required
   - sources of further information for each
   - your personal reflections on participation.

9.5 Settings for exercise

The environments in which people exercise vary according to their fitness needs, facilities available and cost of activities. People who do not have the time or desire to go to a fitness centre to exercise may prefer to exercise at home. In addition to fitness centres, many communities offer other sporting and recreational facilities. Tennis courts, squash centres, leisure centres, golf courses, indoor sports centres and bicycle tracks are just some of the facilities that may be available.

For people who prefer to exercise in a group, exercise clubs and cultural groups provide a range of physical activities. It is important that the setting chosen to exercise in is an enjoyable and convenient environment that meets the individual's needs. If not, the likelihood of the person continuing exercise is reduced.

9.5.1 Exercise at home

It is often difficult to find time to go out and exercise. For people with children or those who work long hours, exercising at home may be the most practical option. Many people who can afford the equipment have set up home gyms. Weights and weight machines are available at most sports stores. Aerobic exercise machines such as treadmills, steppers and stationary bicycles can also be purchased. If exercising at home is the only option available, weights combined with an aerobic machine provides a better workout.

Not everyone who wants to exercise at home can afford expensive exercise equipment. A range of exercises can be done with relatively little equipment. Another option is an online subscription to exercise program videos or DVDs. There are many exercise videos and DVDs on the market that provide exercise instruction. Aerobics, step and pump classes can be done in the home by following the instructor on the online videos or DVD.

Nowadays, going online for subscriptions and workouts is increasing in popularity. In fact, highly motivated people do not need to attend gyms anymore as their personal fitness goals can be achieved from home. It is possible to pay for membership online and select the type of contract and payment system. This can be

followed by access to online streaming of workouts that fit a person's level and schedule. There is usually a free trial and then a commitment to monthly or annual payments.

The advantage here is certainly convenience, having 24/7 access to streaming and the possibility of a customised workout plan. However, the big disadvantage is a total reliance on self-motivation to engage in regular sessions with the same sense of commitment and enthusiasm that would develop under the care of a personal trainer.

One of the downsides to exercising at home is maintaining the motivation to regularly exercise. It is easy to be distracted so it is important to plan a set time in the day that is devoted to exercise.

9.5.2 Community facilities

Availability of and access to community exercise facilities vary. In larger communities the existence of a wide range of facilities provides the individual with greater exercise choice. The likelihood of finding a fitness activity that suits your needs is greater for people who live in large towns and cities. Most councils now have outdoor exercise equipment permanently established in areas surrounding ovals and grounds and in parks and reserves.

Equipment is generally of all-weather construction, and has soft, rubber ground cover with shadecloth or trees for sun protection. Fitness equipment varies but is usually a mixture of benches, strength equipment either fixed or with adjustable resistance, and cycling/stepping type equipment to address aerobic needs.

Community leisure centres provide the convenience of a large number of activities at one venue. These centres cater to a range of needs by providing a variety of activities such as aerobic classes, step and pump classes, weight training, swimming, boxing, yoga, martial arts and circuit training. Centres can include pools, indoor courts that cater for basketball, badminton, volleyball and gymnastics. Some open out to running tracks.

The popularity of team sports for both player and spectator has ensured that playing fields and sporting facilities exist in many communities. Running tracks, golf courses, tennis courts and squash courts are other facilities that may be available. Most communities recognise the importance of regular exercise and encourage participation by providing facilities and keeping costs relatively low compared to commercial facilities.

9.5.3 Fitness centres and personal trainers

Fitness centres are a popular choice for many people who exercise to improve fitness. Most fitness centres provide a range of fitness classes and weight training facilities. Classes can include aerobics, step, pump, flex, body sculpt, yoga, tai chi, cycle and power boxing. Each class varies in intensity of exercise and level of choreography and there is generally a class suitable to every ability level. For people who prefer resistance training, most fitness centres have a range of weights and weight training machines. Treadmills, steppers and stationary bicycles can be used to improve aerobic fitness. Fitness centres provide the convenience of being able to combine an aerobic workout with resistance training to achieve a good whole body workout.

FIGURE 9.30 Personal trainers provide exercise, fitness and diet expertise, as well as being motivators for many.

Commercially run fitness centres provide many services designed to aid customers in their efforts to improve their fitness. The inclusion of child-minding facilities is an appealing service to many parents. Fitness centre personnel can provide information on training, technique and nutrition.

Personal trainers are available either as a centre employee or a self-employed trainer. For people who have little knowledge of resistance training and general exercise principles, personal trainers are an excellent resource. Not only do they have the expert knowledge, they are great motivators for many people. It is important to check the credentials and experience of personal trainers before employing them. There are a number of qualified organisations that teach fitness professionals. You can contact the Fitness Industry Association for verification of qualifications. As with any service provider, there are good and bad personal trainers. It is important to choose one that meets your needs.

SNAPSHOT

Why PTs are your best choice

By Pete Tansley

What do Novak Djokovic, Michael Phelps and Stephanie Gilmour have in common?

Apart from being No.1 in their sport, they all have a team of personal trainers to help them stay on top.

If the world's best athletes have a personal trainer, then you, too, could benefit from one. Having a personal trainer used to be reserved for the elite and mega-rich. Today, they're a necessity rather than a luxury.

Here are six reasons why you should invest in a personal trainer:

1. A personal trainer will offer an objective eye.
   Personal trainers are not paid to make you feel good. No tennis player hires a coach to commend them on their swing and shout 'well done old, chap!' as they mis-hit another serve.
   A personal trainer will offer technique corrections and constructive criticism to improve your workouts and meal plan. When you're not on the right track, they won't go easy on you, and nor should they. They will tell you where you're going wrong, offer positive encouragement, suggest improvements and keep you accountable for your actions.
2. A personal trainer will help you master your technique.
   While a training partner (or even a mirror) can help you with form correction, nothing beats live coaching from a trainer.
   A recent client of mine, who has been lifting weights longer than I have been alive, managed to increase his personal best on his deadlift by 10% after just one personal training session. Sure, that might not be the case for every single session with a trainer, however, it proves a point; there is nothing quite as powerful as coaching during a session. A training partner or a mirror will often not pick up on the intricacies of some exercises.
3. A personal trainer will prevent a plateau.
   Two months have gone by and you have made fantastic progress. You've improved your aerobic capacity, doubled your strength, and friends are asking what your secret is.
   Then it strikes; the dreaded plateau. No matter how hard you exercise or how closely you adhere to your meal plan, nothing changes. A personal trainer is your best defence against reaching a plateau and will employ two key techniques to prevent it: variety and assessment.
   Variety is used to shock your body, both physically and mentally, as workouts can become stale after some time. A personal trainer will change your program when necessary to ensure progress.
   Ongoing assessments can also prevent a plateau. Don't worry; it's not HSC maths. The assessment may include body fat percentage, weigh-ins and strength or fitness tests to track progress. If progress slows, your personal trainer can use this feedback to design the next phase of training.
4. A personal trainer will create a customised plan.
   Anybody can download a workout and meal plan from the internet and get started. The problem with these cookie-cutter plans, however, is they do not take your requirements into account.
   What injuries do you have? How many times per week can you work out? Are you able to access a commercial gym, or are you confined to training in the park or living room? Do you have any food sensitivities or allergies? Are you a total beginner in the kitchen, or a budding Masterchef? All of these questions need to be answered before a plan can be devised.
   I even ask the relationship status of my clients before creating their plan. This is not for my benefit; I am happily married! However, a client's relationship status can have an impact on eating habits. Somebody who is single tends to eat out more often than somebody who enjoys meals at home with their partner.
   All of these angles need to be considered for both training and nutrition, which is why customisation is the key.

5. A personal trainer has been there before.
   It amazes me how often people select personal trainers without looking at their experience. Think about it; would you hire a skydiving instructor who had never jumped before? I doubt it.
   You want someone with plenty of skydiving experience before you put your life in their hands. A personal trainer is no different. They should be in good shape themselves and have a list of clients they have helped.
6. A personal trainer will create more than just workouts.
   As you can see, hiring a personal trainer is much more than just a workout. They will cover all angles of your lifestyle, from training and nutrition through to supplements and lifestyle management.

Choosing a personal trainer

There is no obvious place to find a trainer. Here are some pointers so you do not get stuck at this stage:

Firstly, tap into your network. Ask your friends, family and co-workers if they have someone they are happy to recommend. You can also look around your gym or park. Watch to see who looks approachable and who seems to be offering workouts that suit your level.

Do they seem present in the session? Does it look like they actually care about their client? If they are looking around or checking their mobile phone during the session, keep searching. If the trainer seems to have the same repeat clients week after week, that is a good sign.

Online can also be an effective search tool.

Secondly, it's about finding the right price, personality fit and location that suits your needs. Most trainers will provide an initial consultation to begin with. Don't feel pressured; if they are the right fit for you then get started right away to reap the rewards. If not, do not feel obliged to begin. Keep looking until the right trainer comes along.

Education and qualifications are also important, and so is their track record. Ask to see some recent testimonials of clients they have worked with. A trainer is always going to tell you how fantastic they are but a current or former client will give honest, transparent feedback without any sales jargon.

Source: UltraFit magazine and Pete Tandley

Application

Personal trainers

Investigate the services and expertise of two personal trainers in your local area. Use the profile of a personal trainer (in the following case study) as a guide, then complete the questions in the following inquiry.

CASE STUDY

Profile of a personal trainer

Name: Mary Lougis

Qualifications:

- registered fitness instructor
- Diploma, Sports Science
- registered nurse
- level one swim coach.

Experience:

- 10 years experience as a personal trainer
- 15 years experience as a registered nurse
- State level swimmer
- Winner, New South Wales bodybuilding competition; runner-up in Australian NABBA.

Location: inner west, Sydney area and mobile service.

Cost: $50 per hour at gym, $60 per hour mobile service.

Inquiry

Selecting a personal trainer

1. What qualifications has each trainer achieved? Do you think there is a need for standardisation of qualifications for personal trainers?
2. Do they have any particular areas of expertise; for example, rehabilitation?
3. What are the benefits of using a personal trainer?
4. Identify the different methods of the trainers being investigated.
5. Which personal trainer would you select as the best to meet your fitness needs? What factors led you to this decision?

9.5.4 Exercise clubs

Exercise clubs have grown in popularity as they are an excellent way to enjoy exercise on a regular basis in the company of friends. They provide organised activity and the opportunity to meet others with the same exercise interests. There are many clubs in New South Wales that cater to both the social exerciser and the competitive athlete. Running, walking and cycling clubs can be found in most communities.

The focus on walking as a form of exercise to improve health and fitness is apparent in New South Wales. The establishment of walking for pleasure clubs by the New South Wales Office of Sport promotes walking as a good health and fitness exercise option. These clubs plan weekly or fortnightly walks in settings such as national parks, beaches and other places of interest. Exercise clubs are a great way to get into exercise on a regular basis.

9.5.5 Cultural groups

Multiculturalism is a part of Australian society. The establishment of a variety of cultural groups provides many benefits not only to people of that culture but to every Australian. Cultural groups keep alive many different aspects of the culture. Included in this is the opportunity to participate in culturally based forms of physical activity and exercise. The formation of cultural dance groups is a good example of the activities that cultural groups offer.

A variety of factors influence people's choices of fitness activities. People participating in the same sport or activity may have totally different reasons for participating, such as physical abilities, cost, availability, health benefits and friendships.

Inquiry

Evaluating the appropriateness of my fitness program

Using the information you have read in subtopic 9.5, complete a draft of the type of fitness activities that are available in your area and that you like. Use the following questions to evaluate the appropriateness of your choices. Go to the **Start exercise** weblink in the Resources tab for more information.

1. Does this fitness activity suit my fitness needs?
2. Could I continue to participate in this fitness activity? Why or why not?
3. Are other fitness activities more suitable for me?

Resources

Weblink: Start exercise

9.6 Advertising and promotion

Advertising is a powerful tool. A good advertisement can be very persuasive in influencing people to buy a particular product. Advertisements for fitness and exercise services can be found in or on magazines, newspapers, television home shopping channels, commercials, radio and the internet. Commercial fitness centres do letterbox drops of flyers promoting their facilities.

Promotions aimed at enticing the consumer to buy a product or service can often sound too good to be true. It is important that consumers take the time to investigate the product or service they wish to buy before committing time and money to it.

FIGURE 9.31 Advertisement for a personal trainer

9.6.1 How do you know who to believe?

The first step in finding out who to believe is by checking to see if the product or service is endorsed by a recognised fitness or health institution. Does the person offering the service have any qualifications? What is the basis of their expertise? These are things you should investigate when determining the reliability of the source of information. Generally, well-recognised brands and products endorsed by Australian fitness industry or health organisations such as the Heart Foundation are reliable.

Inquiry

Fitness and exercise services

Use the **Personal trainers — how to choose one** weblink in the Resources tab to explore further.

1. What information is provided about the personal trainer in figure 9.31?
2. Who is the advertisement targeting?
3. What does the advertisement offer?
4. List other information that you require to make an informed decision about the use of a personal trainer.
5. What do you think would be the benefits of the service?
6. How would you establish if the claims are believable?

Resources

Weblink: Personal trainers — how to choose one

9.6.2 Promotional techniques

Promotional techniques are often used to attract customers to products and services. Targeting specific groups and offering limited offers are some promotional techniques used. Don't be fooled by the slick advertising of products. Take the time to:

- compare products
- seek advice from people in the fitness industry
- investigate the quality of the product or service advertised.

Following a long list of complaints about gym memberships, the NSW Department of Fair Trading has prepared a factsheet for points to consider before joining a gym (see Snapshot below).

SNAPSHOT

Gym memberships

8 things you should know

Before you sign up to a gym membership you should be aware of the following:

1. **Shop around**
   Don't be pressured into signing up on the spot. Visit a number of gyms to work out which is the best value for money, has the best facilities, service and location for you. Consider trying a casual membership for a month or a few visits to see if the gym is right for you.
2. **Be cautious of 'great deals'**
   Be wary of special offers, promotions and verbal promises. Some deals may not be as good as they seem, once you read the fine print.
3. **Read the ne print**
   Never take the salesperson's word for it. Always take the gym contract home and read all the terms and conditions before you sign it. Know what you are getting into before you commit. Check the fees listed on the contract are the same as the price that has been quoted to you. Also check the administration fees for setting up or renewing your membership. These are non-refundable even if you cancel the contract during the cooling-off period.
4. **Check the cooling-off period**
   Check if the contract has a cooling-off period which allows you to cancel the membership in writing within a limited time period.
5. **Where will you be in 6 to 12 months?**
   The gym may not be easy to access if you change jobs, work different hours or move house and you may still be locked into the contract for months to come. Consider a 3- or 6-month membership — they are often no more expensive than a 12-month one.
6. **Direct debit**
   Many gyms ask for payments by direct debit. Just because your membership expires doesn't mean the direct debits stop.You often need to provide the gym with 30 days written notice to stop the direct debit deductions. Check the contract before you sign. If the fitness centre continues taking payments, talk to your financial institution.
7. **Cancelling your membership**
   If you need to cancel your membership, check your contract to see what is required. Even if the contract requires you to visit the centre to cancel in person, it is also wise to do it in writing. Then you can prove the date you requested the membership to end. Remember, a membership means you have a binding agreement and you may have difculty cancelling early. Some gyms charge up to $300 for cancelling a membership, so read the terms and conditions in your contract before you sign.
8. **If things go wrong**
   If you have a dispute with a gym, check if it is a member of Fitness Australia. If the gym is a member, Fitness Australia will help negotiate your dispute if you submit it to them in writing. If the gym is not a member of Fitness Australia or you cannot resolve the issue, call Fair Trading on 13 32 20 or visit www.fairtrading.nsw.gov.au for help and advice.

Case study

Vanessa's story

Vanessa heard about an offer for a 2-week 'obligation free' trial for a gym and decided to try it out. In order to get the free trial the gym staff asked Vanessa to fill out a form which included her credit card details. She was assured that she would not be charged if she decided not to join the gym after the 2-week trial ended.

Two weeks later Vanessa decided not to join the gym. She called the gym to let them know but later realised that they had still charged her credit card a $60 monthly membership fee. She spoke to the gym manager who told her that the form she signed was a membership contract and could not be cancelled.

Vanessa called Fair Trading, who explained her rights and how to get the gym to refund her money. Vanessa followed the advice and got all her money back and her membership cancelled.

Source: NSW Department of Fair Trading

9.6.3 Accuracy of information

One technique used in advertising is to promote products through glossy, attractive advertisements that appeal to the senses of the consumer, but really give little information about the product. Compare advertisements

of similar products or services to determine the amount of information given. It is wise to talk to the service providers and ask questions regarding their expertise and qualifications before using that service. It is illegal to give false information in advertising, although information can often be misleading. If you have concerns about the accuracy of information, investigate the information supplied by asking people with more knowledge or experience in that area.

Application

Advertising and promotion of fitness products

Collect a number of advertisements of fitness equipment, fitness centres and fitness services from print media, or compile a video collection from television. Analyse the advertisements, considering the following points.

- What is being promoted? How does it help to improve health and fitness?
- What promotional techniques are used?
- How accurate do you think the information is?

Present your information to the class.

9.6.4 Ethics of advertising

As with any commercial industry, the fitness industry uses many advertising techniques to attract customers and make money. There are many genuine fitness products and service providers available. It is important that people understand that there is a range in the quality of service and product available. The claims made in advertising can be misleading and may even be false.

Inquiry

Advertising and promotion

Critically analyse the advertisement in figure 9.32.

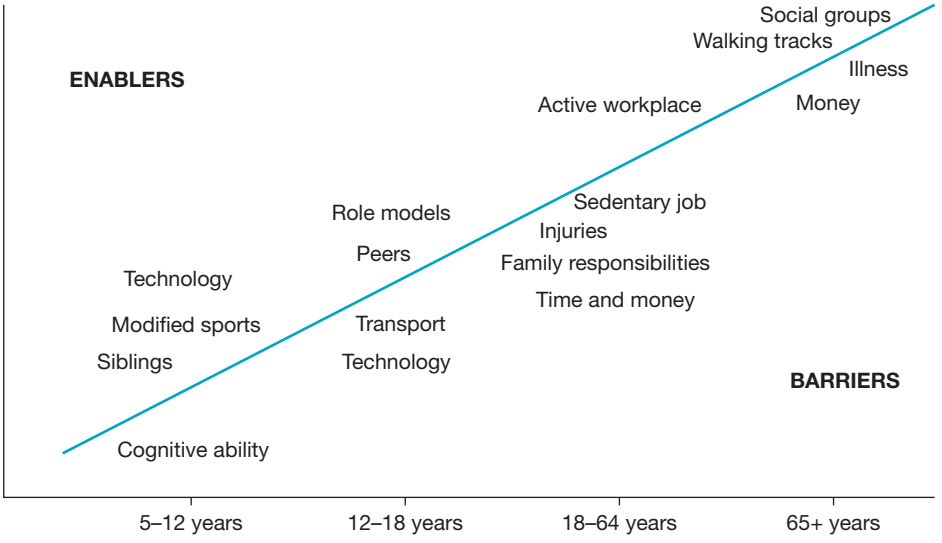
1. What information is provided?
2. Who is the advertisement targeting?
3. What does the advertisement offer?
4. What promotional techniques are used?
5. What are the benefits of this fitness centre?
6. How can you determine if the information is believable?
7. From the information provided, do you think this gym would suit your fitness needs? Explain your answer. What other information would you require?

FIGURE 9.32 Online advertisement for a fitness centre

9.7 Motivators and barriers to participation

For some people regular exercise is a difficult task. While there are many barriers that prevent or deter people from participating in regular physical activity, there are also many enablers. Figure 9.33 shows how enablers and barriers can change across the lifespan.

FIGURE 9.33 Enablers and barriers to participation in physical activity across the lifespan



Inquiry

What are your barriers to participation in physical activity?

Use the **Barriers to exercise** weblink in the Resources tab to take an online quiz or find an alternative online.

1. How many barriers do you need to overcome?
2. How do you think you might overcome these barriers?

on Resources

Weblink: Barriers to exercise

9.7.1 Access to facilities

The availability of and access to exercise facilities impacts on participation in exercise. Physical isolation and financial circumstances can limit access to facilities. For people who live in isolated communities, the facilities available are limited or even non-existent. Both socioeconomic and environmental factors affect ability and desire to participate in physical activity. For example, financial circumstances may prevent some people from being able afford gym memberships or any form of home fitness equipment. Environmental circumstances such as excessive cold, heat or humidity may also act as a deterrent.

9.7.2 Convenience of use

The issue of time can affect people's ability to exercise. People are more likely to participate in exercise, join a team or use a gym if it is convenient to do so. This may mean it is close to home or on the way home from work. For adolescents, it may mean that they can get there easily by public transport. If it is difficult to get to and from facilities, people are more likely to opt out of exercising.

9.7.3 Cost

The ability to afford to join a fitness centre, and buy fitness products or exercise clothing and shoes can be a barrier to people exercising. Lack of money can restrict the range and type of activities available. Many physical activities are very costly. Playing in a social competition, using a fitness centre or a swimming pool means a financial commitment. Some people are not able to make this commitment. The limited range of exercise choices that are left may not be appealing, so participation in regular exercise decreases.

9.7.4 Feelings about fitness and exercise

The exercise experiences people have when they are young can affect their attitudes to exercise. When these experiences are unpleasant, negative feelings about fitness and exercise develop and can form a barrier to exercise for adults. It is important that exercise is fun and not intimidating to young people, so that they develop positive attitudes to exercise.

9.7.5 Exercise as a priority

In people's busy lifestyles today exercise may not be a priority. Some people work long hours at stressful jobs. They do not perceive exercise as a priority, as they have more important deadlines to meet and work to do. For some people who do not recognise the important health benefits of regular exercise, exercise is not important. The challenge is to educate people about the benefits of regular physical activity and to introduce them to enjoyable activities that suit their fitness needs.

9.7.6 Influence of other responsibilities

For many parents, particularly mothers, the commitment of raising children can be a barrier to exercise. Lack of personal time is especially an issue when caring for small children. In some cases, parents do not get time to themselves until early evening. By then they are often too tired to exercise. It is not uncommon for parents to become spectators as their children grow and begin to participate in activity and sport.

Parents need to manage their time to include some activity in their lifestyle. They can become active by increasing their incidental activity; for example, doing the housework more vigorously, walking the children to the shops or getting involved in their children's sport in some capacity. Sharing family responsibilities between parents or caregivers allows each time to engage in exercise.

Inquiry

Overcoming barriers to exercise

Some of the common barriers to exercise we hear are:

- 'I don't have enough time'
- 'Exercise is boring'
- 'I don't know how to be active'
- 'I'm too tired'
- 'It's too hot', 'It's too cold', 'It's raining'
- 'I don't feel like it'.

Use the **Physical activity barriers** weblink in the Resources tab for more information. Suggest ways to overcome these barriers.

on Resources

Weblink: Physical activity barriers

9.8 Topic review

9.8.1 Summary

- Children and youth up to 17 years of age should exercise for 60 minutes per day, every day. The time can be accumulated.
- Adults should accumulate 2½ to 5 hours of moderate exercise over a week.
- Regular moderate to vigorous physical activity and exercise should be a lifelong behaviour that starts in childhood and is carried on throughout life.
- Regular physical activity has many positive health benefits. Improved fitness is linked with reduced risk of all-cause morbidity and mortality.
- The value that people place on exercise and fitness varies across the population and may result from a combination of many factors.
- A significant section of the Australian population does not value fitness and exercise. This is reflected in statistics that reveal a large group of people fail to meet the recommended levels of physical activity.
- People of all ages gain health benefits from regular, moderate physical activity.
- The commodification of fitness has led to the availability of a much wider range of fitness products and services.
- There are many ways in which the individual can choose to exercise for fitness. They include a wide variety of individual and group fitness activities that can be done in a variety of settings.
- Individuals need to determine their fitness needs and investigate the range of exercise types on offer so that they choose an activity that meets their needs, is enjoyable and that they will be likely to continue.
- The fitness industry advertises and promotes many fitness products and services. Quality and value for money is something consumers should consider before making a financial commitment. Consumers need to investigate the accuracy of the information being provided, the qualifications and expertise of people providing the service and the quality and reliability of products being offered.
- There are a number of barriers to people's participation in fitness activities, many of which can be overcome.

9.8.2 Questions

Revision

1. **Describe** how we can improve our health through physical activity. (P6) (3 marks)
2. Briefly **explain** the extent to which exercise should be a part of lifestyle. (P15) (3 marks)
3. What does it mean to be fit? (P15) (1 mark)
4. 'Australians value exercise and fitness.' **Discuss** this statement. (P17) (5 marks)
5. How do Australia's Physical Activity and Sedentary Behaviour Guidelines for children differ from those of adults? (P10) (4 marks)
6. What is meant by the commodification of fitness? How has it been beneficial in improving people's attitudes to fitness? (P17) (5 marks)
7. **Identify** and **discuss** four factors influencing people's attitudes to fitness. (P17) (4 marks)
8. How has your attitude to fitness been formed? **Discuss** the factors that have influenced your attitude. (P17) (5 marks)
9. How is technology changing our approach to fitness? (P10) (3 marks)
10. **Investigate** four emerging group fitness activities in terms of personal appeal and ability to address your fitness needs. (P10) (6 marks)
11. **Identify** two individual and two group fitness activities and **outline** the benefits of each. (P15) (4 marks)
12. **Identify** the important considerations of designing exercise for the aged, children and pregnant women. (P5) (3 marks)
13. **Outline** the exercise needs of a person intent on improving their fitness. (P5) (3 marks)
14. **Investigate** your local fitness centre in terms of the services it provides and ability to meet the fitness needs of the community. (P15) (5 marks)

15. **Describe** the role of a personal trainer. (P15) (1 mark)
16. **Identify** one cultural group in your community. **Describe** a culturally based form of physical activity practised by group members. (P16) (3 marks)
17. What benefits does regular physical activity provide? (P15) (3 marks)
18. **Outline** the things you should consider before believing an advertisement for a fitness service or product. (P16) (2 marks)
19. **Identify** issues that you need to be aware of before purchasing a gym membership. (P15) (3 marks)
20. **Identify** and **describe** three barriers to participation in regular exercise. **Explain** how these might be overcome. (P17) (6 marks)

Extension

1. **Describe** your main motivations for exercising. How do these compare to people of different age groups and activity levels? (P17) (5 marks)
2. **Investigate** methods by which aerobic fitness can be improved within a fitness centre. (P5) (5 marks)
3. **Determine** why it might be necessary to be critical of advertisements for fitness products and services. (P15) (3 marks)

Note: For an explanation of the key words used in the revision questions above, see Appendix 2, page xxx.

Resources

Interactivity: Revision quiz: auto-marked version (int-7247)
Interactivity: Missing word interactive quiz (int-7248)
Digital doc: Revision quiz (doc-26266)

9.8.3 Key terms

commodification is the process of turning something into a commodity that can be bought and sold. *p. 319*
A **commodity** is a product that exists to generate profit. *p. 319*
exercise is planned, structured and repetitive bodily movement. It is performed to improve or maintain one or more components of physical fitness. Exercise is a subset of physical activity. *p. 310*
light exercise is activity that requires approximately three to four times as much energy as rest. *p. 312*
moderate exercise is activity that requires approximately five to six times as much energy as rest. *p. 312*
physical activity is any movement that results in some expenditure of energy. *p. 310*
repetitions are the number of times an exercise is repeated without rest. *p. 328*
A **set** is the number of repetitions done in succession; for example, one set may equal 12 repetitions. *p. 328*
target heart rate (THR) is a predetermined pulse rate to be obtained during exercise and is expressed as a percentage of maximum heart rate. *p. 312*
vigorous exercise is activity that requires seven times or more energy as rest. *p. 312*

TOPIC 10
Outdoor recreation

OVERVIEW

10.1 Reasons for participation in outdoor recreation
10.2 Planning skills
10.3 Camp site selection
10.4 Conservation skills
10.5 Navigational skills
10.6 Emergency management skills
10.7 Leadership styles
10.8 Understanding group dynamics
10.9 Facilitation skills
10.10 Understanding strengths and weakness
10.11 Topic review

OUTCOMES

In this topic students will:

- propose actions that can improve and maintain an individual's health (P6)
- develop plans for participation in physical activity to satisfy a range of individual needs (P10)
- demonstrate the technical and interpersonal skills necessary to participate safely in challenging outdoor recreational activities (P14)
- utilise a range of sources to draw conclusions about health and physical activity concepts (P16)
- analyse factors influencing movement and patterns of participation. (P17)

10.1 Reasons for participation in outdoor recreation

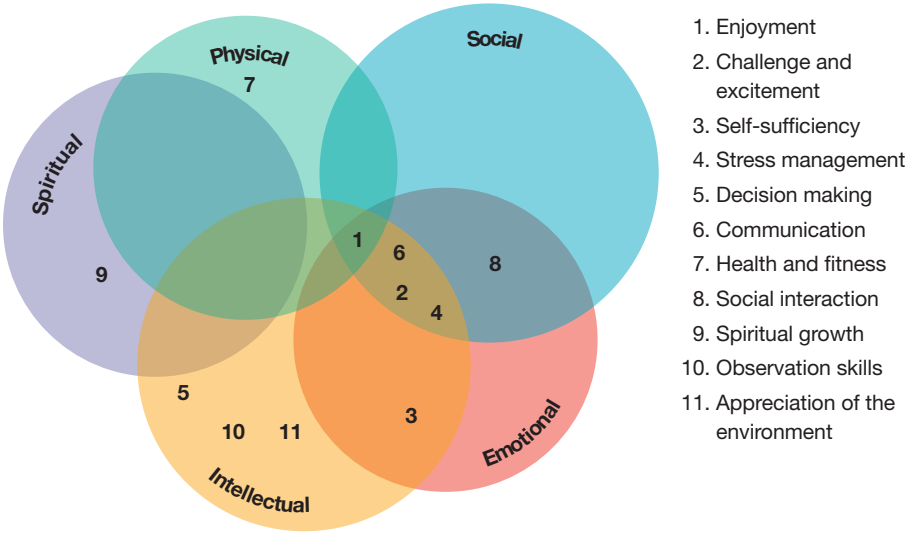
Outdoor recreation includes a wide range of activities undertaken for leisure outdoors. Australia has a great history of participation in outdoor recreation, with most people enjoying the wide range of suitable natural environments, including snowfields, rivers, beaches and mountain ranges.

People of all ages can benefit from participation in a range of outdoor pursuits, which can result in considerable physical, social, intellectual and emotional outcomes, including:

- enjoyment
- fitness
- challenge
- spiritual growth.

Some people prefer activities for relaxation like fishing and bird watching, while others seek more vigorous and adventurous activities including rock climbing, hang-gliding and sailing. Some outdoor recreational activities require detailed planning to ensure the safety of participants on extended expeditions or in potentially high-risk situations, while other activities involve little or no planning, such as surfing or a game of cricket on the beach.

FIGURE 10.1 Venn diagram showing physical, social, intellectual, spiritual and emotional outcomes that may result from participation in outdoor recreation



10.1.1 Stress management and relaxation

Feelings of anxiety and stress are increasingly common in society today. Some of the reasons for these feelings include the following.

- **Urbanisation** has led to individuals and communities being subjected to overcrowding and pollution. Large cities can be lonely places to live, particularly for elderly people, migrants and people from country areas forced to move to the city to find employment.
- Unemployment contributes to higher stress levels, with many individuals suffering low self-esteem, poverty and family pressures as a result of being unable to find work.
- Increased responsibility in the work force means working longer hours, commuting greater distances to work and experiencing traffic delays. All of these factors lead to less time at home with the family.

- Social changes, including changing traditional family roles and family breakdown, contribute to the stress levels of members of our modern society.
- Disadvantaged groups may experience discrimination and harassment, as well as the problems associated with living in cities, drug abuse, poverty and unemployment.

Young people may have additional areas of stress in their lives, possibly caused through:

- pressures from school or parents to achieve
- breakdown in relationships
- confusion about their sexuality
- conflicts with peers and the desire for acceptance.

FIGURE 10.2 Outdoor recreation can provide a valuable source of stress release.

Participating in outdoor recreational activities is often seen as an escape to the outdoors and an opportunity to 're-create' yourself. Interacting with the natural environment generally means fresh, unpolluted air and feelings of relaxation or excitement that can help to distract an individual from their daily life and pressures. The benefits for stress management are that the individual removes themself from the areas of stress in their lives. For many in our community, the outdoors is a wonderful place to do this.

10.1.2 Enjoyment, challenge and excitement

Participating in many forms of outdoor recreation offers opportunities for considerable enjoyment. Some individuals may find outdoor recreational activities to be fun because they are relaxing, while others may enjoy the strenuous and challenging nature of other activities.

Many outdoor recreational activities, such as rock climbing, mountaineering and white water canoeing, involve considerable challenge and risk. The element of risk inherent in many of these activities provides a thrilling adventure and is an enormous attraction for some participants. The range of environmental conditions associated with participation in outdoor activities, including the shape of the land and weather patterns, adds to the challenge and risk.

FIGURE 10.3 Many outdoor recreational activities involve challenge and excitement.

The human spirit is capable of considerable challenge and risk taking. Throughout history, people have sought exciting and adventurous outdoor activities through their work or leisure. Individuals and communities have undertaken some incredible explorations into unknown environments, such as space and Antarctica, as well as arduous expeditions in all parts of the world, from Mt Everest to the South Pole. These types of human achievements generate considerable excitement and inspiration in the community. Many individuals deliberately pursue activities that differ from their work environment. More and more Australians are living and working in urban communities, most often in 'safe', indoor environments. Therefore it becomes important for these people to interact with nature, test personal limits and participate in activities with adventure in mind.

Inquiry

Challenge and excitement in recreation

1. Reflect on any experiences you may have had in outdoor recreation that filled you with a sense of excitement and challenge. Share these with a classmate.
2. In groups, research and discuss the feats of one or more of the following outdoor adventurers. Consider the role of challenge and excitement in their motivation to complete their expeditions.
   (a) Paul Caffyn (kayaked around the coast of Australia, mostly solo)
   (b) Kay Cottee (first woman to sail solo around the globe) or Jessica Watson
   (c) Sir Edmund Hillary (first successful mountaineering expedition to climb Mt Everest)
   (d) Brigitte Muir (first Australian woman to climb Mt Everest)
   (e) Gerrard Gosens (blind adventurer and Paralympian, climbed Everest and other feats)

10.1.3 Social interaction

Individuals choose activities according to their needs, personality and lifestyle. Some people enjoy the opportunities for social interaction that outdoor recreation can bring. Joining with friends who have similar interests, such as camping or sailing, is appealing to many. Meeting new people while skiing or playing beach volleyball may add value to the activity for other people. Many people enjoy the teamwork, companionship and cooperation required in social recreational pursuits. In contrast, other people prefer to escape from crowds and seek out isolated wilderness areas, often participating in individual recreational pursuits such as cross-country skiing. For these people the solace and isolation can be a valuable spiritual experience.

10.1.4 Appreciation of the environment

The Australian environment offers some of the world's most spectacular and varied scenery, including alpine, tropical, desert and coastal landscapes. Individuals and communities do not have to venture far from home to enjoy and appreciate some magnificent natural environment settings.

FIGURE 10.4 Magnificent Australian landscapes offer wonderful opportunities to appreciate the natural environment.

Inquiry

Appreciating the natural environment

1. Prepare a list of recreational activities that can be enjoyed in Australia's varied landscapes. Circle the activities that are within a two-hour drive of your home.
2. Which activities appeal to you? Why?
3. What outcomes could result from participation in these activities?
4. In which activities could a person in a wheelchair or an elderly person participate?

10.1.5 Health and fitness

Many outdoor recreation pursuits involve physical activity and can contribute to the development and maintenance of fitness. The components of fitness developed vary depending on the activity chosen. For example, cross-country skiing is an excellent aerobic activity. In contrast, rock climbing and canoeing develop muscular endurance, while surfing enhances balance and coordination, in addition to aerobic conditioning and strength. More passive forms of outdoor recreation, such as fishing, may offer health benefits generated through enjoyment and relaxation, rather than benefits to fitness.

Fitness requirements for many outdoor recreation activities are quite specific. While regular involvement in sport and fitness activities is beneficial for general conditioning, it may not be adequate to prepare for specialised activities, such as a hard bushwalk over several days. This will test even the fittest person who is not conditioned to carry a heavy pack, walk up and down steep slopes and balance on uneven ground. As with any activity, training needs to closely resemble the 'real thing' for effective gains to be made. The dynamic nature of the environment also needs to be considered, with extremes in weather including rain, wind, cold or heat adding demands on the body.

Inquiry

Participating in outdoor recreation

Using the information in the text and your own ideas, think of reasons for participating in outdoor recreation. Prioritise your reasons in the ranking chart below and provide an explanation for each of your choices.

Priority chart

Reason for participating in outdoor recreation	Justification
1.	
2.	
3.	
4.	
5.	
6.	

10.2 Planning skills

Many outdoor recreational activities involve considerable planning to ensure that participants are safe, enjoy themselves, are adequately prepared for conditions, meet their goals, interact with minimal impact on the natural environment and develop positive relationships with authorities. Most of this planning needs to be done before the trip even begins; for example, finance, rations, equipment and transport. During the expedition, plans may need to be changed due to weather or group capabilities. A successful party needs knowledge and skills to adapt, survive and make alternative plans if necessary.

10.2.1 Environmental planning

Planning for environmental hazards depends on the activity being undertaken and the venue chosen. Local knowledge of weather conditions in the area to be visited is essential. Leaders must consider the hazards of the chosen venue. It is important that the venue is suitable for the ability level of the participants, therefore leaders must have prior experience in the area and research it thoroughly before taking a group of less experienced participants. Equipment suitable for conditions likely to be encountered should be taken.

The type of activity determines the planning for environmental conditions. For instance, a party of sea kayakers may need to take extra supplies in case they are stranded due to high seas for an extended period. Canoeists on a river may finish their trip sooner or later than planned, depending on water levels. Touring cyclists need to take clothing and equipment suitable for all weather conditions, as they may be delayed by strong head winds. Bushwalkers may strike high winds, snow, rain, floods or high temperatures.

CASE STUDY

Caving tragedy

Expeditions in the outdoors are often delayed by poor weather. In some situations, groups are advised to stay where they are, rather than attempt to keep going in very poor conditions. Of course, it is important to be dry, have shelter and sufficient provisions. The following tragic story illustrates how poor weather conditions, combined with poor decision making, can be fatal.

A party of students and teachers became stranded in a cave after heavy rain raised water levels in the cave. The group was delayed and began to worry about their families and the authorities, who would be anxious and waiting for their arrival. Two people decided to get out of the cave to communicate the situation while the others remained in a high part of the cave. Tragically, the two who left the main party drowned as they tried to get out. The rest of the party survived and were rescued.

Inquiry

Planning skills

1. What are the risks associated with caving described in the case study above?
2. What information could have been left with family and authorities before the group set out?
3. How could the tragedy have been prevented?

10.2.2 Emergency management planning

There are important safety risk management and organisational factors that must be addressed before and during a trip in order to manage the group's safety. In any outdoor recreational trip, it is essential that the group:

- stay calm at all times
- assess each situation logically.

Thorough research, planning, clear thinking and experience can enable a group to survive the toughest conditions. Panic can cause people to make mistakes. These mistakes may lead to tragedy for an inexperienced group.

Many outdoor recreational activities involve elements of risk. While the risks involved often make the activity more appealing and challenging, it is important that participants ensure that risks taken are controlled or calculated and individual needs and abilities within the group are considered. This means that although the activity itself may be potentially dangerous, the level of danger can be reduced by ensuring that:

- equipment is regularly checked to ensure it is safe and suitable to the environmental conditions
- participants have the necessary physical and mental skills needed to complete the challenge
- routes are carefully planned
- participants are skilled in navigation and have options for early exit if the weather turns bad or someone is injured
- communication modes with external authorities are established, including mobile phones, emergency contact numbers and a contingency plan to notify authorities if help is needed
- participants recognise their own capabilities. Failure to do this can place the whole group in danger.
- at least one member of the party is qualified in first aid
- the group should carry a comprehensive first aid kit and individuals should carry their own first aid supplies.

A group may need to use an **escape route** if:

- the weather changes
- participants are not coping with the terrain
- an injury is suffered.

An escape route provides the group with an alternative way out of the area. Thorough planning of the route to be taken is paramount for overnight trips. Leaders should know the area well and be familiar with road access points and some alternative routes. If all participants are new to an area, they should study maps carefully before leaving and talk to the National Parks and Wildlife Service, other experienced people who know the area well, or local residents to familiarise themselves with the terrain and access points.

FIGURE 10.5 Groups should establish safety procedures and understand in advance how safe the environment is for the activity.

Source: © John Wiley & Sons Australia/Photo by Carol Grabham.

Application

Using escape routes

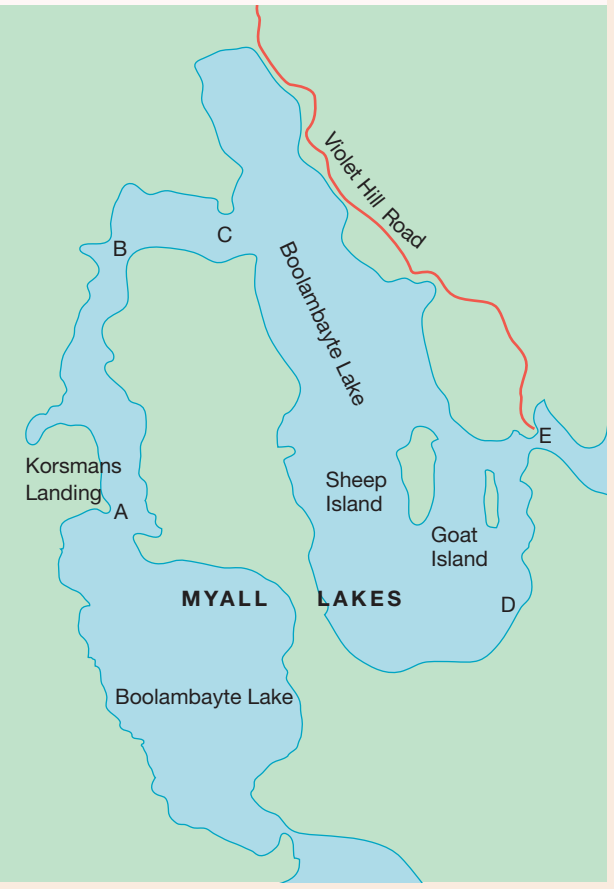
Read the following account and study figure 10.6, which shows the route planned for an inexperienced canoeing group attempting their first overnight expedition.

A canoeing group had participated in some short trips to learn techniques and become familiar with the lake conditions. They were well prepared with food, camping supplies in waterproof drums and bags, and good quality canoeing equipment. They set out at 9.00 a.m. from point A when the weather was fine and mild and the

water calm. The group kept together and had lunch at B before exploring the creek at C and then heading to D for the overnight camp. The leaders had noticed some high level cloud building up from the south during the day and thought the weather could change overnight and into the next day. They were right. After a peaceful overnight camp the group awoke early to drizzling rain, cold temperatures and strong southerly winds. The winds had made the water in the lake quite choppy, very unsuitable for the open Canadian canoes that most of the inexperienced members of the group were paddling in. The wind change meant that the group would be heading straight into the strong winds for the return journey, which was not good for beginners.

The group leaders held a conference and decided to use the escape route at E that linked to a major road. This would still involve some canoeing but would be in relatively sheltered water and the group would be moving in the same direction as the wind. Two of the leaders who were experienced paddlers returned to point A and drove the vehicles around to escape route E to collect the group. The wind and rain increased steadily throughout the day and the lake became extremely turbulent by the afternoon. The group averted a potential tragedy by being prepared and using the escape route.

FIGURE 10.6 Map of the Myall Lakes area showing the planned route of the canoeists



Inquiry

Planning an escape route

1. Identify the parts of the account in the application above that indicate the group was well prepared.
2. The leaders made the correct decision to use the escape route. What may have happened to the group if they had decided to continue with the trip as planned?
3. Identify the pressures that the leaders may have faced in making the decision to cut short the trip. Consider the opinions of the participants and parents.

First aid preparation

All groups should have first aid knowledge. It is preferable that participants be trained to senior first aid level. Specific emergencies in outdoor recreation expeditions could include:

- snakebites
- cuts and grazes
- bites and stings
- hypothermia
- hyperthermia

- sprains
- strains
- blisters.

The group needs to have the knowledge and skills to cope with such problems.

A comprehensive first aid kit should be carried by the group. Each member of the group should also have their own first aid supplies. For camping, overnight canoeing or bushwalking for a group of five to six, the group first aid kit should be stored in a waterproof, durable container. It should contain:

- triangular and crepe bandages
- cotton bandages (to secure dressings to wounds)
- two packets of wound closures (steri-strips) for cuts
- sterile nonstick dressings
- one roll of tape (secure bandages, tape joints)
- scissors, tweezers, safety pins
- antiseptic lotion and insect repellent
- small first aid manual
- instant cold compress
- a pain relief cream in case of stings.

FIGURE 10.7 First aid preparation should be thorough, but lightweight and ready to meet the immediate demands resulting from injury.

In addition to the group first aid kit, every person should carry a personal first aid kit containing the following items:

- paracetamol tablets
- moleskin or foam strip for blisters
- survival blanket
- sunscreen
- bandaids
- personal medication, such as an asthma relief puffer
- antiseptic cream.

10.2.3 Food and water considerations

The length and type of the expedition, possible weather conditions and the season will determine the consideration given to food and water. It is worth remembering that most humans can live for up to three weeks without food, but will survive for only one to three days without water, depending on the temperatures. If the temperature is 20°C, a person would need 1.2 litres of water if resting in the shade, whereas if the temperature increased to 30°C the need for water increases to 2.5 litres.

At least one day's supply of emergency food should be carried for most expeditions; more should be taken for extended trips. Many expedition foods require water for cooking (for example, to cook rice) and this needs to be taken into consideration. Unfortunately in many places, water from rivers is not safe to drink, due to pollution caused by sewage and domestic and industrial waste from humans. The water therefore needs to be boiled for 10 minutes or purified using soluble iodine or commercial tablets such as Puritabs, which tend to have a strong chlorine smell and taste. Where possible, overnight camps should be near a reliable water supply to save carrying more than 1.5 to two litres per day each. Route planning should therefore include reliable water sources.

It is essential that participants prepare a balanced intake of food during extended activity. Kilojoule intake needs to be high in physically demanding activities to provide energy for activity and to keep the body warm. Carbohydrates should be the dominant food group consumed, followed by protein and fats. Vitamins and minerals are also essential. Menus should include meals that are nutritious, light to carry and quick to prepare. Packaging should be minimised and only foods that do not require refrigeration should be taken. If the expedition is bushwalking with packs, keeping weight to a minimum is vital for comfort and well-being.

Food should be grouped into meals of equal weight and distributed evenly among the group to carry. It is therefore very important to consider the size and weight of food packaging. Weight should be kept to 750–900 grams per day per person when carrying all food in a backpack.

Rice, pasta and cereals can be carried in plastic bags that can be easily compressed and carried out or used to carry rubbish. Spreads like honey can be carried in small plastic containers or in tubes that are available from camping stores. **Scroggin** should be packed in small snaplock bags, one for each day. Tins should be small and kept to a minimum, as they are heavy.

When selecting food and planning menus for the outdoors, it is necessary to consider the following questions.

- Is the food nutritious?
- Is the food lightweight?
- Is it easy to prepare?
- Will you enjoy the food — do you like the taste?
- Is packaging kept to a minimum?

Consider the following suggestions in food selection and menu planning.

Breakfast:

- cereal, porridge, muesli
- fruit — fresh for the first few days then rehydrated dried fruit or packaged snack-pack or tinned fruit (can be heavy)
- muffins, bread, pita bread
- baked beans, eggs (will keep for two days if carefully packaged).

Lunch:

- bread, dry biscuits like Ryvita or pita bread
- cheese (processed cheese with preservatives is not as healthy as fresh cheese but keeps better)
- tinned salmon, tuna or salami
- toppings including chutney, peanut butter, jam, honey
- fast-cook noodles or soups.

Dinner:

- use rice, pasta or legumes as a base and create a sauce using vegetables, tomato paste, curry powders, miso, garlic, herbs or powdered milk with cheese
- use fresh vegetables that will keep for a few days; for example, carrots, onions, zucchini and garlic
- custard, packaged cheesecakes, tinned puddings, fruit cake and rehydrated dried fruit (soak overnight and lightly simmer in water) make tasty desserts.

There are many commercially available ready-made meals such as pasta and rice meals to which you add water or powdered milk and simmer. These are convenient and quick to prepare, but are often high in salt and fat and low in nutrients. With a little more preparation you can add fresh vegetables or create your own pasta and rice dishes which are a healthier alternative for a main meal. For longer expeditions, many people use freeze-dried or dehydrated meals; however, they often lack flavour and nutrients and are expensive. See table 10.1 for a sample menu for a three-day bushwalking or canoeing expedition.

FIGURE 10.8 Some foods suitable for a short outdoor trip

Source: © Carol Grabham.

FIGURE 10.9 A metho burning trangia stove is ideal for lightweight camping.

Source: © Carol Grabham.

Application

Expedition food

Choose one of the following recipes and make the meal at home. Evaluate its suitability as an expedition food.

Minestrone soup
handful of fast cooking noodles
1 tspn vegetable stock powder
freeze-dried kidney beans
sachet of tomato paste
parsley flakes, dried basil and oregano
fresh garlic and onion
parmesan cheese
Mix dry ingredients at home and carry in a snaplock bag. In camp, chop the onion and garlic. Add all of the ingredients and two to three cups of water. Simmer for three to five minutes until the noodles are tender.

Lentil tomato stew
½ cup split red lentils
handful of dried noodles
sachet of tomato paste
parsley flakes
1 tspn stock powder or a stock cube
pepper
fresh garlic and onion
Combine all dry ingredients in a snaplock bag at home. In camp, chop the onion and garlic. Boil two to three cups of water, then add all of the ingredients. Simmer for 10–15 minutes.

Macaroni cheese and tuna
1 cup macaroni
1 tin tuna
1 cup grated cheese
½ cup milk
parsley flakes
garlic and onion
Chop the garlic and onion. Bring three cups of water to the boil and cook the macaroni. Drain and add the other ingredients. Return to the heat for two to three minutes. Stir continuously.

Rice curry
1 cup rice
fresh onion and carrot chopped in camp
curry powder
handful dried apricots, sultanas, raisins, almonds, cashews, peanuts
Combine all of the ingredients except the vegetables in a snaplock bag at home. In camp, boil three cups of water. Add the rice mixture, chopped onion and carrot and simmer for 15 minutes. Stir frequently.

Pasta with tomato vegetable sauce
tomato paste (sachet or tube)
fresh carrot, zucchini, onion, mushrooms, garlic chopped in camp,
or dried variety
pepper, oregano, basil
pasta
parmesan cheese
Chop all of the vegetables. Add the tomato paste and herbs and simmer until soft. Boil three cups of water in another pot and boil the pasta for 10 minutes. Combine with the sauce. Sprinkle with cheese.

Damper
1 cup flour
1 tblspn butter
½ cup milk
Rub together the butter and flour. Mix in the milk, then form a dough. Use a flat surface to knead the dough for several minutes. Add extra flour if it is too sticky, then wrap in foil if cooking in the fire or place in a pot and cook over low heat for 30–40 minutes.
Alternatively, wrap the dough around a stick like a rope and hold over fire. Try adding dried fruit and nuts, honey, cheese, onion and so on to achieve the taste you want.

TABLE 10.1 Sample menu for a three-day bushwalking or canoeing expedition

Meal	Day one	Day two	Day three
Breakfast	at home	porridge or Weetbix with warmed powdered milk small container fruit muffins with butter, vegemite or honey tea, coffee or Milo	porridge or other cereal container of fruit baked beans or spaghetti muffins tea, coffee or Milo
Lunch	prepacked sandwich apple muesli bar fruit drink	pita bread with cheese, chutney, tinned fish or salami orange or apple hot or cold drink	dry biscuits cheese, chutney, salami orange or apple hot or cold drink
Dinner	Cup-a-soup pasta tomato paste chopped carrot, onion, zucchini tin of tuna fruit cake and custard	Cup-a-soup satay rice with peanut butter, onion, potato, carrot, sultanas, dried apricots small tin pudding	hopefully you will be safe at home
Snacks	scroggin mixture of dried fruit, chocolate and nuts	scroggin mixture apple or orange	scroggin mixture apple or orange
Emergency	two rice or pasta packs two-minute noodles rolled oats or Weetbix chocolate		

10.2.4 Resources for safe participation

The choices made about the clothing and equipment taken on an expedition can save lives. Equipment needs vary depending on the expedition undertaken. In general, outdoor recreational activities demand lightweight, durable equipment and clothing that protect you from environmental conditions. It is important that the loads carried are manageable, therefore all equipment needs to be carefully chosen. Quality equipment is often expensive; however, it will generally last a lot longer and be more comfortable than cheap equipment. It is important to be selective when packing and consider what you really need. It is vitally important to minimise weight and it is worth remembering that you can still enjoy yourself and meet the goals of the expedition, without a lot of unnecessary gear.

10.2.5 Legal and administrative requirements

Expeditions may involve travel on private land or in national parks. If this is the case, participants need to consider the following:

- booking of camp sites
- permission from the land owner to drive, camp, ski, walk, paddle or cycle on their land
- entry permits
- attention to detail; for example, leaving camp sites clean, leaving all gates as you find them, respecting privacy and avoiding disturbing domestic plants and animals.

If a leader is acting in an official capacity (for example, if they are being paid by the participants) or has a duty of care over the group, such as a teacher with students, they are accountable for the planning and management of the trip. In this situation, the leader could also be held legally responsible if something went

wrong on the expedition and they were found to be negligent. Most often negligence involves poor planning and decision making and can be avoided by having a leader who is qualified or experienced in the activity. The leader should:

- conscientiously check all equipment, routes and weather
- know the capabilities of the party
- have first aid qualifications
- be aware of medical conditions in the group
- ensure that all required permissions have been sought through liaison with appropriate authorities and trip intention forms have been lodged. Included here will be:
  - permission notes if taking school students or people under the age of 18
  - risk assessment forms; that is, forms detailing areas of possible risk and measures that will be adopted should problems occur (schools)
  - trip detail forms providing information about where the group is going, how long they expect to be away, mobile phone contact numbers, modes of transport and other relevant information.

Inquiry

Expedition equipment

The growth in manufacture and sales of outdoor equipment has boomed in the last decade or two. Some of the early adventurers would be amazed to see the huge range of available gear on the market today. Research an expedition from the past and provide details of the equipment used.

Provided that it is cared for properly, good quality equipment is a good investment for the years to come and may even last a lifetime. All equipment should be stored in a cool, dry location and completely dried off after use. Synthetic clothing will melt and leather boots may crack if placed close to direct sources of heat. Mud should be removed from packs and tents.

Essential equipment for bushwalking expeditions includes the following:

- comfortable, well-fitting rucksack
- waterproof pack liner (a strong garbage bag is suitable)
- warm sleeping bag that is compact and light to carry
- sleeping mat (foam mat is suitable, or 'therm-a-rest' for a really comfortable sleep!)
- lightweight tent with sewn-in floor and waterproof fly
- lightweight cooking and eating utensils
- lightweight cooking stove (metho burning trangia is ideal) and fuel
- torch
- plastic bags for rubbish
- toilet paper and trowel for burying faeces
- fire lighting kit (candle, matches)
- map, compass, whistle, signalling mirror, pencil and notepad
- first aid supplies
- general purpose repair kit (shoelace, cotton and strong needle, waterproof tape)
- food, including at least one day's emergency rations
- sunscreen and lip balm
- camera
- water (each person will use 1.5 to four litres per day depending on the weather conditions).

A clothing check list should include:

- wet weather jacket
- waterproof overpants (these may be needed for wet weather or snow expeditions)

- warm jacket or jumper that is not bulky
- beanie and gloves, as well as a sun hat and sunscreen
- trackpants
- thermal underwear. These are made from synthetic material that is designed to dry quickly and keep you warm, even when wet.
- shorts, T-shirts to walk in
- underwear
- swimmers
- thick socks
- lightweight shoes for around camp (optional)
- comfortable boots. The style of boots chosen largely depends on personal choice and the location of the walk. For many areas, lightweight canvas sandshoes or soft leather boots are sufficient. However, in snow, wet or muddy terrain, full leather boots that enclose the ankle are necessary. The addition of gaiters that attach onto the boots and protect the lower leg can be beneficial in these conditions.

The choice of clothing on an expedition needs to be carefully considered, with proposed weather conditions in mind. The weather in New South Wales tends to be unpredictable and participants in outdoor activities need to be prepared for sudden changes in weather. In order to adjust to weather conditions, it is advisable to wear layers of clothing that can be easily shed or added. A wet weather jacket is always advisable and in cold weather it is best to wear at least three layers of clothing rather than one bulky layer, along with beanie, gloves and warm socks. In this way, your body heat is trapped within the layers. In warm weather, light coloured clothing needs to be worn to reflect the heat, along with hats, sunglasses and sunscreen.

FIGURE 10.10 Protective clothing suitable for a bushwalking expedition

FIGURE 10.11 Common camping equipment

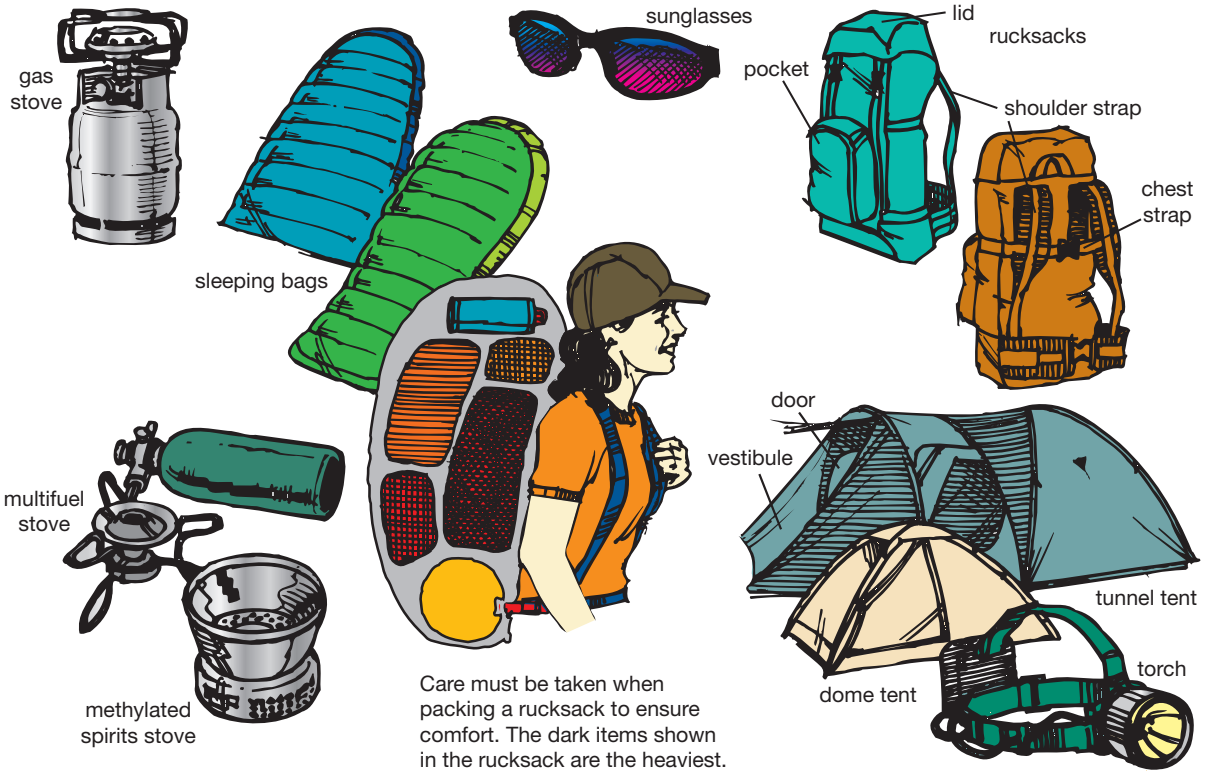


FIGURE 10.12 An example of a comprehensive equipment list distributed to participants by group leaders

Canoeing safety check list

Canoe equipment

- ☐ Canoe in good condition with flotation and end loops
- ☐ Paddle/s to suit canoe/kayak
- ☐ Spare paddle
- ☐ Repair kits (wide tape)
- ☐ Waterproof bags/drums
- ☐ Ropes (to secure drums, etc.)
- ☐ Leader should carry rescue equipment (rope, karabiners, knife, prusiks, throw bag)

Personal canoeing equipment

- ☐ Buoyancy vest
- ☐ Wetsuit (optional)
- ☐ Spray jacket
- ☐ Helmet (white water)
- ☐ Spray skirt (white water kayaking)
- ☐ Shorts, swimmers
- ☐ Old sandshoes/neoprene boots
- ☐ Sunglasses with strap
- ☐ Thermal top/woollen jumper
- ☐ Cap/straw hat

Camp clothing

- ☐ T-shirt
- ☐ Flannelette shirt
- ☐ Long sleeved shirt (sun protection)
- ☐ Tracksuit pants
- ☐ Thermal underwear
- ☐ Underwear
- ☐ Waterproof jacket (can use spray jacket)
- ☐ Beanie

Camping equipment (plan this with your paddling partner)

- ☐ Tent
- ☐ Sleeping bag and mat
- ☐ Water bottle/bladders (four litres per day per person)
- ☐ Fire lighting kit
- ☐ Map, compass, pencil
- ☐ Torch/candles
- ☐ Billy can/s
- ☐ Trangia
- ☐ Cup, knife, spoon, plastic bowl
- ☐ Toilet paper, trowel
- ☐ First aid kit
- ☐ Toothbrush and paste, small travel bag
- ☐ Personal toiletry items (small and compact)
- ☐ Insect repellent
- ☐ Fishing gear (optional)
- ☐ Camera (optional)

Remember: keep gear light and compact

FIGURE 10.13 A leader has a duty of care over the group.

Inquiry

Guidelines for bushwalking in schools

Investigate the New South Wales Department of Education's guidelines for the safe conduct of sport and physical education in schools with reference to bushwalking. Use the **Bushwalking safety** weblink in the Resources tab.

1. In what areas do you need instruction before you participate in an overnight hike?
2. What is a risk assessment and why is it necessary?
3. What equipment do you require for an extended walk?
4. What is the maximum weight of a loaded pack to be carried by an individual on an extended walk by school students? Why do you think the Department of Education has made this recommendation?
5. What additional safety considerations can you identify in this document? Discuss these with the class.

on Resources

Weblink: Bushwalking safety

10.3 Camp site selection

It is worthwhile spending time in planning and searching for a good camp site on an expedition. If the weather becomes unfavourable, the group could end up staying longer than expected. Effective planning is essential to ensure that groups leave enough time to set up camp in the daylight. A comfortable camp can increase the morale of any group and is important for group dynamics. Most often it is difficult to find a spot that encompasses all the points mentioned below. Sometimes compromise is needed.

10.3.1 Geographic, environmental and climatic considerations for establishing a camp site

Consider the following points when choosing the 'perfect spot' for your camp. Also consult the bushwalkers' code (see subtopic 10.4) to ensure that your camp site has minimal impact on the natural environment.

Water

- Is there adequate water nearby?
- Is the site at least four metres above the river bank in case of heavy rain? Some rivers can rise much more than this and rapidly — look for signs of debris in trees. It is also worth remembering that you may not get rain where you are camping, but if it is raining higher up in the catchment area, unexpected flooding can occur.

Site

- Ensure that the ground is flat and free from sticks, stones, animal nests or burrows and is not in a drainage area. Also be careful of camping under trees with dead limbs that may fall.
- Is there a fairly open area with interesting views? Is the area slightly elevated? Does the site have grass or sand — clay will turn to mud during rain! Old water channels should be avoided.

Fires

- Are there fire bans in operation? If not, is wood plentiful?
- Fires are not permitted in many areas that are sensitive; for example, alpine regions or in heavily used areas. Potentially they can impact on the area by causing significant disturbance to the natural ecosystem.
- Is an existing fireplace available? (See notes in the bushwalkers' code, subtopic 10.4, for more information about fire management.)

Toilet facilities

- Are there toilet facilities? If not, are there suitably private places for people to use?
- Can you successfully set up a group latrine?
- Position the toilet well away from the water supply and down wind from camp. Human excrement can pollute rivers and spread disease. (See notes in the bushwalkers' code, subtopic 10.4, for guidelines on managing human excrement.)

Camp site waste disposal

- Carry out everything that is carried in. This is a simple rule that is easily obeyed. (See notes in the bushwalkers' code, subtopic 10.4, for more information.)
- Never be too proud to pick up other people's rubbish. It improves the area, teaches others and helps you to care for the environment.

Privacy and shelter

- Is the area secluded? Many people seek a wilderness experience and are unhappy if other groups are close by.
- Does the site provide shelter from prevailing winds? Will you get sun or shade? In winter it can be important to get morning sun to get the group going and dry out tents, but in summer some afternoon shade is advisable.
- In winter, mist and fog often form over water. Therefore, it may be advisable to camp higher up.

Hazards

- Are there swampy areas that may attract mosquitoes?
- Are there any potential hazards like cliffs, dead trees, falling rocks and mine shafts?

FIGURE 10.14 Check all regulations for national parks before camping and lighting fires.

Source: © John Wiley & Sons Australia/ Photo by Paul Grabham.

Inquiry

Camping safety

Use the information above and the **Camping safety** weblinks in the Resources tab to create a PowerPoint or Prezi presentation that could be delivered to novice campers.

Resources

Weblink: Camping safety 1
Weblink: Camping safety 2

10.3.2 Tree fall evaluation

While the risk of injury from falling trees and their branches is minimal during good weather, the potential for injury and even death increases considerably during heavy rain and wild winds. Tree fall evaluation should be included in the risk assessment made prior to conducting expeditions. Students and other campers should be given training in safe camp site selection strategies prior to leaving and choose established camp sites where possible. Tents should ideally be pitched in open spaces, well away from large trees and overhanging branches that can snap anytime, particularly in strong winds.

FIGURE 10.15 A safe camp site should eliminate the risk of tree fall.

Inquiry

Planning for hazards

1. In 2005, a 16-year-old schoolgirl on a school camp was crushed by a tree while she slept during a storm. What features would you look for when making a camp site selection that might enhance comfort and safety?
2. How might you be more aware of changing climatic conditions?
3. What prior planning skills might help you avoid dangers associated with sudden weather changes?

10.4 Conservation skills

All campers have a responsibility to have minimal impact on the environment. Participants need knowledge and skills in relation to waste management, erosion control, protecting flora and fauna and managing fires. Waste in the form of human excrement and rubbish from food packaging is potentially disastrous for the natural environment. Everything that is carried in, must be taken out. If you find rubbish left by others, clean it up as you go. For large amounts, report it to authorities such as the National Parks and Wildlife Service. Before leaving your camp site ensure that all rubbish is cleaned up, toilet pits are filled in and fires are fully extinguished. In some countries, camp fires are banned and faeces must be carried out in plastic bags.

SNAPSHOT

The Bushwalkers' Code

Preamble

Bushwalking is a highly rewarding activity made even more enjoyable when engaged in safely, respectfully, inclusively, and in a manner that preserves nature for our future enjoyment.

Bushwalking NSW publishes this Bushwalker's Code to make the principles and actions that bushwalkers use to plan and conduct rewarding outdoor adventure available to all; so that everyone may continue to experience the greatest enjoyment of bushwalking in NSW, the ACT, and beyond.

We leave no trace

- We use existing tracks where possible and avoid creating multiple tracks which lead to erosion.
- We avoid easily damaged plants and places such as peat bogs, cushion moss, swamps and fragile rock formations.
- We remove from the bush all rubbish, including food scraps, and bury human waste well away from watercourses.
- We do not remove plants or rocks from National Parks.
- We do not disturb nor feed wildlife.
- We do not pollute the ground and waterways with soaps and detergents.
- We carry cooking equipment, or use existing fireplaces when possible, and do not scar the landscape with fire rings.
- We comply with fuel-stove only requirements.
- We leave campsites in a pristine state.

We preserve Australia's bio-security

- We proactively seek to protect the natural environment from the negative impacts of pests, weeds and diseases.
- We clean our clothing, equipment, cars, wheels and vessels to prevent the spread of pathogens and diseases that threaten bio-security.
- We report significant or unusual pests, weeds and diseases.

We prevent incidents

Because incidents and rescues have the greatest impact on the environment and people:

- We plan and prepare fully.
- We share our trip intentions.
- We act safely.
- We are self-reliant.

We take responsibility for acting safely

- We always carry appropriate clothing and equipment for the nature of the activity engaged in.
- We carry first aid kits and are trained in first aid appropriate to our (often remote) activities.
- We walk in groups of three or more so that there are sufficient people to summon help in an emergency.
- We do not rely solely on GPS systems, but carry a map and compass.
- We know how to navigate with map and compass according to the difficulty of the activity we are engaged in.
- We do not rely on mobile phone coverage for dealing with an emergency but carry a Personal Locator Beacon (PLB) and/or satellite phone when appropriate. A satellite phone has global coverage and means we can inform emergency services of our needs.
- We consider battery life of electronic devices and take a recharger if necessary.
- We register all Personal Locator Beacons (PLB) with AMSA and groups always carry a PLB in wilderness areas.
- We prepare an incident response and exit plan prior to each activity in case of accident or emergency.
- We carry appropriate equipment that may be needed in case of accident or emergency.
- We check for adverse weather, flood, fire, tides, transport, and access issues when planning, and before we head out.
- We check the safety status of our destinations before entering, observe the safety instructions of park rangers, and do not enter closed National Parks.

- We advise the appropriate authorities, responsible friends or relatives of our walking plans and intentions so that emergency services can be alerted in case of our failure to return from an activity. We inform those authorities/persons when our group has safely returned.
- We only light fires when it is safe to do so, and ensure they are fully extinguished.
- We ensure the safety and wellbeing of all dependents entrusted to our care.
- We engage in bushwalking activities unimpaired by the consumption of alcohol or use of drugs.

We are self-reliant

- We carry sufficient food and water in order to survive an unexpected delay in returning from the bush.
- We wear and carry appropriate clothing and equipment for our comfort and safety in expected weather conditions. We also carry gear to suit the worst possible conditions we are likely to encounter.
- We ensure we have sufficient training, experience and expertise to safely carry out our planned activity.

We respect fellow bushwalkers

- We welcome people from all walks of life irrespective of gender, age, race, religion, culture, colour, sexuality; and behave in a harmonious manner.
- We appreciate difference and welcome learning from others, building relationships based on mutual respect.
- We do not tolerate bullying, harassment or discrimination in any form.
- We encourage, respect and support our activity leaders, as competent and motivated leaders are essential to the success of our activities.
- We respect the right of our activity leaders to accept or reject walker applicants for specific activities based upon the assessed degree of difficulty, and the assessed competence of individual walkers.
- We respect the right of bushwalkers to enjoy the peace and quiet of the bush without undue disturbance from technology.
- We help fellow bushwalkers in need, in situations such as: assisting with emergency communications, offering medical aid for which we are qualified, carrying the gear of an injured person, or sharing equipment.

We respect Indigenous culture

- We acknowledge the traditional owners of the land on which we walk.
- We treat sites of spiritual or cultural significance with respect.
- We obtain permission from traditional landowners or the relevant land manager to visit sensitive areas.
- We do not damage Aboriginal rock art or camp under overhangs that contain Aboriginal rock art.

We respect landowners

- We respect landowners and do not trespass on their land.
- We leave farm gates as we find them.
- We respect the rules of National Parks, and other land managers, such as camping conditions, maximum numbers in wilderness areas, permitted activities and park closures.

In case of emergency

- If in distress contact the emergency services on **Triple Zero (000)**.
- If you are in distress and need assistance and have no other means of communication, set off your Personal Locator Beacon (PLB). Remain near your PLB and be prepared with food and shelter to wait for a response. This may take several hours, or longer depending on weather conditions, and if a ground team needs to reach you. Make yourself visible from the air with a brightly coloured sheet of fabric, or if safe, make a smoky fire. Extinguish any fire entirely when the helicopter approaches. Pack up and secure your gear against the helicopter downdraft so your gear is not lost and the rescue site is left as untouched as possible.

See the Bushwalking NSW website for further guidance and information: www.bushwalkingnsw.org.au.

Bushwalking NSW
Keep exploring, be amazed!

Source: The Bushwalker's Code, © Bushwalking NSW Inc. www.bushwalkingnsw.org.au.

10.4.1 'Leave no trace' camping

Participation in outdoor recreational activities must be accompanied by a respect for the natural environment and a willingness to interact with nature with minimal impact. Individuals who participate in activities in the

natural environment have a responsibility to ensure that they don't damage, destroy or change it. Many of our native plant and animal species are facing threat and extinction from diminishing habitats and we must be vigilant in minimising disturbance. For example, when setting up a camp site, a clear area should be chosen rather than clearing vegetation. When rock climbing, vegetation or animal and bird nests should not be destroyed to make it easier to complete the climb. Rubbish should be removed after camping — the only things that should remain behind are footprints!

10.4.2 Minimal impact practices

Extended bushwalks offer opportunities to explore remote wilderness locations with your 'house on your back'. In order to enjoy the wilderness experience and ensure the enjoyment of others who use the area after you, it is vital that attention is paid to conservation issues to minimise the impact of your party on the area. Particular attention needs to be paid to camp fire control, waste disposal and disturbances to vegetation and flora.

FIGURE 10.16 Some outdoor recreational activities are more conducive to conservation than others!

10.4.3 Ethical issues

People who participate in outdoor recreational activities have a wide range of attitudes and values towards conservation. They all may feel that they are conserving and protecting the environment, but in different ways. For example, some people believe that camp fires are a waste of valuable timber resources and scar the landscape. Therefore, they always carry portable stoves. Other people see benefits in using a renewable resource such as timber for warmth and cooking rather than using fuel. They may enjoy the atmosphere of the camp fire. Some activities are more conducive to conservation than others. For instance, canoeing or bushwalking could be seen to be more environmentally friendly than water skiing or jet skiing, which impact on the environment through noise and increased wave action on the banks. The choice of activity generally reflects the values and attitudes of the participants in relation to the environment.

In all outdoor recreational activities, people have a responsibility to 'tread lightly' and ensure that their activities have a minimal impact on the environment. Consideration for waste disposal, fire hazards, biological disturbances and erosion are responsibilities of participants in outdoor activities. It is essential that these things are treated responsibly if we are to conserve and preserve our natural environments for future generations to enjoy.

Application

Ethical issues

Conduct a class debate on one of the following topics that relate to conservation, ethical issues and the environment.

(a) Horse riding and four-wheel driving have no place in national parks.
(b) Our national parks should be protected by permit systems and a fee structure to limit the number of visitors and help preserve the parks.
(c) Speed boats, jet skis and trail bikes should be restricted to less fragile areas to minimise harm to the natural environment from erosion and noise pollution.
(d) Alpine resorts, such as Thredbo and Perisher, should have been built below the snow line, rather than in the main range, to minimise disturbance to vegetation and pollution in waterways.

SNAPSHOT

Selling adventure

I recently returned to [a] cliff after many years of absence only to be firstly angered then dismayed at the transformation of what had been a wilderness climbing area. At one end of the cliff is a cemented series of benches and retaining walls. At the other, a picnic bench is set in the middle of a large cleared area which had been cut out of the scrub with what I deduced to be a whippersnipper. The same tool had been used to slash new tracks along the clifftop, which is now littered with bolts and other ironmongery used in commercial abseiling.

At one point the clifftop is totally denuded of vegetation, as the result of intensive use. At the same site, in what I regard as an act of wilful vandalism rarely encountered in the world of outdoor recreation, ironstand bands . . . had been smashed off and other sharp edges cemented over, presumably in the attempt to reduce the wear and tear on abseil ropes . . . I then discovered that the character of classic climbs had been fundamentally transformed by ring bolts and belay chains installed to facilitate the techniques of commercial rockclimbing operations . . .

Through the selling of adventure, many more people now have access to the experiences and skills of outdoor activities. In many ways, this is a welcome development, because it makes those experiences available to anybody who chooses to use their money in this way. By introducing larger numbers of people to new ways of relating to the natural world, a wider environmental appreciation may be fostered.

Source: Dr Ben Maddison is a Senior Lecturer in History at University of Wollongong. His most recent book is *Class and Colonialism in Antarctic Exploration 1750–1920* Pickering & Chatto, 2014.

Inquiry

Impacts of recreational activities

1. Read the snapshot titled ‘Selling adventure’. Identify the positive and negative aspects of commercial adventure operations in our wilderness areas.
2. Discuss ways in which commercial adventure companies could minimise their impact on natural environments (for example, group sizes, toilet practices).
3. Contact commercial adventure companies in your local area, or find them on the internet. Ask them what measures they take to minimise the impact of tour groups on the environment.

Inquiry

Camp site planning and behaviour

Examine the following statement: ‘Take nothing but photos and leave nothing but footprints. Leave the area cleaner than you found it.’ Critically examine this statement in light of the photograph below.

FIGURE 10.17 Camp site behaviour should include respect for the environment and consideration for other users.

10.5 Navigational skills

The ability to navigate is an essential bushcraft skill. Many people seek wilderness areas without roads and tracks and therefore need to have the skills to find their way using a map and compass. Skills of navigation include observation, concentration and knowledge of map and compass work. They are best developed through practice. The use of satellite navigational equipment (global positioning systems or GPS) is increasing. However, the ability to read a map and use a compass is still essential.

10.5.1 Check list for navigation

To successfully find your way in the bush, you should learn to:

- understand map scales and how to measure distance
- recognise symbols used on topographic maps
- understand how contour lines represent the height and shape of the land
- be able to calculate grid reference bearings to give location
- orientate your map to match the real world
- recognise and understand true north, magnetic north and grid north
- know how to take a bearing
- understand how to take magnetic variation into consideration when calculating bearings.

The following equipment is needed for navigation:

- compass
- map (in a waterproof bag or specially designed map cover)
- whistle
- notepad and pencil.

10.5.2 Map reading

Maps are models or pictorial representations of the Earth's surface. They are made using information from photographs taken of the Earth's surface from aircraft flying overhead. Features on the Earth's surface are represented by symbols on the map.

Maps used in outdoor recreation are topographic maps that have standard symbols. They contain information about:

- the natural landscape, such as hills, rivers, forests and swamps
- the artificial landscape or constructed environment, including towns, roads, railways and bridges.

Scale is the ratio between the distance measured on a map and the actual distance measured on the Earth's surface. Topographic maps generally state scale as a line scale as well as a representative fraction or ratio. The line scale is a numbered line showing how many kilometres are represented by a centimetre on the map.

Most topographic maps used for outdoor recreation have a scale of 1:25 000, which means that one centimetre on the map is equal to 25 000 centimetres on the land. Two centimetres on the map is equal to 50 000 centimetres; therefore, four centimetres on the map represents one kilometre.

The map scale is used to measure distance. Smaller scale maps show less detail and may be used for a road map (1:100 000) or country map in an atlas (1:500 000).

Application

Using a topographic map

Examine the legend below that shows the symbols commonly found on a topographic map and what they represent.

1. Identify the symbols for (a) swamps, (b) cliffs and (c) areas of vegetation.
2. Identify the symbols for (a) sealed roads, (b) unsealed roads and (c) mines.

FIGURE 10.18 Legend from a topographic map

Contour lines join all places of equal height on a map, above sea level. They provide information about the shape, steepness and height of the land. When the lines are close together this means that height is gained (or lost) quickly and therefore the slope is steep. When contour lines are spaced further apart, then the land is gently sloping or even flat. Evenly spaced contours indicate uniform slopes.

FIGURE 10.19 Diagram showing how contour lines represent the shape and height of the land

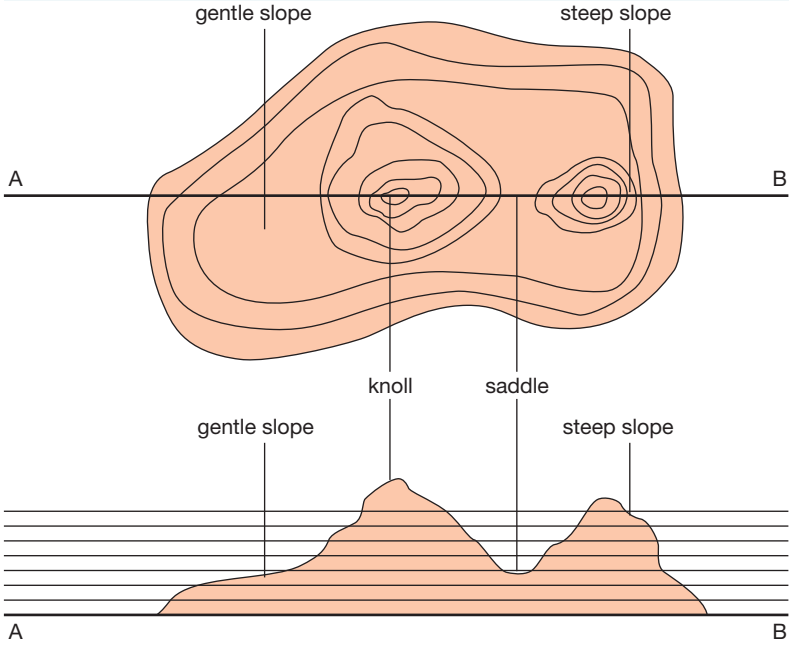
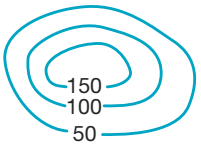
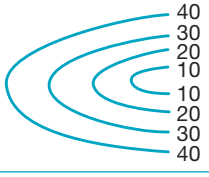
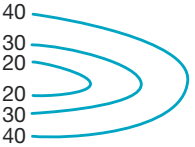
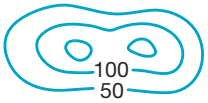
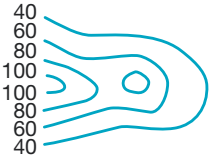
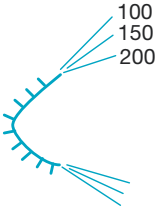
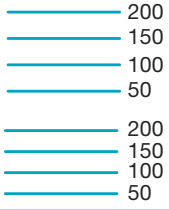


FIGURE 10.20 A range of land forms and contour representations

Name of land form	Contour pattern	Explanation of contour pattern	Side view	Explanation of land form	Sketch of land form
Round hill		Contours in a circle or oval shape		High, round area of land; not as big as a mountain	
Spur		Contours in a U or V shape that point away from high land		Area of high land that sticks out like a finger from the side of a mountain or hill	
Re-entrant		Contours in a U or V shape that point towards high land		Dip between two spurs; a small valley	
Two hilltops and a saddle		Two circle-shaped contours with a space between them		Two areas of high land with a shallow dip between them	
Knoll		A circle-shaped contour located on a spur		Low, knob-like hill located on a spur	
Cliff		Contours on top of or almost on top of each other		Almost vertical fall in the land	
Gorge		Contours go down very steeply then back up very steeply		Deep valley with steep sides	

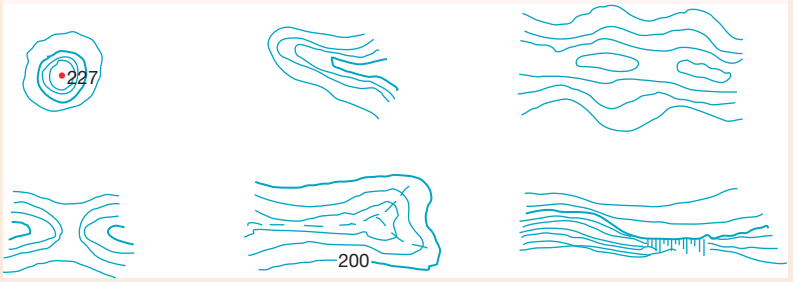
Application

Identifying land forms on a map

Match the following names of land forms to the correct diagram in figure 10.21 (you may need to refer to figure 10.20).

(a) Valley
(b) Hill or knoll
(c) Ridge
(d) Cliffs
(e) Spur
(f) Saddle

FIGURE 10.21



Resources

- **eLesson:** Introducing topographic maps (eles-2265)
- **eLesson:** Reading topographic maps at an advanced level (eles-2268)
- **eLesson:** Using contour maps (eles-2267)
- **eLesson:** Recognising land features (eles-2266)

10.5.3 Grid bearings

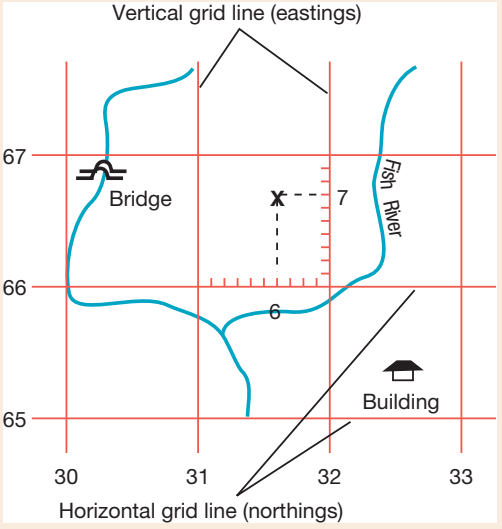
Grid references are a quick and accurate method of locating places or features on a map. On a typical 1:25 000 topographic map, these vertical and horizontal lines are every four centimetres on the map and represent one kilometre on the land, making them useful for measuring approximate distance. However, the main function of grid references is for locating features.

Application

Locating features using grid bearings

1. Examine the map in figure 10.22, which illustrates how grid reference lines may be used to give a location. The location of X on this map would be 316 667. Each grid reference line is numbered and each square is divided into 10 imaginary squares. The top of a map is always north. The horizontal grid lines are therefore called northings because they increase in value to the north. The vertical grid lines increase in value to the east and are called eastings. The GR (grid reference) is always read from the bottom first (eastings), followed by the side readings (northings).
2. Give the grid bearing of the following features on the map in figure 10.22:
   (a) bridge
   (b) building
   (c) river junction.

FIGURE 10.22 Sample map showing grid reference lines



10.5.4 Magnetic bearing

Using a compass to find magnetic north and true north

A compass is a valuable navigational tool if it is used accurately. It can provide direction and assist in determining location. A compass can assist in navigation by providing the location of magnetic north. The compass needle always points to **magnetic north**, which is in the direction of the North Pole. It is a position that changes slightly every year. **True north** is the direction of the North Pole. The top of a map is always **grid north**. There is a slight variation between magnetic north and grid north, which is due to the fact that maps are flat, but the Earth's surface is curved. This variation between the two is known as the **magnetic variation**.

The position of magnetic north is constantly changing, although at a very slow rate, taking 20 years to move just one degree. However, this variation must be taken into consideration when using a map and compass to give accurate readings and enable a location to be found. In New South Wales, it is generally assumed that the amount of the variation is 11–12° unless the map is particularly old. It is worthwhile checking the information displayed in the map legend about magnetic variation.

FIGURE 10.23 Diagram showing the difference between grid and magnetic north (MN). This difference is referred to as magnetic variation.

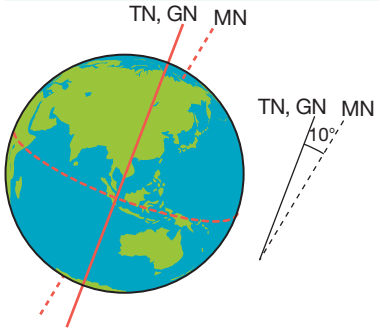
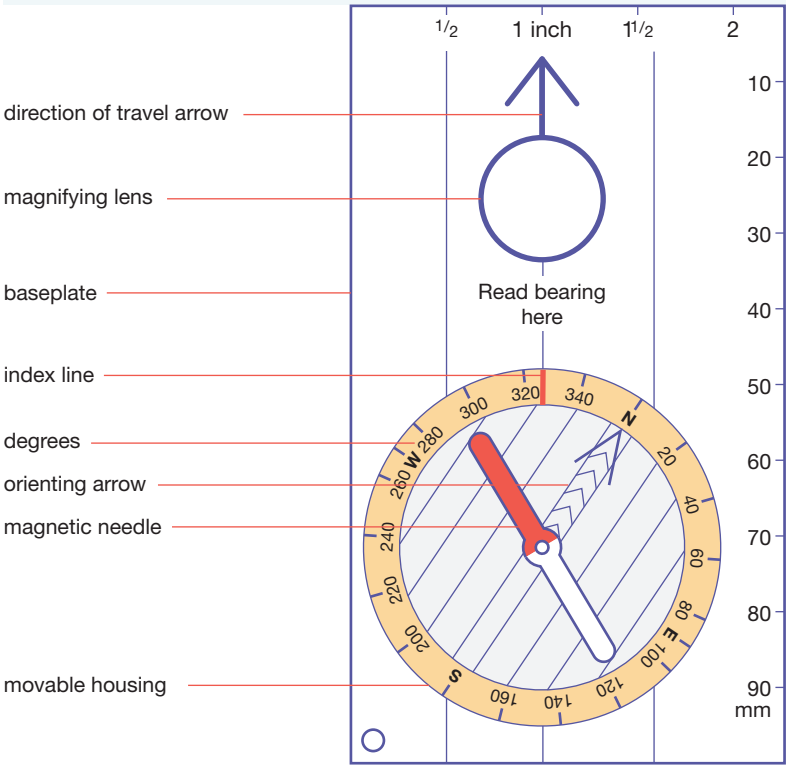


FIGURE 10.24 Components of a compass



Application

Using a compass

1. Examine the diagram of the compass (figure 10.24) to identify the main components.
2. To use the compass to find north:
   - hold the compass flat in your hand about waist height
   - the red end of the moving needle will always point to the north
   - align the direction of travel arrow on the top of the compass with the red end of the compass needle by turning the compass housing until the two (usually red) lines match up.
   - the bearing should be 0°. This indicates north.

3. Identify objects in your school grounds that are found in a northerly direction. Identify the compass bearing of other **cardinal points** on the compass. Cardinal points on the compass are the major directional points; that is, north, south, east and west.
4. Complete figure 10.25 showing the cardinal points and their compass bearings.
5. To use the compass to orientate the map:
   - lay the map out flat and place the compass on top of it, with the red end of the moving needle pointing to the direction of travel arrow (which is north 0°) and pointing towards the top of the map
   - rotate the map until the grid lines on the map are parallel with the lines on the compass housing. North on the compass should face the top of the map.
   - the map is now orientated and land forms should be able to be identified in the appropriate direction.

FIGURE 10.25 Cardinal points and their compass bearings

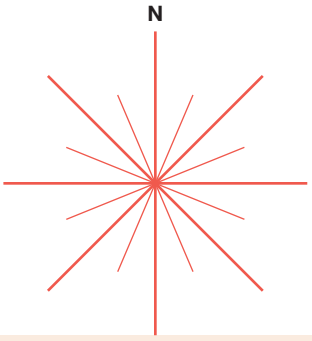
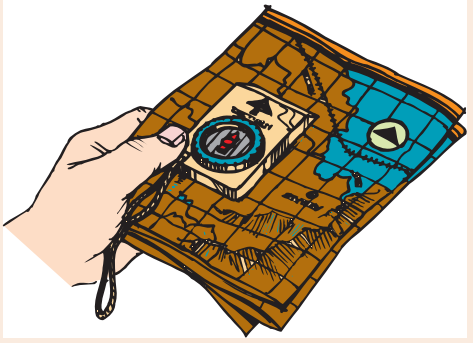


FIGURE 10.26 Using the compass to orientate the map to point north



Taking a bearing using the compass

In many situations, we can use only the map or only the compass to determine which direction to travel. However, for greater accuracy, it is best to use the two together. A compass can be used to calculate and follow **bearings**. A bearing is the direction of travel measured as the angle from 0° (north) and recorded in degrees. For example, to travel south the bearing would be 180°.

Application

Taking a compass bearing

1. Practise taking bearings of objects in your school yard by following these instructions.
   - Hold the compass steady at chest level and point the direction of travel arrow at the object. The object in figure 10.27 is the bush.
   - Rotate the adjustable dial until the N on the compass housing lines up with the red end of the moving needle.
   - Take the reading for the bearing from the direction of travel arrow. In figure 10.27 this would be 100°ESE.
   - As you proceed towards the bush, you will be following the bearing of 100°.
2. Design an orienteering course for a partner or group to complete around your school grounds.

FIGURE 10.27 Taking a bearing from an object in the school yard

Considering magnetic variation when recording bearings

To check position in the field, a bearing can be taken from objects in the distance and then checked on the map to clarify where you are. However, whenever a bearing is calculated from the field and located on the map or calculated on the map and checked in the field, the magnetic variation must be considered to compensate for the difference between magnetic and grid north.

When converting a bearing from the field to the map, the magnetic variation must be added to the bearing. In New South Wales, this generally means that 11° is added.

When converting a bearing from the map to the field, the magnetic variation must be subtracted from the bearing. In New South Wales, subtract 11°.

Application

Setting and following a course from a map

When contemplating a long bushwalk, the course needs to be planned before leaving. This can be done at home, selecting the course and using the compass to take bearings from the map. Consider the example in figures 10.28 and 10.29 in which the person is intending to walk from point A to point B.

Step 1

- Place the long end of the compass on the map to join A and B along the edge of the compass (figure 10.28).

Step 2

- Rotate the compass housing until the lines on the housing are parallel with the grid lines. Turn the map so that north on the compass needle is pointing in the same direction as north on the map.
- Read the bearing from the direction of travel arrow. The bearing in figure 10.29 is 100°.

FIGURE 10.28

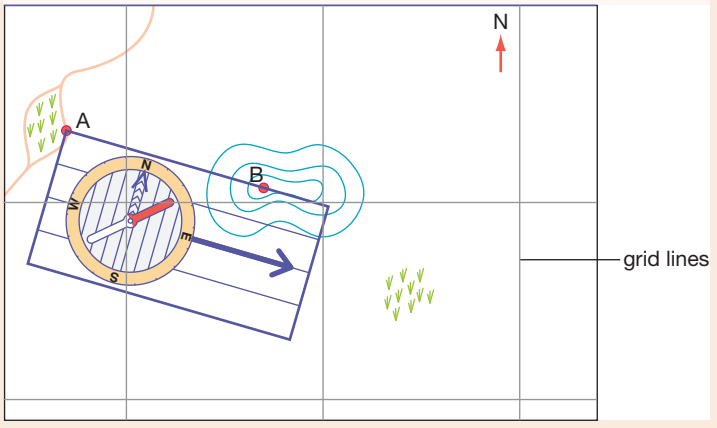
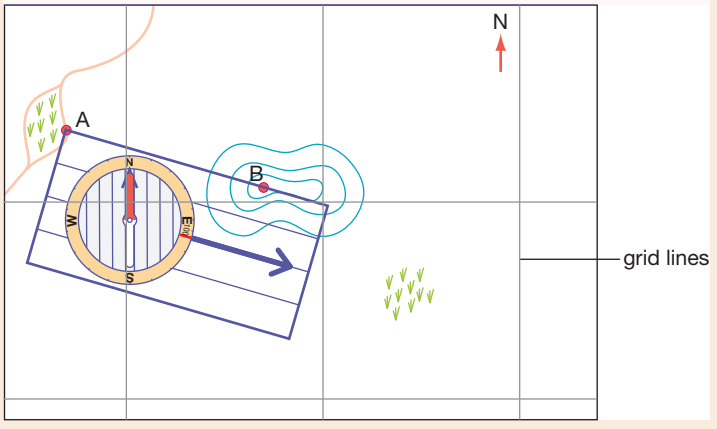


FIGURE 10.29



10.5.5 Measuring distance

The scale on the map assists in the calculation of distance to be travelled. Most walking parties could expect to travel four to five kilometres per hour on flat, cleared ground. More time should be allowed for sloping and densely vegetated land, where it may take one hour to cover less than one kilometre. Naismith's rule is commonly used to estimate the time it will take to cover a distance over varying terrain. Simple calculators are available online, such as at the **Wild Walks: Naismith's rule** weblink in the Resources tab. After distance,

walking speed, ascent and decent are established, an estimate of time for the walk is calculated providing participants have a reasonable level of fitness.

on Resources

Weblink: Wild Walks: Naismith's rule

10.5.6 Natural navigation

In addition to the map and compass, it is possible to navigate by using the sun, moon and stars to assess location and direction.

Navigation by the sun

In the southern hemisphere the sun always appears in the northern sky. In summer the position of the sun at midday will be much higher in the sky than in winter; however, it still appears in a northerly direction. Appreciating this, plus the fact that the sun always rises in the east and sets in the western sky, can give broad direction. The sun can also be used to determine direction if a shadow stick is used to map the movement during the day.

Navigation by the stars

The most useful stars for direction in the southern hemisphere are the Southern Cross and the Pointers.

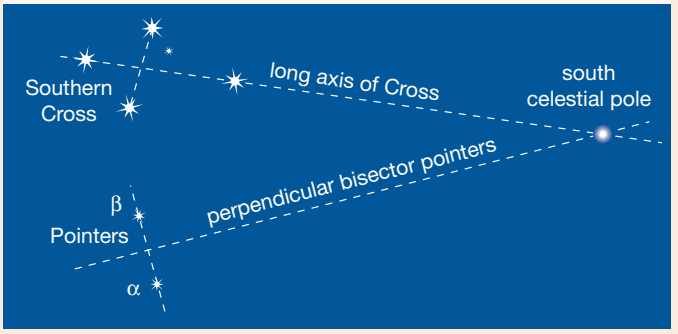
Application

Natural navigation using the stars

To find south:

- draw a line between the long axis of the Southern Cross
- imagine a vertical line between the Pointers. Bisect the line and continue until the line meets an imaginary extension from the Pointers.
- at the point at which they meet, drop an imaginary line to the horizon, which indicates south.

FIGURE 10.30 Using the Southern Cross and the Pointers to find south



10.6 Emergency management skills

Many accidents and emergencies occur because of poor planning or inadequate knowledge and skills. Before leaving, refer to the following check list.

- Are all participants fit and healthy?
- Do any of the participants have medical conditions that may affect their performance?
- Has the group leader clearly communicated the nature and demands of the trip?

- Have equipment lists been issued and followed by all participants?
- Are food and water rations adequate and appropriate?
- Have weather forecasts been checked?
- Do participants have appropriate clothing and equipment to cope with predicted weather conditions?
- Have details including exact route, anticipated timing, transport arrangements and phone contact numbers been left with family, authorities including National Parks and Wildlife Service, or land owners?
- Are first aid supplies and knowledge adequate?

10.6.1 Wilderness first aid

Following are procedures for dealing with first aid emergencies.

- Ensure that you are not in danger of being hurt yourself.
- Assess the injury. Talk to the patient if possible and try to determine the extent of damage. Observe the injury and look for swelling, abnormal movement or redness.
- Treat the site of the injury — control bleeding, treat blisters, bandage the limb.
- Determine whether the injured person can continue. This depends upon the nature of the injury. The group may need to stop for a while or even set up camp for the night to allow the person to rest.
- If the injury is serious (for example, the person has a snakebite, is unconscious, has a broken limb or is suffering from severe exposure) and the person needs medical attention, then the group needs to alert authorities and monitor the patient's condition using DRSABCD (see section 7.1.3).
- Depending on the situation, the remaining party may need to locate themselves near a clearing, in case a helicopter is needed. The patient needs to be made as comfortable as possible; for example, erect shelter and start a camp fire. Two experienced and responsible people should go to the nearest exit and seek help, making sure they know the exact location of the remaining party, including grid references and details about the patient's condition. At least one person, but preferably two people should remain with the injured person.

Thermoregulation

Hyperthermia and hypothermia are caused by adverse environmental conditions. Table 10.2 discusses the symptoms and treatment of hyperthermia and hypothermia.

TABLE 10.2 Signs, symptoms and treatment of hyperthermia and hypothermia

Condition	Signs and symptoms	Treatment guidelines
Hyperthermia is a condition associated with raised body temperature that can result in death if it is not treated. It can be prevented by: • ensuring adequate hydration • planning routes where water sources are reliable • wearing a hat and light-coloured clothing • avoiding the heat of the day • resting in the shade. As long as the person keeps sweating, their body is cooling. Once sweating stops, the condition is very serious.	• flushed • headache • rapid, weak, irregular pulse • vomiting, blurred vision, dizziness • unconsciousness	If the victim is conscious • give them water to drink • rest them in the shade • remove unnecessary clothing • drape them with wet triangular bandages or light cotton clothing. If the victim is unconscious • DRSABCD • give nothing by mouth • continue the cooling process as described above. Medical help is needed as the person may suffer complications later.

Condition	Signs and symptoms	Treatment guidelines
Hypothermia is a condition associated with lowered body temperature that can result in death if it is not treated. Prevention is the key, so ensure appropriate clothing and equipment, sound knowledge and leadership. Layers of clothing with a waterproof coat and pants, as well as beanie and gloves are needed in cold environments. Wind increases cooling significantly. A combination of wind, rain and cold temperatures can be quickly fatal to the underprepared person. Exhaustion and lack of food can speed up the process. One of the most dangerous aspects of hypothermia is that a person may become very confused and become incapable of making decisions to treat the condition. It is vital to recognise signs early and treat the condition immediately.	Progression of the following: • sensation of chilliness • skin numbness • impairment of muscle function • shivering • stumbling • confusion • loss of speech • poor decision-making capacity. If untreated, the skin becomes blue and cold to touch, the pulse becomes weak and behaviour is irrational. Unconsciousness and death may result.	• stop at first sign of exposure • shelter from wind and rain • put on extra clothing (it may be necessary to remove wet clothing) • if recognised early, have something warm to eat or drink If the person does not warm themselves early using the above techniques, their core temperature continues to fall, which is very dangerous. The person needs to be warmed slowly by wrapping them in a survival blanket or sleeping bags, huddling together in the same sleeping bag or side-by-side, creating a shelter and adding warm, dry clothing. Monitor using DRSABCD. Do not place the person next to direct heat such as a fire or rub the body, as this increases heat at the skin's surface and removes it from the body core (brain, heart, lungs), which most needs the heat.

Other first aid conditions

Table 10.3 discusses other first aid situations you may encounter in the wilderness. See topic 7 for details on other first aid emergencies.

TABLE 10.3 Other conditions requiring first aid in the wilderness

Condition	Signs and symptoms	Treatment guidelines
Snakebite can generally be avoided by wearing shoes and socks and inspecting logs before lifting them. Most snakes move out of your path if you give them time and space to move. It is rare for them to be aggressive unless they are threatened.	• fang marks • pain at the area • headache, nausea, vomiting • unconsciousness	Apply a firm pressure bandage (see topic 7, page xxx) from the bite site all the way up the limb and back to the site, then use a splint to immobilise the limb. The person must lie still. Medical assistance is needed as quickly as possible.
Blisters can be avoided by wearing boots that fit properly and avoiding wrinkles in socks. Do not walk in wet socks. Cover areas with tape as soon as you notice blisters.	• burning, irritating feeling on pressure points, usually on toes and heels on the feet	• stop • clean and dry the area • use a sterilised needle to prick the blister along the bottom • apply disinfectant • cover with leucoplast tape • once in camp, uncover the blister and allow it to dry out

10.6.2 What to do when you are lost

If you become lost, follow the procedure below.

- If you become lost, STOP and do not panic.
- Find shelter and discuss the situation as a whole group.
- Examine maps carefully and consider retracing your steps back to the last known point on the route plan.
- If the group is not confident about retracing their steps
  - stay together
  - keep a smoky fire going to attract attention
  - conserve energy
  - set up shelter
  - listen for voices
  - stay where you are.
- Distress signals for search and rescue include three short whistle blasts, flashes of a signal mirror, smoke from fires and waving bright clothing.
- If conditions are bad and it is likely that anyone setting off will get into difficulty, the whole group should remain together. Part of effective planning is ensuring that others know your route and expected time of return. Provided you have stayed on the route, authorities should be able to locate you.

Inquiry

Constructing an emergency shelter

1. Use the **Outdoor shelter** weblink in the Resources tab to learn how to construct a debris hut.
2. Discuss the importance of having shelter in emergency situations.

Application

Building a shelter

As a class, build a small emergency shelter using only materials you can find.

Resources

Weblink: Outdoor shelter

10.6.3 Bushfire procedures

Most injuries or loss of life in a bushfire are caused by ignorance and panic. The greatest danger is from radiated heat, hence it is vital to protect yourself by covering all of your skin. If caught out while bushwalking, remember the following points.

- Woollen clothing is best as synthetic materials may melt and bubble.
- Dampen your clothing (use wet mud if possible) and drink a lot of fluid.
- Breathing difficulties may be eased by using a damp cloth as a filter.
- If caught on a ridge line, it is best to stay low to the ground as the air there contains less smoke. Finding a hollow, wombat hole or cave can help.
- Fire generally burns fastest uphill. The fire will race up the slope, pause at the top and may be less intense as it passes over, so the leeward side of a ridge could be the safest.

- In a gully seek a stream, cave or damp bank, but avoid being halfway up a slope.
- If your clothing catches on fire, stop, drop and roll on the ground.
- Once the front has passed, danger remains from half-burnt logs, falling trees and frightened wildlife.
- If you are in your car, stay there. Cover yourself and lie on the floor until the front has passed.

FIGURE 10.31 Points for bushfire survival when on foot (adapted from brochure published by the Bush Fire Council of New South Wales)

10.6.4 Lightning

Lightning storms can be very frightening when camping outdoors. If storms are present, use the following guidelines.

- Erecting tents in sheltered locations of a grove of low shrubs is best.
- Avoid stopping under very large or isolated trees.
- Stay away from wire fences or rock crevices.
- If caught out in the open, remove all metal objects such as trangia stoves and sit on your backpack with your feet and hands off the ground.

10.6.5 Flooded rivers

It is best to plan routes to avoid crossing large rivers, which can be very hazardous. Possible hazards include:

- unstable banks
- fast-flowing water
- deep holes
- cold water
- debris caught on the river bed.

If the river is considered safe to cross, the following guidelines should be followed.

- Throw a stick in the flow to check the speed of the moving water.
- If the water is below knee height, cross the river as individuals, in a diagonal, downstream direction.
- Ensure your gear is in waterproof bags. Use a large plastic bag to line your pack.
- Leave your shoes on unless the river has a clear, sandy bottom.
- Release the waist belt on your pack. If you are swept off your feet, remove the pack from your shoulders.

- If the water is above knee height, try to find a long stick that four to five people can hold onto at waist height. Cross in a diagonal, downstream direction.
- Individuals may cross a river on their own, aided by a stick that they can plant on the upstream side and lean into as they cross.
- Packs can assist with flotation if sufficiently waterproofed inside. Lean back onto the pack and keep your legs and feet up. However, in many instances packs should be shed, as they can become very heavy and weigh down a weak swimmer.
- If in doubt, do not cross.

10.6.6 Skills needed for other outdoor activities relevant to the experience

Canoeing, kayaking and abseiling are outdoor recreation activities whose popularity has increased significantly in recent years. All three activities can be performed as recreational activities, but lend themselves to increased risk taking when performed at the extreme level. Sometimes these activities are programmed as part of an expedition or adventure and require particular knowledge and skills to avoid injury.

Canoeing and kayaking skills

The basic difference between the canoe and kayak is that the canoe is an open vessel while the kayak is enclosed. It is usual to use a single-bladed paddle with the canoe and a double-bladed paddle with the kayak; however, this is not always the case and depends on the type of activity. Rivers, lakes, surf, white water rapids, sprint racing and marathons are some settings where canoes and kayaks are used. Some of these, such as sea and white water kayaking, can be both challenging and dangerous, requiring specific knowledge and particular skills before attempting.

FIGURE 10.32 Canoeing (left) and kayaking (right) should be carried out in groups.

Some skills and behaviours required by canoeists/kayakers include:

- always wear appropriate gear, including helmet, wetsuit, wetsuit shoes and personal flotation device (PFD)
- do not canoe/kayak by yourself and always tell someone if you intend setting out
- research the waterway, dam, river or surf area you intend to use and be aware of places nearby that might be able to provide access or first aid if required
- ensure your canoe/kayak is in good condition
- always challenge yourself within your level of ability, but avoid taking risks that could result in injury

- when paddling be careful to avoid hazards such as sticks, overhanging branches, submerged trees and rocks
- ensure you carry a first aid kit including mobile phone inside a waterproof container
- do not engage in canoeing or kayaking unless you are a competent swimmer
- ensure you have had lessons on entering and exiting the canoe/kayak, paddling and what to do if you capsize
- do not perform the activity if weather conditions are unfavourable or the forecast suggests deteriorating conditions such as thunderstorms, extreme temperatures, big swells or waves, or increased flow in inland rivers.

To learn more about the basic skills of kayaking and canoeing, use the **Basic skills of kayaking** and **Basic skills of canoeing** weblinks in the Resources tab.

Abseiling skills

Abseiling is an adventurous activity that requires the participant to descend a cliff or prefabricated wall using a fixed rope. Most sport and recreation facilities offer abseiling as a challenge activity, while in the bush it has the potential to be a more dangerous yet challenging experience. If you intend to go camping and abseiling, it is good practice to learn basic skills using indoor climbing and abseiling walls to establish proper techniques.

Some skills and behaviours of which the abseiler should be aware include:

- always ensure that the equipment has been checked for safety. This includes items such as harnesses, helmets, ropes, safety lines, gloves and footwear.
- never abseil alone
- develop your skill gradually and progress to greater heights and natural landscapes only after gaining basic abseiling proficiency
- check that you know which knots are required, how to tie them and when to use them
- ensure that all devices are securely in place before using
- avoid sharp edges on rocks when descending
- do not abseil if weather is windy or inclement as you are likely to lose your footing.

To find out more about basic abseiling techniques, use the **How to abseil** weblink in the Resources tab.

FIGURE 10.33 Abseiling is an adventurous activity where steep cliffs can be descended once basic skills have been mastered.

on Resources

- **Weblink:** Basic skills of kayaking
- **Weblink:** Basic skills of canoeing
- **Weblink:** How to abseil

10.7 Leadership styles

The leader's task is to find the right balance between safety, enjoyment and achievement in a group. The leader must have sufficient experience, knowledge and skills to change their style of leadership as they evaluate situations and strive to assist the group achieve its outcomes. A range of different styles of leadership are appropriate to cater for different situations in outdoor recreation. Each style has strengths and weaknesses. An effective leader is able to assume different styles, depending on the situation. Examine table 10.4 which explains the styles of leadership and outlines the strengths and weaknesses of each.

TABLE 10.4 Leadership styles

Style of leadership	Strengths	Weaknesses
Democratic — the leader may call for a vote among the group and the majority wins. Alternatively, the leader may consult all participants and make a decision based on the majority of views without conducting a vote. He or she may try to persuade the group to achieve consensus.	• individuals feel important and valued • the whole group has a chance to give opinions and use their experience • gives the group responsibility and ownership of the decision • wider range of options identified • gives people the opportunity to learn through experience	• not all group members may have the relevant experience to make a decision • creates uncertainty • conflict may result from differing opinions • may take some time to reach a decision • a clear decision may not be reached • slow if safety issue is involved
Laissez–faire — this type of leader is often disorganised, very casual and leaves decisions to chance	• can promote leadership opportunities in the group	• can result in dangerous situations emerging due to lack of leadership • group may not pay enough attention to important issues such as conservation
Autocratic — the leader is clearly in charge. He or she makes decisions without consultation.	• saves time, which can be important in potentially dangerous situations such as bad weather • responsibility is clearly held by decision maker	• removes control from the group members — they have limited input and involvement • participants may have alternatives to the leader's decisions that are not considered • levels of dissatisfaction and frustration may cause conflict
Strategic nonintervention — the leader observes from a distance and steps in only if the situation is becoming dangerous	• promotes group decision making and teamwork • useful in assessment situations where participants are encouraged to display leadership, such as the Duke of Edinburgh Award	• situation may become dangerous if leader doesn't step in at the right time

Application

Debating leadership styles

Debate the style of leadership that would be most effective in each of the following recreation experiences:
(a) a 10 kilometre alpine adventure requiring cross-country skiing and building snow caves

(b) an overnight camp in the mountains in hot weather
(c) a 10 kilometre bushwalk involving abseiling and bushwalking
(d) a canoeing expedition that involved the need to navigate rapids and an overnight camp near the river bank.

10.8 Understanding group dynamics

Many outdoor recreational activities involve working together in groups to achieve a common purpose. Relationships or the group dynamics between group members can determine the success of the expedition and also the extent to which participants enjoy the experience.

A successful model for understanding the stages of group development is summarised in the 'forming', 'storming', 'norming', 'transforming', 'adjourning' model originally developed by educational psychologist, Bruce Tuckerman. Table 10.5 shows a summary of this model.

TABLE 10.5 Stages of group development

Forming	In this stage, most team members are positive and polite. Some are anxious, as they haven't fully understood what work the team will do. Others are simply excited about the task ahead. As leader, you play a dominant role at this stage, because team members' roles and responsibilities aren't clear. This stage can last for some time, as people start to work together, and as they make an effort to get to know their new colleagues.
Storming	Next, the team moves into the storming phase, where people start to push against the boundaries established in the forming stage. This is the stage where many teams fail. Storming often starts where there is a conflict between team members' natural working styles. People may work in different ways for all sorts of reasons, but if differing working styles cause unforeseen problems, people may become frustrated. Storming can also happen in other situations. For example, team members may challenge your authority, or jockey for position as their roles are clarified. Or, if you haven't defined clearly how the team will work, people may feel overwhelmed by their workload, or they could be uncomfortable with the approach you're using. Some may question the worth of the team's goal, and they may resist taking on tasks. Team members who stick with the task at hand may experience stress, particularly as they don't have the support of established processes, or strong relationships with their colleagues.
Norming	Gradually, the team moves into the norming stage. This is when people start to resolve their differences, appreciate colleagues' strengths, and respect your authority as a leader. Now that your team members know one another better, they may socialise together, and they are able to ask each other for help and provide constructive feedback. People develop a stronger commitment to the team goal, and you start to see good progress towards it. There is often a prolonged overlap between storming and norming, because, as new tasks come up, the team may lapse back into behaviour from the storming stage.
Transforming	The team reaches the transforming stage when hard work leads, without friction, to the achievement of the team's goal. The structures and processes that you have set up support this well. As leader, you can delegate much of your work, and you can concentrate on developing team members. It feels easy to be part of the team at this stage, and people who join or leave won't disrupt performance.

(*Continued*)

TABLE 10.5 Stages of group development (*Continued*)

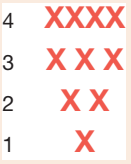
Adjourning	Many teams will reach this stage eventually. For example, project teams exist for only a fixed period, and even permanent teams may be disbanded through organisational restructuring. Team members who like routine, or who have developed close working relationships with other team members, may find this stage difficult, particularly if their future now looks uncertain.

Source: http://www.mindtools.com/pages/article/newLDR_86.htm. Reproduced with the permission of Mind Tools Ltd.

Application

Solving an initiative challenge

1. Divide the class into groups of 10.
2. Each group stands in a triangular formation making a 4-3-2-1 arrangement (see diagram below).



3. From there, change the base with the apex by moving only three people.

10.8.1 Conflict resolution

Effective communication skills are needed to resolve conflict situations that often occur because of misunderstandings between individuals within the group, such as the agreed time to set off in the mornings. Whenever a group of people attempt a common task, there is potential for conflict to occur. Outdoor recreation offers opportunities to develop conflict resolution skills because teamwork and cooperation are essential if the group is to be successful in achieving its goals. In any conflict situation, a resolution occurs only if both parties acknowledge the conflict and are willing to take steps to resolve the problem.

10.8.2 Team building

Outdoor recreation offers considerable challenges and, in some cases, difficult obstacles that need to be overcome by participants working together as a team to achieve a common goal. Successful groups work together effectively by recognising and valuing the strengths and weaknesses of each other.

10.8.3 Cooperation

Successful groups can work cooperatively towards achieving a common goal. Experienced or capable members of the group can assist others who may be slower and less confident by offering encouragement and assisting with equipment. Meal preparation and camp site management are much easier and more enjoyable for all participants if they are tackled by all group members in a cooperative manner. In difficult expeditions, most group members require some encouragement from others in the group at some point.

Application

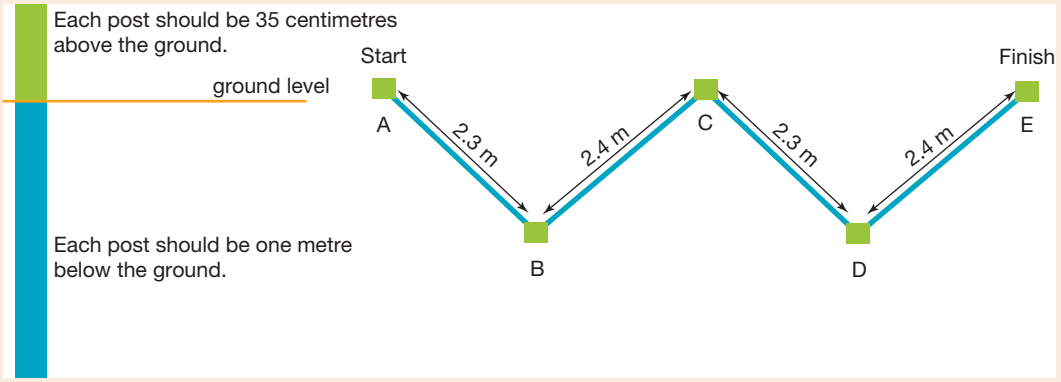
Team building

Visit an outdoor adventure centre that has a ropes course and problem-solving tasks. Work cooperatively to solve simulated initiative challenges. Alternatively, try some team building activities that are designed to enhance

group cohesion when working in teams. Figure 10.34 provides an example. The object of this task is to transport a group from A to E using boards. No part of the boards or of the participants' bodies may touch the ground. The boards must be slotted into the groove in the top of the posts. If any part of the boards or participants touches the ground, the group must start again at A.

You will need two boards. One board should fit the space between A and B, and C and D; the other board should fit the space between B and C, and D and E.

FIGURE 10.34 Course and equipment for the team building and problem-solving task



10.9 Facilitation skills

10.9.1 Communication skills

Effective communication could be the difference between a safe and enjoyable experience and an unhappy and dangerous expedition. Communication in outdoor recreation must involve all participants within the group, as well as relevant authorities and family who are staying behind. Participants need to ensure that all group members are aware of routes, camp sites and possible hazards in case they become separated. Open communication, where all participants feel free to express their opinions and ideas, contributes to effective decision making and group cohesion. Participants should ensure that communication with outside groups, including family and relevant authorities, is also clear.

Accurate details of plans should be left with responsible adults in case of emergency, and mobile phones should be carried for additional safety. It should be noted that in many remote regions, signals for mobile phones may be difficult to obtain and participants may need to climb to a high point to make a connection. In remote areas, participants should consider carrying additional forms of communication used to signal distress, including flares and an EPIRB, which is an emergency signalling device.

10.9.2 Decision making

Many outdoor adventure activities involve groups working together to solve problems, make decisions and judge various situations; for example, deciding whether to cross a fast-flowing river. It is important that the group can develop effective methods of communication and decision making, to ensure that they make progress and have a safe and enjoyable experience.

10.9.3 Flexibility

Weather conditions, ability levels of the participants and injury are just some of the variables that could make a change in plans necessary. Flexibility in planning is therefore essential. Groups need to ensure that they are adequately prepared to extend or change their trip as needed.

CASE STUDY

Group challenges

Josie, Tran, Yasser, Jill and Tony set off on a bushwalking expedition in the Snowy Mountains in October. They had organised to be picked up at their final destination in five days. The group were all very excited about the expedition, which they had been planning for several months. All had done some training in the Ku-ring-gai National Park, which was close to their homes, and felt confident in their fitness levels. Josie and Tran bought all the food for the group and had it organised into five packages of equal weight for the group to carry. Tony was a keen skier and had been to the Snowy Mountains several times in the past. Tony felt confident that he was familiar with the terrain.

The first day was very hard going and soon the group began to separate, with Yasser and Jill starting to lag behind. Yasser was having trouble with his new hiking boots and Jill was struggling with the weight of the backpack. Tony was getting anxious as some black clouds loomed in the distance and the group was still a long way from their planned destination to spend the first night. He suggested that the group not stop for lunch to save time.

As the group climbed higher they began to strike snow and found the walking to be very slippery on the snowy grass. The weight of their packs was difficult to manage in the conditions. The group thought that most of the snow would be melted and were surprised to find themselves trudging through knee-high sections.

At about 4.00 p.m., Josie suggested the group stop and have a rest and look at the map to find a closer place to camp. The wind was getting stronger and it looked like it might rain. Tony spoke out angrily and said that the group must keep going to reach the creek so that they could get water for their overnight camp. But Yasser and Jill were exhausted and refused to go any further. They began to set up their tents. Tony was furious and told them that they were not trying and should not give up so easily, before storming off in a huff.

Josie and Tran had been studying the map and found a waterway marked that was not too far from where the group had stopped. They scouted around the area and found a grove of trees suitable for a camp site and suggested that the group move to the spot. Tony returned and reluctantly agreed, but Yasser and Jill decided to stay where they were, having already unpacked their packs, despite the position being quite open and exposed.

It was getting late and cold and the group could not agree on a camp site. Finally Josie, Tran and Tony set off for the grove of trees and left Yasser and Jill at the spot, agreeing to meet again in the morning. During the night, the wind and rain increased.

Inquiry

Group challenges

In small groups discuss the case study above, which involves a group facing challenges and needing to solve problems on their expedition. Then answer the questions that follow.

1. What problems, challenges and potential hazards did the group in the case study above face?
2. Identify and discuss any poor judgements or bad decisions that were made.
3. Comment on the communication and leadership skills displayed in the group.
4. Write a possible ending for the case study.
5. *Group challenge*: form groups of five. You will need a newspaper and a roll of sticky tape. One person in the group is allocated the role of an observer and the remaining four people are participants.
   (a) The group: using the newspaper and roll of sticky tape, your group has to construct an Australian animal in five minutes.
   (b) The observer: record your observations of the group dynamics displayed under the following headings — roles within the group, methods of communication, skills used to deal with conflict.
   (c) After five minutes the observer is to report to the group. Discuss the aspects of group dynamics, leadership styles and communication that emerged during the activity.

10.10 Understanding strengths and weakness

10.10.1 Participant readiness

Participants must understand the strengths and weaknesses of themselves and others in the group. People have different boundaries of comfort and respond to situations differently. Leaders must strive to ensure that group members are individually catered for. What is exciting and challenging for one individual may be terrifying for another.

Individuals must be given information to form choices surrounding their participation. Leaders need to ensure that participants have sufficient knowledge about what they are getting themselves in for and are therefore ready to face the challenges and take risks within the bounds of their own competence. Leaders must also be able to assess risks on behalf of their inexperienced group, who may not have the knowledge or personal fitness level to accurately assess the situation at hand.

10.10.2 Self-efficacy

Outdoor recreation offers many opportunities to develop self-confidence. Participants may face challenges and strive to overcome them individually or as a part of a group. Facing challenges and fears takes a certain amount of courage and self-efficacy, or confidence that you can complete the task. Participants need determination and tenacity to succeed in difficult conditions and this can contribute to motivation and personal growth in other areas in their lives.

10.10.3 Balancing challenge and safety

Safety considerations are very important to those involved in outdoor recreation as many activities are performed in remote locations a long way from medical assistance. It is imperative that groups who venture into the outdoors have sufficient knowledge and experience to participate safely. The level of risk involved in an activity depends on many factors including:

- prior experience and fitness of the party
- equipment
- weather conditions
- knowledge and skills within the group and group leaders
- choice of activity.

We can minimise risk by using state-of-the-art equipment. However, it would not be desirable to remove all risks in outdoor adventure activities, because this would remove much of the desire to participate in them! Many individuals and groups are attracted to outdoor adventure activities because of the risks and difficulties involved. They force participants to push the limits of their comfort zone. Indeed, many leaders in outdoor adventure activities deliberately set out to push the limits of the comfort zone and provide a thrilling experience with potential for personal growth. Therefore, while we must balance safety and challenge, to remove all risks would kill the excitement and adrenaline rush that participants feel are inherent in many outdoor adventure activities.

The benefits of teamwork and personal growth inherent in outdoor adventure activities have been recognised by many employers, who are increasingly choosing staff development opportunities that involve the challenge of the outdoors. Many outdoor enthusiasts believe that our society is becoming too urbane and preoccupied with being safe, and therefore we miss out on many opportunities presented by undertaking some risk.

However, the role of the experienced person or leader is still to protect the group and sometimes the best option is to cancel the trip or activity in poor conditions, rather than risk injury. Prior to taking part in many outdoor recreational activities, it is the leader's responsibility to assess the level of risk in an activity and then minimise the possible dangers to ensure that challenge and safety are balanced.

10.10.4 Pushing the comfort zone

Our comfort zone refers to the level of risk in a situation that we can tolerate or feel comfortable with. A risky situation is one in which we feel that we may lose something. Assessing risk can be quite an individual thing, depending on the level of experience and confidence a person has. What may be risky for one person may seem perfectly safe to another, depending on prior experience and ability. In a group participating in abseiling for the first time, for example, some individuals may be confident and progress from a five metre to a 30 metre drop quickly, while others in the same group may be sufficiently challenged by simply putting on the harness and getting to the edge of the cliff, without actually proceeding down the cliff. The inexperienced person is challenged by the perceived risk associated with the activity, whereas the experienced person may consider the activity to be risky only if poor equipment or technique are used.

In addition to helping others to assess risk, leaders can also provide opportunities for pushing the comfort zone by introducing controlled or perceived risks. For example, in abseiling the leader would ensure safety ropes and helmets are used to promote the safety of the participants. In this way, the level of risk is controlled by the leader, but the participant still faces a perceived level of risk and is challenged. This means that the participants may still feel challenged and even scared, but the risks of injury are minimised.

Application

Challenging our comfort zone

Visit a sport and recreation or similar facility that offers challenging experiences such as abseiling, high ropes, giant swing and climbing frames. Participate in the activities under the supervision of the trained staff.

Inquiry

Debating issues about risk and adventure

On return from the excursion in the application above, debate the following questions.

- How do you control risks while being encouraged to push beyond your comfort zone?
- What ethical considerations confront an instructor in balancing challenge and safety?

10.11 Topic review

10.11.1 Summary

- Participating in outdoor recreation activities is often seen as an escape to the outdoors and an opportunity to ‘re-create’ oneself.
- Increasingly, more and more Australians are living and working in urban communities, most often in ‘safe’, indoor environments. Therefore it becomes important for these people to interact with nature, test personal limits and participate in activities with adventure in mind.
- Outdoor recreation activities can offer new environments and unfamiliar activities that can assist a person to explore personal limits and capabilities.
- Many outdoor recreational pursuits involve physical activity and can contribute to the development and maintenance of fitness.
- Leaders must have prior experience in the area and research thoroughly before leading a group of less experienced participants. Equipment should be carried that will be suitable for conditions likely to be encountered.

- On an expedition, a group may need to use an escape route if the weather changes, participants are not coping with the terrain, or an injury is suffered.
- Specific emergencies in outdoor recreational expeditions could include snakebites, cuts and grazes, bites and stings, hypothermia, hyperthermia, sprains, strains and blisters. The group needs to have the knowledge and skills to cope with such problems.
- Hypothermia is a condition associated with lowered body temperature and is often called exposure. It can result in death if not treated.
- It is essential that participants prepare a balanced intake of food during extended activity. Kilojoule intake needs to be high in physically demanding activities to provide energy for activity and to keep the body warm. Carbohydrates need to be the dominant food group consumed, followed by protein and fats.
- Outdoor recreational activities demand lightweight, durable equipment and clothing that will protect you from environmental conditions.
- All campers have a responsibility to have a minimal impact on the outdoor environment. Participants need knowledge and skills in relation to waste management, erosion control, protecting flora and fauna, and managing fires.
- Everything that is carried in must be taken out.
- Contour lines join all places of equal height above sea level on a map. They provide information about the shape, steepness and height of the land.
- Many accidents and emergencies occur because of poor planning or inadequate knowledge and skills.
- A range of different styles of leadership are appropriate to cater for different situations in outdoor recreation. Each style has strengths and weaknesses. An effective leader is able to assume different styles, depending on the situation.
- It is important that the group can develop effective methods of communication and decision making, to ensure that they make progress and have a safe and enjoyable experience.
- Facing challenges and fears takes a certain amount of courage and self-efficacy, or confidence that you can complete the task.

10.11.2 Questions

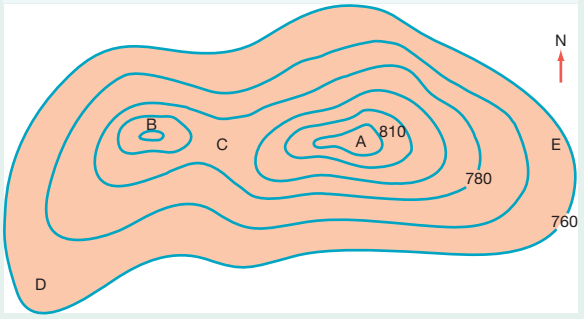
Revision

1. **Describe** the potential value that participation in outdoor recreational activities may offer individuals and society. (P6, P10, P16) (5 marks)
2. Choose one outdoor recreational activity. Prepare a list of the risks and potential hazards involved and how they could be reduced or overcome. (P14, P17) (6 marks)
3. **Construct** a check list of planning tasks that would need to be done before participating in a four-day bushwalking, canoeing or mountain biking expedition in a national park. (P14) (5 marks)
4. Camp fires have become a contentious issue for many participants in outdoor recreational activities. **Discuss** the positive and negative aspects of using camp fires and identify steps that can be taken to minimise the harm from them. (P14) (6 marks)
5. **Describe** key behaviours and attitudes that are important in minimal impact bushwalking. (P14) (4 marks)
6. **Describe** the procedures your group could take if it becomes lost in a wilderness location. (P6, P14) (5 marks)
7. A group of inexperienced mountaineers, accompanied by two experienced leaders, is confronted by gale force winds and snow, reducing visibility to one metre. A decision needs to be made about whether to continue with the expedition, set up camp where the group are, or to proceed down the mountain and abort the expedition. Select the most appropriate form of leadership for the situation described. **Justify** your decision. (P6, P10, P14) (5 marks)
8. **Create** a code of conduct that could be used by commercial adventure companies to ensure that they have minimal impact on the natural environment. (P6, P14) (5 marks)
9. **Create** and present a practical demonstration to the class on one of these technical aspects of outdoor recreation:
   (a) camp site selection

(b) menu planning and/or outdoor cooking
(c) an aspect of navigation. (P14) (6 marks)

10. Use the contour map in figure 10.35 to answer the questions below. Each line on the map represents a 10 metre change in altitude.

FIGURE 10.35



(a) Is A higher or lower than B?
(b) What type of landform is C?
(c) Could you see B from E?
(d) Where would a trig station be located? (A trig station is a high point used as a point of reference by surveyors.)
(e) Locate two spurs on the map.
(f) Mark with an X a suitable place for a picnic lunch on a day with strong south westerly winds.
(g) Which point would be the best place to camp? **Explain** your decision. (P14) (7 marks)

11. Use figure 10.36 to answer the following questions.

FIGURE 10.36

(a) Draw the easiest route to the plateau at A.
(b) Can you see B from C?
(c) Label the saddle on the map with an S.
(d) Use dotted lines to plot an interesting day walk. Remember it is easiest to walk up spurs and that precautions must be taken when crossing rivers. Include walking along the valleys as well as taking in some high points for coastal views.
(e) Would D be a good camp site? Why or why not? (P14) (5 marks)

12. **Explain** the difference between canoeing and kayaking. (P10) (2 marks)
13. **Discuss** how leadership styles and group dynamics might affect planning of a three-day wilderness expedition. (P14, P16) (6 marks)

Extension

1. **Explain** the relationship between challenge, risk and safety in outdoor recreational activities. (6 marks)
2. Use the weblinks in the Resources tab for the following organisations to find more information relating to outdoor recreation. (10 marks)
   - **The Wilderness Society**
   - ***Wild*, Australia's Wilderness Adventure Magazine**
   - **Australian Canoeing Online**
   - **Greenpeace**
   - **Australian Conservation Foundation**
   - **New South Wales National Parks and Wildlife Service**

Note: For an explanation of the key words used in the revision questions above, see Appendix 2, page xxx.

Resources

Weblink: The Wilderness Society
Weblink: *Wild*, Australia's Wilderness Adventure Magazine
Weblink: Australian Canoeing Online
Weblink: Greenpeace
Weblink: Australian Conservation Foundation
Weblink: New South Wales National Parks and Wildlife Service
Interactivity: Revision quiz: auto-marked version (int-7249)
Interactivity: Missing word interactive quiz (int-7250)
Digital doc: Revision quiz (doc-26267)

10.11.3 Key terms

A **bearing** is the direction of travel measured as the angle from 0° (north) and recorded in degrees. For example, to travel south the bearing would be 180°. *p. 379*

Cardinal points on the compass are the major directional points; that is, north, south, east and west. *p. 379*

An **escape route** is an alternative way out of an area. It is best if a road or settlement is nearby. *p. 357*

Grid north is the top of the map. It is usually the same as true north. *p. 378*

Magnetic north is in the direction of the North Pole and changes slightly every year. A compass needle points towards magnetic north. *p. 378*

Magnetic variation refers to the difference between true north and magnetic north. When navigating we need to take this difference into consideration. *p. 378*

Scale is the ratio between the distance measured on a map and the actual distance measured on the Earth's surface. *p. 374*

Scroggin refers to high energy foods such as dried fruit, nuts and chocolate that are suitable for snacks on expeditions. *p. 360*

True north is the direction of the North Pole. *p. 378*

Urbanisation refers to the trend towards more people living in cities. *p. 352*